



Statutory Planning Committee

Notice is hereby given that a meeting of the
Statutory Planning Committee will be held on:

**Tuesday 14 August 2012
10.00 am**

**Level 2, Room 2.39
One40 William Street
Perth**



Noelene Jennings
Executive Director, Governance and People Services

Statutory Planning Committee

Membership:

Member	Representation in accordance with <i>Planning and Development Act 2005</i>	Term of office ends
Mr Gary PRATTLEY	Chairperson, WAPC Schedule 2 clause 4(2)(a)	20/4/2013
Ms Sue BURROWS	Nominee of the Director General, Department of Planning Schedule 2 clause 4(2)(b)	16/4/2013
Mr Henty FARRAR	Regional Minister nominee Schedule 2 clause 4(2)(c)	26/9/2013
Ms Elizabeth TAYLOR	Community representative Schedule 2 clause 4(2)(d)	1/2/2012
Mr Ian HOLLOWAY	Professions representative Schedule 2 clause 4(2)(e)	1/2/2012
Mayor Carol ADAMS	Local Government representative Schedule 2 clause 4(2)(f)	1/2/2012
Vacant	WAPC Nominee Schedule 2 clause 4(2)(g)	N/A

Quorum: 4

In accordance with the Western Australian Planning Commission (WAPC) Standing Orders 2009, 3.7 - Quorum for meetings:

(2) A quorum for a meeting of a committee is at least 50% of the number of offices (whether vacant or not) of members of the committee.

Role:

Schedule 2(4)(4) of the *Planning and Development Act 2005*

The Statutory Planning Committee is the WAPC's regulatory decision-making body and performs such of the statutory planning functions of the WAPC under the *Planning and Development Act 2005* and Part II of the *Strata Titles Act 1985* as are delegated to the Statutory Planning Committee under section 16 and such other functions as are delegated to it under that section. These functions include approval of the subdivision of land, approval of leases and licenses, approval of strata schemes, advice to the Minister for Planning on local planning schemes and scheme amendments, and the determination of certain development applications under the Metropolitan Region Scheme.

Delegated Authority

- 2.1 Power to determine applications for approval to commence and carry out development lodged with or referred to the WAPC pursuant to the provisions of a region scheme.
- 2.2 Power to approve detailed plans requiring the subsequent approval of the WAPC as a condition of development approval pursuant to the provisions of a region scheme and

power to confirm that conditions imposed by the WAPC on a development approval pursuant to the provisions of a region scheme have been complied with.

- 2.3 Power to determine whether or not proposals and the ongoing implementation of a region scheme comply with conditions (if any) applied pursuant to sections 48F and 48J of the *Environmental Protection Act 1986*.
- 2.4 Power to determine whether or not applications to commence and carry out development are of State or regional importance, or in the public interest, pursuant to any resolution of the WAPC made under a region scheme requiring such determination.
- 2.5 Power to request the Minister for Planning to approve the WAPC disregarding the advice of the Swan River Trust in whole or in part in relation to the approval of development of land within the Riverbank or Development Control Area as defined under the *Swan and Canning Rivers Management Act 2006* where the determining authority is the WAPC.
- 2.6 All functions of the WAPC as set out in -
 - (i) Sections 14(a), 14(c), 34, 97, 98, 100, 104, 105, 106, 107, 109, 110, 111, 134, 135, 136, 138, 139, 140, 142, 143, 144, 145, 147, 151, 153, 154, 157, 169, 185, 214, 215, 216 of the Act;
 - (ii) Town Planning Regulations 1967;
 - (iii) Regulations 21, 22, 24 and 27 of the Planning and Development Regulations 2009;
 - (iv) *Strata Titles Act 1985* or the provisions of a strata or survey-strata scheme;
 - (v) Strata Titles General Regulations 1996;
 - (vi) Section 52 and section 85 of the *Land Administration Act 1997*;
 - (vii) Section 40 of the *Liquor Control Act 1988*;
 - (viii) *Perry Lakes Redevelopment Act 2005*.
- 2.7 Power to determine requests for variations to plans of subdivision where WAPC approval is required pursuant to the provisions of an approved local planning scheme.
- 2.8 Power to provide comment on and grant approval to plans known generally as outline development plans, structure plans and similar plans, and to planning policies and similar documents or amendments thereto, requiring the approval or endorsement of the WAPC pursuant to the provisions of a local planning scheme.
- 2.9 Power to provide comments or advice on behalf of the WAPC to a local government or a redevelopment authority where a provision of a local planning scheme or a redevelopment scheme requires comments from the WAPC.
- 2.10 Power to execute and accept the benefit of easements in gross, covenants in gross, records on title and other instruments for dealings in land for subdivisions, strata subdivisions and developments in accordance with any applicable policy and legislation.
- 2.11 Power to make recommendations to the Minister for Planning in relation to requests from local governments to expend monies paid by subdividing land owners in lieu of setting aside free of cost to the Crown, areas of land for public open space, where such recommendations are in accordance with WAPC policy.

- 2.12 Power to determine whether or not a proposal is likely to have a significant effect on the environment pursuant to section 38(1) of the *Environmental Protection Act 1986* and to refer such proposal to the Environmental Protection Authority.
- 2.13 Power to waive or clear conditions affixed as conditions of approval.
- 2.14 Power to endorse diagrams and plans of survey and deposited plans involving the acquisition and resumption of land created pursuant to Part 11 of the Act and the *Land Administration Act 1997*.
- 2.15 Power to advise the Minister for Planning on any appeal or matter arising therefrom pursuant to Part 14 of the Act.
- 2.16 Power to defend and otherwise deal with applications for review lodged with the State Administrative Tribunal and to appeal, defend, respond and otherwise deal with any matter that may be appealed to the Supreme Court on a question of law.
- 2.17 Power to defend, respond, appeal and otherwise deal with legal proceedings.
- 2.18 Power to prepare and approve, subject to the prior approval of the Minister for Planning, policies relating to planning matters and/or the functions of the WAPC, save and except for State Planning Policies under Part 3 of the Act.
- 2.19 Power to determine matters under Regional Interim Development Orders.

This meeting is not open to members of the public.

RELEVANT INFORMATION FOR MEMBERS

Disclosure of interests

In accordance with the *Planning and Development Act 2005* and Part 6 of the Standing Orders 2009, members of Committees (and certain employees) are required to disclose the following types of interests that they have or persons closely associated to them, have:

- direct and indirect pecuniary interests (financial);
- proximity interests (location); and
- impartiality interests (relationship).

A “**direct pecuniary interest**” means a relevant person’s interest in a matter where it is reasonable to expect that the matter if dealt with by the board or a Committee, or an employee in a particular way, will result in a financial gain, loss, benefit or detriment for the person.

An “**indirect pecuniary interest**” means a relevant person’s interest in a matter where a financial relationship exists between that person and another person who requires a board or Committee decision in relation to the matter.

A “**proximity interest**” means a relevant person’s interest in a matter if the matter concerns -

- (i) a proposed change to a planning scheme affecting land that adjoins the person’s land;
- (ii) a proposed change to the zoning or use of land that adjoins the person’s land; or
- (iii) a proposed development, maintenance or management of the land or of services or facilities on the land that adjoins the person’s land.

An “**Impartiality interest**” means an interest that could, or could reasonably be perceived to, adversely affect the impartiality of the member having the interest and includes an interest arising from kinship, friendship, partnership or membership of an association or an association with any decision making process relating to a matter for discussion before the board or a Committee.

Members disclosing any pecuniary or proximity interests for an item can not participate in discussion or the decision making procedure relating to the item and must leave the meeting room during the discussion of the item. Members disclosing an impartiality interest in an item must also leave the room during the discussion or the decision making procedure relating to the item unless the Committee, by formal resolution, allows the member to remain. The reason to allow a member to remain must be stated in the formal resolution and will be minuted.

Disclosure of representations

Where a member has had verbal communication with or on behalf of a person with an interest in a matter which is before a meeting, the member is to disclose the interest.

Where a member is in receipt of relevant written material (including email) from or on behalf of a person with an interest in a matter which is before a meeting, the member is to table the material at the meeting for the information of members and relevant employees.

ORDER OF BUSINESS

- 1. Declaration of opening**
- 2. Apologies**
- 3. Members on leave of absence and applications for leave of absence**
- 4. Disclosure of interests**
- 5. Declaration of due consideration**
- 6. Deputations and presentations**
- 7. Announcements by the Chairperson of the board and communication from the WAPC**
- 8. Confirmation of minutes of the meeting of 24 July 2012**
- 9. Reports (see attached index of reports)**
- 10. Confidential items (see attached index of reports)**
- 11. General business**
- 12. Items for consideration at a future meeting**
Nil
- 13. Closure - next meeting to be held on 28 August 2012**

Statutory Planning Committee

Minutes
of ordinary meeting 7464
held on Tuesday 24 July 2012

Attendance

Members

Mr Gary Prattley	WAPC Chairman (Presiding Member)
Mayor Carol Adams	Local Government representative
Ms Sue Burrows	Nominee of Director General, Department of Planning
Mr Henty Farrar	Regional Minister's nominee
Mr Ian Holloway	Professional representative
Ms Elizabeth Taylor	Community representative

Officers

Ms Nicole Lucas-Smith	Department of Planning Principal Planner, Perth and Peel Planning (item 10.1)
Ms Marion Thompson	Urban Development Co-ordinator, Infrastructure Planning and Coordination (item 10.1)
Mr Wayne Zimmermann	Planning Director, Perth and Peel Planning (item 10.1)

Committee Support

Mr Luke Downes	Committee Support Officer - Department of Planning
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7464.1 Declaration of Opening

The Presiding Member declared the meeting open at 10.00 am, acknowledged the traditional owners and custodians of the land on which the meeting is taking place and welcomed members.

7464.2 Apologies

Nil.

7464.3 Members on Leave of Absence and Applications for Leave of Absence

Nil.

7464.4 Disclosure of Interests

Nil.

Statutory Planning Committee

Minutes
of ordinary meeting 7464
held on Tuesday 24 July 2012

7464.5 Declaration of Due Consideration

No declarations were made.

7464.6 Deputations and Presentations

Nil.

7464.7 Announcements by the Chairperson of the Board and communication from the WAPC

Nil.

7464.8 Confirmation of Minutes

7464.8.1 **Minutes of the Statutory Planning Committee meeting held on Tuesday 10 July 2012**

Resolved

Moved by Mayor Adams, seconded by Ms Taylor

The Committee was advised that for item 7463.10.2, an incorrect date had been inserted into the officer's recommendation and subsequent resolution.

The Western Australian Planning Commission resolved:

1. THIS ITEM IS CONFIDENTIAL

2. *that the minutes of the Statutory Planning Committee meeting held on Tuesday 10 July 2012 as amended, be confirmed as a true and correct record of the proceedings.*

The motion was put and carried.

Statutory Planning Committee

Minutes
of ordinary meeting 7464
held on Tuesday 24 July 2012

7464.9 Reports

7464.9.1 **Aboriginal Settlements Guideline 1 - Layout Plan Provisions, and Aboriginal Settlements Guideline 3 - Exclusion Boundaries**

File DPI09/01997V2
Report Number SPC/222
Agenda Part A
Reporting Officer Principal Planner, Operational Policy Coordination

Resolved

Moved by Mr Holloway, seconded by Ms Taylor

That the Western Australian Planning Commission resolves to:

- 1. endorse Aboriginal Settlements Guideline 1 – Layout Plan Provisions;*
- 2. endorse Aboriginal Settlements Guideline 3 – Exclusion Boundaries.*

The motion was put and carried.

7464.9.2 **Aboriginal Settlement Layout Plans - for Endorsement**

File DP/057/1/1/25P86V
Report Number SPC/223
Agenda Part C
Reporting Officer Manager Planning - Aboriginal Communities

Resolved

Moved by Ms Taylor, seconded by Ms Burrows

That the Western Australian Planning Commission resolves to endorse the Aboriginal settlement Layout Plans and Layout Plan amendments for:

- 1. Billiluna Layout Plan 1;*
- 2. Tjuntjuntjara Layout Plan 1. (Amendment 2)*

The motion was put and carried.

Statutory Planning Committee

Minutes
of ordinary meeting 7464
held on Tuesday 24 July 2012

7464.10 Confidential Items

- 7464.10.1 Model Subdivision Condition Schedule**
File DPI09/01997V2
Report Number SPC/224
Agenda Part A
Reporting Officer Principal Planner, Operational Policy
Coordination

THIS ITEM IS CONFIDENTIAL

- 7464.10.2 Red Hill Hard Rock Quarry - Lot 11 Toodyay Road Red Hill - Status of Approval**
File 21-50418-2
Report Number SPC/225
Agenda Part D
Reporting Officer A/Director - Metropolitan Planning North
East

THIS ITEM IS CONFIDENTIAL

- 7464.10.3 Shire of Broome Local Planning Scheme No. 6 – Resolution to Prepare a Local Planning Scheme**
File TPS/0915
Report Number SPC/226
Agenda Part E
Reporting Officer Planning Director Northern Regions

THIS ITEM IS CONFIDENTIAL

- 7464.10.4 Shire of Trayning - Local Planning Scheme No. 1 and Local Planning Strategy - for Final Approval**
File TPS/0179
Report Number SPC/227
Agenda Part E
Reporting Officer Executive Director, Regional Planning &
Strategy

THIS ITEM IS CONFIDENTIAL

7464.11 General Business

- 7464.11.1 R-Codes**

Ms Taylor queried the status of the R-Codes approval. The Chairman had advised that the R-Codes had been approved by the Western Australian Planning Commission at the meeting of 26 June 2012.

Statutory Planning Committee

Minutes
of ordinary meeting 7464
held on Tuesday 24 July 2012

7464.12 Items for Consideration at a Future Meeting

Nil.

7464.13 Closure

The next ordinary meeting is scheduled for 10.00 am on 14 August 2012.

There being no further business before the Committee, the Presiding Member thanked members for their attendance and declared the meeting closed at 10.56 am.

PRESIDING MEMBER _____

DATE _____

UNCONFIRMED

INDEX OF REPORTS

Item	Description
9	REPORTS
	A POLICIES
9.1	FINALISATION AND ADOPTION OF IPWEA LOCAL GOVERNMENT GUIDELINES FOR SUBDIVISIONAL DEVELOPMENT
9.2	TRANSPORT ASSESSMENT GUIDELINES
	C SUBDIVISIONAL / STRATA ITEMS / DEVELOPMENTS
9.3	DEVELOPMENT APPLICATION FOR INTEGRATED RESPITE CARE AND TRANSITIONAL ACCOMMODATION FACILITY - LOT 13 RESERVE RD, SPEARWOOD
	G DEVELOPMENTS / SUBDIVISIONAL / SURVEY STRATA
9.4	APPLICATION FOR RETROSPECTIVE APPROVAL OF EXPANSION OF EXISTING POULTRY FARM (BIRD NUMBERS) AND ASSOCIATED BUILDINGS AND STRUCTURES. APPLICATION FOR APPROVAL TO CONSTRUCT VENTILATION STACKS, ABLUTION FACILITY AND OTHER ASSOCIATED IMPROVEMENTS TO POULTRY FARM. LOT 600 CHELTENHAM ROAD, WEST SWAN.
10	CONFIDENTIAL REPORTS
	B LOCAL PLANNING SCHEMES / AMENDMENTS
10.1	CITY OF FREMANTLE - LOCAL PLANNING SCHEME NO.4 AMENDMENT NO.45 - FOR FINAL APPROVAL
10.2	DAMPIER PENINSULA PLANNING STRATEGY (DRAFT) - CONSENT TO ADVERTISE FOR PUBLIC COMMENT

D GENERAL ITEMS / OTHER MATTERS

- 10.3 RECONSIDERATION: SUBDIVISION TO CREATE TWO RESIDENTIAL LOTS – LOT 241 GREAT EASTERN HIGHWAY, DARLINGTON.
- 10.4 INFORMAL STATE ADMINISTRATIVE TRIBUNAL RECONSIDERATION OF DEVELOPMENT APPLICATION - REQUEST FOR RETROSPECTIVE APPROVAL FOR THE YANCHEP BOARDWALK
- 10.5 STATE ADMINISTRATIVE TRIBUNAL REVIEW: RECONSIDERATION OF DEEMED REFUSAL OF DEVELOPMENT APPLICATION

E LOCAL PLANNING SCHEME AMENDMENT

- 10.6 CITY OF MANDURAH - LOCAL PLANNING SCHEME AMENDMENT 118 - FOR FINAL APPROVAL

G DEVELOPMENTS / SUBDIVISIONAL / SURVEY STRATA

- 10.7 STATE ADMINISTRATIVE TRIBUNAL REVIEW: RECONSIDERATION OF PROPOSED SUBDIVISION AT LOT 251 VICTORIA ROAD, WATTLE GROVE



ITEM NO: 9.1

FINALISATION AND ADOPTION OF IPWEA LOCAL GOVERNMENT GUIDELINES FOR SUBDIVISIONAL DEVELOPMENT

WAPC OR COMMITTEE: Statutory Planning Committee

REPORTING AGENCY: Department of Planning
REPORTING OFFICER: Urban Development Coordinator, Infrastructure Planning and Coordination
AUTHORISING OFFICER: Executive Director, Strategy, Policy and Projects
AGENDA PART: A
FILE NO: DP/12/00796/2
DATE: 8 August 2012
ATTACHMENT(S): 1- WAPC resolution of 12 April 2011
2- Summary of Submissions
3- Peer review- Kent McDowall
4- Outstanding matters listed by IPWEA Steering Committee for 2012 review
5- Copy of IPWEA Guidelines Edition 2.2, 2012 with modifications

RECOMMENDATION:

That the Western Australian Planning Commission resolves to:

- 1. adopt the Institute of Public Works Engineering Australia Guidelines version 2.2, 2012 as a 'Guidelines' document within the policy framework, as the current best practice minimum engineering standards to support subdivision conditions state-wide;*
- 2. endorse the use of the Guidelines version 2.2 as a default minimum standard in cases where the WAPC is asked to clear subdivision engineering conditions under S145 of the Planning and Development Act;*
- 3. advise the Institute of Public Works Engineering Australia that it shares Urban Development Institute of Australia's concerns regarding the reluctance of local governments to adopt the guidelines without significant*

Edition 2.1 in December 2010. IPWEA has committed to regular reviews of the Guidelines, with the next major review due in 2012.

The review of these Guidelines was strategic priority 3.14 of *Planning Makes it Happen*, the Blueprint for Planning Reform, released in September 2009. The Guidelines were seen as critical to underpin model subdivision conditions- and in particular to identify the specific engineering standard or requirements that needed to be met for subdivisional works. There was concern that there was significant inconsistency in engineering requirements being requested by local governments across the state.

CONSULTATION:

The WAPC at its Statutory Planning Committee meeting on 12 April 2011 resolved to advertise Edition 2.1 of the Guidelines for 42 days, with the intention of adopting them as Guidance and referring to them in advice notes on subdivisions as being the current best practice 'minimum' standard. Consultation was seen as necessary as IPWEA had not undertaken broad industry nor local government consultation.

Edition 2.1 of the Guidelines was also adopted in the interim as a default minimum standard in cases where the WAPC was asked to clear subdivision conditions under S145 of the *Planning and Development Act, 2005*. The 12 April 2011 adopted resolution is at Attachment 1.

Following proofreading, the guidelines were advertised for 42 days from 10 August until 26 September 2011. A total of 28 submissions were received:

- 21 submissions from Local Governments
- 3 from industry associations
- 2 from state government agencies (Department of Water and Swan River Trust)
- One from an individual and one from a private engineering consulting firm.

A summary of submissions is at Attachment 2.

Most submissions were fully or partly in support of the guidelines and a number were neutral. Modifications or technical queries were raised in a number of submissions. Many Local Governments, while supporting the guidelines, saw the need for local 'addendums' to accommodate local circumstances, and requested that the guidelines not be adopted as 'policy' but instead as 'guidance'.

The Urban Development Institute of Australia (UDIA) in its submission noted that it has strongly supported the Guidelines, as it believes that it is imperative that there be a consistent minimum standard for subdivision across the state. However, it was concerned that the guidelines need to be endorsed by WAPC and become the expected standard against which disputes in SAT are determined. UDIA is also concerned that there has been no history of widespread adoption of previous editions of the guidelines without significant customisation by Local Government. However UDIA still wishes to maintain flexibility for developers to negotiate different standards in specific locations.

The IPWEA Guidelines Steering Committee was subsequently re-formed to consider submissions, as a number raised detailed technical issues. The Steering Committee completed its consideration of changes in June 2012 and the Guidelines, Edition 2.2, has now been agreed by the Steering Committee. The Committee has also prepared a schedule of outstanding matters that it recommends be considered as part of IPWEA's intended next (2012) review (refer Attachment 4). It should be noted that the Steering Committee included a UDIA member, and a representative each from the Department of Planning and Department of Water.

The Guidelines with modifications (Edition 2.2) are at Attachment 5.

COMMENTS:

1. Adoption and policy status of Guidelines

The WAPC does not currently specify engineering conditions in such detail as to prescribe standards, instead allowing Local Governments to negotiate directly with developers/proponents on specific engineering requirements. To provide greater clarity for the development industry as to the standard of works required to construct a subdivision, and in the interests of greater consistency state-wide; improved clarity of requirements is considered desirable.

However, both the development industry and Local Government in their submissions, indicate that they still wish to accommodate flexibility to allow for innovation and site specific responses.

The Director General of the Department of Planning requested the draft guidelines be peer reviewed by an engineering expert to ensure that after lengthy review and evaluation they still reflected best engineering practice. The Director General requested the review be undertaken by Mr Kent McDowall.

Edition 2.1 was peer reviewed by Mr Kent McDowall (comments at Attachment 3) who considered that they provided a very good guide as to best practice subdivisional development of land within the Perth region when it is relatively flat, sand plain terrain. Mr McDowall however noted that the Guidelines do not deal with earthworking for steeper lots and emphasized that the reader would have to have professional civil engineering qualifications and experience. He suggested that they should continue to be used as guidelines but not given any 'legal or pseudo legal' status.

The Guidelines with modifications agreed by the Steering Committee are considered appropriate for adoption, given the extensive and lengthy review process undertaken. It is recommended that they be adopted by the WAPC as a 'Guidance' document within the policy framework (Planning Guidelines and Manuals), acknowledging IPWEA copyright.

As per the 12 April 2011 resolution, the Guidelines should also be endorsed as a default minimum standard in cases where the WAPC is asked to clear subdivision engineering conditions under S145 of the *Planning and Development Act, 2005*.

2. Link to Model Subdivision Conditions and Advice

The report on the Model Subdivision Conditions, presented to the SPC at its last meeting (24th July 2012) includes an advice note (Ta2) to be applied to all subdivisions with subdivisional engineering conditions, as follows:

The landowner/applicant and the local government are advised to refer to the Institute of Public Works Engineering Australia Local Government Guidelines for Subdivisional Development (current edition). The guidelines set out the minimum best practice requirements recommended for subdivision construction and granting clearance of engineering conditions imposed.

While advice notes have no legal status, inclusion of such an advice note is intended to indicate to both the proponents and clearance agencies, the standards and requirements that are appropriate to support WAPC subdivision conditions. This approach is seen to provide the balance between certainty and flexibility sought by industry and regulators.

3. Providing for flexibility and local variations

Submissions from Local Governments indicated that a number of them intend to use the Guidelines as a minimum, but develop 'addendums' where they will detail 'city/shire specific' requirements. No Local Government outlined with any clarity those specific areas where they considered variations were warranted. As noted by the UDIA, this approach will reduce the objective of state wide consistency and clarity of requirements.

The current Guidelines are lengthy and contain significant descriptive text about the subdivision and planning processes and legislative frameworks, as well a mixture of standards and specific design criteria. It is recommended that as part of its planned 2012 review, IPWEA consider separating out the planning and legislative framework sections, identify those standards or specifications that are appropriately applied state wide, and those where local variation is warranted.

It is also recommended that Mr Kent McDowall's comments be provided to IPWEA for its consideration as part of the planned 2012 review, (Attachment 3) along with the matters raised in submissions that the Steering Committee has deferred for consideration (refer Attachment 4).

CONCLUSION:

It is recommended that the Guidelines Edition 2.2 including modifications as agreed by the IPWEA Steering Committee, be adopted by the WAPC as a Guidelines documents within the policy framework, and endorsed as a default minimum standard in cases where the WAPC is asked to clear subdivision engineering conditions under S145 of *the Planning and Development Act, 2005*.

As IPWEA has committed to a review of the edition 2.2, it is recommended that the Institute be requested to consider that the next Edition identifies those standards or requirements that should be applied state wide, as distinct from those where local variation can be shown to be justified.

ATTACHMENT 1

RESOLUTION OF STATUTORY PLANNING COMMITTEE 12 APRIL 2012

That the Western Australian Planning Commission resolves to:

- 1. advertise Edition 2.1, subject to agreement of IPWEA at item 2, of the IPWEA Subdivisional Guidelines for 42 days to key stakeholders (including Local Government, the development and consulting engineering sectors and associations), with the intention of adopting Edition 2.1 of the Guidelines and referring to them in advice notes on subdivision as being the current minimum standard;*
- 2. request IPWEA to agree to this approach and to mutually agree to a list of key stakeholders for consultation;*
- 3. adopt Edition 2.1 of the IPWEA Guidelines in the interim as a default minimum standard in cases where the WAPC is asked to clear subdivision conditions under s145 of the Planning and Development Act 2005;*
- 4. fund professional editing and proofreading of the guidelines to ensure they are at a standard appropriate for public consultation, and requests IPWEA to fund the insertion of the required corrections.*

IPWEA Guidelines Submissions						
no.	date	name	Organisation	Contact	Support/Response	Comment
						Section of guidelines
						Summary
1	12/09/2011	Rob Korenhof	City of Wanneroo	9405 5000 [bell@cambridge.wa.gov.au]	support in part	The City has its own "Guidelines for the Development and Subdivision of Land" using the Aus-Spec standard. The City will present these guidelines to be used along with their own addendum detailing City specific requirements including road design criteria and specs, ground conditions, preservation of flora and fauna, retaining walls and filling, stormwater drainage design specs, footpath design etc.
2	15/09/2011	Jon Bell	Town of Cambridge	Jon Bell [bell@cambridge.wa.gov.au]	support	The Town will use these guidelines as the default for subdivisional developments, and will provide addendums as appropriate for each subdivision
3	15/09/2011	Griffin Longley	Nature Play WA (Dept Sport and Rec)	Griffin Longley [Griffin.Longley@dsr.wa.gov.au]	neutral	Asks that reference to "modular units" be removed from section on Playground Equipment so as not to limit the types of 'play spaces' provided for children, and the reference specifically to modular units may be too limiting to achieve the goal of encouraging children to explore natural elements of their surroundings. 6.3.3.7
4	15/09/2011	Bill Till/Ken McIntosh	Department of Water	bill.till@water.wa.gov.au	support	Spelling and referencing corrections are required. Recommends some edits, and suggests that the planned 2012 comprehensive review be conducted as soon as possible to improve clarity
5	21/09/2011	Sabbir Hussain	City of Cockburn	Sabbir Hussain [shussain@cockburn.wa.gov.au]	support	City is happy to endorse guidelines as minimum default standard to be used by WAPC. The City has its own guidelines that will prevail where the City standard exceeds that of the guidelines.
6	21/09/2011	Graeme Jones	Shire of Busselton	Graeme Jones [Graeme.Jones@busselton.wa.gov.au]	neutral	2.2.1.5.7 fire breaks, 3.3.6 cul-de-sac turning circles, 4.3.3.7 stormwater infiltration, 4.3.4 design in rural areas, 6.3.3.2.2 development process
7	21/09/2011	Nicholas Deeks	GHD	Nicholas.Deeks@ghd.com	neutral	Technical comments throughout section 4: reword 'one in 100 year ARI event, Figure 4.3 suggest a lower afflux value used; compensating basin design, Fig 4.4 suggest 5 year ARI is min standard for servcability.
8	22/09/2011	vesna kiurski	Town of Kwimana	Vesna Kiurski [Vesna.Kiurski@vesna.kiurski.com.au]	support	Some data is outdated or incorrect including Ausroads guidelines and titles, (pg 40 and 54). Practical completion, AS for protection of Trees, bonding at 2.20.1, title on page 111. 1.17.2, 1.17.4, 1.20.1, 2.2.1.5, pg 111
9	23/09/2011	Judy Harley	UDIA	J.Harley@udia.wa.com.au	neutral	Guidelines need to be the standard by which SAT disputes are determined to have desired weight. The documents extensive coverage and detail may turn into a barrier for adoption by LG's who significantly customise for their own areas. Suggest that if the desired outcome is not being met, simplifying the document to only cover important aspects of subdivisional development would increase LG's adoption of the guidelines. The length of the guidelines illustrates the fact that the process is unnecessarily complex. Sections 1, 2, 3, 5, 7, 8

10	23/09/2011	Jim Coten	City of Swan	Jim Coten [jim.coten@swan.wa.gov.au]	Supports the guidelines in principle but feels further consultation/review be conducted as a number of issues need review if Guidelines to be adopted as a minimum standard.	general	City support standardised engineering infrastructure requirements. A greater degree of specificity in a number of areas would be preferred. Some paragraphs are open to interpretation and may be appealable at SAT with consequences for long term declines in standards. Some engineering infrastructure is site specific and must be designed to meet prevailing conditions. Request extension of advertising period and adoption as guidelines only.
11	26/09/2011	Alan Smith	Shire of Murray	Linda Barter [PADTS@murray.wa.gov.au]	Council supports in principle but requests that they not be adopted by WAPC pending further consultation.	general	Council requests guidelines not be adopted by WAPC but remain as guidelines at present, not be adopted but referred back to the industry for restructure and redrafting as a policy over 12 months and under the leadership of IPWEA.
12	26/09/2011	Bob Evans	Shire of Capel	Bob Evans [BEvans@capel.wa.gov.au]	Supports the adoption of the Guidelines as minimum standard		Support. Shire has been using the guidelines since 2009, has resisted the temptation to develop its own guidelines, and subscribe to the principle of uniformity.
13	26/09/2011	Rod Hughes	Swan River Trust	Money, Angus [Angus.Money@swanrivertrust.wa.gov.au]	technical advice	sections well tabled, parts of 1, 2, 3, 4, 6, 8, 9	Reference required to various policy documents and legislation, minor changes requested incl to 8.3.1.18.4 Headwalls and 8.3.1.18.11 Stone Pitching.
14	26/09/2011	Doug Pearson	City of Bayswater	Wardia Du Toit [wardia.dutoit@bayswater.wa.gov.au]	support		Supports guidelines as a minimum standard, subject to LG's being able to have an addendum specifying local variations to address specific conditions or community expectations.
15	26/09/2011	Luke Botica	Dardanup Shire	Luke Botica [lukeb@dardanup.wa.gov.au]	technical comments	pg 5, pg 19, pg 93, pg 167, pg 168	Supports the guidelines as a minimum standard. Council has adopted Edition 2 as a minimum standard with a variation for issues specific to Dardanup. Stresses that LG's should be able to specify standards above those prescribed, also suggests some clarification and edits, suggests website addresses not be included as they often change.
16	26/09/2011	Lee Gyomorei	City of Armadale	Lee Gyomorei [LGyomorei@armadale.wa.gov.au]	Supports the guidelines in principle but feels further consultation/review should be remain as guidelines at present and should be referred back to the industry for restructure and redrafting as a policy document over 12 months.	General	Document is very vague in some places and a greater degree of specificity would be appreciated. Guidelines open to interpretation can lead to increased challenged to LG standards and more referrals to SAT as well as a drop in engineering standards. Language of the document is not "policy" like, engineering infrastructure cannot be standardised in such a simplistic manner and much is site specific and must be designed to meet prevailing conditions. IPWEA Executive requested members support with allowance for a local variation. Also believe LG addendums would not hold weight at SAT
17	26/09/2011	David Harris	City of Gosnells	council@gosnells.wa.gov.au	Supports the guidelines in principle but feels further consultation/review should be remain as guidelines at present and should be referred back to the industry for restructure and redrafting as a policy document over 12 months.	general	Document is very vague in some places and a greater degree of specificity would be appreciated. Guidelines open to interpretation can lead to increased challenged to LG standards and more referrals to SAT as well as a drop in engineering standards. Language of the document is not "policy" like, engineering infrastructure cannot be standardised in such a simplistic manner and much is site specific and must be designed to meet prevailing conditions. IPWEA Executive requested members support with allowance for a local variation. Also believe LG addendums would not hold weight at SAT

18	26/09/2011	Stephen Bell	City of South Perth	enquiries@southperth.wa	objection	Supports the guidelines in principle but feels further consultation/review be conducted. Requests guidelines remain as guidelines at present and should be referred back to the industry for restructure and redrafting as a policy document over 12 months.	general	Document is vague in some places and a greater degree of specificity would be appreciated. Guidelines open to interpretation can lead to increased challenged to LG standards and more referrals to SAT as well as a drop in engineering standards. Language of the document is not "policy" like. Engineering infrastructure cannot be standardised in such a simplistic manner and much is site specific and must be designed to meet prevailing conditions. IPWEA Executive requested capacity for LG variation via an addendum. Also believe LG addendums would not hold weight at SAT
19	28/09/2011	Gabriela Poezyn	City of Nedlands	Gabriela Poezyn [gpoezyn@support	support		general	Provisions are acceptable
20	28/09/2011	Rob Whooley	Shire of Denmark	Rob Whooley [engineer1@denmark.wa.gov.au]	neutral	technical advice	pages 8, 19, 20, sections set out in the letter	Has general comments regarding grammar and clarity, some comments relating to fees
21	29/09/2011	Cecil Hensley	Shire of Harvey	(08) 9729 0364 (no email given, hardcopy submission)	neutral	Many technical comments and general editing requirements	through doc	A copy of the text with numerous annotations was provided.
22	30/09/2011	Mrak Luzi	Shire of Mundaring	shire@mundaring.wa.gov	support	Technical comments		Broad support but minimum standards may stifle innovation. Incentives should be considered to promote higher than minimum standards. Engineering conditions should make reference to Model Conditions from which they are derived. Some minor text changes and corrections recommended. Consolidate reference to clearing and to AS 4970 Retention of Trees on Development Sites
23	4/10/2011	(via) John Ambrose	Shire of Serpentine Jarrahdale		support	technical advice	changes are throughout document, but well labelled in table.	Document generally supported. However certain issues have not been adequately covered. Have provided comprehensive list of relevant modifications.
24	4/10/2011	Remo Mucciarone	Shire of Kalamunda	Remo Mucciarone [mailto:Remo.Mucciarone@kalamunda.wa.gov.au]	support	technical advice	module 3	Issues with street trees in Liveable neighbourhoods policy. Consistent approach to use of words & numbers required. Shire of Kalamunda has its own addendum to the guidelines.
25	4/10/2011	Tony Pyke	City of Joondalup	Pyke, Tony [mailto:Tony.Pyke@joondalup.wa.gov.au]	neutral	technical advice		Clarification regarding compaction standards, asphalt, primers and seals, dryback, segmented paving. New Austroads standards to be used in guidelines.
26	4/10/2011	(via) John Ambrose	Franz Winkler	finkler@smartchat.net.au	neutral			References are to out of date standards and guidelines needs to be corrected. Now a legal precedent that may require road safety audit as part of the initial application.
27	4/10/2011	Leo Pudhota	Shire of Gin Gin	emes@gingin.wa.gov.au	support			Would like to see section on standards for rural road construction included. Attached a set of suggested standards
28	7/10/2011	Jan Grimoldby	Parks and Leisure Australia WA	jangrimoldby@parksleisure.com.au	support	supports and technical comments	sections 3, 4, 5, 6, 7	Supports guidelines and adoption as minimum standard by WAPC. Prescriptive nature of the guidelines may cause conflict with some LG requirements, specifications and practices. Specific comments on specific sections are included in the submission.

IPWEA Guidelines Submissions									
no.	date	name	Organisation	Contact	Support/Op pose	Comment	Section of guidelines	Summary	
1	12/09/2011	Rob Korenhof	City of Wanneroo	9405 5000	support in part			The City has its own "Guidelines for the Development and Subdivision of Land" using the Aus-Spec standard. The City will present these guidelines to be used along with their own addendum detailing City specific requirements including road design criteria and specs, ground conditions, preservation of flora and fauna, retaining walls and filling, stormwater drainage design specs, footpath design etc.	
2	15/09/2011	Jon Bell	Town of Cambridge	Jon Bell [jbell@cambridge.wa.gov.au]	support			The Town will use these guidelines as the default for subdivisional developments, and will provide addendums as appropriate for each subdivision	
3	15/09/2011	Griffin Longley	Nature Play WA (Dept Sport and Rec)	Griffin Longley [Griffin.Longley@dsr.wa.gov.au]	neutral		6.3.3.7	Asks that reference to "modular units" be removed from section on Playground Equipment so as not to limit the types of 'play spaces' provided for children, and the reference specifically to modular units may be too limiting to achieve the goal of encouraging children to explore natural elements of their surroundings. Spelling and referencing corrections are required.	
4	15/09/2011	Bill Till/Ken McIntosh	Department of Water	bill.till@water.wa.gov.au	support	Recommends some edits, and suggests that the planned 2012 comprehensive review be conducted as soon as possible to improve clarity			
5	21/09/2011	Sabbir Hussain	City of Cockburn	Sabbir Hussain [shussain@cockburn.wa.gov.au]	support			City is happy to endorse guidelines as minimum default standard to be used by WAPC. The City has its own guidelines that will prevail where the City standard exceeds that of the guidelines.	
6	21/09/2011	Graeme Jones	Shire of Busselton	Graeme Jones [Graeme.Jones@bussett.on.wa.gov.au]	neutral	5 dot points with specific standards to correct/amend		2.2.1.5.7 fire breaks, 3.3.6 cul-de-sac turning circles, 4.3.3.7 stormwater infiltration, 4.3.4 design in rural areas, 6.3.3.2.2 development process	
7	21/09/2011	Nicholas Deeks	GHD	Nicholas.Deeks@ghd.com	neutral	Specific technical comments		Technical comments throughout section 4: reword 'one in 100 year ARI event, Figure 4.3 suggest a lower afflux value used; compensating basin design, Fig 4.4 suggest 5 year ARI is min standard for serv/ability.	4
8	22/09/2011	Vesna Kiurski	Town of Kwinana	Vesna Kiurski [Vesna.Kiurski@vesna.com.au]	support	Town looking to adopt edition 2.1, but some changes required.	1.17.2, 1.17.4, 1.20.1, 2.2.1.5, pg 111	Some data is outdated or incorrect including Austroroads guidelines and titles, (pg 40 and 54). Practical completion, AS for protection of Trees, bonding at 2.20.1, title on page 111.	
9	23/09/2011	Judy Harley	UDIA	JHarley@udiawa.com.au	neutral	Has technical comments and queries whether they will be adopted or used properly	Sections 1, 2, 3, 5, 7, 8	Guidelines need to be the standard by which SAT disputes are determined to have desired weight. The documents extensive coverage and detail may turn into a barrier for adoption by LG's who significantly customise for their own areas. Suggest that if the desired outcome is not being met, simplifying the document to only cover important aspects of subdivisional development would increase LG's adoption of the guidelines. The length of the guidelines illustrates the fact that the process is unnecessarily complex.	

10	23/09/2011	Jim Coten	City of Swan	Jim Coten [jim.coten@sws.wa.gov.au]	Supports the guidelines in principle but feels further consultation/review be conducted as a number of issues need review if Guidelines to be adopted as a minimum standard.	general	City support standardised engineering infrastructure requirements. A greater degree of specificity in a number of areas would be preferred. Some paragraphs are open to interpretation and may be appealable at SAT with consequences for long term declines in standards. Some engineering infrastructure is site specific and must be designed to meet prevailing conditions. Request extension of advertising period and adoption as guidelines only.
11	26/09/2011	Alan Smith	Shire of Murray	Linda Barter [PADTS@murray.wa.gov.au]	Council supports in principle but requests that they not be adopted by WAPC pending further consultation.	general	Council requests guidelines not be adopted by WAPC but remain as guidelines at present, not be adopted but referred back to the industry for restructuring and redrafting as a policy over 12 months and under the leadership of IPWEA.
12	26/09/2011	Bob Evans	Shire of Capel	Bob Evans [BEvans@capel.wa.gov.au]	Supports the adoption of the Guidelines as minimum standard		Support: Shire has been using the guidelines since 2009, has resisted the temptation to develop its own guidelines, and subscribe to the principle of uniformity.
13	26/09/2011	Rod Hughes	Swan River Trust	Money, Angus [Angus.Money@swanrivertrust.wa.gov.au]	technical advice	sections well tabled, parts of 1, 2, 3, 4, 6, 8, 9	Reference required to various policy documents and legislation, minor changes requested incl to 8.3.1.18.4 Headwalls and 8.3.1.18.11 Stone Pitching.
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26	4/10/2011	(via) John Ambrose	Franz Winkler	fwinkler@smartchat.net.au	neutral				References are out of date standards and guidelines needs to be corrected. Now a legal precedent that may require road safety audit as part of the initial application.
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ATTACHMENT 3

Initial Report to WAPC on Constructed Road Standards and General Land Subdivision Practice.

Preliminary.

A copy of the confidential proposed report to the Statutory Planning Committee was forwarded to me, together with the current edition of Guidelines for Subdivisional Development prepared by IPWEA.

I have been asked to comment on what is proposed, in that the main recommendation to the SPC is to adopt the IPWEA guidelines as a minimum standard of subdivision and attach it as an advice note to Local Authority and Developer for conditions where it is relevant to the subdivisional application.

Analysis.

I read the guidelines publication and make the following comments.

1 The publication is clearly meant to be a set of guidelines.

2 the document is an amalgam of what some councils are doing as best practice together with several documents taken from Road and other Standards plus policies published by relevant authorities. These include Austroads, NAASRA, Aust Standards and WAPC policy.

Also included are some materials specifications that appear to have been taken directly from actual contract documents.

3 The document is a very good guide as to best practice for subdivisional development of land within the Perth Region when it is relatively flat sand plain terrain. All to produce building blocks suited to, housing using, on ground concrete floor slab construction. The majority of residential land subdivision occurs in these conditions

4 The document outlines Legal and contractual matters, current earthwork standards for sand plain blocks. Road preferred sections, It gives advice about drainage consideration, Streetscape. Open Space development and proposes minimum Drawing Standards that should be required to ensure uniformity, between Council, contractors, supervisors, and developer
It finally makes comments on construction in regard to ground conditions and materials.

5 The document as a guide line is quite useful but to be accurately interpreted the reader would need to have professional Civil Engineering qualifications and experience.

Comments in Regard to the Documents Use as a Minimum Standard Advice Note

1 The document understands that there are many circumstances where it will not provide the appropriate or best practice answers.

2 Earthworking of lots for steeper land is not really mentioned. Clearly major earthwork on terrain that is, relatively steeper, contains clay, gravel or rock requires quite different consideration. Many residential lots outside the Perth type sand plain areas will require different treatment. For many no earthwork would be a good solution and for some subdivisions it would be more economic to construct housing that does not use on ground concrete slab construction.

3 Drainage frequently requires specific solutions for specific sites and as such it is very difficult to apply general minimum standards apart from stating desired performance outcomes .

The documents leave that to be determined giving only information on current practice

4 Road reserve cross sections are easily defined in flat sand plain country.

When the terrain is steeper or contains rock clay gravel different solutions are likely to produce better economic outcomes for both Council and Lot purchaser. A major function of a residential street is to provide easiest access to each lot not just give easiest outcome for the Council. This problem is not addressed realistically in the guidelines.

5 Streetscapes are under the guidelines developed to a relatively high standard. However Councils have to subsequently own, maintain, replace the streetscape and manage it. The question as to desired level of development should in my opinion remain with the Council. This should be a consideration as to what the council rating level should be and it will be a function off what the ratepayers can and are willing to pay. Council may well decide that some streetscape components will not be used or are unnecessary. The guidelines tell how and what is being done. They should not be made minimum standards.

6 Open Space development is not always a requirement. The comments about development of streetscape above are also applicable to the open space standards

7 Construction guidelines should not be used as minimum standards. When documents say how things have to be done rather than what the required outcome should be, then there can be major conflicts and suits for damages occur when the “how to” statements do not lead to the expected outcome. Guidelines are meant to be helpful not legal.

8 Councils that do not have access to professional engineering expertise but use technical officers and/or administrators for subdivision conditions are likely to misunderstand some of the guidelines and if they are to use them as minimum standards there will probably be difficult debates.

9 WAPC sets conditions subdivisional conditions for a wide range of Councils who operate in widely differing terrains and soil/ rock types as well as socio economic conditions. The guidelines make no attempt to differentiate these

factors but simply provide best practice notes for the majority of subdivisions that are built on flatter land in sand plain soils and they assume that there is no variation in affordability standard between councils

Suggestions.

- 1 Encourage the continued use of the guidelines document but only as guidelines and ensure that they are not given legal or pseudo legal status
- 2 WAPC should acknowledge that in trying to get uniformity that many Councils operate in diverse economic , geological and geographic conditions that may not be at all like the Perth sand plain where most subdivision occurs
- 3 WAPC should not try and impose minimum standards of construction on Councils. It should continue to leave the choice of construction standards to the relevant Authority, subject to point 3. This would be consistent in that WAPC does not appear to impose engineering standards on Watercorp or Main Roads. It leaves that to their professional judgement. Councils should be treated in the same manner. Their local knowledge is often valid and where they need help they can choose to engage engineering professionals
- 4 WAPC should in their advice note, indicate for subdivision conditions administered by a Council, that the standard of construction should be equal to the standard currently being built in that council area for similar circumstances but not normally greater. That Council does not have to accept higher construction standards from developers (aimed at marketing appeal) that would create a higher long term ownership cost to council above the costs expected for similar developments in their area
- 5 The IPWEA should be encouraged to have the document professionally edited particularly removing the words "shall" from parts of the document that have been copied from actual contract documents and perhaps trying to reposition material standards into a separate section or addendum in the way they have dealt with required drawing standards rather than having them clog up the straight forward reading of the document

J K McDowall
MIE
14/2/2012

ATTACHMENT 4

SCHEDULE OF MATTERS IN IPWEA GUIDELINES RECOMMENDED FOR CONSIDERATION IN 2012 REVIEW-

AS DETERMINED BY IPWEA GUIDELINES STEERING COMMITTEE 2012

PAGE AND SECTION	SUBMISSION NUMBER	CHANGE REQUESTED	DECISION
Module 1	Steering Committee	MG to appoint someone to draft new para for Module 1 re need to interface with surrounding subdivisions- survey of adjoining land, liaison with adjacent planning, road design, drainage etc	Defer to 2012 review.
p1, S1.1	S9, UDIA	Rephrase to 'standards that are considered acceptable for most Australian applications' or similar.	Worthy of consideration. Defer to 2012 review.
p2 S1.1 dot pints at contract documents	S23, Shire of Serpentine Jarrahdale	Add to dot points: landscape maintenance after practical completion for 24 months, and maintenance bonds	List is not meant to be exhaustive. Defer to 2012 review.
P2 Objectives	S9 UDIA	Expand objectives of guidelines	Worthy of addition. Defer to 2012 review.
P7 Figure 1.1	?	Does not include appeal process	Defer to 2012 review (not relevant to guidelines?)
P9 S1.2.2.1 last para on retaining walls	S20 Shire of Denmark	More text required and attention to fees for earthworks on private property.	Defer to 2012 review
P9, S 1.2.2.1 and P13 S 1.13.1.1	S9 UDIA	Issue about supervision and inspection of works under s158 of P&D Act, and design in accordance with IPWEA Guidelines. See also Section 1.15, 1.17.3, 1.17.4, 1.19.1,	Defer further discussion to 2012 review. Problem may be with <i>Planning and Development Act</i> not reflecting practice and AS for supervision
P 14/15 S1.13.2	S9 UDIA	Currently developers are not required to provide copies of insurances to LG. Not currently required and not necessary	Defer to 2012 review
P16 S1.15, P35 S2.2.1.5.3	S13 Swan River Trust	Request reference to EMRC's Erosion and Sediment Control Policy and guidelines for Local Government.	Could not be located on EMRC's website so defer to 2012 review when can be sourced.
P25. S1.20.1 S1.20.3	S8 Town of Kwinana, S23 Shire of Serpentine Jarrahdale; S9 UDIA	Kwinana wants bonding for roads revisited. Consistent approach to bonding practices required across LGs. SJ wants specifics on bond arrangements to be included.	Defer to 2012 review
P28 S1.21.2	S9 UDIA	Concern about calculation basis of defects liability bond, and proportion used- 2.5% rather than 5%.	Defer to 2012 review

PAGE AND SECTION	SUBMISSION NUMBER	CHANGE REQUESTED	DECISION
P28 S1.2.2	9 UDIA	Concerned about specification required for asset register and additional cost. Notes cost of D Spec, R Spec and O spec	Defer to 2012 review
P35, S 2.2.1.5.4 Also appears at S8.3.1.3 on page 150	9 UDIA 23, Shire of SJ	Change requested by Steering Committee, but 2011 DEC Guidelines relate to dust management not soil stabilisation. Steering Committee agreed to coordinate a working group to review appropriate guidelines- not yet done.	Defer to 2012 review
P37 S2.2.1.5.7	6 Shire of Busselton, 22 Shire of Mundaring	Various methods of creating fire breaks should be included, and reference to steep terrain.	Defer to 2012 review
2.3.2. Hydromulching	9 UDIA	Questions why hydro-mulch can't include seed and fertiliser.	Defer to 2012 review
P43 and table 3.1 at page 42	21 Shire of SJ	Differences between MRWA Road Hierarchy and Liveable Neighbourhoods	Defer to 2012 review but needs to be addressed by MRWA and DoP
P54, s3.3.6	22 Shire of Mundaring	Make reference to Bush Fire Planning guidelines in cul de sac heads.	Defer to 2012 review - check Keelty report
P57	-	Note spelling error of asphalt (asphalt) at top left of 3.5 and top left at 3.6- can be corrected?	Original cannot be sourced and needs to be redrawn. Defer to 2012 review
P84, S 4.3.1.1.2	7, GHD	Confusion over the use of term one in 100 year ARI event. Australian Rainfall and runoff prefers either 1 in 100 annual exceedence probability (AEP) or 1% AEP, or just 100 year ARI without the '1' in.	Defer to 2012 review
P91, S4.3.2.3	22, Shire of Mundaring	Measures to be installed to manage overland flow runoff from lots during & after construction period.	Defer to 2012 review
P92, S4.3.2.4	13, Swan River Trust	Add ' or creek or where the drain discharges into the Swan-Canning river system'	Defer to 2012 review
P99, s4.3.3.4	13, Swan River Trust	Specify that subsoil drainage outlet should be free flowing and treated prior to discharge	Defer to 2012 review

PAGE AND SECTION	SUBMISSION NUMBER	CHANGE REQUESTED	DECISION
P105, S5.3.6	28, Parks and Leisure Australia	Should have more text supporting street trees.	Defer to 2012 review
P110, S5.3.8, P124, S6.3.3.2.4	9, UDIA	Requests text changes including for a bond of landscape maintenance bond of 5% of the contract value for maintenance duration, and that 5 years of maintenance should not apply.	Defer to 2012 review
P110, S5.4.1	28, Parks and Leisure Australia	Cycle paths should be line marked based on Austroads	Defer to 2012 review
P113, S6	28, Parks and Leisure Australia	When referring to landscaping, use 'irrigation' not 'reticulation'	Defer to 2012 review
P121, S 6.3.1	28, Parks and Leisure Australia	Refer to LGs strategic plan for POS and facilities and re entry statements	Defer to 2012 review
P 122, S6.3.3.2.1	23, Shire of SJ	Include reference to fire management plans for BAL assessments	Defer to 2012 review and outcome of bushfire mapping arising from Keelty report
P129, S6.5.4.1	28, Parks and Leisure Australia	Refer to micro and drip irrigation as most desirable	Defer to 2012 review
P136, S7.3.1.7	9 UDIA	Xref files- 4 MB is too small	Defer to 2012 review
P 137, S 7.3.1.10	9 UDIA	Annotations and dimensions should be in 'model space' as well as/instead of 'paper space'	Defer to 2012 review
P142, S7.5.7	9 UDIA	Not common practice to show drainage lines in plan and profile. Generally there is a road profile plan prepared showing drain vertical information and the overall road and drainage plans provide the horizontal layout.	Defer to 2012 review
P152, S 8.3.1.5.2	23, Shire of SJ	What about fill for industrial development?	Defer to 2012 review
P153, S 8.3.1.5.5	13, Swan River Trust	Address water borne erosion as well. See comments in submission.	Defer to 2012 review
P154, S 8.3.1.8.3	25, City of Joondalup	There appears to be confusion about compaction standards- max dry density and modified max dry density. Text in submission	Defer to 2012 review

PAGE AND SECTION	SUBMISSION NUMBER	CHANGE REQUESTED	DECISION
		explains in more detail.	
P158, S 8.3.1.12	25, City of Joondalup	Asphalt seal – comment on class 170 bitumen. Seek advice from AAPA	Defer to 2012 review
P159, S 8.3.1.12	-	PB was to provide text on finished level tolerances for block pavements similar to provision for asphalt pavements	Copies of Civil Groups specs provided but summary needed by GL and AV. Is additional text required? Suggest defer to 2012 review.
P163, end of 8.3.1.12.7	25, City of Joondalup	No mention of allowing pavement base courses to dry back prior to sealing. Suggestion of a new section	Defer to 2012 review
P162, S 8.3.1.13.1	25, City of Joondalup	Comment on need for subgrade and pavement materials for brick and concrete paving to be based on CBR values. Note also that numbering in this section needs to be checked.	Committee requested addition of words “Block paving pavement design for sub base and based course shall be based on soaked CBR values”. Unclear where this text is to be inserted. Defer to 2012 review

Local Government Guidelines for Subdivisional Development

Edition 2.2 - 2012



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Institute of Public Works Engineering Australia
WA Division Inc.
36 Brisbane Street, Perth
Western Australia 6000

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Eric Lumsden, PSM
Director General Department for
Planning and Infrastructure



John Ambrose
Executive Manager Institute of
Public Works Engineering
Australia (WA Division)

Foreword

The ability of State and local government and the development industry to provide an affordable, sustainable and timely supply of urban land is a key planning priority. The specific requirements necessary to achieve planning and engineering approval for the subdivision of residential, industrial and commercial lots should be clear, transparent, and consistently applied.

To provide greater clarity and certainty of subdivisional engineering requirements, the Department of Planning has partnered with the Institute of Public Works Engineering Australia (WA Division) (IPWEA) to produce Edition No. 2.1 of the *Local Government Guidelines for Subdivisional Development, 2011*. This document updates Edition No. 2, which was released in 2009.

These 2012 Guidelines are intended to underlie and support subdivision conditions applied by the Western Australian Planning Commission pursuant to the *Planning and Development Act 2005*. The Guidelines encompass current legislation and best practice minimum engineering standards. They are intended to guide local government and the development industry through engineering specification, construction and post-construction subdivision approval. IPWEA has committed to update the Guidelines on a regular basis every two years.

The Department of Planning and IPWEA urge developers, designers and approval authorities to employ this document as their basis for subdivision engineering design and construction. Local authorities are also strongly encouraged to formally adopt these Edition 2.2 Guidelines as the basis for subdivisional engineering approval within their municipality.

ACKNOWLEDGEMENTS

This production of Edition No.2.2 of the Local Government Subdivisional Guidelines was overseen by a Steering Committee on behalf of the Department of Planning and the Institute of Public Works Engineers Australia (WA Division) (IPWEA).

The Department of Planning funded the project on behalf of the IPWEA to ensure that the Guidelines contain best practice and the latest statutory regulations for the development of land within Western Australia.

The Steering Committee consisted of the following Members:

Mr Martyn Glover	Chair – IPWEA Immediate Past President – Director, Infrastructure Services, City of Joondalup
Ms Marion Thompson	Urban Development Coordinator, Department of Planning
Mr Denis Blair	Director Infrastructure, City of Wanneroo, representing IPWEA
Mr Chris Thompson	Director Engineering and Parks Services, City of Rockingham, representing IPWEA
Mr Graham Lantzke	Policy Manager Roads and Transport, Western Australian Local Government Association
Mr Bill Till	Supervising Engineer, Drainage and Waterways Branch, Department of Water
Mr Peter Kata	Drainage and Waterways Branch, Department of Water (Deputy for Mr Till)
Mr Glenn Hall Mr Peter Bowyer	Urban Development Institute of Australia representatives

The contributions of the individuals above and their organisation is recognised and acknowledged for the cooperation and supply of technical data and support for the project.

Consultants:
Terry Blanchard and Robert Willis

Updates

The IPWEA will update the Guidelines for Subdivisional Development on a biennial basis.

Each update will be listed below with the Guidelines, as amended, available on the IPWEA web site <http://www.ipweawa.org.au/>

Date	Updates	Contents and purpose	Pages
July 2009	Update 0	Revised 2 nd Edition 2	All
Jan 2011	Update 01 Amendment	Revised Edition 2.1	
		Acknowledgement	
	1.1	General requirements	P1
	1.2.1.3	Road safety audit	P7
	1.13.2	Liability and insurance	P13
	1.16	Project signage	P15
	1.17	Control, inspection and supervision of works	P16
	1.17.1	Notification and commencement of works	P17
	1.17.4	Commencement of works, meeting and inspections	P18
	1.17.4.1	Inspection for road works	P19
	1.17.4.2	Inspections for drainage works	P20
	1.18	Practical completion	P22
	2.2.1.1	Site preparation, general	P29
	2.2.1.2	Residential areas	P30
	2.2.1.5	Soil filling and clearing	P31
	2.2.1.5.7	Fire breaks for rural areas	P34
	2.3.3	Mulching	P35
	3.3.1.1	Urban roads hierarchy, Table 3.4, Note 11	P44
	3.3.6	Figure 3.3, note	P51
	4.2.2	Standard/Guidelines	P79
	4.3.1.2.2	Water quality management criteria	P82
	4.3.1.2.3	Stormwater modelling criteria	P82
	4.3.2.2	Flood protection(managing storm events)	P86
	4.3.2.5	Ground drainage design	P90
	4.3.3.1	Drainage systems	P91
	4.3.3.7	Stormwater infiltration	P99
	4.3.4	Design of rural areas	P100
	5.3.5	Bus shelter and seating	P110
	6.2.2	Public open space, standards	P115
	6.3.3.2.2	Development process	P118
	7.2.1	Standard drawings, standards	P127

TABLE OF CONTENTS

1	Module No. 1 – Legal Framework and Contract Administration	2
1.1	General requirements	2
1.1.1	Objectives of the Guidelines.....	3
1.2	Planning and Development Act 2005.....	4
1.2.1	Subdivision and clearance process.....	4
1.2.1.1.	Subdivision process	4
1.2.1.2.	Design, construction and the clearance process.....	5
1.2.1.3.	Road safety audits	8
1.2.1.3.1.	Road safety auditor.....	8
1.2.1.4.	Traffic impact study.....	8
1.2.1.5.	Cash in lieu of public open space	8
1.2.1.6.	Monies paid to local government in lieu of public open space	9
1.2.2	Subdivision costs	9
1.2.2.1.	Expenses of road or waterway construction and road drainage.....	9
1.2.2.2.	Initial subdivider may recover road costs from subsequent subdivider	9
1.3	Environmental Protection Act 1986.....	10
1.4	Contaminated Sites Act 2003.....	10
1.4.1	Accredited auditors	10
1.5	Acid sulfate soils.....	10
1.5.1	Technical advice	10
1.6	Disabilities Services Act 1993.....	11
1.7	Aboriginal Heritage Act 1972.....	11
1.7.1	Consent to certain uses	11
1.8	Heritage of Western Australia Act 1990	11
1.9	Fire and Emergency Services Authority WA Act 1998.....	11
1.10	Environmental Protection and Biodiversity Conservation Act 1999 as amended (Federal).....	12
1.11	Statutory requirements.....	12
1.12	Local government responsibilities	13
1.12.1	Approval period for designs and documentation	13
1.13	Developer responsibilities.....	13
1.13.1	Engaging consultants.....	13
1.13.1.1.	Engineering consultants.....	13
1.13.1.2.	Environmental consultants.....	13
1.13.1.3.	Dilapidation survey or service reinstatements.....	14
1.13.1.4.	Hydrological consultants	14
1.13.1.5.	Indigenous heritage consultants	14
1.13.1.6.	Horticultural/Aboricultural consultants.....	14
1.13.1.7.	Geotechnical investigations	14
1.13.2	Liabilities and insurances	14
1.13.3	Occupational safety and health.....	15
1.13.4	Road upgrading for subdivisions	15
1.14	Street lighting	16
1.15	Erosion control.....	16
1.16	Project signage.....	17
1.17	Control, inspection and supervision of works.....	17
1.17.1	Notification of commencement of works.....	18
1.17.2	Hours of work.....	18

1.17.3	Inspection by consultants and supervision by contractors	19
1.17.4	Commencement of works, meetings and inspections	19
1.17.4.1.	Inspections for road works	21
1.17.4.2.	Inspections for drainage works	21
1.17.4.3.	Indicative Inspection Standard Form – Roadworks	22
1.17.5	Testing	23
1.18	Practical completion	23
1.19	Clearance	24
1.19.1	Certification of compliance	24
1.19.2	Conditions of clearance.....	24
1.19.3	Creation of new roads	25
1.20	Bonding outstanding works	25
1.20.1	Bond applications.....	25
1.20.2	Bond agreement.....	26
1.20.3	Calculation of bond amount	27
1.21	Defects liability	27
1.21.1	General	27
1.21.2	Defects liability bond	28
1.22	Asset register	28
2	Module No.2 – Site Preparation Guidelines	32
2.1	General.....	32
2.2	Design	32
2.2.1	Earthworks, re-contouring and lot preparation	32
2.2.1.1.	General	32
2.2.1.2.	Residential areas	33
2.2.1.3.	Industrial areas	33
2.2.1.4.	Rural areas	34
2.2.1.5.	Filling and clearing	34
2.2.1.5.1.	Soil filling.....	34
2.2.1.5.2.	Fencing and landscaping to limited access roads.....	34
2.2.1.5.3.	Soil stabilisation, dust and smoke control	35
2.2.1.5.4.	Soil stabilisation strategy	35
2.2.1.5.5.	Soil stabilisation bond	36
2.2.1.5.6.	Disposal of cleared vegetation.....	37
2.2.1.5.7.	Fire breaks for rural areas.....	37
2.3	Specifications	38
2.3.1	Filling.....	38
2.3.2	Hydromulching and seeding.....	38
2.3.3	Mulching.....	38
3	Module No.3 – Road Guidelines	40
3.1	General requirements	40
3.2	Policies and standards	40
3.2.1	Policies.....	40
3.2.2	Standards.....	40
3.3	Design	41
3.3.1	Road hierarchy	41
3.3.1.1.	Urban roads hierarchy.....	41
3.3.1.2.	Rural roads hierarchy.....	49
3.3.2	Road Alignments.....	49
3.3.2.1.	General	49
3.3.2.2.	Rural road grades	49

3.3.3	Road crossfalls.....	50
3.3.4	Verge and property grades	50
3.3.5	Kerbing.....	51
3.3.6	Cul-de-sac turning circles.....	54
3.3.7	Pavement thickness	55
3.3.8	Design life of pavements.....	56
3.3.9	Urban base course profiles	56
3.3.10	Rural base course profiles	57
3.3.11	Typical cross-sections.....	58
3.3.12	Wearing course	59
3.3.13	Traffic management – urban roads	59
3.3.13.1.	Traffic speed – leg length impact	60
3.3.14	Parking provisions.....	61
3.3.15	Eyebrow treatments	61
3.3.16	Verge management – rural roads.....	62
3.3.17	Battleaxe access legs	62
3.3.17.1.	General.....	62
3.3.17.2.	Urban areas	63
3.3.17.3.	Rural areas	63
3.3.17.4.	Industrial subdivisions.....	64
3.3.18	Signs and pavement marking.....	64
3.3.18.1.	Regulatory and traffic control signs.....	64
3.4	Materials specifications.....	64
3.4.1	Saline environments.....	64
3.4.2	Crushed limestone	65
3.4.2.1.	General	65
3.4.2.2.	Testing	65
3.4.2.3.	Properties.....	65
3.4.2.4.	Grading	65
3.4.3	Bitumen emulsion.....	65
3.4.3.1.	Bitumen emulsion – specification.....	65
3.4.4	Bitumen stabilised limestone.....	66
3.4.4.1.	General	66
3.4.4.2.	Bitumen stabilised limestone specification	66
3.4.5	Gravel	66
3.4.5.1.	General	66
3.4.5.2.	Properties.....	66
3.4.5.3.	Grading	67
3.4.6	Fine crushed rock (roadbase)	67
3.4.6.1.	General	67
3.4.6.2.	Grading	67
3.4.6.3.	Properties.....	67
3.4.7	Ferricrete.....	68
3.4.8	Recycled materials for base course construction.....	68
3.4.9	Bitumen.....	68
3.4.9.1.	General	68
3.4.9.2.	Bitumen emulsion	69
3.4.9.3.	Medium curing cutting oil	69
3.4.9.4.	Fluxing oil.....	69
3.4.9.4.1.	Property requirements	69
3.4.10	Polymer modified binder	69

3.4.11	Road sealing aggregates	73
3.4.11.1.	Aggregate	73
3.4.11.2.	Particle shape	73
3.4.11.3.	Hardness.....	73
3.4.11.4.	Specific gravity	73
3.4.11.5.	Elongation factor	73
3.4.11.6.	Method of sampling and testing	73
3.4.11.7.	Flakiness index	73
3.4.11.8.	Grading requirements (percentage by weight)	74
3.4.11.9.	Average least dimension requirements	74
3.4.12	Asphalt	74
3.4.12.1.	General	74
3.4.12.2.	Specification.....	74
3.4.12.3.	Characteristics of the asphalt design	74
3.4.13	Paving units.....	79
3.4.13.1.	Dimension tolerance	79
3.4.13.2.	Transverse strength	79
3.4.13.3.	Compressive strength	79
3.4.13.4.	Efflorescence	79
3.4.13.5.	Abrasion Resistance	79
3.4.13.6.	Pitting (lime particles).....	79
3.4.13.7.	Absorption.....	80
3.4.13.8.	Resistance to salt attack	80
3.4.13.9.	Permanent expansion	80
3.4.13.10.	Slip or skid resistance	80
3.4.13.11.	Colour.....	80
4	Module No.4 – Drainage Management Guidelines.....	82
4.1	General requirements	82
4.2	Policies, standards and guidelines.....	82
4.2.1	Policies.....	82
4.2.2	Standards and guidelines.....	82
4.3	Design	83
4.3.1	Drainage design objectives for water sensitive urban design.....	83
4.3.1.1.	Water quantity management	84
4.3.1.1.1.	Principle	84
4.3.1.1.2.	Criteria	84
4.3.1.2.	Water quality management	84
4.3.1.2.1.	Principle	84
4.3.1.2.2.	Criteria	85
4.3.1.2.3.	Stormwater quality modelling criteria	85
4.3.1.3.	Disease vector and nuisance insect management.....	85
4.3.1.4.	Planning and integrated water cycle management	86
4.3.1.4.1.	State Planning Policy 2.9 Water Resources (State Government, 2006)	86
4.3.1.4.2.	Element five: Liveable Neighbourhoods.....	86
4.3.1.4.3.	Better urban water management	87
4.3.2	Key elements for water-sensitive urban design.....	89
4.3.2.1.	Water balance, conservation, use and efficiency	89
4.3.2.2.	Flood protection (managing storm events).....	89
4.3.2.3.	Frequent (up to one-year ARI) events.....	91
4.3.2.4.	Stormwater drainage design – general principles	91

4.3.2.5.	Groundwater drainage design.....	93
4.3.3	Design in urban areas.....	94
4.3.3.1.	Drainage systems.....	94
4.3.3.2.	Grated gullies and side entry pits.....	95
4.3.3.3.	Junction pits.....	98
4.3.3.4.	Sub-soil drainage.....	100
4.3.3.5.	Primary and district distributor road drainage.....	102
4.3.3.6.	Open access flood storage/detention facilities.....	102
4.3.3.7.	Stormwater infiltration.....	102
4.3.4	Design in rural areas.....	103
4.3.4.1.	Open channels.....	103
4.3.4.2.	Crossover culverts.....	103
4.3.4.3.	Overland flows.....	103
5	Module No.5 – Streetscape Guidelines.....	106
5.1	General requirements.....	106
5.2	Policies and standards.....	106
5.2.1	Policies.....	106
5.2.2	Standards.....	107
5.3	Design.....	107
5.3.1	Pedestrian and bicycle facilities.....	107
5.3.1.1.	General.....	107
5.3.1.2.	Urban areas.....	110
5.3.1.2.1.	Pedestrian access way.....	111
5.3.1.3.	Rural areas.....	112
5.3.2	Footpaths and shared paths in rural developments.....	112
5.3.3	Street name plates and community signs.....	113
5.3.4	Street and public area lighting.....	113
5.3.4.1.	Responsibilities.....	114
5.3.4.2.	Equipment locations.....	114
5.3.5	Bus shelters and seating.....	114
5.3.6	Street trees and landscaping.....	115
5.3.7	Banner poles.....	116
5.3.8	Streetscape maintenance bond.....	116
5.4	Specifications.....	116
5.4.1	Footpath and/or shared path construction.....	116
5.4.2	Street trees.....	116
5.4.3	Lighting categories for roadways and public areas.....	117
6	Module No.6 – Public Open Space Guidelines.....	120
6.1	General Requirements.....	120
6.2	Policies and standards.....	120
6.2.1	Policies.....	120
6.2.2	Standards.....	120
6.3	Design.....	121
6.3.1	General.....	121
6.3.2	Objectives.....	121
6.3.3	Public open space.....	122
6.3.3.1.	Clearing.....	122
6.3.3.2.	Development in reserve areas.....	122
6.3.3.2.1.	Management plan.....	122
6.3.3.2.2.	Development process.....	123
6.3.3.3.	Landscape maintenance agreement.....	123

6.3.3.4.	Landscape maintenance bond	124
6.3.3.5.	Power supply	124
6.3.3.6.	Planting	124
6.3.3.7.	Playground equipment and play opportunities	124
6.3.3.8.	Lake areas	124
6.3.3.9.	Use of reserves for drainage and floodwater storage purposes	125
6.3.4	Tree planting	126
6.3.4.1.	Trees in paved areas	126
6.3.4.2.	Protection of trees from excavation works	126
6.3.5	Site drainage	127
6.3.5.1.	General	127
6.3.5.2.	Guidelines for construction of access to beaches	127
6.3.5.3.	General requirements for beach access tracks	128
6.4.	Specifications	128
6.4.1.	Clearing	128
6.4.2.	Land or form – earthworks	129
6.4.3.	Compaction	129
6.4.4.	Irrigation	129
6.4.5.	Watering systems in paved areas	129
6.4.5.1.	Watering systems for trees in paved areas	129
6.4.5.2.	Basic guidelines for water system operation	130
6.4.6.	Post and rail fencing and bollards	130
6.4.6.1.	Private property and reserve boundary fencing	131
6.4.6.2.	Vegetation protection fence	131
6.4.7.	Specifications for access tracks	131
6.4.7.1.	Base and surface	131
6.4.7.2.	Cross-section	132
7	Module No.7 – Standard Drawing Guidelines	134
7.1.	General requirements	134
7.2.	Policies and standards	134
7.2.1.	Standards	134
7.3.	Design	134
7.3.1.	Drawings	134
7.3.1.1.	Drawing lines and sets	135
7.3.1.2.	Layer naming and layer discipline	135
7.3.1.3.	Viewports	136
7.3.1.4.	Plot styles	136
7.3.1.5.	Hatching	136
7.3.1.6.	Raster images	136
7.3.1.7.	XRef files	137
7.3.1.8.	Coordinates	137
7.3.1.9.	Polylines	137
7.3.1.10.	Annotations and dimensions	137
7.4.	Submission of documents for approval	137
7.5.	Information to be shown on drawings	139
7.5.1.	Scales for drawings	139
7.5.2.	Locality plan	140
7.5.3.	Pre-calculation plan	140
7.5.4.	Re-contouring and earthworks layout plan	140
7.5.5.	Layout plan	140
7.5.6.	Road plans	141

7.5.6.1.	Street plans.....	141
7.5.6.2.	Longitudinal profile.....	141
7.5.6.3.	Cross-section details.....	142
7.5.6.4.	Plans of other features.....	142
7.5.7.	Drainage plans.....	143
7.5.8.	Landscaping plans.....	143
7.5.9.	Drawings of standard details.....	144
7.5.10.	'As-constructed' drawings.....	145
8.	Module No.8 – Construction Guidelines.....	148
8.1.	General requirements.....	148
8.2.	Acts and standards.....	149
8.2.1.	Acts.....	149
8.2.2.	Standards.....	149
8.3.	Specifications.....	150
8.3.1.	Construction requirements.....	150
8.3.1.1.	Codes and other applicable documents.....	150
8.3.1.2.	Survey preparation.....	150
8.3.1.3.	Clearing.....	150
8.3.1.4.	Topsoil.....	151
8.3.1.5.	Earthworks.....	151
8.3.1.5.1.	General.....	151
8.3.1.5.2.	Lot filling.....	152
8.3.1.5.3.	Limestone and rock.....	152
8.3.1.5.4.	Blasting.....	152
8.3.1.5.5.	Soil stabilisation.....	153
8.3.1.6.	Sub-grade.....	153
8.3.1.7.	Sub-base.....	154
8.3.1.7.1.	Materials.....	154
8.3.1.7.2.	Spreading.....	154
8.3.1.7.3.	Compaction.....	154
8.3.1.7.4.	Acceptance.....	154
8.3.1.8.	Base course.....	155
8.3.1.8.1.	Materials.....	155
8.3.1.8.2.	Spreading.....	155
8.3.1.8.3.	Compaction.....	155
8.3.1.8.4.	Acceptance.....	155
8.3.1.9.	Primer sealing of pavements.....	156
8.3.1.9.1.	General.....	156
8.3.1.9.2.	Preparation.....	156
8.3.1.9.3.	Binder.....	156
8.3.1.9.4.	Aggregate.....	156
8.3.1.10.	Hot sprayed bitumen seal.....	157
8.3.1.10.1.	General.....	157
8.3.1.10.2.	Materials.....	157
8.3.1.10.3.	Binder.....	157
8.3.1.10.4.	Aggregate.....	158
8.3.1.11.	Two-coat seal.....	158
8.3.1.11.1.	Measurement and recording of application rates.....	159
8.3.1.12.	Asphalt seal.....	159
8.3.1.12.1.	General.....	159
8.3.1.12.2.	Preparation of surface.....	159

8.3.1.12.3.	Tack coat	159
8.3.1.12.4.	Placing of asphalt.....	160
8.3.1.12.5.	Joints	160
8.3.1.12.6.	Compaction of asphalt	161
8.3.1.12.7.	Acceptance of asphalt seal	161
8.3.1.13.	Interlocking segmental pavements (block paving)	163
8.3.1.13.1.	General	163
8.3.1.13.2.	Segmental paving blocks	164
8.3.1.13.3.	Edge restraint	164
8.3.1.13.4.	Bedding sand.....	164
8.3.1.13.5.	Laying segmental paving blocks	165
8.3.1.13.6.	Segmental paving block compaction.....	165
8.3.1.13.7.	Joint filling	165
8.3.1.13.8.	Daily finishing of pavements	166
8.3.1.13.9.	Minimum paver size	166
8.3.1.13.10.	Permeable paving	166
8.3.1.13.11.	Acceptance of interlocking segmental pavements	166
8.3.1.14.	Extruded concrete kerbing	167
8.3.1.14.1.	General	167
8.3.1.14.2.	Materials	167
8.3.1.14.3.	Preparation and placement.....	167
8.3.1.14.4.	Tolerances	167
8.3.1.14.5.	Contraction joints	167
8.3.1.14.6.	Expansion joints.....	167
8.3.1.14.7.	Curing	168
8.3.1.14.8.	Backfilling.....	168
8.3.1.14.9.	Keyed kerbing.....	168
8.3.1.15.	Concrete footpaths and shared paths	168
8.3.1.15.1.	General	168
8.3.1.15.2.	Materials	168
8.3.1.15.3.	Preparation and placement.....	169
8.3.1.15.4.	Expansion joints.....	169
8.3.1.15.5.	Contraction joints	170
8.3.1.15.6.	Edge treatment	170
8.3.1.15.7.	Protection.....	170
8.3.1.15.8.	Backfilling and reinstatement of the verge	170
8.3.1.16.	Asphalt pathways.....	170
8.3.1.16.1.	General	170
8.3.1.16.2.	Sub-grade	170
8.3.1.16.3.	Base course	170
8.3.1.16.4.	Wearing course.....	170
8.3.1.16.5.	Edge restraints.....	171
8.3.1.17.	Street name plates	171
8.3.1.17.1.	Location	171
8.3.1.17.2.	Dimensions	171
8.3.1.17.3.	Colour	171
8.3.1.17.4.	Legend.....	171
8.3.1.17.5.	Mounting.....	171
8.3.1.17.6.	Post colour and fixing.....	171
8.3.1.18.	Stormwater drainage.....	172
8.3.1.18.1.	General	172

8.3.1.18.2.	Materials	172
8.3.1.18.3.	Installation of junction pits and gullies.....	175
8.3.1.18.4.	Headwalls	175
8.3.1.18.5.	Excavation	175
8.3.1.18.6.	Shoring	176
8.3.1.18.7.	Blasting	176
8.3.1.18.8.	Pipe laying and backfilling.....	176
8.3.1.18.9.	Excavation in roadways	177
8.3.1.18.10.	Open drains	177
8.3.1.18.11.	Stone pitching	177
8.3.1.19.	Subdivisional materials sampling	178
9.	Module No. 9 – Glossary, References and Further Reading.....	181
9.1.	Glossary of terms.....	181
9.2.	References and additional reading.....	183
9.3.	Abbreviations	186

Module No. 1

Legal Framework and Contract Administration

1 Module No. 1 – Legal Framework and Contract Administration

1.1 General requirements

These subdivisional development guidelines have been developed as a reference guide for developers, planners, engineers, technical consultants and contractors involved in subdivisional design and construction. They can be interpreted as setting out the minimum requirements that should be accepted by a local government in granting clearance of the engineering conditions imposed on a subdivision by the Western Australian Planning Commission (WAPC). The Commission is the subdivision approval authority in Western Australia, acting under the *Planning and Development Act 2005*.

The guidelines are intended to balance specifications for land affordability whilst maintaining life expectancies for major infrastructure, and they shall not form the basis of a construction contract. The developer is to provide adequate and sound infrastructure which is not in the long-term detriment of the local community or government.

The guidelines prescribe the use of best practice to set minimum standards applicable to the design and construction of roads, drainage, pathways, earthworks and public open space. Developers are encouraged to discuss their proposals with the WAPC and the local government at an early stage. These guidelines are not intended to restrict or prevent innovative solutions or improvements in best practice.

It is acknowledged that accepted industry standards change over time. In order to accommodate such changes, periodic revisions will be made to these guidelines on an as needs basis. The guidelines also prescribe the latest legislative requirements at the time of drafting.

This Edition No. 2.2 – 2012 also attempts to highlight many agency policies which have been formulated under jurisdiction of the legal framework in place at the time of drafting. These policies serve as a description or clarification of individual agency interpretations of legislation and how that legislation is to be put into practice in planning, designing and constructing subdivisions.

Local governments are encouraged to adopt these guidelines as the minimum standard for subdivisional development and they are to be read in conjunction with other policies and legislation relevant to agencies associated with subdivisional approvals.

Module No. 1 addresses the legislative framework that both local government and the development industry are bound to abide by to plan, design, construct and approve land development within Western Australia. This module also sets out several contractual issues which should be addressed when considering and planning subdivisions. These items need to be considered by both developers and local government when signing contracts and seeking approvals for those contracts.

Legislation that sets the legal framework which governs subdivisional development throughout the State includes:

- *Planning and Development Act 2005*;
- *Environmental Protection Act 1986 and Environment Protection Regulations 1987*;
- *Contaminated Sites Act 2003*;
- *Disability Services Act 1993*;

- *Health Act 1911;*
- *Bush Fires Act 1954;*
- *Conservation and Land Management Act 1945;*
- *Native Title Act 1993 and Amendments 1998 (Federal);*
- *Aboriginal Heritage Act 1972;*
- *Local Government Act 1995;*
- *Fire and Emergency Services Authority WA Act 1998;*
- *Swan and Canning Rivers management Act 2005*
- *Occupational Safety and Health Act 1984;* and
- *Environmental Protection and Biodiversity Conservation Act 1999 as amended (Federal).*

There are also Acts of Parliament that have relevance but do not have a direct effect on subdivisional construction. These include:

- *Main Roads Act 1930;*
- *Transport Coordination Act 1966;* and
- *Soil and Land Conservation Act 1945.*

Contract documents address many of the following items so that developers in particular, understand their obligations prior to proceeding to conditional planning approval stage. These guidelines will give developers the opportunity, prior to seeking any approvals, to discuss and understand what legislation governs their development and what issues can arise during that approval process. Some of these contractual issues include:

- statutory requirements
- developer responsibilities
- occupational health and safety
- road upgrading for subdivisions
- street lighting
- dust control
- control and supervision of works
- practical completion
- survey release
- bonding outstanding works
- defects liability.

Many of these topics are discussed in further detail in the following sections.

1.1.1 Objectives of the Guidelines

These guidelines are for use by both statutory organisations and the development industry. They aim to ensure that subdivisional development:

- meets relevant design and construction standards to ensure safety and longevity;
- produces a beneficial asset for the community;
- being effective (achieves its intention);
- occurs in an efficient manner;
- minimises adverse effects on the local environment;

- produces suitable lots and facilities at a reasonable cost to the community;
- minimises future maintenance liability; and
- considers and allows for future development and maintenance.

1.2 Planning and Development Act 2005

Subdivision in Western Australia is administered by the WAPC. The statutory basis for broad acre subdivision is established primarily by the *Planning and Development Act 2005*.

The guidelines set out in this document become applicable *only* after the planning conditions for subdivision have been set by the WAPC.

1.2.1 Subdivision and clearance process

Subdivision generally occurs after the planning context for a landholding has been established by zoning under the Metropolitan Regional Scheme (MRS) or other region scheme and the local planning scheme; and by the preparation of structure plans or outline development plans under the local government's local planning scheme.

Structure plans and/or outline development plans should occur in advance of subdivision and broadly outline the distribution and type of land uses proposed and the indicative site layout including streets, retail and commercial facilities, employment areas, open space, schools, community facilities and infrastructure provision. Initiation and preparation of structure plans and outline development plans generally rests with the landowner, although the WAPC and local governments may prepare these documents to guide development, particularly where land ownership is fragmented or has complex development constraints.

Local government engineering involvement is critical at structure planning stage to address general design issues. The WAPC has operational policies that guide the design of urban areas and the assessment of proposals. The current subdivision design and assessment policy is the WAPC's *Liveable Neighbourhoods* (and supporting) operational policies, which is available online at www.wapc.wa.gov.au. The Commission also has power under the *Planning and Development Act 2005* to set minimum standards of construction for roads (s169).

There may be situations where the developer may enter into a cost sharing arrangement with the local government for common infrastructure and this could be set out under a Development Contribution Plan.

IT IS IMPERATIVE THAT ALL LOCAL GOVERNMENT DISCIPLINES HAVE INPUT AT THE DISTRICT AND LOCAL STRUCTURE PLAN STAGES. IF THIS OCCURS AND THE DESIGNS CONFORM TO 'LIVEABLE NEIGHBOURHOODS POLICIES', THEN MOST OF THE DESIGN ISSUES SHOULD BE SOLVED WITHOUT CONDITIONS BEING COMPROMISED.

1.2.1.1. Subdivision process

The WAPC determines all green title, built, vacant and survey strata subdivision (except built strata subdivision applications of five lots and under which are determined by local government).

Application to the WAPC for subdivision approval is initiated by the landowner/developer. Subdivision applications are lodged with supporting information, including a plan, and are processed by the Department of Planning on behalf of the WAPC.

Subdivision applications are registered by the Department of Planning then referred to relevant State government agencies and the local government for comment on whether to grant conditional or unconditional approval, or refusal. All applications are referred to the relevant local government, Western Power and the Water Corporation. Other possible referral agencies include the Department of Environment and Conservation, Department of Water, Main Roads Western Australia (Main Roads WA), Swan River Trust, Fire and Emergency Services, Department of Health, Department of Agriculture and Department of Education.

Referral agencies have 42 days to respond. If conditional approval is recommended, conditions are normally derived from a set of conditions developed and adopted by the WAPC and based on advice from referral authorities; however, non-generic conditions may be imposed. This is the critical point for detailed local government engineering involvement and dialogue between the local government and the developer should take place as early in the process as possible. The *Planning and Development Act* now provides that if referral advice is not received within 42 days, there is deemed to be no objection to approval and no requirement for conditions from that agency.

Once referrals are received, the planning officer generates a report and recommendation. A set of 'model' conditions, adopted by the WAPC, is used as the basis for condition setting.

The decision of the WAPC is forwarded to the applicant with copies to referral agencies. Generic conditions that apply to most major subdivisions include site contouring and provision of power, sewer, potable water, drainage, streets and open space. In general, more than half of the approval conditions relate to the local government requirements.

A responsible State or local government agency is identified for each condition to ensure compliance by the developer. These agencies specify the requirements necessary to meet generically worded conditions and they are responsible for confirming that the works or tasks have been completed satisfactorily during the development. In addition to conditions, approvals often contain advice notes that provide more detailed information on what may be required to satisfy certain conditions. Engineering conditions may be generic and the lack of certainty and specificity on engineering conditions has warranted the Department of Planning's funding of this current review. The clearance process is outlined in section 1.2.1.2.

An applicant receives either a refusal, or an approval with conditions. If the applicant considers the decision (refusal or conditions) unacceptable, they have a right of review to the State Administrative Tribunal (SAT). There is also a right of appeal if the subdivision application is not determined within 90 days.

Most conditional approvals are valid for four years.

1.2.1.2. Design, construction and the clearance process

A landowner/developer with a conditional subdivision approval initiates the clearance process. After construction of the subdivision and certification that relevant standards and conditions have been met, an application is made for final approval and issue of title. Not all conditional approvals progress to final approval. For large subdivision approvals, clearances are sought for stages (usually of 40–80 lots) rather than the entire subdivision.

The WAPC remains the statutory approval authority for clearances but conditions are worded such that works are to the specification and/or satisfaction of the clearing authority. The landowner/developer or their representative(s) approaches each individual clearing agency to receive advice on the specific works or tasks necessary to satisfy the condition(s) for the lots for which clearance is sought.

The landowner/developer then proceeds to prepare plans, undertake the specified works, and seek clearance at or near the end of the site construction process. The *Planning and Development Act* at section 170 requires that a proponent (subdivider) is to provide to the local government drawings and specifications for roads, artificial waterways and any such other information relating to levels, drainage, nature of soil and physical features as the local government requires. The Act specifies the process that is to be followed by the local government and the proponent in dealing with drawings and specifications. There is a right of review to the SAT if a proponent does not agree with the requirements specified by the local government.

Once all works are completed or near completion, application is made for clearance of the stage. A diagram of survey outlining the surveyed public and private lot configurations and dimensions is submitted to each clearance agency and the agency advises the WAPC or proponent in writing that the condition has been satisfied. The proponent lodges application with the WAPC together with clearance letters from all relevant agencies and the diagram of survey. Once compliant, these are forwarded to Landgate for the issue of title.

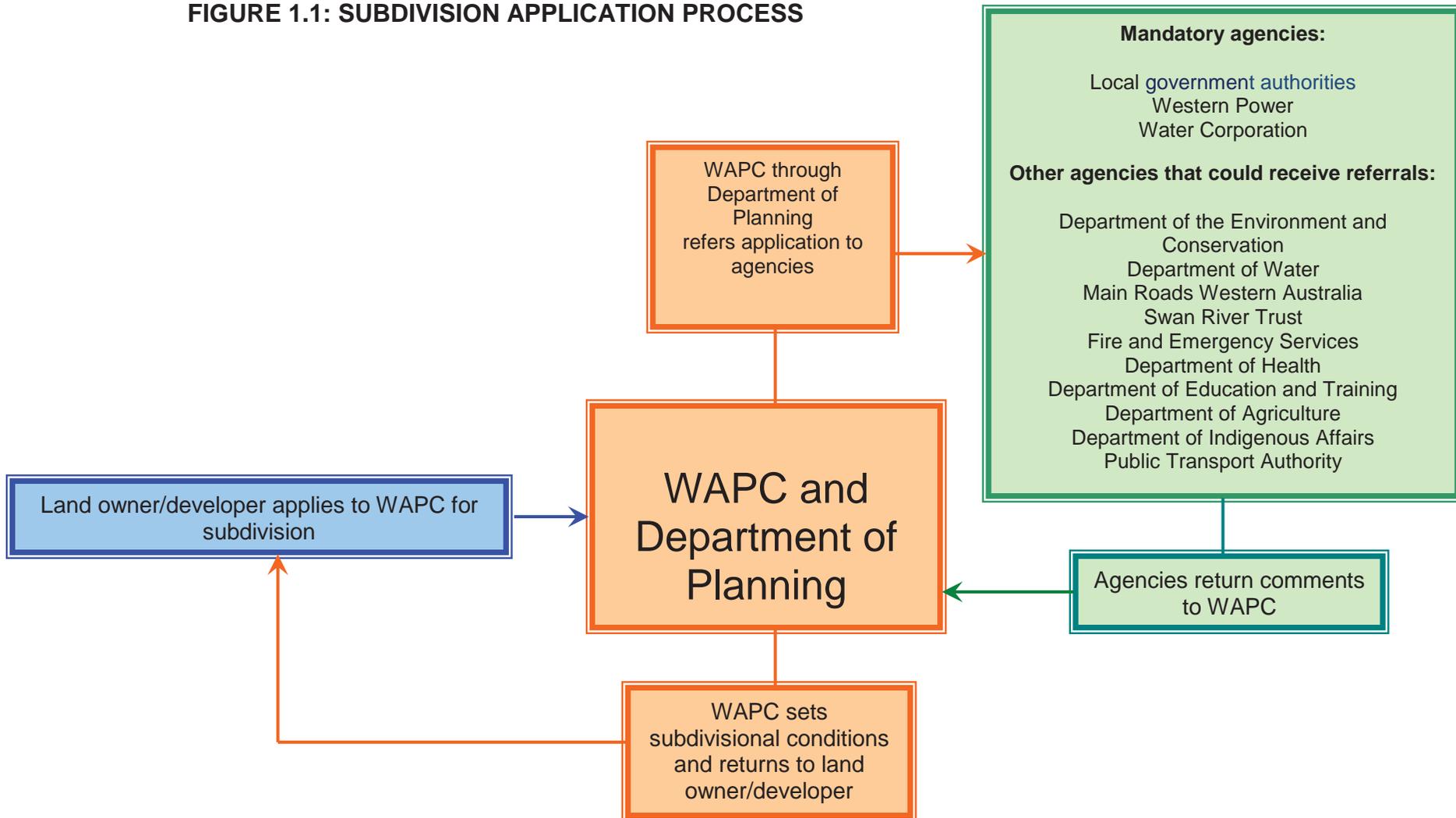
If a clearance agency refuses to clear a condition, a proponent may request the WAPC to clear the condition and endorse the diagram of survey pursuant to section 145 of the Act. The WAPC is likely to use these guidelines as minimum standards in determining requests for endorsement of diagram where a local government will not. The WAPC is to try to deal with an endorsement request within 30 days. A proponent has a right of review to SAT if the Commission refuses to endorse the diagram, or does not make a decision within 30 days.

A sample condition from the WAPC's Model Conditions is:

Those lots not fronting an existing road being provided with frontage to a constructed road(s) connected by a constructed road(s) to the local road system and such road(s) being constructed and drained at the applicant/owner's cost. As an alternative the WAPC is prepared to accept the applicant/owner paying to the local government the cost of such road works as estimated by the local government subject to the local government providing formal assurance to the WAPC confirming that the works will be completed within a reasonable period as agreed by the WAPC. (Local Government)

The following diagram shows the subdivisional process as described previously.

FIGURE 1.1: SUBDIVISION APPLICATION PROCESS



1.2.1.3. Road safety audits

Most traffic and road safety issues should be resolved through the road network design at structure planning stage. Road safety audits may be further required by the local government in specific situations. These may include but are not limited to:

- main streets and other streets and intersections in town and neighbourhood centres;
- rail station precincts;
- special streets with cross-sections different from those included in the WAPC's *Liveable Neighbourhoods* policy;
- intersections that do not meet the requirements of *Liveable Neighbourhoods*;
- where traffic volumes are high and risk warrants an audit;
- new schools; and
- other areas where there is potential for significant conflict between cyclists, pedestrians and vehicles.

An audit must make balanced consideration of the safety of all users, not just vehicle safety. The road safety audit team should have expertise in pedestrian, cycle and public transport safety matters.

1.2.1.3.1. Road safety auditor

Where a road safety audit is required, it is to be undertaken by an Accredited Senior Road Safety Auditor and supported by at least one independent team member.

1.2.1.4. Traffic impact study

Where a traffic impact study is required it is to identify:

- current traffic conditions on relevant external roads;
- predicted traffic volumes (internal roads and relevant external roads).
- current and future road hierarchy;
- road upgrade requirements (including intersection requirements);
- intersection treatments; and
- recommended design solutions.

It is recommended that when considering traffic impact studies, the developer should be aware of the requirements and conditions within the Transport Assessment Guidelines developed by the Department of Planning. These guidelines will give rise to a full transport assessment for the development.

1.2.1.5. Cash in lieu of public open space

Where the WAPC, the local government and the developer agree, a condition may be imposed that relieves the developer from setting aside land for public open space if payment occurs to the local government to the value of the land. This is governed by section 153 of the *Planning and Development Act*.

1.2.1.6. Monies paid to local government in lieu of public open space

Section 154 of the *Planning and Development Act* outlines that cash in lieu of public open space must be placed in a dedicated trust account with use to be on public open space within the locality.

1.2.2 Subdivision costs

Subdivision costs to the local government are covered under Division 4 of the *Planning and Development Act 2005*, however, some definition will be supplied as to certain calculations and the areas of subdivisions to which they should apply.

1.2.2.1. Expenses of road or waterway construction and road drainage

Section 158 of the *Planning and Development Act* addresses the supervision fees for local governments which were originally within the *Local Government Act*. The section not only gives legal jurisdiction for local governments to collect these funds but it sets down how these fees should be calculated.

Section 158 of the *Planning and Development Act 2005* requires the involvement of a consulting engineer and clerk of works. The current practice is that subject to the agreement of the developer and the local government, another person may be appointed in lieu of the clerk of works. A suitable inspection and quality assurance process can be implemented in lieu of the clerk of works.

The latest water designs include overland flow across future private property and therefore, any artificial waterways must include run-off from those areas and the subsequent works be subject to the fees for supervision.

Where public open space development is not a condition of subdivision but where the developer wishes to upgrade these areas, then they are subject to negotiation and costs of such works may be included in the calculations for fees.

In addition, where drainage is placed in public open space and the stormwater is to flow across such public open space the supervision fee is to apply to both the public open space and the actual area of the drainage.

In general, roads contribute approximately 15 per cent of the total area, including earthworks on private lots. This area then (15 per cent of total area of earthworks) should be subject to supervision fees as required under section 158 of the *Planning and Development Act*.

Where practical, retaining walls within subdivisions should be wholly contained within private title and are subsequently subject to building licences, so do not form part of the subdivision calculations for supervision fees. As such, they would normally attract a Building Licence fee.

1.2.2.2. Initial subdivider may recover road costs from subsequent subdivider

In some instances subdivision requires road and drainage to be constructed on a boundary with vacant land and the initial subdivider is required to construct the full pavement at subdivision stage. Section 159 of the Act includes a mechanism for the initial subdivider to claim a portion of the initial road costs from the subsequent subdivider.

1.3 Environmental Protection Act 1986

Environmental conditions may be applied to schemes and specific development or subdivision proposals under the *Environmental Protection Act*. These must be complied with.

In other cases, requests may be made by the Department of the Environment and Conservation to the WAPC for the imposition of environmental conditions on subdivisions. There may need to be liaison between the local government and the Department of the Environment and Conservation if such conditions are set by the WAPC.

1.4 Contaminated Sites Act 2003

The *Contaminated Sites Act* applies separately to the *Planning and Development Act*. Responsibilities in relation to contaminated sites rest with proponents, landowners, the polluter and auditors. The Department of Environment and Conservation is the responsible agency for this Act and more information is available online at www.dec.wa.gov.au/pollution-prevention/contaminated-sites.

1.4.1 Accredited auditors

Part 7 of the *Contaminated Sites Act* refers to independent auditors who act on behalf of the client under the authorisation of the Department of Environment and Conservation. These auditors are paid by the proponent but carry out the overseeing role on consultants that work on and report on the remediation of contaminated sites. The auditors carry out a role to ensure that remedial reports cover the requirements of the Department of the Environment and Conservation so approval by that department is easier and the process is quicker for the developer.

1.5 Acid sulfate soils

An acid sulfate soil is the common name given to naturally occurring soil and sediment containing iron sulphides. These naturally occurring iron sulphides are generally found in a layer of waterlogged soil or sediment, and are benign in their natural state. When disturbed and exposed to air however, they oxidise and produce sulphuric acid, iron precipitates and concentrations of dissolved heavy metals such as aluminium, iron and arsenic. If acid sulfate soils are not managed there are potential adverse impacts on the natural and built environment.

Subdivision proposals on sites of medium to high risk of acid sulfate soils are automatically referred to the Department of the Environment and Conservation by the WAPC. Standard conditions are applied including acid sulfate soil self-assessment and preparation of reports and management plans for Department of Environment and Conservation clearance.

1.5.1 Technical advice

The WAPC's website contains *Acid Sulfate Soil Planning Guidelines* (January 2009) and a related Planning Bulletin 64/2009. The Department of Environment and Conservation has also prepared the *Acid Sulfate Soils Guidelines* series to assist agencies, developers and individuals to manage development in areas where acid sulfate soils will or may be impacted upon.

Further technical advice and information can be obtained online at the Contaminated Sites page on the Department of Environment's website at <http://www.environ.wa.gov.au/contaminatedsites>.

1.6 Disabilities Services Act 1993

The *Disabilities Services Act* has a direct effect on construction of subdivisions and sets out the frameworks and requirements to allow the disabled to use and enjoy the facilities provided in a new development. It attempts to provide guidance to the issues that must be considered when providing infrastructure within a subdivision so that all members of the community receive the same benefits.

1.7 Aboriginal Heritage Act 1972

This *Aboriginal Heritage Act* is in place to provide protection for places and objects which are considered of significance to the aboriginal heritage. It protects the traditional use of such land or objects that have been or are in use by aboriginal people and is part of tradition in those places or in use of those objects.

The Act sets up the Aboriginal Cultural Materials Committee which oversees the functions of the Act and makes determinations in relation to issues raised under the Act.

Traditional Custodians (aboriginals) who, in the opinion of the Committee, have an interest in the place or object, are gazetted by the Minister.

1.7.1 Consent to certain uses

Under section 18 of the *Aboriginal Heritage Act* the owner of any land which has an aboriginal interest must seek approval from the aboriginal elders of the land and subsequently an approval from the Aboriginal Cultural Materials Committee to develop the land in question.

Requirements for such approvals are no longer set as a condition by the WAPC as they occur under separate legislation. There may, however, be an advice note alerting proponents to the need to seek separate approval. Section 18 approval under the *Aboriginal Heritage Act* will be required before clearance and approval of the condition is granted.

1.8 Heritage of Western Australia Act 1990

Where development or subdivision of any land entered in the Heritage Register is requested, the matter must be referred to the Heritage Council prior to any decision being made in relation to the development. Part 8 of the *Heritage of Western Australia Act* refers to effects on development proposals and would form part of the consultation process by the WAPC, prior to subdivision conditions being set and sent out to developing parties and relevant authorities.

1.9 Fire and Emergency Services Authority WA Act 1998

The Fire and Emergency Services Authority (FESA) is a referral agency for many subdivisions in accordance with WAPC Policy DC 3.7 and by means of mutually agreed referral criteria. It also has direct responsibility for fire protection matters in defined areas of the State (Emergency State Locations 1, 2 and 4) (ESL) and has a direct interest in ensuring that land development does not add unnecessary risk to the community.

Local government has responsibility for fire protection matters in defined areas of the State (ESL 3 and 5) and therefore has responsibility for ensuring land development has adequately considered fire risks. WAPC Policy DC 3.7 (and associated documents such as *Planning for Bush Fire Protection*) apply.

The WAPC applies appropriate conditions on the advice of FESA.

Where fire-fighting services are required verification of the water supply will be required to provide flow rates and pressures to protect the potential fire loads (industrial) to suit Australian Standard 2419.

It should be noted that the water utility (Water Corporation, Aqwest, Busselton Water) will apply and clear conditions relating to hydrants as part of their condition relating to water supply infrastructure, utilising FESA standards for hydrant spacing, flow and marking. However, FESA can assess subdivisions and advise on the processes by which water should be stored or made available in times of fires.

1.10 Environmental Protection and Biodiversity Conservation Act 1999 as amended (Federal)

Developers and local government should be aware that section 266B of the *Environmental Protection and Biodiversity Conservation Act* refers to a list of threatened species, which must be considered as part of any development proposals.

While there is a list of threatened species it is also relevant to understand that there are matters of national significance covered by both the State and federal acts in relation to the environment.

1.11 Statutory requirements

The preceding section shows the relevant Acts of Parliament that need to be taken into account when development is taking place within an area. However, there are policies and guidelines which are updated and need reference checks to assess appropriate changes as they occur.

The draft policies are sometimes given a period of testing and developers and local authorities are requested to partially implement and comment on the success or otherwise of these documents.

There are also documents and technical papers developed but these are for reference only. Until formally adopted by the government agencies the information held within those guides can be negotiated between parties but do not have the legislative or departmental backing.

Local government officers should make themselves fully conversant with the relationship between the developer and the consultants prior to calculating the fees as set down in S158 of the *Planning and Development Act*. The setup of the inspection and supervision structures for the subdivision will determine the level of fees that the developer is to pay to the local government.

Where the developer wishes to carry out work outside the conditions of development then these fees are to be negotiated and agreed upon by both parties. This document sets basic or minimum fees applicable but where extra works are done then these fees will need to be negotiated at the time of both parties agreeing to the extra works.

1.12 Local government responsibilities

1.12.1 Approval period for designs and documentation

It is incumbent on local authorities to expedite the processing of approvals, particularly approval of designs for subdivision. If these guidelines are adopted by local authorities the requirements for documents to be submitted for approval are clearly known by the developer and the local government, and the approval process should follow in due course.

Approvals should be given as soon as possible but in a period no longer than six (6) weeks. Despite the resources available to a local government contact with the various consultants should be feasible within that period. Consultants require some form of consultation and feedback on documents within the six-week period so amendments can be made or arrangements to move the project forward after the documents have been approved. This feedback is essential and must be done as soon as possible as in many cases, developers have interim finance on projects and any major delays can create a flow-on effect of costs to the ultimate purchaser of the land.

1.13 Developer responsibilities

Once the WAPC has set down subdivision conditions it becomes the responsibility of the developer to engage appropriate expertise either from his or her own qualified staff or by engaging qualified consultants, or by engaging the local government to carry out the specific tasks of design and documentation of the development.

1.13.1 Engaging consultants

Subdivisional conditions can involve several areas of expertise including but not limited to engineering, environmental, hydrology, horticulture, landscaping and aboriculture.

1.13.1.1. Engineering consultants

The developer shall engage a consulting engineer to design and inspect the engineering works associated with the subdivision. As an alternative the developer may engage local government to design and inspect works under section 158 of the *Planning and Development Act*.

The consulting engineer shall prepare designs and specifications for the engineering works listed in the WAPC's conditional approval of subdivision in accordance with these guidelines. Before any work commences on the construction of the subdivision, the drawings and specifications shall be approved by the local government.

By way of definition the consulting engineer shall be a professional eligible for corporate membership of the Institution of Engineers Australia or registration in the National Professional Engineers Register.

1.13.1.2. Environmental consultants

Where conditions of subdivision highlight environmental issues that must be addressed for subdivisional clearance, the developer shall engage appropriately qualified environmental consultants in line with current practices of the Department of Environment and Conservation and the Department of Health. This may include such consultants as environmental auditors to assess environmental consultants reports on behalf of the State authorities.

1.13.1.3. Dilapidation survey or service reinstatements

Where applicable and where developments are directly adjacent to old, heritage and other structures, it may be prudent for the developer to carry out a dilapidation survey on the existing infrastructure. This may reduce damage claims during the construction and at the end of works on the development.

There will be a need to assess the location of existing services prior to works commencing to ensure the viability of those services not being damaged during construction.

1.13.1.4. Hydrological consultants

Water and its treatment has become a major issue for land developers and in many cases there may be a need to engage hydrological consultants to model and determine the effect of the development on surface and groundwater resources to satisfy the requirements of the Department of Water. The outcomes of these investigations, which should be prepared by suitably qualified consultants, will usually require endorsement by the Department of Water.

1.13.1.5. Indigenous heritage consultants

Where land is affected by indigenous heritage laws and will require a section 18 clearance under the *Aboriginal Heritage Act 1972*, the developer can be required to engage specialist consultants to deal with the issues in gaining clearances under section 18.

1.13.1.6. Horticultural/Aboricultural consultants

Where the requirements of *Liveable Neighbourhoods* or a negotiated development of public open space is to be part of the overall development there may be a need to engage consultants with horticultural and/or aboricultural expertise which may even require the advice and involvement of a qualified landscape architect and in some instances an environmental consultant.

Negotiations may also result in the requirement for a landscaping plan to be provided to the local government.

1.13.1.7. Geotechnical investigations

Prior to the consulting engineer undertaking the design of the subdivision, the developer shall carry out a site inspection and investigation by a geotechnical engineer to determine the geotechnical properties of the soils. The level of investigation shall be determined by the particular site characteristics required for the development and in some cases there may be specific requirements detailed by the local government. Such information shall form the basis of the design of the subdivisional infrastructure. A copy of the report on the site investigation shall be lodged with the appropriate authorities for approval of relevant subdivisional conditions prior to, or at the same time as, the design drawings and specifications are also lodged for approval.

1.13.2 Liabilities and insurances

For the duration of the subdivision process (through to the issuing of titles) the developer shall be responsible for all damage caused by or contributed to by it (or its contractors, servants or agents) to existing facilities, including retained vegetation, services and

structures in both public and private ownership, sustained as a result of the development of the subdivision.

Any damage shall be reinstated to a similar standard acceptable to the relevant owner without delay.

The developer shall obtain insurance cover, on standard terms with a reputable insurer, for public liability, contractors' works and workers compensation risks, to a level of liability approved by the local government, and thereafter provide copies of all current certificates of insurance to the local government.

1.13.3 Occupational safety and health

All phases of the construction works associated with the proposed subdivision shall be carried out in compliance with all Acts and Regulations administered by the relevant government authorities. The developer's attention is specifically drawn to the requirements of the *Occupational Safety and Health Act 1984*, *Clean Air Regulations 1967* and *Environmental Protection Act 1986*.

The safety of the general public, contractor's employees and road users on adjacent streets during the construction of the subdivision is paramount and details of how this is to be achieved shall be included in the project specification.

Where subdivisional works interface with existing infrastructure and traffic the developers shall be responsible for producing and having approved by the local government traffic management plans prior to any works commencing. These plans will be accordance with the relevant Australian Standard AS1742.3–2002 and Main Roads WA's code of practice *Traffic Management for Works on Roads – Total Practice*.

1.13.4 Road upgrading for subdivisions

Where a planned subdivision shows the joining of a subdivisional road with an existing public road, then the subdivisional road is generally required by condition to be constructed to connect to the existing public road.

Where a subdivision is constructed adjacent to a future primary or district distributor in accordance with WAPC Policy No. DC 1.7 (3.3), the local government requires the ceding of the land free of cost and the construction of earthworks for the whole of the road reserve, the construction of one carriageway (two lanes) and associated drainage facilities. In addition, grade separated pedestrian crossings and a dual use path along one side of the road may be required where these facilities accord with proposals for the overall structure planning for the area. Where junctions, through the subdivisional process, are upgraded the developer shall also upgrade the street lighting to Australian standards.

A landowner's agreement may be negotiated between the local government and the developer for the contributory arrangements for provision of the primary and distributor road networks.

Where it is considered that existing roads, whether directly abutting the subdivision or not, are substandard or inadequate to accommodate the expected additional traffic generated by the subdivision, the local government may request, as a subdivision condition, the upgrading of that existing road in accordance with WAPC Policy No. DC 1.7 (3.2).

Generally, where a proposed subdivision abuts an existing road reserve containing a substandard road, the local government will request a condition be imposed requiring that section of the road contained within the one-half of the road reserve fronting the subdivision to be upgraded to the standard for that class of road, with the upgrading works required to be carried out prior to the clearance of the subdivision.

In cases where the whole road requires upgrading as a condition of subdivision and the development is located on one side of the road only (eg. in situations where there is no existing road and it would be impractical to build one-half of the proposed road), the cost of this work will generally be shared in accordance with a negotiated cost share agreement between the local government and the developer of the land. The local government's portion shall be funded in accordance with the repayment terms of the agreement.

Every attempt shall be made to partially or wholly upgrade substandard roads fronting new subdivisions. Where it is impractical to physically construct the road or part thereof, the developer shall lodge a non-refundable cash contribution equal to the estimated cost of the proposed roadworks with the local government prior to the clearance of the subdivision.

1.14 Street lighting

The developer may be required to provide street lighting, including the suitable illumination of traffic management treatments to the newly created subdivision, in accordance with Western Power Corporation specifications for illumination level, materials and installation.

Alternatively, the provision of decorative street lighting may be negotiated between the local government, Western Power Corporation and the developer. Decorative lighting should generally be selected from Western Power's Street Vision Decorative Lighting series.

Standard street lighting is designed and implemented in accordance with *Australian Standard 1158.1: Road Lighting – Vehicular Traffic Lighting – Performance and Installation Design Requirements*, based on the road hierarchy and the associated lighting category.

In some country areas local authorities may only require street lighting at intersections and where paths cross roadways. These situations should be done by negotiation with the local government and Western Power. The lighting standard should comply with the relevant Australian Standard.

When considering street lighting particular emphasis should be placed on facilities for pedestrians and cyclists.

1.15 Erosion control

Details of dust and sand drift control measures to be adopted during the construction of the subdivision shall be included in the specification and shown on the drawings. The measures are to be in accordance with 'A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities (Department of Environment and Conservation, March, 2011). The WAPC does not normally require a dust management plan as a condition of subdivision, as developers are required to comply with separate health and environmental legislation, including the Department of Environment and Conservation Guidelines. Where dust control creates a problem for adjacent residents and developments the local government can implement Schedule 9.1 of the *Local Government Act 1995* dust control and sand drift.

In those locations, where climatic conditions are such that wind borne dust and sand drift may cause significant problems the responsible local government may require a dust control and sand drift bond to be lodged as a condition of approval of the engineering drawings.

1.16 Project signage

Where required by the local government, a project signboard shall be erected at a suitable location on the site to advise the public of the project details, including contact details for the consulting engineer and contractors, and the expected completion date of the project.

1.17 Control, inspection and supervision of works

The construction works shall be carried out in accordance with the approved drawings and specifications, and will be subject to stage inspections and approval by the local government. Final approval shall only be given when all works have been executed to the true intent and meaning of the approved drawings and specification.

Prior to commencing construction the local government shall be advised in writing of the:

- name and address of the contractor;
- name of the contractor's representative;
- name of the consulting engineer's representative or superintendent;
- timetable for construction in the form of a bar chart, indicating the starting and finishing dates for each stage of the works; and
- contract price of the works.

The local government may require the developer or consulting engineer to lodge documentary evidence as to the contract value of the works, including bulk earthworks as set out in section 1.2.2.1.

The payment of fees as set down in the section 158 of the *Planning and Development Act 2005* should be made just prior to seeking clearance of the subdivision.

Section 158 of the *Planning and Development Act* reads:

'158. Expenses of road or waterway construction and road drainage

- (1) Where a person who is subdividing land is required under this Part to construct and drain roads or construct artificial waterways shown on the plan of subdivision that person may
 - (a) carry out or cause to be carried out the construction and drainage at his or her own expense; or
 - (b) arrange for the local government to carry out the work on behalf, and at the cost and expense, of that person.
- (2) Where the person does not make the arrangement with the local government, that person is to pay to the local government, on demand, an amount (calculated under subsection (3)) to cover the reasonable costs of the local government in supervising the construction and drainage.

- (3) For the purposes of subsection (2) the amount is to be calculated as follows —
- (a) where the person has not engaged a consulting engineer and clerk of works to design and supervise the construction and drainage, the amount is to be three per cent of the cost of the construction and drainage as estimated by the local government;
 - (b) where the person has engaged a consulting engineer and clerk of works to design and supervise the construction and drainage, the amount is to be 1.5 per cent of the cost of the construction and drainage as estimated by the local government.'
- (4) The local government may require the person to employ a consulting engineer and clerk of works to design and supervise the construction and drainage and that person, when required to do so by the local government, is to carry out the requirement.

1.17.1 Notification of commencement of works

The local government shall be advised five working days before the commencement of any works, and after a cessation of work, one day before recommencing any works. Residents who may be affected either directly or indirectly by the proposed subdivisional works may be required by the local government to be notified in writing of these works prior to the works commencing.

This notice may include:

- names of the developer and contractor;
- date of commencement of the works;
- expected completion date;
- details of measures proposed for the prevention of unacceptable levels of dust, noise and vibration;
- a statement regarding compliance with the Department of Environmental Protection publication: *A guideline for the prevention of dust and smoke pollution from land development sites in Western Australia (1996)*, and advice that a copy can be obtained from the engineering officer; and
- contact details for the contractor's representative to whom complaints regarding excessive dust, noise and vibration can be directed.

Disruption to local neighbourhoods caused by work activities associated with a development need to be minimised and the developer needs to comply with any reasonable requests by the local government relating to neighbourhood disruption. Transport routes to and from development sites need to be approved by the local government, and the developer shall ensure that such routes are used by all contractors.

1.17.2 Hours of work

All work shall be contained between the hours as set down by the *Environmental Protection (Noise) Regulations 1997*, and no work shall be carried out outside these hours without the prior written approval of the local government or the Department of the Environment and Conservation.

Generally, normal working hours for construction work are 7.00 am to 7.00 pm everyday except Sundays and public holidays. No work shall be undertaken outside these hours without prior local government approval. Construction work includes deliveries to the site of the works and the onsite servicing and fuelling of machinery.

Any application for work outside of normal hours shall demonstrate that it is reasonably necessary to perform the work outside of normal hours and additional neighbourhood consultation is required.

1.17.3 Inspection by consultants and supervision by contractors

The consulting engineer shall audit the contractor's work on a regular basis and in particular at the milestone stages as set out in the construction schedules and agreed to with the local government. Inspections by the local government shall not in any way diminish the responsibility of the consulting engineer to adequately audit the works. Auditing shall include regular site inspections.

The contractor's supervisor shall, when not personally present on site, be represented by a competent and experienced clerk of works as per the definition in section 1.2.2.1

The consulting engineer shall be available for the purpose of joint interim inspections where deemed necessary by the local government.

Where a developer and a local government wish to negotiate a different regime of inspections and auditing processes this is not discouraged as long as the process is mutually agreed.

1.17.4 Commencement of works, meetings and inspections

The local government's representative, consulting engineer and contractor or clerk of works may jointly meet as well as inspect the site prior to any work commencing to discuss the methods of construction, preservation of significant vegetation, or the eradication of noxious weeds, dust control and any other matters to minimise the likelihood of any problems associated with the subdivisional works.

The contractor shall ensure that any particular stage of work to be inspected has been satisfactorily completed before requesting an inspection by the local government. A minimum of 24 hours notice is required to enable arrangements to be made for an inspection. Each stage shall be inspected prior to the next or following stage of construction being commenced. The local government shall to the best its ability carry out the inspection within 48 hours of the notification of an inspection being required.

In circumstances where there is concern about workmanship or materials, the local government representative may request a certificate endorsed by the consulting engineer who certifies the correctness of any work in accordance with the approved drawings and specifications for all or any of the main stages of construction. No further stages shall proceed until this certificate is received by the local government.

With the building industry requiring level sites there is generally considerable earthworks carried out to form lots and subsequently, the road reservations. This generally adds an inspection phase to the overall processes involved with roads and drainage. Overland flows form part of drainage systems and with such flows an integral part of the water sensitive urban design. An inspection of earthworks should be done prior to any road and drainage construction being commenced. There may be instances however, where major lot

earthworks and road earthworks and construction proceed at the same time. In these cases the inspection stages can be amended between the concerned parties.

Where filling is required over an impervious layer it may be necessary to provide an inspection stage after the shaping of the impervious layer. This is an inspection process that could be the exception rather than the norm and should be negotiated between the developer and the local government.

The inspection and meeting phases that are recommended in approving subdivision construction are:

1. start-up meeting prior to any works commencing;
2. after completion of earthworks;
3. roads construction phases as per section 1.17.4.1;
4. drainage phases as per section 1.17.4.2;
5. completion of landscaping and irrigation processes; and
6. completion of defects liability period.

Where heritage issues are part of the subdivision there may be a need for specific site set-up inspections to ensure that heritage items are protected prior to any works commencing. This can be combined with the start-up meeting but both developers and local authorities need to be fully aware of their responsibilities at that early stage of subdivision.

Where public open space is developed inspections need to be carried out at the following stages:

1. when earthworks and the clearing footprint are marked out;
2. prior to earthworks commencing – could be done at start up meeting;
3. completion of earthworks;
4. where irrigation is installed at bore development stage, laying of mains prior to backfilling and at commissioning of system;
5. prior to grassing;
6. completion of play equipment and fencing if included in plans; and
7. relevant inspections should be implemented where buildings are being constructed as part of the subdivisional works.

It is also noted that in some areas level building sites are not possible due to natural topography and this major earthworks may not occur and the building industry will need to design buildings to suit the final earthworks levels rather than the other way around. In some instances it may be a more efficient practice to have the building industry design home to suit the site rather than have the site designed to suit the buildings.

Where some construction phases overlap or precede in tandem to other processes, inspections should be negotiated with the local government to ensure that construction phases are inspected by the relevant personnel.

1.17.4.1. Inspections for road works

The minimum inspection and regular site meetings regime for the construction of road works is:

1. when the road has been boxed out and the sub-grade shaped and compacted;
2. when the sub-base has been placed, graded and compacted to shape, level and specifications;
3. when the base course has been placed, graded, compacted and water bound to correct shape and level before priming or where asphalt is used as a base course medium this surface has been laid and compacted;
4. immediately after kerbing;
5. before the placement of asphalt or sprayed surface wearing course; and
6. prior to construction of pathways.

1.17.4.2. Inspections for drainage works

The minimum inspection and regular site meetings regime for the construction of drainage works is:

1. when the trenches have been excavated and the pipes laid true to line and level;
2. when using sub-soil drainage pipes, after the calibrated aggregate has been placed; and
3. after junction pits, gullies and other structures have been constructed.

Where water sensitive urban design criteria have been used and much of the drainage system includes overland flows, inspections need to be carried out:

1. after earthworks completion;
2. after appropriate drainage structures have been completed but prior to backfilling; and
3. after plantings are completed.

The consulting engineer shall be present to attend and record findings of stage inspections for roads and drainage.

1.17.4.3. Indicative Inspection Standard Form – Roadworks

**ROADWORKS
QUALITY ASSURANCE CERTIFICATION**

Project: _____
 Contract No: _____
 Contractor: _____
 NATA Tester: _____

SUB BASE

Material used _____
 Material Test certificates attached _____ date _____
 Compaction results attached _____ date _____
 As Con checked by _____ date _____
 As Con attached _____ date _____

BASE

Material used _____
 Material Test certificates attached _____ date _____
 Compaction results attached _____ date _____
 As Con checked by _____ date _____
 As Con attached _____ date _____

SEALING

As Cons checked by _____ date _____
 Suppliers Compliance Certificate attached _____ date _____
 Application rates and details attached _____ date _____
 Aggregate rates and details attached _____ date _____
 Aggregate type _____ date _____

KERBING

As Con checked by _____ date _____
 Concrete suppliers compliance Certificate attached _____ date _____
 Expansion and Contraction Joints in place _____ date _____
 As Con attached _____ date _____

ASPHALT

As Con checked by _____ date _____
 Material Mix details attached _____ date _____
 Suppliers Certification _____ date _____
 Materials Tests _____ date _____
 Core Tests attached _____ date _____
 As Con attached _____ date _____
 Ponding Checked by _____ date _____

DUCTS

As Con checked by _____ date _____
 Contractor Certification _____ date _____

SIGNS/POSTS

Footing to each post checked by _____ date _____

TME Standard Specification

Section 7

Contractor Certification _____ date _____

LINEMARKING

As Con checked by _____ date _____

TRAFFIC MANAGEMENT PLAN/RECORDS

Copy of Plan and records attached _____ date _____

CONTRACTOR VERIFICATION

I certify that the works have been completed in accordance with the Specification and drawings.	
Signed: .....(Contractor)	Date ___/___/___

Source: TME Standard Specification for Subdivisions

1.17.5 Testing

The consulting engineer shall provide to the local government, a copy of all test results related to the subdivisional works. Testing shall be carried out by a laboratory approved by the National Association of Testing Authorities (NATA) in accordance with the relevant Australian Standards. Where testing of a stage of construction is requested the next stage can proceed on the proviso that the Contractor accepts full liability for the previous stage. Should remedial works be required they shall be at the Contractor's expense.

In addition to the normal inspection and testing requirements as detailed elsewhere in these guidelines, the local government reserves the right to inspect and require samples to be tested to ascertain quantity and quality of materials being used in the construction work. The consulting engineer will be informed of any matters requiring remedial action. In the event that such testing reveals the work to be defective, the developer shall reimburse the local government for the cost of the testing.

1.18 Practical completion

Upon the satisfactory completion of all subdivisional work and soil stabilisation, the consulting engineer shall notify the local government in writing that the works have been inspected and are in accordance with the approved drawings and specifications. A local government may permit staging of practical completion as areas become finalised.

Upon receipt of this notification, the local government shall arrange a practical completion inspection of the completed works at a mutually convenient time. There may be a need, by negotiation, for water sensitive urban design and landscaping to have different dates for practical completion.

The inspection shall require the presence of the local government's representative, the consulting engineer and the contractor. The consulting engineer is to arrange for all road pavements to be swept, the drainage system cleaned out and gully and manhole covers temporarily opened for inspection. All drainage infrastructure needs to be accessible at the time of inspection.

At the time of practical completion or as soon as possible thereafter, the local government representative shall inform the consulting engineer of any item not in accordance with the specification and drawings.

Any such items shall be divided into:

- those items requiring completion, repair or alteration before clearance will be issued. A further inspection of these works when completed shall be deemed to be a continuation of the practical completion inspection; and
- those items that may be completed, repaired or altered during the defects liability period.

When all subdivisional works are completed in accordance with the approved drawings and specifications other than those agreed for completion during the defects liability period, the consulting engineer shall be notified of the practical completion date.

If at any time after the granting of practical completion, and during the defects liability period, the subdivisional work is found to be not in accordance with the approved specification and drawings then the works shall be rectified at the developer's cost. Minor items as agreed between the local government and the consulting engineer may be undertaken towards the end of the defects liability period.

1.19 Clearance

1.19.1 Certification of compliance

The contractor shall certify in writing that all the relevant engineering designs have been constructed as per the specifications. The consulting engineer shall supply copies of those certifications to the local government. The consulting engineer, in conjunction with the local government shall sign-off on the conditions imposed by the WAPC on the subdivision pertaining to survey release have been complied with and that the works have been completed in accordance with the approved drawings and specifications.

Certification documents could be as the example in section 1.17.4.3.

1.19.2 Conditions of clearance

The following items refer to the conditions which must be completed by the developer prior to approval of survey release of a subdivision:

- creation of the Diagram of Survey showing full details of all lots, road reserves, easements (temporary and permanent) and reserves;
- completion of all works associated with the subdivisional construction, including soil stabilisation where required, or the payment of an appropriate bond to cover outstanding works;
- receipt of the consulting engineer's confirmation that the works have been completed in accordance with the approved drawings and specifications;

- provision of as-constructed drawings in electronic format as specified by the local government;
- provide detail and value of the works so that it can be placed on the local government's asset register;
- payment of the appropriate engineering supervision fees;
- payment of a defects liability bond;
- payment of all or any monies required for works to be undertaken by the local government on the developer's behalf at some future date. eg. construction of roads, footpaths or development of public open space; and
- payment of any other specific monies relevant to the subdivision.

1.19.3 Creation of new roads

After the clearance of Diagram of Survey by the WAPC and Landgate, any land delineated and shown as a new road on such diagrams shall then be under the control and responsibility of the local government, subject to the defects liability requirements referred to in sections 1.18 and 1.21.

1.20 Bonding outstanding works

Bonding of incomplete works shall be by negotiation between the local government and the developer. Bonds may be in the form of a cash payment, bank guarantee or by written agreement between the local government and the developer.

1.20.1 Bond applications

The developer may lodge a bond in the form of cash or an unconditional guarantee from a financial institution (bank guarantee) acceptable to the local government in lieu of completion of all or part of the subdivisional works.

Applications for bonding shall be in writing and shall include the following information:

- concise reference to the extent, nature and location of the work to be bonded;
- a timetable for the proposed future completion of the bonded work;
- an itemised estimate of the costs of the bonded work, including the contract price and the name and address of the contractor responsible for the bonded works;
- reasons for requesting the bonding of the incomplete works; and
- any other information that will assist the assessment of the application.

Compliance with the above requirements does not necessarily imply acceptance of the bond and each request shall be subject to the approval of the local government.

1.20.2 Bond agreement

In cases where bonding is approved the developer shall enter into a written bond agreement with the local government, which clearly states:

- the name and address of the person or persons responsible for the payment or arranging the unconditional guarantee;
- the amount of the payment or unconditional guarantee;
- the name, stage number and location of the subdivision;
- the WAPC reference number of the subdivision; and
- a concise explanation of the purpose of the bond referring to all items for which it is to be utilised.

It is recommended that the earliest stage at which bonding will be considered is at the completed drainage infrastructure and the road limestone or sub-base stage. However, this is to be determined by the local government.

Agreements should detail what the bond is for, the amount agreed by the parties, the default conditions and how the local government can have unrestricted access to bond monies to complete works in case of the developer defaulting on the works in question.

A bank guarantee is recommended as an alternative to a cash bond as the local government is guaranteed access to funds should the developer default on works. It is however, recommended that the following conditions apply:

- the bank guarantee is clearly in favour of the local government;
- the conditions of the bank guarantee should clearly state its purpose and what works are being bonded;
- the bank guarantee has not expiry date and is only released upon the approval of the local government;
- the bank guarantee shall not have an expiry date but shall be directly tied to the outstanding works and the date on which the local government approves their completion;
- these conditions should also detail how the local government will demonstrate to the bank concerned that the developer/contractor has defaulted and that certain conditions of the bond have been ignored upon which demonstration the bank will release to the local government the bonded monies;
- the conditions of the bank guarantee must be clear that upon demonstrated default the bank concerned will release the bond monies without restriction upon demand by the local government; and
- the bond agreement must be legally checked to ensure the intent of the bond can be administered by the local government. This could be done by setting up a legal pro-forma which could be used from one development to another, reducing time delays with legal advisers.

1.20.3 Calculation of bond amount

The calculation of a bond amount is to be negotiated between the developer and the local government.

In calculating the amount, it is suggested to consider:

- the contractual amount for the works being bonded that can be taken from the contract documents supplied by the consulting engineer;
- a financial penalty against the developer should the local government have to carry out the works either by its own day labour workforce or by hiring another contractor. (it is suggested a 25 per cent surcharge be placed on the contractual cost for the work);
- obligatory GST charges by any new contractor who is brought in, which would need to be calculated on the contractual costs and the 25 per cent surcharge (it should be noted that if the local government was to engage a new contractor then GST would apply); and
- a non-refundable administration fee by local government to handle the setting up of the bond agreement and its implementation, should the need arise (a fee of \$1000 plus GST is recommended as reasonable).

Bonds should be returned to developers on their written request in a timely manner.

1.21 Defects liability

1.21.1 General

It shall be deemed to be the responsibility of the developer to repair any defects resulting from faulty workmanship and/or defective materials on all roads and associated works for a period of 12 months from the date of practical completion – referred to as the defects liability period.

Where urgent defects requiring attention and become evident during the defects liability period, the local government may request such defects to be rectified immediately. Should the contractor fail to complete the rectification works within the time specified then the local government may arrange for the works to be undertaken using monies from the defects liability bond.

Prior to the expiry of the defects liability period the consulting engineer shall arrange an inspection after ensuring that all defects are repaired and swept. Should the consulting engineer delay or defer this process, any defects which arise during the deferment period may be deemed by the local government to be a defect under the defects liability period.

The consulting engineer shall apply in writing to the local government for defects liability release which will be subject to the effective repair of any defective works.

Where a developer chooses to delay seeking subdivisional clearance after the date of practical completion, the local government may determine the date of commencement of the defects liability period as being the date of subdivisional clearance.

In a rural environment in the mid or north-west there may be special circumstances (climatic hydro geological, etc.) where a local government may decide that a longer period is required, such as over two wet seasons and one dry season.

Defects liability periods can be extended past the twelve months period, particularly in 'brownfield' developments and this should be negotiated between the developer and the local government.

1.21.2 Defects liability bond

Prior to the clearance of the subdivision, the developer may be required to pay to the local government a defects liability bond, which is to be five per cent of the works as calculated on the total contractual cost of the subdivision being the subject of the clearance.

This payment can be either in the form of cash or an unconditional guarantee from an acceptable financial institution and may be used at the discretion of the local government during the defects liability period for minor or urgent maintenance works after written notification to the consulting engineer of the need for such works. Minor works should be negotiated between the local government and the developer.

The defects liability period shall commence when the local government and the consulting engineer agree on a practical completion date.

Upon the local government's acceptance of defects liability release, all monies will be refunded to the developer.

1.22 Asset register

Local authorities have the responsibility for the management of all infrastructure assets provided by developers as part of the land subdivision process. These assets include roads, drains, pathways, signage, streetscape, street furniture and public open space items such as irrigation, pathways, barbecues, playgrounds, retaining wall, gazebos and shade shelters.

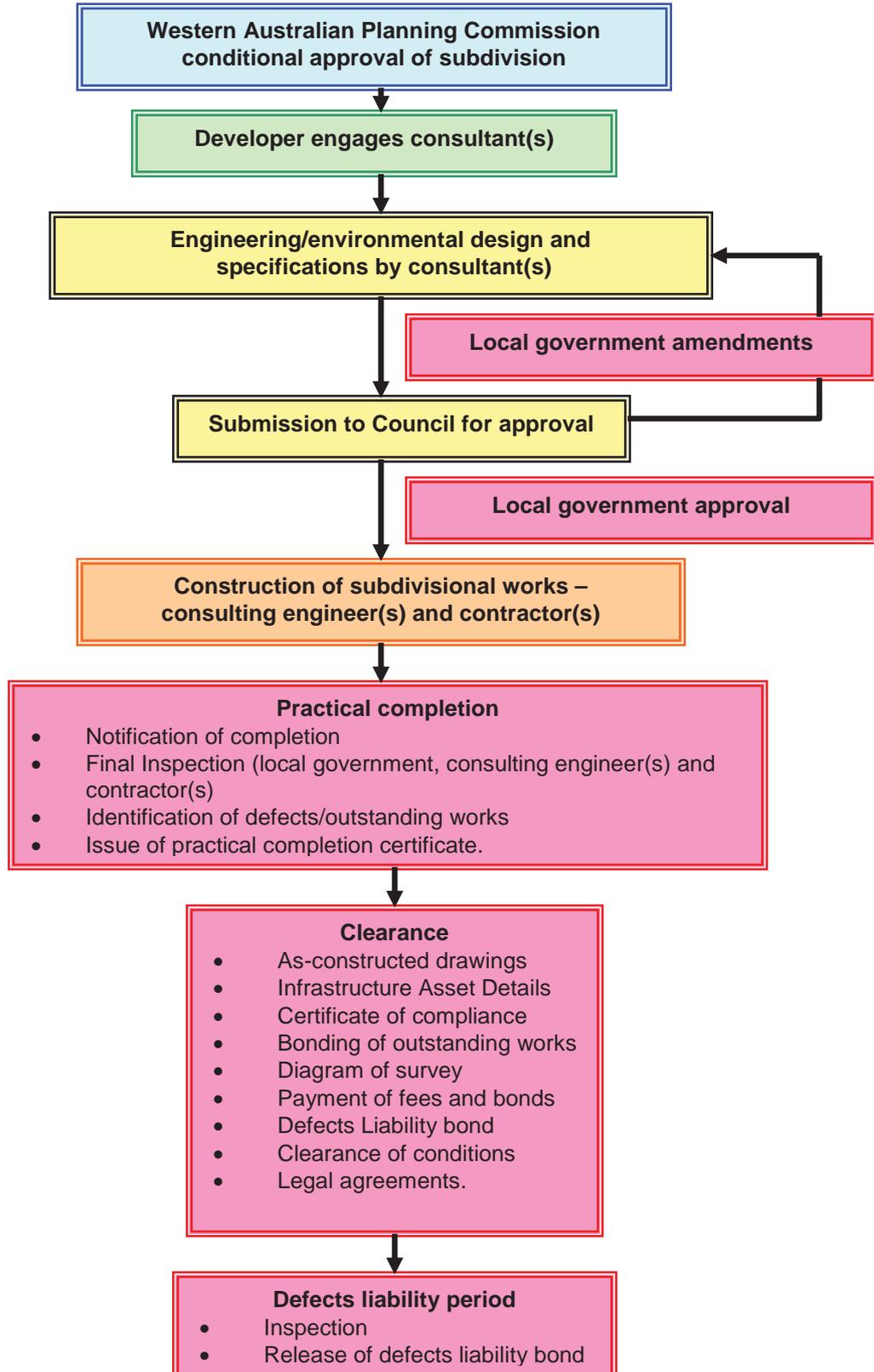
An electronic asset register, containing all details of infrastructure assets such as description, construction costs, quantities, estimated life and preventative maintenance programs is maintained by local governments.

Developers shall provide the infrastructure asset details in a format acceptable to the local government as part of the Survey Release process.

Subdivisional development process

Figure 1.2 shows the major elements and local government roles in the subdivisional development process.

FIGURE 1.2: SUBDIVISIONAL DEVELOPMENT FLOWCHART



Module No. 2

Site Preparation

Guidelines

2 Module No.2 – Site Preparation Guidelines

2.1 General

This section has been separated to include lot earthworks as well as road earthworks due to the local authorities being required to sign-off on compaction details and also the levels and slopes on lots.

With the advent of water sensitive urban design and the need to assess stormwater flows throughout the whole subdivision the earthworks become a vital part of overland flows and the direction of the subdivision's total water management by the local government.

2.2 Design

2.2.1 Earthworks, re-contouring and lot preparation

2.2.1.1. General

Filling of lots in a subdivision may be provided for a variety of reasons, such as:

- filling of local unwanted depressions;
- provision of sand fill in areas where the existing soils contain plastic and/or reactive soil conditions;
- raising the site to a sufficient level to economically provide for on-site effluent disposal in unsewered areas. The level of filling for the satisfactory performance of the effluent disposal systems shall be in accordance with the requirements of the *Health Act 1911*;
- filling may also be required for the provision of stormwater drainage systems which flow to the street drainage system or other discharge points;
- providing a level compatible with adjoining developed lots; and
- provision of a freeboard to the 100 year storm event and/or above the 1:100 year flood event.

The final fill requirement for lots, particularly those on clay soils where on-site effluent disposal is required, shall be determined by a geotechnical investigation.

Where it is necessary to fill to the boundary of a subdivision, a suitable retaining wall shall be erected immediately inside the boundary of the subdivision. Alternatively, the fill shall be carried beyond the boundary for a minimum distance of one metre and battered to a natural ground level at a slope not greater than 33.3 per cent (one in three). The written consent of the owner of the abutting land shall be obtained before proceeding with earthworks.

Where retaining walls are over 0.45 metres in height they shall be designed in accordance with the relevant Australian Standard(s) and must be approved by the Local Government. Such approvals require a building licence and payment of appropriate building licence fee(s). Certification by a practicing structural engineer will be required in most cases.

Design levels shall take into account drainage and access requirements together with consideration for the future development of the site. Land disturbed as part of development shall be stabilised to prevent wind or water erosion.

Where filling on a subdivision affects the drainage of adjoining land, provision shall be made to manage the water within or through the subdivision. No filled lots shall be permitted to drain onto abutting land. Extra precautions should be taken at lot driveways to prevent road drainage from entering private property especially for lots graded below kerb level.

2.2.1.2. Residential areas

Current housing sector preference and consequently development industry practice is for most greenfield lots to be relatively flat, especially smaller lots.

In areas where re-contouring is proposed the maximum gradient across lots and developed areas shall not exceed 12.5 per cent (one in eight), property boundary to property boundary, unless constrained by the existing site topography. On the low side the first 1.5 metres behind the kerb should be graded up two per cent from the adjacent road kerb height.

If overall re-contouring is not required, the maximum lot grading from the design verge level at the property boundary should not be greater than seven per cent (one in 14 for disability access) extending to the building set back line within the property.

Earthworks for public access ways and battleaxe access legs should have a level cross section boundary to boundary and an absolute maximum longitudinal gradient of 16.5 per cent (one in six).

Re-contouring of land adjacent to primary and/or district distributor roads with control of access, shall match the boundary levels for the road. Alternatively the land shall be retained with an approved retaining wall.

Re-contouring and earthworks in public open space shall be designed such that all areas are accessible to tractor-mounted mowing equipment.

The whole area of re-contouring and earthworks shall be cleared of trees, shrubs and vegetation, and grubbed out to clear roots and stones. Topsoil shall be removed, stockpiled and where a geotechnical report advises suitable topsoil shall be respread after re-contouring and earthworks to encourage vegetation regrowth. Clearing shall be restricted generally to those areas which require earth working.

2.2.1.3. Industrial areas

Industrial areas shall be re-contoured and earth worked to provide suitable grades to accommodate:

- sewerage disposal and stormwater drainage;
- large structures and storage areas requiring level pads; and
- large and oversize commercial vehicles.

The maximum grade across lots shall not exceed 6.67 per cent (one in 15).

In areas where overall re-contouring is not required, grading up a maximum of 12.5 per cent (one in eight) from the verge design level at the property boundary, to natural surface inside

the property and extending no further than nine metres back into the property, may be accepted.

2.2.1.4. Rural areas

Re-contouring and earthworks would not normally be expected in rural areas other than adjacent to roadways.

All embankments and cuttings should be covered with topsoil to encourage the regrowth of native vegetation. Embankments should be in accordance with section 3.3.4.

The depth of topsoil should be a minimum of 100 millimetres and where applicable soil stabilisation may be required to prevent soil erosion by wind and/or water.

2.2.1.5. Filling and clearing

2.2.1.5.1. Soil filling

The design of filling on both the private lots and lots being required for public areas shall be usable by future residents, visitors and other users. A geotechnical approach is recommended but does not prevent consultants and local government officers resolving an alternative solution.

Earthworks in street areas should be set so that both longitudinal grades and cross section can be designed to conform to all standards and policies applying to the detailed design of roads.

In the case of public open space and landscaped areas the earthworks should be such that future maintenance is achievable using standard plant and equipment. Where irrigation is to be supplied then earthworks must allow appropriate systems to water areas without special equipment being required.

Where overland drainage forms part of the subdivision then earthworks must also be set so as to allow for standard design of such drainage avenues.

Lot filling shall be set so as to provide the building industry with sites that reduce building costs to the customer. Where natural topography does not allow for such levels, exceptions can be allowed.

2.2.1.5.2. Fencing and landscaping to limited access roads

Fencing along the boundary of the road reserve shall be provided by the developer in those subdivisions where lots abut but do not have access to limited access roads. Fencing details and locations shall be included in the design drawings. Fencing shall also be constructed of vandal proof materials to limit future damage and possible replacement.

Fencing will be subject to an approval as specified by the local government. Should the area in question be subject to major winds or other issues which could cause structural damage to the fence, the design should be certified by a practicing structural engineer.

The developer shall undertake the planting and establishment of vegetation to ensure the ultimate stabilisation of the cleared road verge, prevent sand blow and soften the appearance of the fence line.

The type and density of the vegetation shall take account of the future long-term maintenance of the area, weed suppression and fire resistance, and be approved by the local government.

2.2.1.5.3. Soil stabilisation, dust and smoke control

The *Local Government Act 1995* requires local government authorities to ensure that roads and properties are not injuriously affected by sand drift or wind borne dust and to take prompt action to abate any sand drift or dust problems.

The lighting of fires for the disposal of cleared timber or other purposes is controlled by the *Bush Fires Act 1954*. It is preferable that cleared timber and vegetation is mulched and either respread on site or made available to the public.

The developer shall be responsible to control sand drift and wind borne dust on the subdivision construction site, until such time as the land ownership is transferred.

All works shall be carried out with minimum effect on the amenity of existing surrounding developments or land.

2.2.1.5.4. Soil stabilisation strategy

Prior to the commencement of any works on a development site involving the movement of soil and/or sand, the developer shall submit a site classification assessment and soil stabilisation strategy in accordance with "A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities". (Department of Environment and Conservation March 2011).

Consideration shall also be given to the Department of Environmental and Conservation's publication: *Land development sites and impacts on air quality* and the requirements of the documents referred to in Section 2.2.1.5.3.above.

The stabilisation of topsoil, sand or other material or matter subject to movement over or near the subdivision shall generally be carried out in accordance with the above recommendations and/or requirements of the above documents.

The soil stabilisation strategy shall incorporate some or all of the following measures appropriate to the site to prevent both soil and sediment erosion:

- minimise clearing of natural vegetation;
- construction periods programmed for periods of light winds;
- development work being undertaken in such a manner that a minimum amount of ground is disturbed at any one time;
- wind break fencing;
- brushing;
- hydromulching;
- seeding;

- use of dust suppression products;
- watering;
- signs and fencing restricting access;
- regular sweeping;
- replacement of top soil to encourage revegetation; and
- other appropriate measures.

2.2.1.5.5. Soil stabilisation bond

A soil stabilisation bond in the form of either cash or an unconditional guarantee from a financial institution acceptable to the local government may be required in areas where climatic, site and soil conditions are such that wind born dust or sand drift may cause significant problems. The amount of bond should be in line with bonding agreements in Module No. 1.

Further advice on the calculation of soil stabilisation bonding is based on the Dust Control Guidelines:

- | | | |
|---|---|------------|
| • Site Classification 1 – Negligible risk | = | \$ Nil |
| • Site Classification 2 – Low risk | = | \$600 /ha |
| • Site Classification 3 – Medium risk | = | \$1800 /ha |
| • Site Classification 4 – High risk | = | \$3600 /ha |

The purpose of this bond is to provide a source of funds to cover the cost of dust or sand drift control and for clean up operations in subdivisional developments should the developer fail to install or maintain adequate control measures.

The soil stabilisation bond shall cover any soil stabilisation work required on land owned by the developer, including land ceded for public purposes, and for any clean up works that may be necessary on adjacent lands caused by wind erosion emanating from the subdivisional works.

These monies may be used by the local government to control dust or sand drift if the contractor is not taking adequate precautions to control dust and/or sand drift during the progress of the construction work. The consulting engineer shall be advised in writing on each occasion it becomes necessary for the local government to use these monies for the control of, or cleaning up of, dust or sand drift.

The soil stabilisation bond, less any amount expended by the local government on the control of, or cleaning up of, dust or sand drift, shall be refunded upon completion of the works.

A local government may require that subdivisional development works be carried out during prescribed periods where prevailing conditions may cause problems, to ensure that adjacent properties are not subjected to unacceptable dust or sand drift nuisance.

To prevent dust nuisance to adjacent properties the local government may direct that no earthworks, including stripping, filling, trenching or placing of topsoil, be carried out when wind, soil and climate conditions are such as to cause or likely to cause dust or sand drift to affect those properties.

2.2.1.5.6. Disposal of cleared vegetation

In considering the disposal of vegetation cleared from subdivisional development sites, priority should be given to options other than burning, such as:

- transplanting appropriate species;
- stacking and cutting of timber for fire wood for sale or collection. If this method is used it is necessary for the developer to ensure that appropriate arrangements are in hand to protect the public from injury and to protect the contractor, developer and the local government from any claim by the public;
- Chipping and mulching for soil stabilisation.

Cleared vegetation shall be stored in a bushfire- safe manner, in consultation with the local fire officer.

Pollution of the atmosphere by smoke generated from burning cleared vegetation on a subdivisional development site is not acceptable. Where burning is the only practical alternative for the disposal of such cleared vegetation it shall be undertaken strictly in accordance with the requirements of the Department of Environmental and Conservation and the *Bush Fires Act 1954*.

The burning of vegetation in the Perth Metropolitan Area is prohibited under *Environmental Protection Regulations 1987*, Part 7A, Regulation 1 6B. However, rural areas may not be subject to these conditions and developers should check local laws in relation to the disposal of vegetation.

Re-use of topsoil may also be restricted if adverse pathogens are present such as die back. There may be a need in some cases to have test, completed on topsoil to ascertain its suitability for re-use. However, this process should be made clear to developers when the initial design of the subdivision is commenced. This will ensure that developers are aware of the problem prior to the actual construction taking place.

2.2.1.5.7. Fire breaks for rural areas

All firebreaks are to comply with the *Bushfires Act 1957*. In rural areas there is a need to provide access to batters and drains for maintenance purposes and the design should incorporate such access. Also there is a need to negotiate property fencing to ensure that property access is in specific locations rather than an ad hoc access anywhere along a street frontage.

Part of this process will include fire breaks which are important prior to lots being sold. The outbreak of fire prior to the sale of a subdivision is the responsibility of the developer. This process will be required both by the local government and the fire and emergency services and should form part of the design processes. Firebreaks need to be provided in such a way to reduce the likelihood of erosion and flooding.

2.3 Specifications

2.3.1 Filling

Areas of lot filling shall be cleared and stripped of all organic material and rubbish and the filling placed and compacted to the approved design levels.

The tolerances on lot filling shall be ± 50 millimetres.

All fill material shall be clean, free draining, suitable fill material as determined by an appropriate geotechnical investigation, free from foreign and organic matter.

All fill shall be compacted to the full depth in accordance with AS 3798 – 2007 *Guidelines for Earthworks on Commercial and Residential Developments*.

The requirements of sections 2.2.1.5.3 and 2.2.1.5.4 for dust control, sand drift control and stabilisation shall apply to all lot filling.

2.3.2 Hydromulching and seeding

Hydromulching shall consist of the application of a mixture of water, seed, and fertiliser, binding agent and biodegradable filler to the surface of the ground.

Hydromulching that does not incorporate seed and fertiliser is not acceptable as a permanent soil stabilisation measure.

Where germination satisfactory to the local government does not occur within the defects liability period, the local government may request reseeded prior to releasing the defects bond.

2.3.3 Mulching

Mulches must comply with AS 4454–2003 *Composts, soil conditioners and mulches*.

Module No. 3

Road Guidelines

3 Module No.3 – Road Guidelines

3.1 General requirements

The application of various planning policies and principles to road design is intended as a guide to help provide minimum standards for the geometric elements of the road. Other factors of some importance to the total efficiency of the road system include the coordination of vertical and horizontal alignments; fitting the road to the natural contours of the land rather than carrying out major earthworks to produce road grades, which are in conflict with those contours; preservation of natural features (including vegetation); and using higher than minimum standards to provide a functional and aesthetically pleasing streetscape.

In maximising the use of the existing physical features within a subdivision, consideration must also be given to the practicalities of lot access, building requirements, the provision of a pleasant living environment and in some cases the provision of public transport facilities. It is desirable that engineering input occur during the planning process to ensure that good engineering principles are achieved from the outset, without compromise.

The long-term maintenance of roads is another important factor in the design of subdivisional roads. The road design should reflect features that provide for a safe and practical road system that can be maintained by the local government at a reasonable cost.

3.2 Policies and standards

3.2.1 Policies

General road layout, intersections, road hierarchy and major pedestrian and cycle path locations are determined at structure planning stage. Road reserves, pavement widths, embayment parking and footpath locations are generally determined at subdivision stage. Road engineering drawings are to be in accordance with road design details, such as reserve and/or pavements widths and/or truncation dimensions shown on a plan of subdivision or in conditions approved by the Western Australian Planning Commission pursuant to the *Planning and Development Act 2005*.

The WAPC uses the following policies as design guidance for proponents and assessment criteria.

- *Liveable Neighbourhoods* (WAPC);
- WAPC Policy DC 1.5 – Bicycle Planning (February, 1990);
- WAPC Policy DC 2.6 – Residential Road Planning (December, 1992);
- WAPC Policy DC 4.1 – Industrial Subdivisions;
- Australian National Cycling Strategy 2005–2010 (Austroads 2005); and
- The Perth Bicycle Network Plan (Bikewest).

3.2.2 Standards

Additionally, road designs should conform to the relevant Austroads standards and have regard to Australian Road Research Board and other publications, which include:

- Guide to Traffic Engineering Practice: Parts 1–15 (Austroads);
- Turning Path Templates (Austroads, 1995);
- Sealed Local Roads Manual (Australian Road Research Board);

- Guide for the Design of Typical Urban Intersections (National Association of Australian State Road Authorities, 1965);
- Guide Policy for the Geometric Design of Major Urban Roads (National Association of Australian State Road Authorities, 1976);
- Rural Road Design: Policy for the Geometric Design of Rural Roads (Austroads, 1993);
- Guidelines for the Design and Geometric Layout of Residential Roads (November, 1989);
- Rural Road Design – A Guide to the Geometric Design of Rural Roads – (Austroads);
- Policy for Installations by Public Utility Authorities within the Road Reserve;
- Pavement Design – A Guide to the Structural Design of Road Pavements (Austroads, 2004);
- Guidelines for the Design of Bicycle Facilities (Bikewest);
- Street (Road) Lighting Code AS 1158;
- AS 2150: Hot Mix Asphalt;
- AS 2008: Residual Bitumen for Pavements;
- Technical Specification, Tender Form and Schedule for Supply and Laying of Hot Asphalt Road Surfacing (AAPA/IPWEA);
- Guide to Traffic Engineering Practice – Part 14: Bicycles (Austroads); and
- Guide To Traffic Engineering Practice – Part 13 Pedestrians (Austroads).

3.3 Design

3.3.1 Road hierarchy

A road hierarchy shall be established for the development that enables the safe and orderly movement of vehicles, cyclists and pedestrians within, between and across roads. The road hierarchy shall be based on the road classifications shown in *Liveable Neighbourhoods* (reproduced in Table 3.1 and Table 3.2) and be subject to detailed road planning.

3.3.1.1. Urban roads hierarchy

The road reserve is required to accommodate a variety of pedestrian and vehicular activities as well as public utility providers. It should also be safe for the various users; contribute to the amenity of the area; and to be able to carry out its transport function.

Liveable Neighbourhoods classifies roads slightly differently to Main Roads WA, but general categories align except for the nomenclature which refers to roads as integrators rather than distributors. *Liveable Neighbourhoods* is the adopted policy for the WAPC and the Department of Planning.

TABLE 3.1: ROAD CLASSIFICATIONS

Route type and function	Route characteristics	Route name	Max speed limit (km/hr)	Indicative volume range* (vehicles per day)	Indicative street reserve width (metres)**	Indicative road pavement width (metres)
Primary distributors Form the regional grid of Main Roads WA traffic routes, including Highways; and catering for inter- and intra-regional traffic. Major truck routes.	Should be designed to be fronted by development and connected with service roads wherever possible. Usually median divided.	Six lane Primary distributor	80	50,000	Determined by Main Roads WA	
	Intersections limited and often signal-controlled.	Four lane Primary distributor	80	35,000		
Integrator arterials Form a finer grain of routes than the primary distributors, with frequent connections to local streets. Low percentage of trucks. Usually bus routes. On-street bike lanes and separate dual-use paths are usually required.	Four lane and two lane arterial road types. Integrators outside centres typically have service roads and development frontage to support a mix of uses.	Integrator A (Four lanes, outside centres)	70 or 60	15,000–35,000	50.6–52.6	2 x 8.2 including bike lane and 2 x 5.5 service roads with parking.
	Direct vehicle access from adjoining property should be limited where no service roads are provided. On-street parking desirable.	Integrator A – centres (Four lanes, in centres)	60	<25,000	35.6	2 x 10.7 in centres including combined on-street parking and bike lane.
	Integrators through centres typically will have at least one clear travel lane in each direction, and a parking and/or manoeuvring lane. Volumes above 15,000 vehicles per day need detailed design to manage traffic at intersections, facilitate bus movement and deal with parking and access.	Integrator B (Two lanes, outside centres)	60	7000–15,000 15,000–20,000	29.2	2 x 7.5 including on-street parking and bike lane. 2 x 7.5 including bike lane. Parking requires special consideration, or service roads may be needed.
		Integrator B – centres (Two lanes)	40–50	15,000	25.2	2 x 7.5 including on-street parking.

Source: *Liveable Neighbourhoods, WAPC*

Note: Wider central medians are to be provided where a route is planned to be used for a future bus transit way or light rail route, or possibly for drainage swales to provide stormwater infiltration. Where an integrator is constructed in an interim situation at a higher posted speed than that intended as the ultimate speed limit, the horizontal and vertical alignment should suit the higher speed but the lane widths and planned intersection spacings should be designed to the ultimate speed standard. All functions of streets need to be considered as well as traffic volume and through-traffic needs.

Refer to figures in *Liveable Neighbourhoods* for indicative cross-sections.

Adequate reserves need to be provided to accommodate space for trees, varied service requirements, or wider shared path requirements, particularly where densities are at 15 dwellings per hectare or greater, and/or mixed-use development is anticipated. Widening for intersections may also be required.

The urban road hierarchy may also be classified under the following Main Roads WA's criteria.

- Primary distributor roads are used for carrying long distance traffic across the urban area and may connect to the national highway network. Traffic volumes are high, usually in excess of 6000 vehicles per day. These roads are designed to integrator road standards with access control.
- District distributor roads are used to convey traffic between adjacent suburbs. Traffic flows are usually greater than 3000 vehicles per day. They are often designated as bus routes and must be designed with that consideration.
- Local distributor roads carry traffic within a residential cell and usually have traffic volumes of less than 3000 vehicles per day with direct lot frontages. Care should be taken in the design of residential cells to ensure that local distributor roads do not become short cuts between district distributors.
- Rear laneways provide vehicular access to the rear of lots. They can be used to improve parking and/or access provisions.

Liveable Neighbourhoods also designates access roads as shown in Table 3.2.

TABLE 3.2: ROAD CLASSIFICATIONS

Street type and function	Street characteristics	Street name	Max design speed/ target operating speed (km/hr)	Indicative volume range* (vehicles per day)	Indicative street reserve width (metres)+	Indicative road pavement width (metres)
Neighbourhood connectors Streets with mostly residential frontage that typically provide the lower order sub-arterial network. These streets service and link neighbourhoods and towns	A two-lane divided street used for higher neighbourhood connector volumes, or for character, stormwater infiltration swales or safety. These are often special streets and their design needs to have particular regard to context, function and adjacent land uses.	Neighbourhood connector A (Median)	50/50	7000	24.4 **	2 x 7.1 including parking, on-street bike lane, median plus shared path on one verge.
	A two-lane undivided street for lower volume neighbourhood connectors. Typically can accommodate buses, will have at least one shared path and above 3000 vehicles per day separate on-street bike lane.	Neighbourhood connector B (Minor)	50/50	3000	19.4	11.2 including parking, plus shared path on one verge.
Access streets Access streets are to accommodate shared pedestrian, bike and vehicular movements. The requirements of adjacent land uses should be supported through street design.	Varied formats to suit a range of typical conditions in predominantly residential areas at different densities, and with different traffic volumes. An avenue access street (Access street A) with median is particularly suited to incorporation of a drainage swale.	Access street A – avenue	50/40	3000	20–24	2 x 3.5 (or 2 x 3.6 under some conditions) plus indented parking. 9.7
	Access street B is a wider undivided street for situations with increased parking and/or traffic demand.	Access street B – wider street	50/40	3000	16.5–18	7.2 (7–7.5)
	The most typical and most common residential street will be Access street C – Yield street.	Access street C – yield or give way street	50/40	3000	15.4–16	5.5–6
	Access street D is for short, low volume and low parking demand streets. In addition, a comprehensively designed variant with 3.5 m travel lane with indented parking, is also specified for very low volume short	Access street D – narrow yield or give way street	50/30	1000	14.2	3.5 (plus parking indents)
Laneways Provide access to the side or rear of lots principally for access to garages.	Laneways may incorporate some services and can provide rubbish collection access.	Laneway/rear lane	15	300	6**–6.4	typical
	Laneways usually contain some studio units over garages for surveillance. Lane may be widened in parts to create mews courts.					3–6.4 (range)

Street type and function	Street characteristics	Street name	Max design speed/ target operating speed (km/hr)	Indicative volume range* (vehicles per day)	Indicative street reserve width (metres)+	Indicative road pavement width (metres)
Small town centre street Suited to small secondary streets in centres.	For use in predominantly pedestrian areas in centres, where the street is short and is specifically designed for pedestrian emphasis, and visual containment is required.	Small town centre street	50/20	300	10–12	5.5 m

** Lesser reserves and road pavement widths may be applied over limited lengths where performance can be justified, such as laneway entrances.

Source: *Liveable Neighbourhoods*

Table 3.3 shows the classifications in *Liveable Neighbourhoods* and how they align with those set down by Main Roads WA.

As these Subdivision Guidelines are underpinned by *Liveable Neighbourhoods* the classifications will be used from that document rather than the classification from Main Roads WA.

TABLE 3.3: COMPARISON OF ROAD CLASSIFICATIONS FOR LIVEABLE NEIGHBOURHOODS AND MAIN ROADS WA

Road Classifications – Liveable Neighbourhoods versus Main Roads WA	
Liveable Neighbourhoods	Main Roads WA
Primary distributor	Primary distributor
Integrator arterial A	District distributor A
Integrator arterial B	District distributor B
Neighbourhood connector A	Local distributor
Neighbourhood connector	
Access street A	Access street
Access street B	
Access street C	
Access street D	
Access place	
Access laneway	Rear laneway
Small town centre street	

FIGURE 3.1: EXAMPLE OF ROAD LAYOUT



Source: *Liveable Neighbourhoods*

Residential road design guidelines should generally be in accordance with the WAPC's *Development Control Policy 2.6* and the Summary of Planning Criteria for Residential Roads shown in Table 3.4. However, where conflicts arise *Liveable Neighbourhoods* should be considered to override the policy.

TABLE 3.4: SUMMARY OF PLANNING CRITERIA FOR RESIDENTIAL ROADS

Function/Road type	Integrator category B	Neighbourhood connector	Access way	Access place	Access lanes and rear laneways
Network role	Major tributary to Primary Distributor	Housing access Neighbourhood tributary	House access and minor tributary	Housing access only	Housing access only
Degree of connectivity	Important between neighbourhoods	Moderate within neighbourhood	Very low	Through or none	Through or none
Connects with	Primary distributor District distributor Category A & B Local distributors	District distributors Local distributors Access ways	Local distributors Access ways Access places	Access ways Access places Occasionally Local distributors	Access ways Access places Occasionally Local distributors
Maximum desirable traffic volume vehicles/day	8000	3,000 with direct lot frontage 3,000 with direct lot frontage and frontage treatments	600	200	100
Maximum desirable operating speed km/hr	60	40 with driveways 60 without driveways	30	20	20 or less
Speed for sight distance criteria	70	60	40	40	20
Bus route	Yes	Yes	Occasional mini bus	No	No
Shared pedestrian/vehicle carriageway	No	No	No	Yes	Yes
Separate footpath/dual use path provision	At least one side	At least one side	Desirably one side	No	No
Carriageway edges	Barrier or semi barrier kerb	Mountable	Mountable	Mountable or flush kerb	Flush kerb
Parking provisions	On carriageway Off carriageway in widened strips	On carriageway Off carriageway in widened strips	On carriageway Off carriageway in widened strips	In road parking bays	In road parking bays
Acceptable carriageway width (excluding parking)	7.4m–10.0m See note 1	6.0m–10.0m See note 2	5.5m–6.0m	4.0–5.5m Where 4 dwellings or less are serviced, 3.0m acceptable	4.0m–5.5m
MINIMUM TO ACCOMMODATE SERVICES					
Verge widths	5.0m–6.3m	4.2m–6.3m	4.0m–4.5m	4.0m–4.5m	1.5m–4.0m
Total road reserve width	20.0 Min	15.0m–23.0m	11.5m–15.0m	10.0m–14.5m	6.0m–13.5m

Notes: To be read in conjunction with Table 3.4.

- Note 1 10-metre carriageway widths for distributor roads will only be approved in cases where residential access is restricted, traffic volumes, vehicle turning movements and/or carriageway parking are expected to be high and/or on-road cycling facilities are provided.
- Note 2 Six-metre carriageway widths for local distributor roads will only be approved in cases where parking on the carriageway is prohibited and widened parking strips are provided.
- Note 3 The minimum carriageway width in an area zoned commercial or industrial shall be nine metres.
- Note 4 Truncations in rural and industrial/commercial areas shall be based on design needs with a minimum of 10 x 10 metres.
- A minimum truncation of 6 x 6 metres shall be used in all cases where the classification of a road in the functional road hierarchy is in doubt.
- Note 5 Where a developer requires the minimum widths specified in Table 3.3 for access ways, access places, access lanes and rear laneways, it is essential that all public utility services and drainage facilities are designed prior to approval of the layout.
- Note 6 Local distributor roads, where traffic volumes are expected to be between 3000–7000 vehicles per day, shall be designed to recognise the integrator arterial as a residential street. Frontage management techniques shall be used to improve safety and amenity.
- Note 7 Foreshore access roads are a special category of local distributors which give access to linear open spaces such as beach, lake or river foreshores. Foreshore access roads may carry up to 10,000 vehicles per day near the district distributor network and up to 5000 vehicles per day adjacent to the foreshore.
- Note 8 Higher design standards will generally be required for primary distributor and district distributor category A roads.
- Note 9 All parking areas shall have a contrasting surface finish to the Carriageway and should comply with Australian Standard 2890.1.
- Note 10 Adequate provision shall be made in the design of median islands for the safety of pedestrians and cyclists. Ideally islands shall have a minimum width of two metres with an absolute minimum width of 1.2 metres at the crossing location. All other details of the road crossing shall be in accordance with *Guidelines for the Design of Bicycle Facilities* (Bikewest).
- Note 11 Flush kerbs or broken kerbs are allowable options with local government approval on all roads to provide for water sensitive urban design outcomes where desired traffic outcomes allow (eg. allowing road run-off to drain directly to public parkland, wide mediums and verges or non-active frontages).

Liveable Neighbourhoods also has several sections relating to the following issues, which should be referred to when assessing design criteria for developments:

- road widths on bus routes refer to R27;
- on street cycle lanes R40;
- stopping sight distances and truncations R54 and R55;
- intersection design R57 to R61;
- treatment of fur way intersections R62 to R65;
- roundabouts R66; and
- service roads R67.

3.3.1.2. Rural roads hierarchy

Rural roads may be defined as where the roads service lots are equal to or greater than 4000m². However, there may be instances where the development clearly is within the urban environment despite the size of the lots being developed.

The rural road hierarchy may be divided into two major categories:

1. Collector roads which convey traffic to the integrator road system. The minimum pavement width shall be 7.4 metres with 1.2-metre wide shoulders located in a road reserve with a minimum width of 22 metres.
2. Local roads which provide lot frontage and property access. The minimum pavement width shall be 5.6 metres with 1.2 metre wide shoulders for culs-de-sac and six metres with 1.2 metre wide shoulders for loop roads, located in a road reserve with a minimum width of 20 metres.

In all cases, sufficient verge width shall be provided to allow for the provision of services, such as overhead power lines, underground power provision, table drains and protection of vegetation.

The road formation shall provide for a berm with a minimum width of 600 millimetres between the shoulder edge and start of the table drain.

3.3.2 Road Alignments

3.3.2.1. General

Roads shall be designed to give the best possible grade to suit the natural ground conditions and minimise the amount of cut and fill. Natural ground levels shall be obtained from a topographical survey. The assumption of natural ground levels from contour plans is not acceptable as it does not provide the required accuracy.

The maximum longitudinal grade on all roads shall be 10 per cent (one in 10) unless the resultant earthworks and access to adjacent lots are impractical, in which case steeper grades may be approved.

The minimum longitudinal grade shall be 0.5 per cent (one in 200) on all roads that are to be kerbed or likely to be kerbed at some future time. Due to water ponding problems however, higher grades should be used where possible. In cases where terrain does not allow steeper grades, kerb and channel arrangements may be implemented to cope with the drainage run-off.

All changes of grade of more than one per cent shall be joined by a vertical curve. The length of all vertical curves shall be in accordance with the relevant Austroads publications and shall take into account overtaking and stopping sight distances and comfort factors.

Design ground levels are to be obtained from actual field survey. The assumption of levels from contour or other types of plans is unacceptable.

3.3.2.2. Rural road grades

Roads are to be designed to give the best possible grade to suit the natural / existing ground, and minimise the amount of cut and fill.

Table 3.5 shows the general maximum and minimum grades.

TABLE 3.5: MAXIMUM AND MINIMUM GRADES

		Sealed Roads	Unsealed Roads
Desirable Maximum %		8	6
Absolute Maximum %		10	8
Desirable Minimum %		0.5	0.5
Absolute Minimum %	Straight alignment	0.30	0.60
	Up to 60m radius curve	0.40	0.50
	Less than 60m radius curve	0.75	0.75

Source: Shire of Wyndham East Kimberley Guidelines for Rural Road Design

The absolute maximum grades may be approved in special cases. Redesign is to be considered where these grades are contemplated and only after complete examination of all options will they be accepted. Where natural topography does not permit the use of the grades in Table 3.5, steeper or flatter grades can be used with the approval of the local government.

Where grades exceed three per cent longitudinal grade, the designer is to accommodate appropriate drop structures and erosion control devices in the table drain to reduce transportation of silts and sands from the table drain.

3.3.3 Road crossfalls

The crossfall on the cross-section of the road pavement shall generally be three per cent each way from the road crown/centre line. Depending on the natural contour of land there may be instances where one way crossfalls should be considered to reduce earthworks on adjacent land.

One way crossfall or superelevation shall be applied on horizontal curves in accordance with the appropriate Austroads publications, except on local roads or those with a lower classification in urban areas.

One way crossfall and inverted crowns may be used for access ways and access places and on other roads where excessive natural slope across the road reserve dictates the necessity for such treatment.

3.3.4 Verge and property grades

Verge grading should be +2 per cent from the top of the kerb to the property boundary. In areas of steep grades, the verge on the high side of access ways and access places may be graded to suit the land configuration. The verge on the high side of a local distributor road may be graded at +2 per cent for three metres and then battered to suit the finished contours at a maximum of 1:6 slope.

In areas of deep cut and fill, on rural roads or district distributors in urban areas, the maximum grade of fill in the road reserve shall be 25 per cent (one in four) and the maximum grade of cut shall be 33.3 per cent (one in three).

In heavily earthworked areas each lot shall have access at a grade not exceeding 10 per cent (one in 10). The absolute maximum access grade shall be 16 per cent (one in 6.25) unless natural topography does not allow and this must be approved by the local government.

3.3.5 Kerbing

All urban roads and only intersections on rural roads shall be kerbed unless otherwise approved.

The minimum kerb radius at intersections shall be nine metres in residential areas and 12 metres in industrial areas. On roads that connect to district distributor roads with no requirement for channelisation, a 12 metre minimum kerb radius is required. Smaller radii can be negotiated where road speeds are considered low.

All kerb cross-sections and their use shall be in accordance with the details shown in Table 3.6 and Figure 3.2.

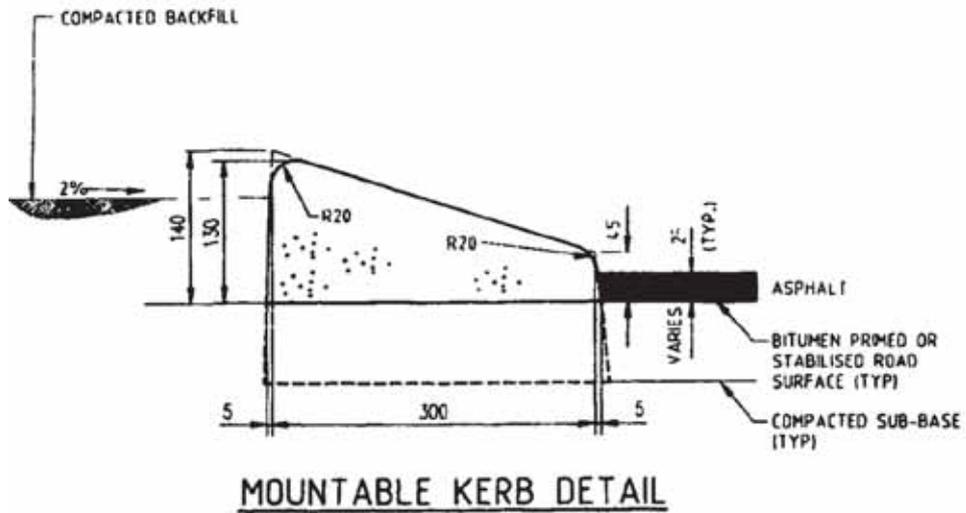
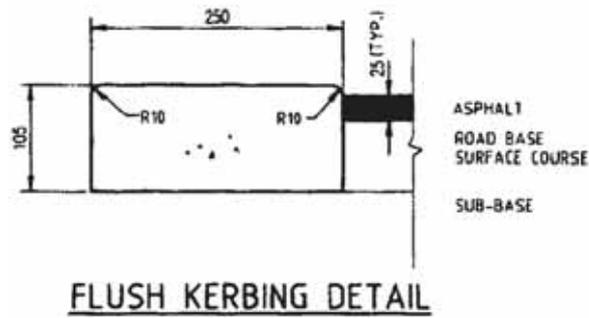
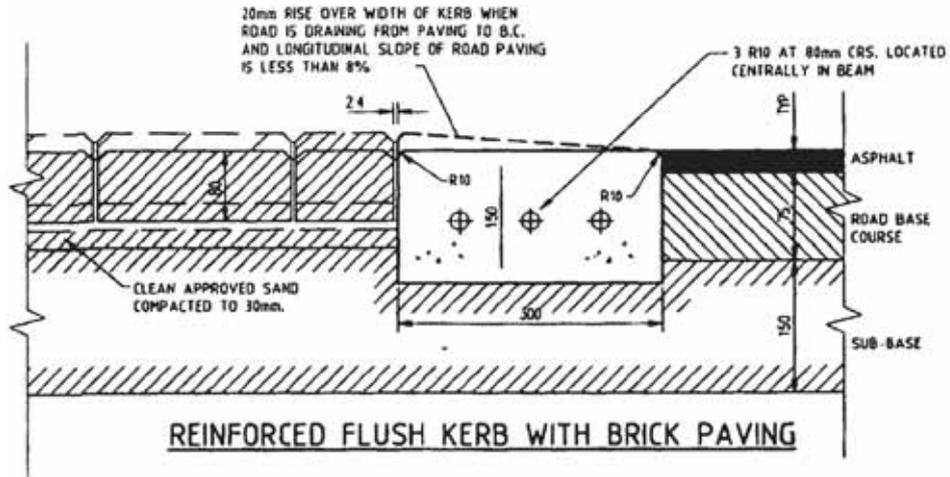
TABLE 3.6: KERB TYPE CROSS-SECTIONS

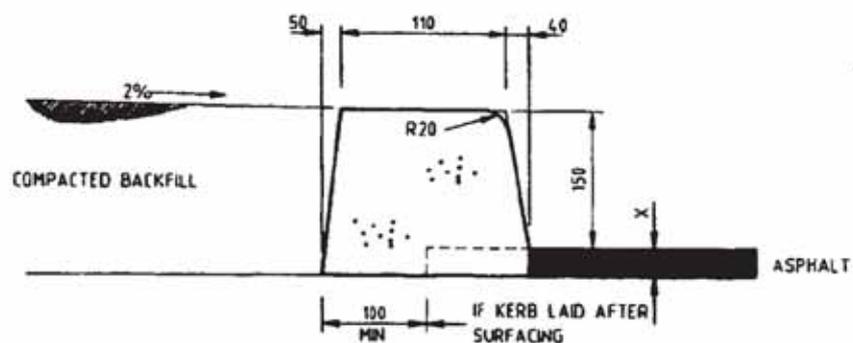
Use of kerb types			
Flush	Mountable	Semi-mountable	Barrier
<ul style="list-style-type: none"> • Adjacent to public open space areas and non-active areas to achieve water sensitive urban design outcomes. • The edges of through carriageway, abutting eyebrow and battleaxe driveway treatments. • Car parks. • Access streets and laneways. • Median islands where water sensitive urban design is used. 	<ul style="list-style-type: none"> • All single carriageway residential streets providing access to new properties. • Neighbourhood connector roads. 	<ul style="list-style-type: none"> • Median Islands on dual carriageways. • Channelisation islands. • Roads providing access to industrial or commercial properties. • All intersections on rural roads unless otherwise approved. • Integrator arterial roads (see also barrier). 	<ul style="list-style-type: none"> • Integrator arterial roads. • Outside kerbs on dual carriageways. • Roads abutting public open space. • Roads in which future paths will be constructed adjacent to the kerb line.

Source: *Liveable Neighbourhoods*

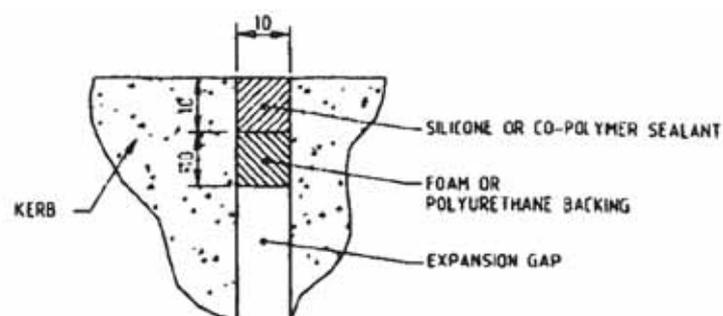
Where water sensitive urban design is not used on public open space the standard kerbings adjacent to public open space should be barrier to prevent intrusion by vehicles. It is preferred to place barrier kerbing adjacent to public open space rather than install bollard fencing which causes major maintenance problems in the future.

FIGURE 3.2: KERBING PROFILES





BARRIER KERB DETAIL - TYPE 2



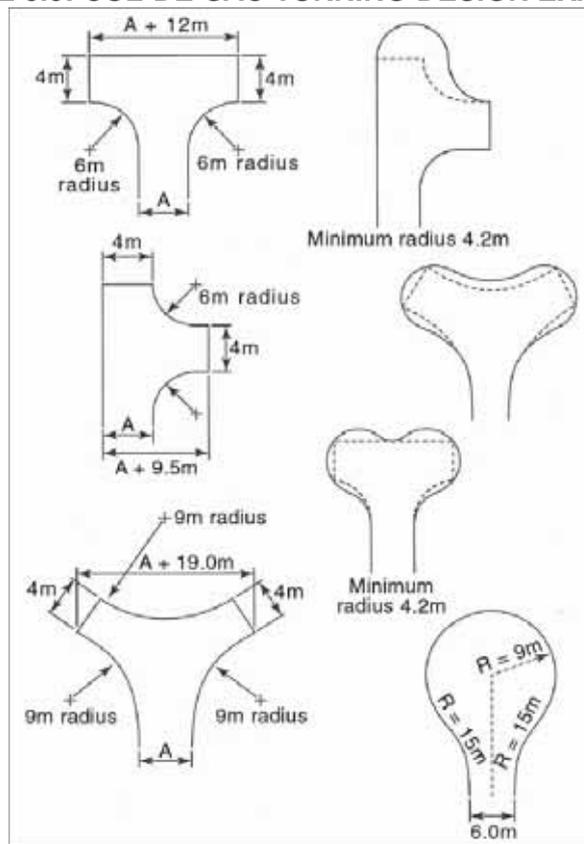
DETAIL OF EXPANSION JOINT DETAIL

3.3.6 Cul-de-sac turning circles

Cul-de-sac turning circles in residential and rural areas can have a minimum radius of nine metres with 15-metre radius transitions. For industrial areas the minimum radius shall be 12 metres with 20-metre radius transitions.

Other turning configurations may be acceptable subject to compliance with WAPC typical layout requirements in *Liveable Neighbourhoods*. Figure 3.3 shows turning and manoeuvring treatments for culs-de-sac for residential streets.

FIGURE 3.3: CUL-DE-SAC TURNING DESIGN EXAMPLES



Source: *Liveable Neighbourhoods*

Radii are to be measured to edge of seal on unkerbed sealed roads.

3.3.7 Pavement thickness

Designs shall be prepared of the road pavement thickness in accordance with the Australian Road Research Board and/or:

- Pavement Design – A Guide to the Structural Design of Road Pavements (Austroads, 2004);
- A Guide to the Design of New Pavements for Light Traffic (APRG Special Report No. 21, 1998); and
- Main Roads WA Engineering Road Note 9 – Procedure for the Design of Flexible Pavements.

The consulting engineer shall provide for pavement drainage where necessary to maintain a moisture free sub-grade and base course as determined by the site investigation.

Main Roads WA's *Engineering Road Note 9* is available online at http://standards.mainroads.wa.gov.au/NR/rdonlyres/8A3AFFDB-068D-41DF-ABF6-ED290B98E525/0/E6907_20080314160946492.PDF

3.3.8 Design life of pavements

Unless specified otherwise by the local government, the permanent deformation of the granular pavement must have a minimum design life of 40 years.

Unless specified otherwise by the local government asphalt must have the following minimum design life:

- open graded asphalt – 10 years;
- dense graded asphalt 50 millimetres total thickness or less – 20 years fatigue life; and
- dense graded asphalt greater than 50 millimetres total thickness – 40 years fatigue life.

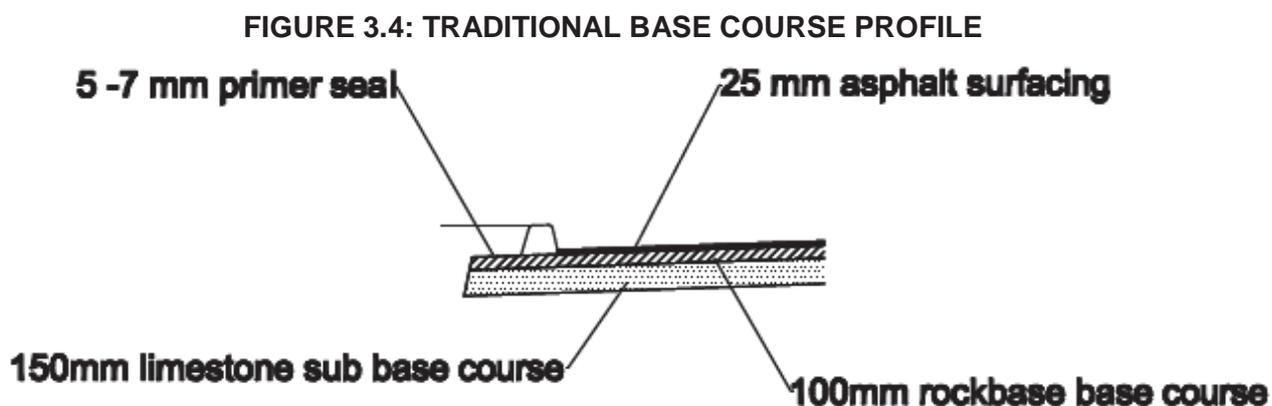
In the rural situation all sealed roads are to be designed to provide a pavement design life of 40 years and the wearing coarse design life of 15 years.

Whilst profiles recommended in the following sections are preferable, there are also many materials that can be used where availability of urban materials is not possible. Also, materials such as stabilised limestone may be substituted for base materials shown with the approval of the local government.

3.3.9 Urban base course profiles

Notwithstanding the design thickness obtained using the above guidelines, a generally accepted minimum pavement for urban residential roads in sandy soil conditions comprises:

- limestone sub-base with a minimum compacted thickness of 150 millimetres;
- base course with a minimum compacted thickness of 100 millimetres;
- a primer seal; and
- asphalt wearing course with a minimum compacted thickness of 25 millimetres (Refer Figure 3.4).

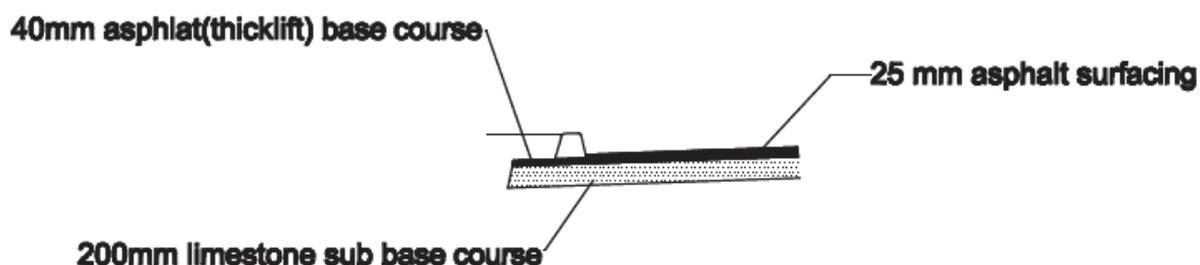


Source: IPWEA Guide to Pavement Profiles in Residential Streets

In an effort to reduce reflective cracking the current recommendation by the IPWEA is to remove the plastic base course and use the new base profile as follows:

1. limestone sub-base with a compacted thickness 150 millimetres to 225 millimetres;
2. thicklift asphalt base course with a compacted thickness 40 millimetres to 50 millimetres, and
3. asphalt wearing course with a minimum compacted thickness of 25 millimetres.

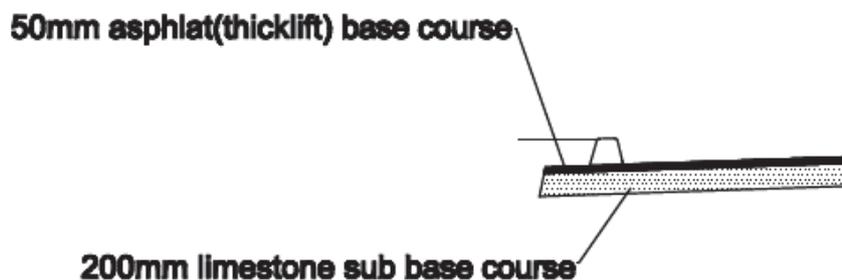
FIGURE 3.5: ALTERNATIVE BASE COURSE PROFILE



Source: IPWEA Guide to Pavement Profiles in Residential Streets

Asphalt thicknesses should conform to 30 millimetres for AC14, 25 millimetres for AC10 and 40 millimetres minimum for AC14.

FIGURE 3.6: ALTERNATIVE CROSS-SECTION WITH NO WEARING COURSE



Source: IPWEA Guide to Pavement Profiles in Residential Streets

In some areas there is also a minimum pavement thickness of 100 millimetres, which is shown on the Australian Road Research Board and Main Roads WA Equivalent Standard Axles (ESA) versus Californian Bearing Ratio (CBR) and Pavement Thickness. This depth of pavement however, is not recommended where any reasonable traffic volumes are in service.

3.3.10 Rural base course profiles

In the rural situations the base profile is not necessarily split into two mediums (limestone and roadbase or thicklift asphalt) but is one medium – typically being laterite as a full depth base course. Ferricrete and full depth road base pavements can also be constructed depending on availability of materials and cost.

It should be noted that the base course profiles used in the urban areas can also be used in rural areas where materials are available and are cost effective in comparison to the full

depth base-course materials. Where alternative materials are required then the depth of base courses may vary by design based on the mechanistic properties of the materials in question.

3.3.11 Typical cross-sections

Figures 3.7, 3.8 and 3.9 show basic cross-sections for roads. These will change with road layouts and the environment in which the road is to be constructed.

FIGURE 3.7: TYPICAL CROSSSECTION – URBAN RESIDENTIAL AREAS

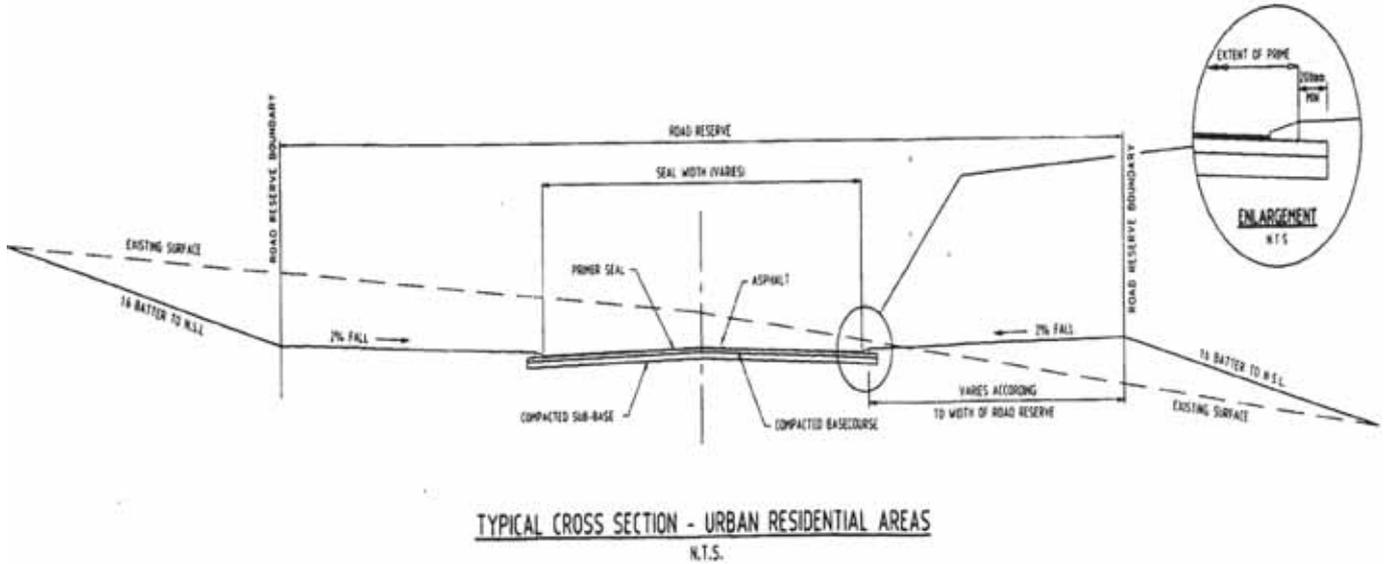


FIGURE 3.8: TYPICAL CROSS-SECTION – RURAL RESIDENTIAL AREAS

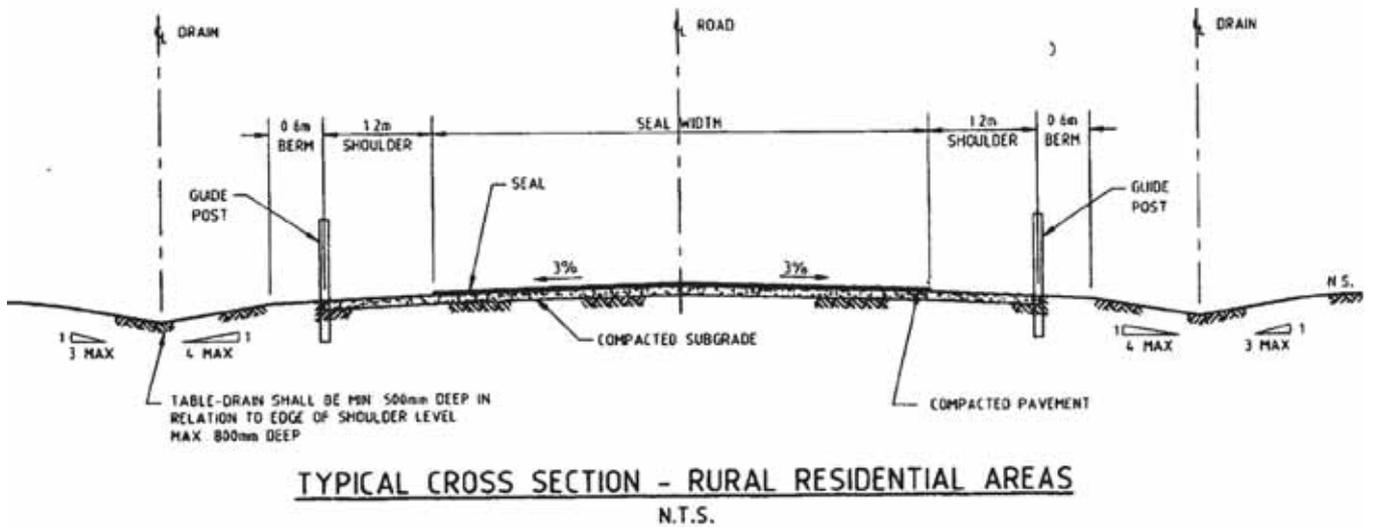
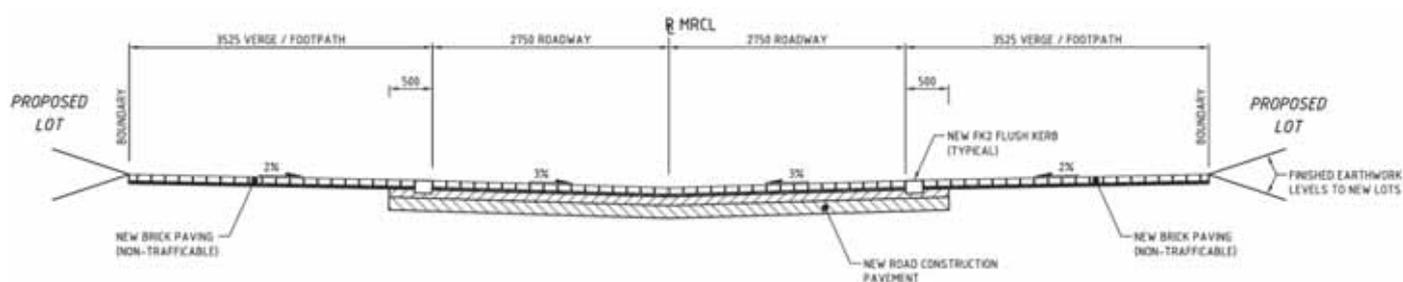


FIGURE 3.9 TYPICAL 'VEE DRAINED' CROSS-SECTION



The vee drained roadway is generally constructed in access roads or places where the carriageway is narrow or the total road reserve is paved. The type of kerbing can be changed with approval of the local government. It is also noted that paving of a full road reserve does not necessarily comply with water sensitive urban design.

3.3.12 Wearing course

The wearing course on all urban roads shall generally be asphalt over a primer seal where road base is used as the base course.

Where thicklift asphalt replaces the roadbase then the 25 millimetres asphalt is directly applied to the thicklift.

Rural roads may be surfaced with either asphalt or a single or two coat sprayed bitumen/aggregate seal. Intersections and cul-de-sac heads shall be asphalt surfaced where asphalt is available. Where two coat seals are used the second coat may be applied after a considerable time difference depending on traffic usage and the need to have the full seal in place.

Heavy duty trafficable bricks or blocks with a minimum thickness of 76 millimetres, laid strictly in accordance with the manufacturer's recommendations and section 3.4.13, may be used to replace the wearing and base courses.

3.3.13 Traffic management – urban roads

Traffic management design shall comply with the following publications:

- Guide to Traffic Engineering Practice Parts 1–14 (Austroads)
- Turning Path Templates (Austroads, 1995).

A traffic environment shall be provided such that vehicle speeds recommended in tables 3.1 and 3.2 are not generally exceeded, with due consideration being given to the requirements of the various emergency services.

Intersections, except those being treated with roundabouts, shall be designed with the turning radii as indicated in Table 3.7.

TABLE 3.7 INTERSECTION TURNING RADII

	Integrator Category A	Integrator Category B	Neighbourhood connector	Access street
Integrator arterial Category A	ST	ST	ST	ST and SU
Integrator arterial Category B	ST	ST	ST	ST and SU
Neighbourhood connector	SU	ST	ST	SU
Access street	ST and SU	ST and SU	SU	SU

Source: *Liveable Neighbourhoods*, especially R57 to R61 and based on Austroads design vehicles

Note 1 ST denotes a design semi-trailer with a turning path radius of 12.5 metres.

Note 2 SU denotes a design single unit truck/bus with a turning radius of 12.5 metres.

Note 3 Any road in an area zoned commercial/industrial shall be designed to accommodate a design semi-trailer.

Note 4 Designers should be aware that as transport functions of roads change there may be need at the planning stage to consider the size of vehicles using roads and how the design will be structured to suit. (eg. B doubles which are now considered an integral part of the transport system and these access industrial areas on a regular basis). Whilst designs may not be based on such vehicles their access to areas should be considered.

Note 5 Designers should refer to *Liveable Neighbourhoods* Element 2 Section R58 for details relating to the requirement for land correct turning movements for the design vehicles.

3.3.13.1. Traffic speed – leg length impact

Traffic management devices can be placed in streets to ensure that desired operating speeds can be achieved. The use of slow points can achieve this goal.

Once desirable speeds for residential areas are set they then have an impact on leg lengths that should be attained to satisfy a safe environment for the community (Table 3.8).

TABLE 3.8 STREET TYPE – TARGET SPEEDS AND LEG LENGTH COMPARISONS

Street type	Target operating speed	Desirable leg length between slow points
Access street D* (6 m road width with parking on pavement)	30 km/hr	70–80 m
Access street C* (7.2m road width with parking on pavement)	40 km/hr	100–130 m
Access street A & B** (Avenue access street or Wider access street with travel lanes unconstrained by parking)	40 km/hr	100–130 m

Source: *Liveable Neighbourhoods*

- * Additional speed constraint measures may not be needed on an access street C or D up to 200 metres in length where the traffic volume is less than 1500 vehicles per day and the street pavement width combined with the adjacent land use will generate periodic parking on the road pavement (not just on the verge).
- ** Slow points may include:
 - the applicable street terminating at a T-intersection, or
 - a street junction with the priority on the other street, or
 - a roundabout with pre-deflection on the approach, or
 - any other local area traffic management device that will constrain speeds to 20 km/hr to 30 km/hr.

Refer to Main Roads WA Guidelines for Local Area Traffic Management devices August 2003, Austroads Part 10 Local Area Traffic Management revision (when finalised) or Public Transport Authority Traffic Management and Control Devices (bus routes).

Target speed limits are for design purposes and their implementation is part of the design process. Physical traffic management devices can ensure that target speed limits are attained. Posting speed limits on signs may have limited effect and it is recommended that where target speed limits are crucial to create the safe environment then physical speed restricting devices form part of the design.

3.3.14 Parking provisions

Parking facilities should take into account the following documents and the specification on development densities and the consolidation of parking embayments and numbers:

- Guide to Traffic Management Austroads Part 11 Parking;
- Australian/New Zealand Standards (for on street and off street parking);
- WAPC Residential Design Code;
- *Liveable Neighbourhoods*; and
- AS 2890.5 – On-street car parking

Roads abutting public open space and schools shall be provided with a car parking embayment at appropriate locations. Such embayments may be designed to accommodate either angle parking or parallel parking, depending upon the available verge width, length of road frontage and the class of road on which the public open space or school is situated.

Designers should be aware that parallel parking is recommended over angle parking based on safety issues with children not having to access vehicles by being in between parked and moving vehicles.

The design of subdivisional roads abutting school sites shall incorporate provision for the safe and convenient pick up and set down of students.

Some changes in planning structure plans, small lot developments and increased densities also gives rise to the need for structured on street parking as onsite parking areas are limited.

3.3.15 Eyebrow treatments

Eyebrow treatments shall be provided at right angle bends on roads where lot boundaries and frontages are arranged in such a manner as to create an irregular verge area. This is to be implemented where the access to lots is designed such that normal access at right angles to the roadway is not possible. This generally occurs on loop roads.

3.3.16 Verge management – rural roads

In the development of rural and special rural subdivisions much of the aesthetic and environmental amenity of the subdivision may depend upon the conservation of the roadside vegetation. Some of the positive values of roadside vegetation include:

- existing roadside flora is usually stable and requires little management;
- it is less of a fire hazard than weeds and therefore takes less effort to maintain;
- the reduction of sunlight and the competition provided by roadside shrubs and trees can suppress the growth of weeds;
- roadside flora assists in erosion control; and
- remnant native roadside vegetation provides a habitat and shelter for native animals and birds.

To minimise the detrimental effects of disturbing roadside vegetation the following matters should be considered in conjunction with the ultimate safety and efficiency of the road system:

- a reduced standard of vertical alignment will decrease the damage caused by cuttings and embankments;
- the generally accepted batters for cuttings and embankments may be varied to reduce the space occupied by earthworks;
- table drains may be modified or deleted where natural surface levels are below the road surface, soil is suitable and no concentration of run-off occurs;
- imported fill may be used for embankments as an alternative to borrow from alongside the road;
- special environmental areas that contain rare flora should be avoided;
- vary the clearing width to accommodate only the space actually required for earthworks and retain stands of vegetation;
- minor variations of the road alignment may reduce the disturbance of an area of significant vegetation;
- roadside flora should be protected against damage from manoeuvring or parking of construction vehicles and/or machinery;
- avoid dumping weed contaminated soil in areas of natural vegetation;
- cleared vegetation should not damage existing roadside flora;
- methods of establishing regrowth on areas disturbed during road works and on erosion prone areas;
- the timing of construction works has an important bearing on the preservation of natural revegetation;
- cleared vegetation should be stacked in a manner that does not damage existing roadside flora and that burning of such vegetation is discouraged (refer section 2.2.1.5.6); and
- use of kerbing and separated drainage routes can also assist in protecting roadside vegetation.

3.3.17 Battleaxe access legs

3.3.17.1. General

Where urban, industrial or rural subdivisions contain lot(s) to which access is provided by a distinct access leg, then that access leg shall be constructed in accordance with these guidelines. Battleaxe leg widths are determined by the WAPC.

3.3.17.2. Urban areas

Where urban, industrial or rural subdivisions contain lot(s) to which access is provided by a distinct access leg, then that access leg shall be constructed in accordance with these guidelines. Battleaxe leg widths are determined by the WAPC.

Battleaxe pavements shall be constructed from concrete, segmental block paving or standard asphalt road pavement. In the rural areas the previous materials can be used to seal a battleaxe leg but it is also permissible to use a two-coat seal. Sufficient verge width for all services shall be allowed in all cases.

Where a battleaxe leg is unsealed and connects to a sealed roadway it shall be sealed for a minimum of the first 5–6 metres.

The access leg shall be drained to ensure that no stormwater from the access way flows on to the frontage road, into the lot, or into any abutting lots.

Stormwater can be collected and piped into the subdivisional drainage system or collected into an approved soakage system located within the access leg.

Where verge widths are not available for public utilities to be installed at a later date the developer, with the approval of the local government and the public utilities, can lay conduits under the roadway with draw wires where applicable.

3.3.17.3. Rural areas

In semi or special rural developments the access leg and pavement widths shall be in accordance with the specifications shown in Table 3.9.

TABLE 3.9: ACCESS LEG AND PAVEMENT WIDTHS

Lot size	1000 m ² –2 ha	2 ha–5 ha	>5 ha
Min. access leg width single lot	5 m	6 m	7 m
Min. access leg width two lots	4 m	5 m	6 m
Min. pavement width single lot	4 m	4 m	4 m
Min. pavement width two lots	3 m	3 m	3 m
Width of shoulders	500 mm	500 mm	500 mm

Source: *Liveable Neighbourhoods*

The minimum standard for semi or special rural access leg pavements shall be a bitumen aggregate seal.

In general, the minimum width of access legs in rural areas shall be 10 metres with a pavement width of 3.5–5 metres, depending on the number of lots serviced by the access leg.

In rural subdivisions where the access leg services a single lot and there is no requirement for dust suppression, the minimum construction standard is compacted gravel, limestone or equivalent pavement.

In those cases where the access leg services two or more lots in a rural subdivision, the access leg shall be sealed with an aggregate seal. The minimum width of seal shall be four metres with 500 millimetres wide shoulders on both sides.

Appropriate drainage to battleaxe access legs in rural areas shall be provided.

3.3.17.4. Industrial subdivisions

Under WAPC Policy DC 4.1, it is noted that shared battleaxe legs are not permitted in industrial subdivisions.

3.3.18 Signs and pavement marking

3.3.18.1. Regulatory and traffic control signs

Main Roads WA is the responsible authority for all traffic control signs and pavement marking. Temporary warning signs for road works are the responsibility of the party undertaking the works.

The consulting engineer shall request approval from the local government prior to submitting plans to Main Roads WA for signs and pavement markings. The submission should include contact officers for both the design and construction of the works. The consulting engineer shall also forward two copies of the traffic design drawings showing clearly the full extent of the works. Prior to any signs and lines being installed on the project the developer shall have Main Roads WA approval of the appropriate drawings. The drawings to scale 1:250 (or 1:500 for larger road sections) shall comply with:

- Main Roads WA Design Guidelines for Channelisation Pavement Markings and Regulatory Signing;
- Austroads Guide to Traffic Control Devices; and
- Australian Standard AS 1742.3 – Manual of Uniform Traffic Control Devices.

3.4 Materials specifications

These guidelines refer to materials that are readily available within the metropolitan area. This may not be the case however, in the regional areas and substitute materials will be required.

The characteristics of the materials referred to in these guidelines give rise to mechanistic properties that allow them to carry vehicular, cycle and pedestrian loads. Alternative materials must display the ability to carry the same loads to the satisfaction of the local government prior to them being used as substitute materials for road and pathway construction.

For example, pavement depths may require extra depth where the mechanistic characteristics of a substitute material does not equal the materials specified in these guidelines. These characteristics can be demonstrated through standard materials testing and the appropriate comparisons being made to those in the guidelines.

3.4.1 Saline environments

The consulting engineer/contractor shall be diligent in design and construction of all roads, drainage and associated structures in salt environments.

Any proposal to use saline water in the preparation of all concrete and mortar mixes, spray seals and road pavements should be carefully considered. Such proposals will need to be supported by appropriate commentary from a geotechnical engineer experienced in pavement construction.

The contractor shall ensure the total soluble salts content is less than 3000 mg/litre (total dissolved salts for use in construction) and shall provide evidence of construction water salt contents.

3.4.2 Crushed limestone

3.4.2.1. General

Crushed limestone shall be obtained and crushed to comply with the grading in this specification. The limestone shall be free from sand, loam, capstone, roots and other foreign material and shall not contain either oversize spalls or an excessive proportion of fine grained material.

3.4.2.2. Testing

Methods of sampling and testing of crushed limestone shall be in accordance with the following Australian standards (AS):

- AS 1141: Methods of Sampling and Testing Aggregates
- AS 1289: Methods of Testing Soils for Engineering Purposes

3.4.2.3. Properties

When tested the crushed limestone shall conform to the following requirements:

- A resistance to abrasion when determined in accordance with the Los Angeles Abrasion Test to show a weight loss not exceeding 60 per cent nor less than 20 per cent.
- Calcium carbonate content shall not be less than 60 per cent or more than 80 per cent by weight.

3.4.2.4. Grading

The crushed limestone for sub-base shall comply with the grading requirements shown in Table 3.10.

TABLE 3.10: LIMESTONE SUB-BASE

Sieve Size (Square Opening AS Sieve)	Percent Passing By Weight
75 mm	100 %
19 mm	50–75%
2.36 mm	30–50%
0.075 mm	0–15%

3.4.3 Bitumen emulsion

3.4.3.1. Bitumen emulsion – specification

The bitumen emulsion shall be of an approved slow breaking anionic type and shall contain only water, emulsifying agents and Class 170 bitumen. No other materials shall be present. The bitumen content shall be a minimum of 60 per cent.

3.4.4 Bitumen stabilised limestone

3.4.4.1. General

The specification for the limestone shall be as per section 3.4.2 – Crushed limestone.

3.4.4.2. Bitumen stabilised limestone specification

The bitumen stabilised limestone shall be supplied from an approved source (which can provide material to the specifications under the contract) and shall be a thoroughly mixed and homogenous mixture when delivered to the site. The mixture shall contain a minimum of two per cent residual bitumen by weight of the limestone.

The product shall conform to the following requirements:

- maximum dry density (Modified ASSHO) – 1750 kg/cubic metre minimum; and
- maximum dry compressive strength (unconfined, cured 1 day and oven dried for 16 hours) – 10.5 kPa minimum.

The stabilised material shall be mixed for such a length of time to ensure even dispersion of the bitumen emulsion.

3.4.5 Gravel

3.4.5.1. General

A gravel base course shall consist of a combination of soil binder, sand and laterite gravel and shall conform with this specification. It shall be free of vegetable matter and lumps or balls of clay and shall not contain excessive quantities of pyrites or other foreign substances.

3.4.5.2. Properties

Coarse aggregate retained on a 2.36 millimetres sieve shall consist of hard, durable particles or fragments of gravel. Materials that break up when alternatively frozen and thawed or wetted and dried shall not be used.

Coarse aggregate shall have a percentage wear by the Los Angeles Abrasion Test of not more than 45 per cent.

Fine aggregate passing a 2.36 millimetres sieve shall consist of natural or crushed sand and fine mineral particles passing the 0.065 millimetres sieve.

The ratio of the portion passing the 0.075 millimetres sieve to the portion passing 0.425 millimetres sieve shall fall within the range 40–60 per cent.

The portion of the sample which passes the 0.425 millimetres sieve (soil mortar) shall conform to the requirements shown in Table 3.11, when tested in accordance with AS 1289: *Methods of Testing Soils for Engineering Purposes*.

TABLE 3.11: SOIL TESTING

Property	Value
Plastic limit shall not exceed	20
Liquid limit shall not exceed	25
Plasticity Index shall not exceed	5
Linear shrinkage shall not exceed	1%
Dry compressive strength shall not be less than	1.75 MPa
Dust ratio shall not exceed	0.67

3.4.5.3. Grading

The grading of the gravel shall conform to the requirements shown in Table 3.12.

TABLE 3.12: GRAVEL GRADING

Sieve size (Square opening AS Sieve)	Percentage by weight passing
19 mm	100%
4.75 mm	45–65%
2.36 mm	30–50%
0.425 mm	12–30%
0.075 mm	0–12%

3.4.6 Fine crushed rock (roadbase)**3.4.6.1. General**

Crushed rock material shall be quarried from an approved source and shall consist of quartzite, granite, diorite, ironstone or other stone of approved hardness and durability. It shall be free from clay lumps and excess organic matter or other foreign material. It shall be freshly blended prior to delivery.

3.4.6.2. Grading

The grading of the portion passing a 19 millimetres sieve shall conform to the requirements shown in Table 3.13.

TABLE 3.13: GRADING 19 MILLIMETRES AS SIEVE

Sieve size (square opening AS Sieve)	Percent by weight passing
19 mm	100%
9.5 mm	70–80%
4.75	40–65%
2.36	30–50%
0.425 mm	12–30%
0.075 mm	3–12%

The ratio of the portion passing 0.075 millimetres sieve to the portion passing 0.425 millimetres sieve shall fall within the range of 40–60 per cent. The portion of the total sample retained on the 19 millimetres sieve shall not exceed five per cent of the total sample.

3.4.6.3. Properties

The portion of the sample which passes the 0.425 millimetres sieve (soil mortar) shall conform to the following requirements shown in Table 3.14 when tested in accordance with

AS 1289: Methods of Testing Soils for Engineering Purposes.

TABLE 3.14: GRADING AS 0.425 MILLIMETRES SIEVE

Soil characteristic	Value
Plastic limit shall not exceed	20
Liquid limit shall not exceed	25
Plasticity index shall not exceed	5
Linear shrinkage shall not exceed	1%
Dry compressive strength shall not be less than	1.75 MPa
Dust ratio shall not exceed	0.67

3.4.7 Ferricrete

The base course material known as ferricrete shall consist of a blend of crushed massive ferricrete and natural ferricrete gravel conforming with the requirements of this specification. The proportion of crushed material shall be not less than 60 per cent.

The source rock shall be massive ferricrete meeting the following requirements.

Los Angeles Abrasion= 45% or less

or

Point Load Index I50 = Average of tests on 20 samples to be not less than 0.5Mpa

Source rock shall be durable material, which does not break-up when alternately wetted and dried.

The portion of sample passing a 0.425 millimetres sieve shall conform to the following requirements:

Liquid limit = 30 or less
 Plasticity index = 6 or less
 Linear shrinkage = 3% or less

The ratio of the percentage passing a 0.075 millimetres sieve to the percentage passing a 0.425 millimetres sieve shall fall within the range 0.4 and 0.6.

3.4.8 Recycled materials for base course construction

The use of recycled materials for base course construction meeting the Main Roads WA standard specification is encouraged. However approval is subject to a certification from a NATA Certified materials testing laboratory confirming the material's compliance with MRWA specifications, that is to be submitted to the Local Government.

3.4.9 Bitumen

3.4.9.1. General

The bitumen shall be a straight run slightly blown bitumen distilled from asphaltic base petroleum. The grade shall be Class 170 (140–200 Pascal second viscosity at 60°C) and comply with AS 2008: Residual Bitumen for Pavements.

3.4.9.2. Bitumen emulsion

Bitumen emulsion shall conform as regards physical qualities, sample and testing with AS 1160: *Bituminous Emulsions for the Construction and Maintenance of pavements for Class 50 bitumen*. The bitumen content shall be a minimum of 60 per cent.

3.4.9.3. Medium curing cutting oil

Medium curing cutting oil shall be a petroleum product conforming to the requirements shown in Table 3.15.

TABLE 3.15: MEDIUM CUTTING CURING OIL SPECIFICATIONS

PROPERTY	REQUIREMENT
Distillation	
Initial boiling point	132°C–160°C
Final boiling point	265°C max
Temperature at 50% recovery	220°C max
Flash point open	35°C min
Relative density at 25°C	0.78–0.92 kg/l
Miscibility with equal parts of class	Complete
160 bitumen	No precipitation
Percentage of aromatics (% vol)	15% min
Water content	0.05% max
Viscosity at 40°C	1.0–1.4 mm ² /s

3.4.9.4. Fluxing oil

Flux oil shall be the recognised petroleum products furnace fuel oil conforming to the requirements shown in the following sections.

3.4.9.4.1. Property requirements

The distillation properties are shown in Table 3.16.

TABLE 3.16: PROPERTY REQUIREMENTS

Property	Value
Distillation	
Initial boiling point	190°C min
Temperature at 50% recovery	320°C min
Viscosity at 50°C	50–100 mm ² /s
Flashpoint	65°C min
Miscibility with equal parts of class	Complete
170 bitumen	No precipitation
Water content	0.5% max
Sulphur content	3.5% max
Sediment content	0.15% max
Pour point	65°C max

3.4.10 Polymer modified binder

There are many types of binders and polymer binders. Tables 3.17, 3.18, 3.19 and 3.20 provide some specifications for the most commonly used modified binders.

Test Method	Minimum Testing Frequency ⁽¹⁾	CLASS	S10E	S20E	S25E	S35E	S45R	S55R
		Binder Property						
AG:PT/T1 21	3-monthly ⁽²⁾	Consistency at 60°C (Pa.s) min.	400 ^(5, 11)	2000 ⁽⁴⁾	6000	350 ⁽¹¹⁾	1800	4000
AG:PT/T1 21	3-monthly ⁽²⁾	Stiffness at 15°C (kPa) max. ⁽⁶⁾	140	130	95	160	180	140
AG:PT/T1 42	Weekly	Rubber content by analysis (%)	NA ⁽⁷⁾	NA	NA	NA	TBR	TBR
AG:PT/T1 32	3-monthly	Compression limit at 70°C, 2 kg (mm) min.	NA	NA	NA	NA	0.2	0.2
AG:PT/T1 21	3-monthly	Elastic recovery at 60°C, 100 s (%) min.	NA	NA	85	NA	25	35
AG:PT/T1 21	3-monthly	Elastic recovery at 15°C, 100 s (%) min. ⁽⁸⁾	NA	NA	65	NA	30	50
AG:PT/T1 24	3-monthly ⁽²⁾	Toughness at 4°C, 100 mm (Nm) min.	TBR ⁽⁷⁾	TBR	TBR	TBR	TBR	TBR
AG:PT/T1 11	Each batch	Viscosity at 165°C (Pa.s) max. ⁽⁹⁾	0.55	0.55	0.8	0.55	4.5 ⁽¹⁰⁾	4.5 ⁽¹⁰⁾
AG:PT/T1 12	Annually	Flash point (°C) min.	250	250	250	250	250	250
AG:PT/T1 03	Annually	Loss on heating (% mass) max.	0.6	0.6	0.6	0.6	0.6	0.6
AG:PT/T1 22	Each batch ⁽⁹⁾	Torsional recovery at 25°C, 30 s (%) min.	22	50	52	16	25	30
AG:PT/T1 31	Each batch ⁽⁹⁾	Softening point (°C) min.	48	65	80	48	55	62
Other	Each batch	Other as proposed by supplier (e.g. penetration, ductility recovery)	TBR	TBR	TBR	TBR	TBR	TBR

Notes to Table 5.1

1. Testing frequencies provided are suggested minima. Different testing frequencies may be agreed between the purchaser and the supplier.
2. For classes S10E and S20E, this minimum testing frequency shall be 1-monthly.
3. 'NA' throughout indicates that the property is considered not applicable for that PMB class.
4. Manufacturers shall aim for a target consistency of 3200 Pa.s at 60°C for S20E within the range 2000 to 5000 Pa.s.
5. Manufacturers shall aim for a target consistency of 450 Pa.s at 60°C for S10E within the range 400 to 600 Pa.s.
6. AG:PT/T1 21 (for determining stiffness and elastic recovery at 15°C) is under trial, hence the specified values are experimental, and must be agreed between the purchaser and supplier.
7. 'TBR' throughout = to be recorded.
8. The shear rate involved in determining viscosity by AG:PT/T1 11 should be calculated and reported.
9. The specified 'As Manufactured' limits for Softening Point and Torsional Recovery are to be used as the 'Point of Delivery' control properties.
10. To assist the binder user determine the quantity of added cutter oil required for spraying, the manufacturer must report on the effective concentration and type of process oil used in the formulation.
11. Consistency at 60°C of S10E and S35E shall be determined using Mould B with a breakpoint of 5 mm and a test speed of 1.5 mm/s.

Source: AAPA – Shell Oil Company

TABLE 3.17: POLYMER MODIFIED BINDERS FOR SPRAYED SEALING

TABLE 3.18: POLYMER MODIFIED BINDERS FOR ASPHALT APPLICATIONS

Test Method	Minimum Testing Frequency ⁽¹⁾	CLASS	A25E	A35P	A20E	A15E	A10E ⁽⁷⁾
		Binder Property					
AG:PT/T1 21	3-monthly	Consistency at 60°C (Pa.s) min.	600 ⁽⁶⁾	2400	2200	8000	12000
AG:PT/T1 21	3-monthly	Stiffness at 25°C (kPa) max. ⁽²⁾	45	120	35	30	30
AG:PT/T1 24	3-monthly	Toughness at 4°C, 100 mm (Nm)	TBR ⁽³⁾	TBR	TBR	TBR	TBR
AG:PT/T1 11	Each batch	Viscosity at 165°C (Pa.s) max. ⁽⁴⁾	0.6	0.6	0.6	0.9	1.1
AG:PT/T1 12	Annually	Flash point (°C) min.	250	250	250	250	250
AG:PT/T1 03	Annually	Loss on heating (% mass) max.	0.6	0.6	0.6	0.6	0.6
AG:PT/T1 22	Each batch ⁽⁵⁾	Torsional recovery at 25°C, 30 s (%) min.	17	6	38	58	60
AG:PT/T1 31	Each batch ⁽⁵⁾	Softening point (°C) min.	52	62	65	82	88
Other	Each batch	Other as proposed by supplier (e.g. penetration, ductility recovery)	TBR	TBR	TBR	TBR	TBR

Notes to Table 5.2

1. Testing frequencies provided are suggested minima. Different testing frequencies may be agreed between the purchaser and the supplier.
2. AG:PT/T1 21 (for determining stiffness at 25°C) is under trial, hence the specified values are experimental, and must be agreed between the purchaser and supplier.
3. 'TBR' throughout = to be recorded.
4. The shear rate involved in determining viscosity by AG:PT/T1 11 should be calculated and reported.
5. The specified 'As Manufactured' limits for Softening Point and Torsional Recovery are to be used as the 'Point of Delivery' control properties
6. Consistency at 60°C of A25E shall be determined using Mould B with a breakpoint of 5 mm and a test speed of 1.5 mm/s.
7. A10E is a specialty binder not recommended in standard applications. For applications using this high modification binder, discuss technical requirements with the manufacturer.

Source: AAPA – Shell Oil Company

Property	Method	M1000/320 ⁽¹⁾	M500/170 ⁽¹⁾
Viscosity at 60°C (Pa.s) ⁽²⁾	AS2341.2	report	400 – 600 ⁽²⁾
Penetration at 25°C 100 g, 5 s, (pu)	AS2341.12	report	65 min ⁽²⁾
Viscosity at 135°C (Pa.s)	AS2341.2	1.5 max	1.0 max
Viscosity at 60°C after RTFOT (Pa.s) ^(3,4)	AG:PT/T1 03 AS2341.2	3,500 - 6,500 ⁽²⁾	report
Penetration at 25°C after RTFOT 100 g, 5 s, (pu) ⁽⁴⁾	AG:PT/T1 03 AS2341.12	26 min ⁽²⁾	report
Matter insoluble in toluene (% by mass)	AS2341.20	1.0 max	1.0 max
Flashpoint (°C)	AS2341.14	250 min	250 min
Density at 15°C (t/m ³)	AS2341.7	report	report
Ductility at 15°C after RTFOT (mm) ⁽⁴⁾	AG:PT/T1 03 AS2341.11	report	report
Loss on heating (% max)	AG:PT/T1 03	0.6	0.6

Notes to Table 5.3

1. M1000/320 is a Multigrade Bitumen developed primarily for use in asphalt. M500/170 is a Multigrade Bitumen which may be used in both sealing and asphalt applications.
2. For the (primarily) sealing class material (M500/170), pre-RTFO viscosity and penetration values are specified. The pre-RTFO condition corresponds more closely to the condition of a sprayed binder. Post-RTFO viscosity and penetration values are also reported so that a comprehensive database of properties can be developed to assist future specification developments.
3. In the case of the asphalt class material (M1000/320), post-RTFO viscosity and penetration values are specified since the post-RTFO binder is believed to have similar properties to the binder in an asphalt at the time of placement. Pre-RTFO viscosity and penetration values are to be reported to assist future specification developments.
4. The original Rolling Thin Film Oven (RTFO) Treatment (Australian Standard 2341.10) has been modified and the new procedure including the procedure for determining loss on heating is described in Austroads test method AG:PT/T1 03. The AG:PT/T1 03 procedure should be used since improvements in between-laboratory reproducibility can be expected.
5. To improve testing precision, a schedule of Asphalt Institute vacuum capillary viscometer tubes has been provided in Austroads test method AG:PT/T1 61.

Table 5.4: Properties of Field Produced Crumb Rubber Binders

Property	Method	Minimum testing frequency	S15RF ⁽¹⁾	S18RF ⁽¹⁾	A27RF ⁽²⁾
Nominal rubber concentration			15	18	25 – 30
Rubber concentration (by analysis) % min.	AG:PT/T1 42	weekly ⁽³⁾	13	16	
Softening point (°C) min.	AG:PT/T1 31	weekly	55	62	
Consistency at 60°C	AG:PT/T1 21	weekly	TBR	TBR	
Torsional recovery (%) min.	AG:PT/T1 22	weekly	25	30	

Notes to Table 5.4

1. Specification for two grades of crumb rubber (see Table 5.5) available for either sealing class. Size 30 is normally used for the 'Dry mix' asphalt system.
2. 'Dry mix' asphalt is normally based on an asphalt mix design with the crumb rubber added at 25 to 30% crumb rubber in the total binder. Refer to Austroads *Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens (Austroads 2005a)* for more detail.
3. For sealing grades, the weekly sampling is from a sprayer load after digestion but prior to the addition of cutter oil. Samples must be free of diluents for subsequent testing to be meaningful. The agreed digestion period (at temperature) must be completed before sampling.

TABLES 3.19 and 3.20: BITUMENS AND RUBBER BINDERS

Source: AAPA – Shell Oil Company

Further major specifications are available on the Austroads website at

<http://www.austroads.com.au/pavement/testmethods.html>

3.4.11 Road sealing aggregates

3.4.11.1. Aggregate

The aggregate shall be crushed diorite, granite or basalt, unless otherwise approved. It should consist of clean, tough, durable fragments free from an excess of thin or elongated pieces; soft or disintegrated pieces; and dirt or other foreign matter.

3.4.11.2. Particle shape

The proportion of flat or elongated particles in any grading of course aggregate shall not exceed 20 per cent. A flat particle is one having a ratio of width to thickness of greater than three and an elongated particle is one having a ratio of length to width greater than three. There shall not be more than 2.5 per cent of particles of greater length in any direction than twice the gauge and there shall not be more than 20 per cent of particles of greater dimensions in any direction than 25 per cent in excess of the gauge.

3.4.11.3. Hardness

The aggregate shall have a Los Angeles Test abrasion value not exceeding 20 per cent of wear for diorite and basalt and 40 per cent for granite.

3.4.11.4. Specific gravity

The bulk specific gravity of the particles shall be not less than 2.9 for diorite, 2.8 for basalt and 2.6 for granite.

3.4.11.5. Elongation factor

The elongation factor, which shall be defined as the ratio of the average long dimension to the average least dimension shall not exceed 2.75 for the sample.

3.4.11.6. Method of sampling and testing

The method of testing the aggregate shall be in accordance with *AS1141: Methods for Sampling and Testing Aggregates*.

3.4.11.7. Flakiness index

The flakiness index of granite shall not exceed 30.

3.4.11.8. Grading requirements (percentage by weight)

Aggregates should conform to the properties shown in table 3.21.

TABLE 3.21: GRADING REQUIREMENTS

Size No.	1	2	3	4
NOMINAL SIZE	14 mm	10 mm	7 mm	5 mm
Passing AS mm Sieve				
37.5				
26.5				
19				
16	100			
13.2	80–100	100		
9.5	0–20	80–100	100	
6.7	0–2	0–25	80–100	100
4.75		0–2	0–30	80–100
2.36				0–30
1.18				0–0.5
600 micron				

3.4.11.9. Average least dimension requirements

The average least dimension of aggregate should comply with Table 3.22.

TABLE 3.22: AVERAGE LEAST DIMENSION

SIZE No.	1	2	3
Nominal size	8–13 mm	5–19 mm	7 mm
Average least dimension	9–13 mm	6–8 mm	4–6 mm

3.4.12 Asphalt

3.4.12.1. General

This specification is to be read in conjunction with the following documents:

- AS 2150: Hot Mix Asphalt;
- AS 2008: Residual Bitumen for Pavements;
- AS 2734: Asphalt (Hot Mixed) Paving – Guide to Good Practice;
- Main Roads WA, Methods for Sampling and Testing of Asphalt;
- Technical Specification, Tender Form and Schedule for Supply and Laying of Hot Asphalt Road Surfacing (AAPA/IPWEA).

3.4.12.2. Specification

All asphalt pavements and wearing courses shall be laid in accordance with the AAPA/IPWEA specification.

3.4.12.3. Characteristics of the asphalt design

The design for the asphalt surface course shall meet the requirements shown in table 3.23 to 3.30 (drawn from the AAPA/IPWEA specification), by weight, when determined by Australian Standard (AS) sieves.

The residual binder (residual asphaltic bitumen), shall be determined as a percentage by weight of the total mixture.

TABLE 3.23: ASPHALT MIXES – HIGHWAYS, ARTERIAL, INDUSTRIAL AND DISTRIBUTOR ROADS

Property	Mix designation		
	AC10	AC14	AC20
Grading limits percentage passing AS Sieve			
26.5 mm			100
19.0 mm		100	90–100
13.2 mm	100	85–100	75–90
9.5 mm	90–100	70–85	60–80
6.7 mm	70–90	62–75	50–70
4.75 mm	58–76	53–70	40–60
2.36 mm	40–58	35–52	25–43
1.18 mm	27–44	24–40	18–35
600 µm	17–35	15–30	14–27
300 µm	11–24	10–24	9–21
150 µm	7–16	7–16	6–15
75 µm	4–7	4–7	3–7
Bitumen content	5.0–7.0	4.5–6.5	4.0–6.0
Marshall voids (%)	50 blow	3.0–5.0	3.0–5.0
	75 blow	4.0–6.0	4.0–6.0
Minimum Marshall stability	50 blow	6.5 kN	6.5 kIM
	75 blow	8.0 kN	8.0 kIM
Marshall flow (mm)	2.0–4.0	2.0–4.0	2.0–4.0
Marshall quotient (min) (kN/mm)	50 blow	1.7	1.7
	75 blow	2.0	2.0

TABLE 3.24: TRAFFIC RECOMMENDATIONS – OVER 20 YEARS DESIGN TRAFFIC

Range/type	Mix	Bitumen type
Heavy truck traffic	75 blow	Class 320
Less than 2,000,000 ESA	50 blow	Class 170
Greater than 2,000,000 ESA	75 blow	Class 320
Maintenance	50 blow	Class 170
Intersections	75 blow	Class 320

TABLE 3.25: ASPHALT MIXES – RESIDENTIAL STREETS/CULS-DE-SAC

Property	Mix designation		
	AC7	AC10	AC14
Grading limits percentage passing AS Sieve			
19.0 mm			100
13.2 mm		100	90–100
9.5 mm	100	95–100	70–90
6.7 mm	80–100	80–95	62–75
4.75 mm	70–90	65–80	47–67
2.36 mm	45–60	45–60	34–52
1.18 mm	35–50	35–50	25–41
600 µm	22–35	25–40	16–32
300 µm	14–25	15–25	9–21
150 µm	8–16	7–15	5–13
75 µm	5–8	3–10	2–8
Bitumen content	5.0–7.0	4.5–6.5	4.5–6.5
Marshall voids (%) 35 blow	3.0–5.0	3.0–5.0	3.0–5.0
50 blow	3.0–5.0	3.0–5.0	3.0–5.0
Minimum Marshall 35 blow Stability	4.0 kN	4.0 kN	5.5 kN
50 blow	5.5 kN	6.5 kN	6.5 kN
Marshall flow (mm) 35 blow	2.0–5.0	2.0–5.0	2.0–5.0
50 blow	2.0–4.0	2.0–4.0	2.0–4.0
Marshall quotient (min) 35 blow (kN/mm)	1.0	1.0	1.0
50 blow	1.7	1.7	1.7

TABLE 3.26 TRAFFIC RECOMMENDATIONS – OVER 20 YEARS DESIGN TRAFFIC

Range/type	Mix	Bitumen type
Greater than 500,000 ESA	Use distributor road mix	
Greater than 50,000 ESA	50 blow	Class 170
Less than 50,000 ESA	35 blow	Class 170
Maintenance	50 blow	Class 170

TABLE 3.27: ASPHALT MIXES – RECREATIONAL AREAS

Property	Mix designation	
	AC 5	AC 7
Grading limits percentage passing AS Sieve		
9.5 mm		100
6.7 mm	100	80–100
4.75 mm	85–100	70–90
2.36 mm	55–75	45–60
1.18 mm	38–57	35–50
600 µm	26–43	22–35
300 µm	15–28	14–25
150 µm	8–18	8–16
75 µm	4–11	5–8
Bitumen content	5.0–7.0	5.0–7.0
Marshall voids (%)	3.0–5.0	3.0–5.0
Minimum Marshall 35 blow	4.0 kN	4.0 kN
Stability 50 blow	5.0 kN	5.5 kN
Marshall flow (mm)	2.0–5.0	2.0–5.0
Marshall quotient (min) 35 blow	1.0	1.0
(kN/mm) 50 blow	1.7	1.7

Note: Bitumen shall be Class 170 unless otherwise approved.

TABLE 3.28: TRAFFIC RECOMMENDATIONS

Range/type	Mix
Cycle paths, basketball courts, etc.	35 blow
Maintenance	50 blow

TABLE 3.29: ASPHALT MIXES: STONE MASTIC ASPHALT (SMA) – SPECIAL REQUIREMENTS (SKID RESISTANCE)

Property	Mix designation		
	SMA 7	SMA 10	SMA 14
Grading limits percentage passing AS Sieve			
26.5 mm			
19.0 mm			100
13.2 mm		100	90–100
9.5 mm	100	90–100	30–40
6.7 mm	90–100	25–40	20–30
4.75 mm	25–45	18–30	18–30
2.36 mm	15–28	15–28	15–28
1.18 mm	13–24	13–24	13–24
600 µm	12–21	12–21	12–21
300 µm	10–18	10–18	10–18
150 µm	9–14	9–14	9–14
75 µm	8–12	8–12	8–12
Bitumen content	6.0–8.0	6.0–8.0	5.5–7.5
Marshall voids (%) 50 blow	3–5.5	3–5.5	3–5.5
Minimum Marshall 50 blow stability	6.0 kN	6.0 kN	6.0 kN
Voids at 80 cycles of the gyratory compactor (%) (mix design process only)	3–5.5	3–5.5	3–5.5
Minimum refusal voids (%) at 360 cycles of the gyratory compactor (mix design process only)	2.5	2.5	2.5
VMA (min) (%)	19	18	17
Binder draindown (max) (%)	0.3	0.3	0.3
Cantabro abrasion – Unconditioned Loss (max) (%) – Conditioned	25 35	25 35	25 35

TABLE 3.30: SPECIAL APPLICATION RECOMMENDATIONS

Range/type	Mix	Bitumen type
Special applications requiring good, rut resistance and fatigue performance	50 blow	Class 320

Note: Recent literature and research has indicated that there may be reduced skid resistance during the early life of the stone mastic asphalt material. The literature also states that the long-term skid resistance of such material is superior to that of dense graded asphalt.

3.4.13 Paving units

Paving units for paved roads shall be high temperature fired with exposed faces of an extruded, wire cut or pressed finish. Interlocking pavers are preferred where possible, for long-term reliability for evenness and level of surface.

3.4.13.1. Dimension tolerance

The paver shall be of 230 millimetres nominal length and 114 millimetres nominal width and have a minimum depth of 76 millimetres with a ± 2 millimetres tolerance on all nominated manufactured dimensions, provided that the paver complies with the length to width relationship as determined by *Paver Note 1* (Clay Brick and Paver Institute, February 1990).

Intersecting faces of pavers shall subtend an angle of 90°.

Bevelled edges of pavers shall have a plan width not exceeding five millimetres and round-edged pavers shall have an edge radius not exceeding five millimetres.

All faces including sides, ends, top and bottom, shall be free from convex or concave deformation and when tested with a straight edge, placed on any face, the deviation from the contact edge shall be less than 1.5 millimetres.

The maximum and minimum limits of length and width for a sample of 20 pavers when measured in accordance with *AS/NZS 4456: Masonry Units and Segmental Pavers – Methods of Test* shall comply with *Paver Note 1*.

3.4.13.2. Transverse strength

Transverse strength (Modulus of rupture) shall be not less than 2.0 MPa when measured in accordance with *AS/NZS 4456*. Alternatively, the minimum transverse breaking load of individual pavers shall be 5kN when measured in accordance with Appendix A of *Paver Note 1*.

3.4.13.3. Compressive strength

The minimum characteristic compressive strength shall be 30 MPa when measured in accordance with *AS/NZS 4456*.

3.4.13.4. Efflorescence

Liability to efflorescence shall be 'nil' to 'slight' when measured in accordance with *AS/NZS 4456*.

3.4.13.5. Abrasion Resistance

A sample of five pavers shall have an average abrasion index greater than 1.5 when tested in accordance with Procedure C of *ASTM C779-76: Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces*, as modified by the Perth City Council.

3.4.13.6. Pitting (lime particles)

The liability to pitting due to expansion of lime particles shall not exceed 'moderate' when measured in accordance with *AS/NZS 4556*.

3.4.13.7. Absorption

Water absorption shall be less than 12.5 per cent, and variations between pavers shall not exceed two per cent when measured in accordance with *AS/NZS 4456* (24 hour test). Variations between bricks tested in accordance with this method shall not exceed two per cent.

3.4.13.8. Resistance to salt attack

Pavers laid in areas liable to salt attack shall withstand 40 cycles of the Sodium Sulphate Test as detailed in *AS/NZS 4456*.

3.4.13.9. Permanent expansion

The estimated long-term (five years) unrestrained expansion shall not exceed 0.6 millimetres per metre when measured in accordance with *AS/NZS 4456*.

3.4.13.10. Slip or skid resistance

The slip or skid resistance (BPN) of a new paver shall be not less than 60 BPN when measured using the British Pendulum Skid Resistance Tester, in accordance with the procedure detailed in Appendix B of *Paver Note 1*.

3.4.13.11. Colour

The brick shall be the same or similar approved colour as shown on the approved drawings.

Module No. 4

Drainage Management Guidelines

4 Module No.4 – Drainage Management Guidelines

4.1 General requirements

The objective of the drainage management guidelines is to achieve best practice for managing both water quantity and quality in a sustainable way, as required by the WAPC's *State Planning Policy 2.9 Water Resources*. Reference is required of the Department of Water and the Department of Environment and Conservation for requirements. Special effort should be given to the retention and management of areas of natural significance within public open space areas

To satisfy conditions of subdivision approval relating to stormwater, developers need to liaise with local government and refer to the Department of Water's *Stormwater Management Manual* and the WAPC's *Better Urban Water Management (2008)* document, together with any specific information, including *Australian Rainfall and Run-off* and other standards given in this section.

4.2 Policies, standards and guidelines

4.2.1 Policies

- State Water Plan (Department of the Premier and Cabinet, Perth Western Australia, 2007).
- State Water Strategy (Department of the Premier and Cabinet, Perth Western Australia, 2003).
- State Planning Policy 1 – State Planning Framework Policy (WAPC, Perth Western Australia, 2006).
- State Planning Policy 2 – Environment and Natural Resources (WAPC, Perth Western Australia, 2003).
- State Planning Policy 2.9 – Water Resource 2006 (WAPC, Perth Western Australia) (available online).
- State Planning Policy 2.10 – Swan Canning River System (WAPC, Perth Western Australia, 2006).
- Planning Bulletin 64 – Acid Sulfate Soils 2003b (WAPC, Perth Western Australia) (available online).
- Planning Bulletin 92 – Urban Stormwater Management (WAPC, Perth Western Australia, 2008).

4.2.2 Standards and guidelines

All drainage designs should comply with the following industry design standards:

- *Better Urban Water Management 2008* (WAPC, Perth Western Australia).
- Urban Water Management Plans – Guidelines for preparation and compliance with subdivision guidelines (Department of Water, Perth Western Australia, 2008).

- Developing an interim local water management strategy (Department of Water, Perth Western Australia, 2008).
- Local Water Management Strategy (Department of Water, Perth Western Australia).
- Stormwater Management Manual for Western Australia (Department of Water, Perth Western Australia, 2004–2007). (Available online).
- Decision process for stormwater management in Western Australia (Department of Water, Perth Western Australia, 2009). (Available online).
- Australian Rainfall and Run-off, 3rd Edition (Institution of Engineers, Canberra Australian Capital Territory, 2001).
- Australian Run-off Quality: A guide to water sensitive urban design (Institution of Engineers Australia, Melbourne Victoria, 2006).
- *Liveable Neighbourhoods* – January 2009 update 02: A Western Australian government sustainable cities initiative, 4th edition (WAPC, Perth Western Australia, 2007). (Available online).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy (Australian and New Zealand Environment and Conservation Council, Canberra, Australian Capital Territory, 2000).
- Interim Position Statement: Constructed Lakes (Department of Water, Perth Western Australia, July 2007).

4.3 Design

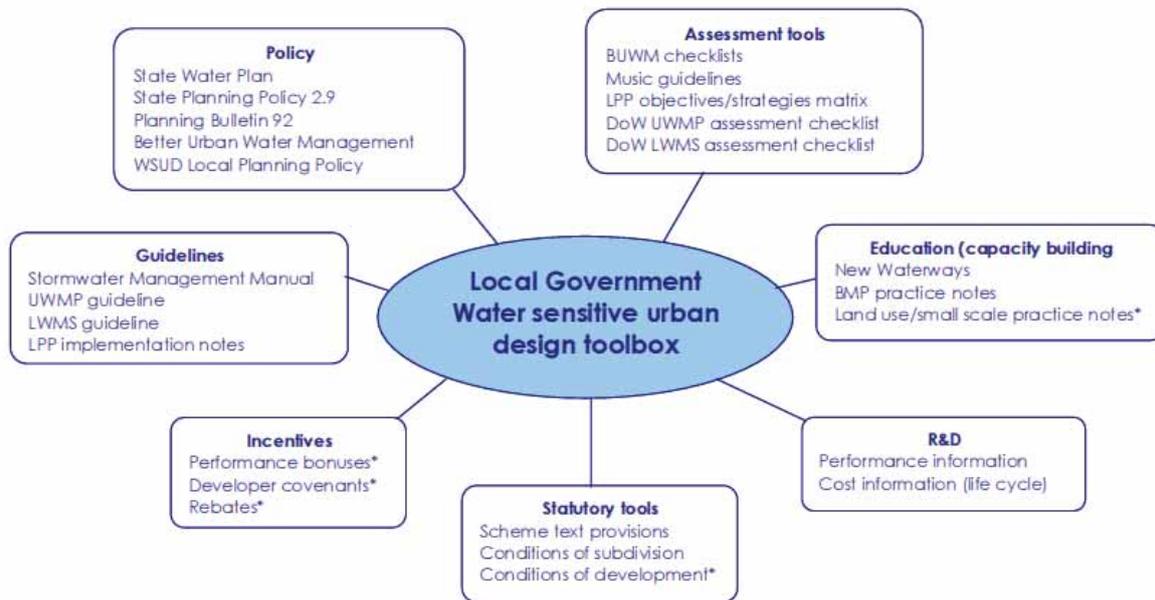
4.3.1 Drainage design objectives for water sensitive urban design

The following design criteria is to be used as a guide for development of the urban water management system for strategic planning, subdivision and development, unless other specific objectives have been defined in other approved water management plans/strategies.

Demonstration of compliance with these design objectives may be through appropriate computer modelling or other assessment methods acceptable to Department of Water. Water management will need to address water quality as well as quantity. Water quality will be essential in water sensitive locations such as rivers and wetlands and where stormwater infiltration groundwater is occurring.

Figure 4.1 demonstrates available tools and resources available to assist local government develop water sensitive urban design.

FIGURE 4.1: LOCAL GOVERNMENT WATER SENSITIVE URBAN DESIGN TOOLBOX



Source: Department of Water

4.3.1.1. Water quantity management

4.3.1.1.1. Principle

Maintain post-development annual discharge volume and peak flow relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments.

Protect the built environment from flooding and water logging; and minimise public risk to the community, including injury or loss of life.

4.3.1.1.2. Criteria

Ecological protection – for the critical one-year average recurrence interval (ARI) event, the post-development discharge volume and peak flow rates shall be maintained relative to pre-development conditions in all parts of the catchment where there are identified impacts on significant ecosystems. Desirable environmental flows and/or hydrological cycles are to be maintained or restored as specified by the Department of Water.

Flood management – manage the catchment run-off for up to the one in 100-year ARI event in the development area to pre-development peak flows, unless otherwise indicated in an approved strategy or as negotiated with the relevant drainage service provider.

4.3.1.2. Water quality management

4.3.1.2.1. Principle

It is necessary to maintain surface and ground water quality at pre-development levels (winter concentrations) and if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located.

4.3.1.2.2. Criteria

Contaminated sites – to be managed in accordance with the *Contaminated Sites Act 2003*.

All other land – if the pollutant outputs of development (measured or modelled concentrations) exceed catchment ambient conditions, the proponent shall achieve water quality improvements in the development area or, alternatively, arrange equivalent water quality improvement offsets inside the catchment. If these conditions have not been determined, the development should meet relevant water quality guidelines stipulated in the *National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000)*.

Drainage –ensure that all run-off contained in the drainage infrastructure network is analysed to assess water quality and where applicable receives treatment prior to discharge to a receiving environment consistent with the *Stormwater Management Manual*.

In addition, all outflows from sub-soils should receive bio-filtration type treatment prior to discharge to the stormwater system or a receiving water body. The implementation of a maintenance program will be needed for the effectiveness of this requirement.

Targets are to be achieved through adopting a treatment train approach including:

- non-structural measures (ie. education and institutional and pollution-prevention practices) to reduce applied pollutant and nutrient loads;
- on-site retention of one-hour duration, one-year average recurrence interval event; and
- bio-retention structures or systems (also referred to as rain gardens) are to be sized at two per cent of connected constructed impervious areas.

4.3.1.2.3. Stormwater quality modelling criteria

If it is proposed to use a stormwater modelling tool to demonstrate compliance with design objectives and the following design modelling parameters are recommended. Compared to a development that does not actively manage stormwater quality there should be at least:

- an 80 per cent reduction of total suspended solids;
- a 60 per cent reduction of total phosphorus;
- a 45 per cent reduction of total nitrogen; and
- a 70 per cent reduction of gross pollutants.

These targets are a minimum standard for normal applications. In sensitive locations like rivers, waterways and wetlands higher targets may be required by the Department of Environment and Conservation or the Swan River Trust.

4.3.1.3. Disease vector and nuisance insect management

To reduce health risks from mosquitoes, retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully infiltrated in a time period not exceeding 96 hours. Un-aerated, permanent

water bodies are discouraged but where accepted by the local government, must be designed to maximise predation of mosquito larvae by native fauna to the satisfaction of the local government on advice of the Departments of Water and Health.

4.3.1.4. Planning and integrated water cycle management

The planning system has a significant role to play in the achievement of total water cycle management and water sensitive urban design via strategic planning and the statutory approvals process. Better urban water management can be achieved through capacity building and assessing new development to ensure the principles and practices of integrated water cycle management are incorporated into the design and development of new urban and redevelopment areas.

The consideration of water issues must be integrated with other planning and development matters, including natural resource management issues, so that land and water planning are undertaken concurrently, rather than independently and consecutively.

The consideration of water should be founded on sustainability principles where a comprehensive range of issues is assessed using a triple-bottom-line approach.

4.3.1.4.1. State Planning Policy 2.9 Water Resources (State Government, 2006)

The *State Planning Policy 2.9 Water Resources* requires land use planning to contribute to the protection and wise management of water resources by ensuring that local and regional land use planning strategies, structure plans, schemes, subdivisions, strata subdivision and development applications take into account total water cycle management and water sensitive urban design principles.

It also ensures that development is consistent with current best management practices and best planning practices for the sustainable use of water resources, particularly stormwater, which is currently defined by the content of *State Planning Policy 2.9 Water Resources and the Stormwater Management Manual for Western Australia. Liveable Neighbourhoods* (WAPC, 2007) defines best planning practices for urban water management and includes specific requirements in Element five.

4.3.1.4.2. Element five: *Liveable Neighbourhoods*

Element five of *Liveable Neighbourhoods* contains guidance on integrating stormwater into public parkland.

This element gives consideration to water and demonstrates how the consideration of water resources can be integrated into the land use planning system to ensure best practice urban water management outcomes are achieved on the ground, and are consistent with *State Planning Policy 2.9 Water Resources*.

The level of detail and process timelines required are consistent with those of the land use planning system.

It is recognised that in order to achieve water sensitive urban design, implementation of the recommended approach must be supported by a broader, complementary program that addresses key issues, assumptions, tools, monitoring, assessment and learning.

This approach is only one facet of the capacity building that will be required to achieve total water cycle management in Western Australia. It is also noted that the information requirements identified in this document do not constrain the Department of Water, the

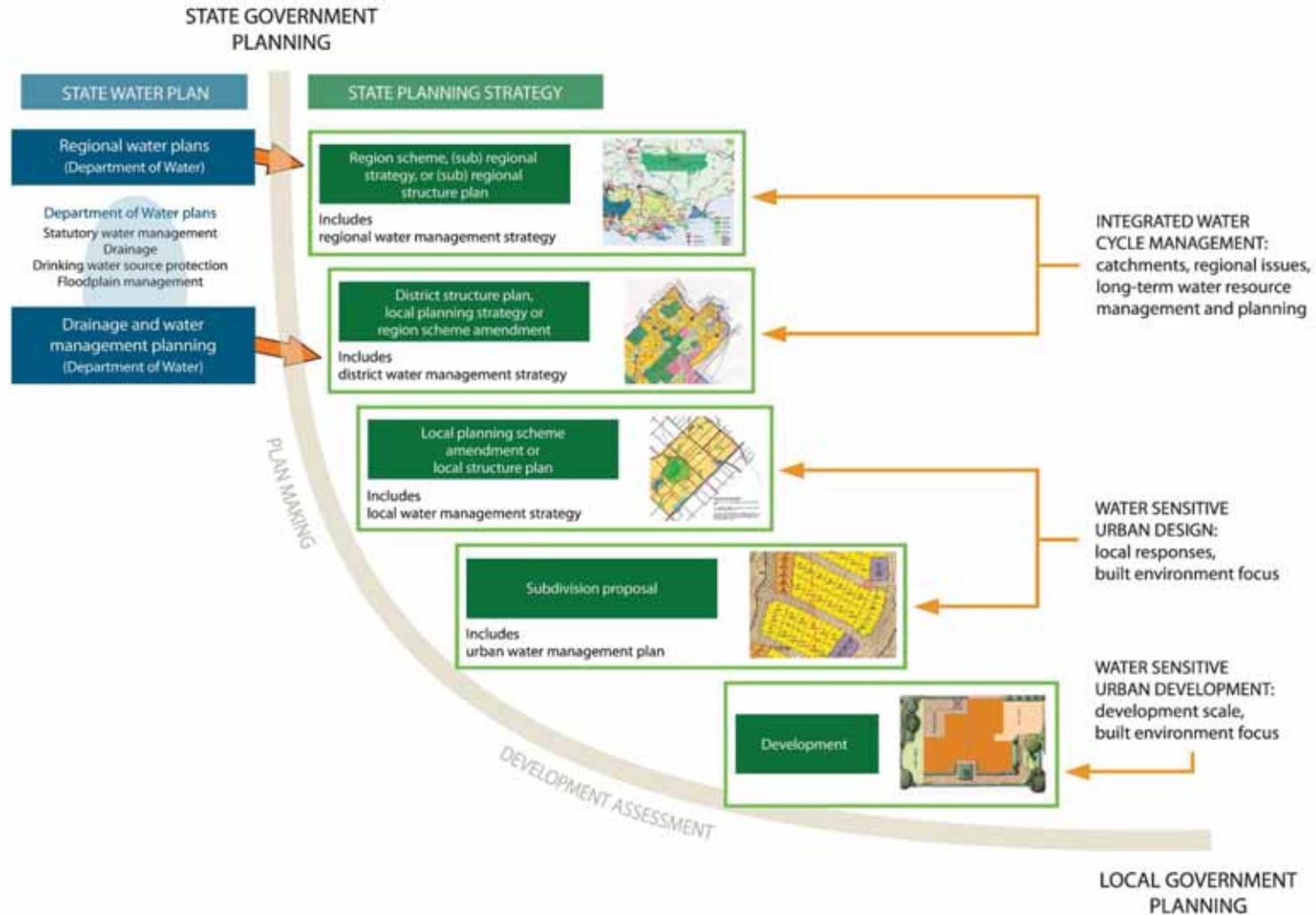
Department of Environment and Conservation or the Swan River Trust from requesting additional information where it is considered necessary to address a specific environmental issue.

4.3.1.4.3. Better urban water management

Better Urban Water Management provides a framework and hierarchy of planning and water management documents to be prepared as a development proposal progresses from strategic planning to metropolitan regional scheme and town planning scheme zoning to structure planning and then to subdivision and lot development. This is outlined in the Figure 4.2.

This guideline is principally aimed at the detail required at the subdivision and development phases, however it forms part of the overall process. The designs developed utilising this guideline must be consistent with and implement the strategies, objectives and concept designs approved in the preceding district and local water management strategies.

FIGURE 4.2: BETTER URBAN WATER MANAGEMENT FRAMEWORK



Source: Department of Water

4.3.2 Key elements for water-sensitive urban design

4.3.2.1. Water balance, conservation, use and efficiency

Demonstrate the understanding of how water is used across the site. Pre-development water balance should have been agreed during the structure planning, or earlier.

The development should achieve:

- conservation of drinking water, through water-efficient fixtures and fittings and xeriscaping (landscaping using plants that do not need irrigation) both private and public spaces;
- fit-for-purpose water use, including from rainwater tanks, grey water and/or reticulated non-potable supply; and
- ecological protection, ie. maintaining the daily, monthly and annual variation in groundwater and surface water (minimums and maximums, flow intensities, extremes).

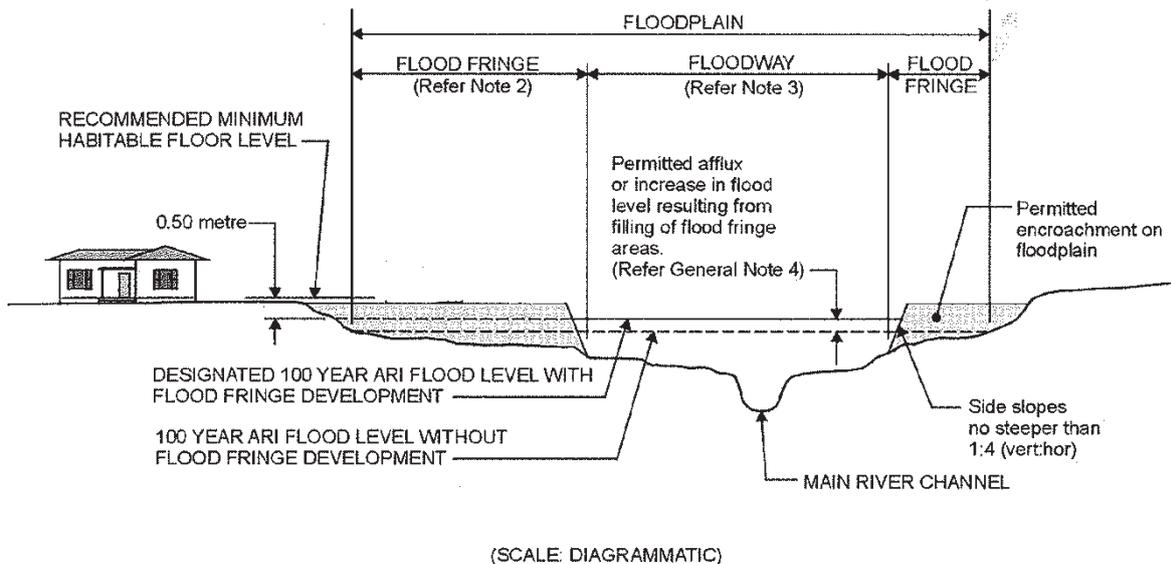
4.3.2.2. Flood protection (managing storm events)

The development needs to conform to the following flood protection considerations.

- Demonstrate that the development is not within a floodway. Development is not permitted within flood ways; however, development may occur within a floodplain (flood fringe), but only if approved in the local structure plan.
- A minimum habitable floor levels of 0.5 metres above the adjacent 100-year ARI flood level is required for new developments on adjacent to flood prone land as shown in Figure 4.3.
- In all other parts of the catchment, development can have a minimum habitable floor level 0.30 metre above the 100-year ARI event level, calculated for the local drainage systems. It is advisable to check with the local government and to consider climate change.
- Accommodate floods events in road reserves in accordance with Figure 4.4, and public parkland in accordance with the agreed local water management strategy.
- Identify the likely flood event flow paths, flow rates and velocities, storage areas and hydraulic grade lines, including top water levels.

FIGURE 4.3: FOODPLAIN DEVELOPMENT STRATEGY

RECOMMENDED FLOODPLAIN DEVELOPMENT STRATEGY



GENERAL NOTES

1. The 100 year ARI flood level is expected to occur, on average, once every 100 years. Floods higher than this level will occur but will be less frequent.
2. The flood fringe is an area affected by a 100 year ARI flood. Development (ie, filling, building, etc) that is located within the *flood fringe* is considered acceptable with respect to major flooding. However, a minimum habitable floor level of 0.50 metre above the adjacent 100 year ARI flood level is recommended to ensure adequate flood protection.
3. Development (ie, filling, building, etc) that is located within the *floodway* and is considered obstructive to major flows is not acceptable as it would increase flood levels upstream. No new dwellings are acceptable within the floodway.
4. The increase in flood level that will result from total development of flood fringe areas has been calculated to be no greater than 0.15 metre.
5. A failure to properly adhere to these recommendations will result in a greater exposure to risks of flood damage.

Source: Department of Water

4.3.2.3. Frequent (up to one-year ARI) events

Design

- Ensure that run-off from constructed impervious surfaces from the one-in-one year (one hour duration) ARI event can be retained, where possible, within the lot or road reserve. Where ground conditions do not support adequate infiltration rates, run-off may also be detained in underground storage systems or public open spaces, provided there is no reduction in the amenities of the public open spaces and the design complies with the policies explained in *Liveable Neighbourhoods*.
- Design the development so that the amount of water flowing off-site remains unchanged before and after development.
- Plant vegetation on all surfaces that are used to accommodate one-in-one-year (one hour duration) ARI event to avoid this area becoming water-logged and to manage water quality.
- Size the water quality structural controls according to the design criteria contained in the local water management strategy and the guidelines in the *Stormwater Management Manual for Western Australia*.

Groundwater

- If groundwater management is part of the proposal, indicate the proposed controlled groundwater level. For example, through the installation of a sub-soil drain. If a controlled groundwater level is proposed close to environmentally sensitive areas, it must be shown that the new regime will be similar to that currently existing.
- Treat any additional outflow of groundwater (eg. via sub-soil drainage) through a structural control, ie. bio-retention system or riparian vegetation zone (see Chapter 9 of the *Stormwater Management Manual for Western Australia* or the *River Restoration Manual for WA*) before it reaches the receiving environment.

4.3.2.4. Stormwater drainage design – general principles

Developers subdividing land for urban residential, commercial or industrial developments are required to provide a stormwater drainage system. The subdivision of rural land may also require the provision of a similar system and in low lying areas or areas subject to a high water table, sub-soil drainage may be required.

Consulting engineers should discuss with State and local governments the requirements for drainage of a new subdivision prior to the preparation of engineering drawings.

The consultant engineer shall examine the total drainage catchment area and ensure that any upstream drainage that may pass through the particular subdivision is included in the design and that the drainage system for the subdivision is capable of carrying the ultimate design flow from the upstream catchment. Guidance may be available from a Department of Water drainage and water management plan or the approved local water management strategy for the development area. In instances where this guidance is not available, consultants shall follow the checklists in the guidelines for preparing local water management strategies and urban water management plans in preparing the stormwater drainage designs for the development area.

Developers are responsible for negotiating their own cost sharing arrangements.

Developers whose land shares a common drainage catchment have a shared responsibility for ensuring that the whole of the catchment including distributor roads is drained. Where development is to be staged, an overall drainage plan for the whole of the catchment is required before approval will be given to any individual stage. Drainage of each stage shall be in accordance with the overall plan.

Where a new subdivision occupies the upper part of a catchment in common with existing developed land, for which there is no overall plan, the existing drainage system of the local government may not be able to carry the design storms applicable to the recurrence intervals detailed in these guidelines. In these circumstances the following requirements shall apply.

- The consulting engineer shall prepare and submit an overall drainage catchment plan indicating the boundaries of the catchment and the estimated run-off from the catchment and each sub-catchment.
- The consulting engineer shall examine the complete downstream drainage network to evaluate the maximum quantity of water which may be discharged into the existing network. If the capacity of the existing drainage network is exceeded, the surplus water shall be either retained or disposed of within the subdivision at the upper part of the catchment, or the existing drainage system upgraded to accommodate the design run-off.

In cases where stormwater is proposed to be discharged onto private land downstream of a subdivision or development, arrangements shall be made by the developer with the owner of the downstream land to provide an easement in favour of the local government over the route of the surface water flow path. Any modifications to the existing channel/flow path should be carried out by the developer.

The developer shall liaise with the Water Corporation where the drain discharges into a Water Corporation main drain; and the Department of Water where the drain discharges into a river or creek.

An approved drain and outfall structure shall be provided in those situations where the subdivisional drainage system is to be connected to an approved outlet in the district drainage system.

Due to the variation of land, land use and soil types throughout Western Australia, it is not practical to list run-off coefficients in these guidelines. Consulting engineers are expected to assess and confirm the run-off coefficients applicable to a particular development prior to undertaking drainage design for that development.

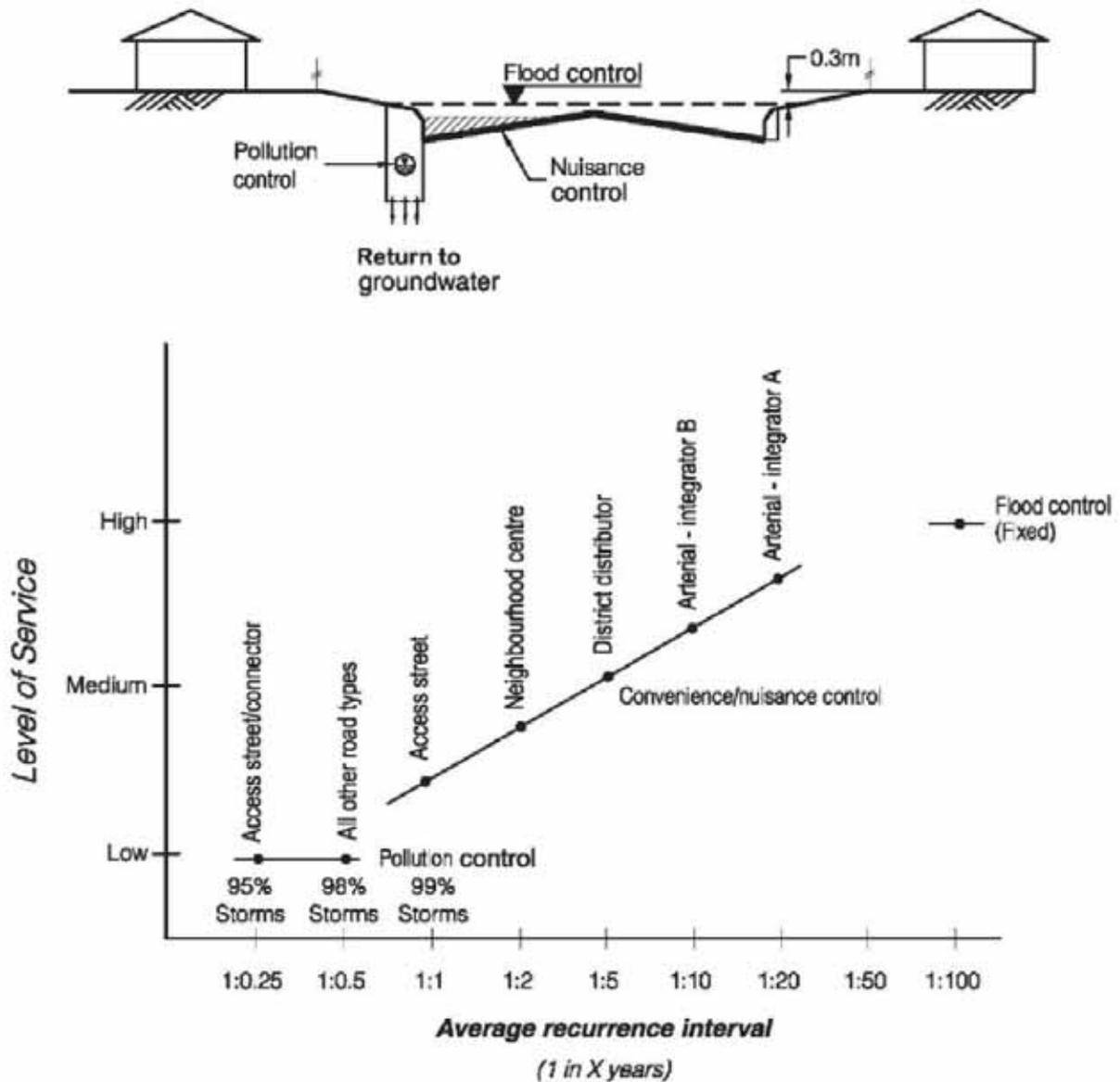
The consulting engineer shall design the drainage network using a recurrence interval of five years, except in the case of arterial drains and compensating basins, where a recurrence interval of 10 years shall be used.

Provision shall also be made using overland flow paths and storage facilities for peak one-in-100-year storm event associated with the 100-year recurrence interval such that the floor level of all buildings shall be a minimum of 300 millimetres above the 100-year storm event level as shown in Figure 4.4.

Where filling on a subdivision affects the drainage of adjoining land, provision shall be made to collect and dispose of such water within or through the subdivision. No filled lots shall be permitted to drain onto abutting land unless it coincides with an existing natural watercourse,

in which case only the excess water from post works run-off exceeds the pre works, run-off shall be redirected through a separate drainage system.

FIGURE 4.4: STORMWATER INFRASTRUCTURE REQUIREMENTS AS A FUNCTION OF ROAD HIERARCHY



Source: *Liveable Neighbourhoods*

4.3.2.5. Groundwater drainage design

Groundwater drainage networks must be designed to ensure:

- water dependent ecosystems are protected;
- mobilisation of nutrient rich groundwater is minimised;
- free-draining outlets to the surface drainage system; and
- adequate separation between the development surface and groundwater.

Consequently, the design of the overall surface and ground water drainage network is an important part of the development design process.

Controlled groundwater level is the design level at which open and sub-soil drainage invert levels are set. The Department of Water is developing a guidance paper to clarify the controlled groundwater level design process.

Groundwater drainage networks are generally constructed in areas where maximum groundwater levels reach within one to two metres of the ground surface every year. A decision needs to be made based upon separation from the historical recorded or modelled maximum groundwater level and management of the risk posed by the high water table. If the decision is to not install a subsurface drainage network then the development surface level should be determined in accordance with standards set for building foundation integrity and other factors relating to the proposed land use by the appropriate authority.

When designing drainage systems to control groundwater levels ecological water requirements, groundwater resource requirements and land surface waterlogging issues should be addressed. These three considerations are important to ensure the groundwater resource and environmental assets are protected and that infrastructure is not compromised by groundwater or standing water.

Reference should be made to the Department of Water for the latest guidance on groundwater management, via <http://www.water.wa.gov.au/Managing+our+water/Stormwater+and+drainage/default.aspx>

4.3.3 Design in urban areas

4.3.3.1 Drainage systems

All drainage systems shall be designed to include water sensitive urban design principles. Such principles set down ARIs of one-in-one-year, where soil conditions are satisfactory for the level of infiltration that is required for the peak flows calculated. Greater ARI storms will then require a conveyance system to cater for the extra water. Where overland flows can cater for the higher peak flows then the conveyance system can be reduced to suit.

All piped drainage lines shall be designed in accordance with the recommendations of the pipe manufacturers and the appropriate Australian standards. The minimum pipe diameter shall be 300 millimetres and Class two concrete or equivalent pipes are the minimum standard to be used in the road reserve.

The pipe system shall have the capacity to accommodate the design rainfall with the design top water level in gullies a minimum of 150 millimetres below the surface and, in junction pits, a minimum of 300 millimetres below the surface. Energy losses shall be allowed for in junction pits and gullies.

Stormwater drainage lines in road reserves shall generally be aligned in accordance with the *Utility Providers Code of Practice for Western Australia* (January 2007). Approval from the local government is required for alignments other than those specified in the code.

Sealed joints shall be used for all drainage lines located under road pavements.

Pipes located within property allotments shall be laid centrally in easements granted in favour of the local government. The minimum easement width shall be three metres for pipe diameters of 450 millimetres or less and at depths up to 1.5 metres. Increased easement widths shall be provided for pipe diameters greater than 450 millimetres and drainage lines deeper than 1.5 metres. A drainage line crossing an allotment boundary shall be laid approximately perpendicular to the boundary of the allotment.

A drainage connection or provision of an overland flood flow path shall be provided to each lot in subdivisions with clay soils. The connection or overflow path shall be sited at the lowest point of the lot.

The Water Corporation's approval shall be obtained for any drainage line connection to a Water Corporation main drain.

4.3.3.2. Grated gullies and side entry pits

Road gullies may be of the grated or side-entry type.

Gullies shall be placed at all low points, the upstream side of intersections and at intermediate positions to limit the width of flow in the gutter to 1.5 metres for crown roads or two metres where there is one way crossfall.

For access ways and access places with one way crossfall, this gutter flow width may be increased to 2.5 metres.

Gullies shall be installed on the upstream side of pedestrian ramps and pedestrian crossing points to limit the width of flow to 500 millimetres. Road low points and accompanying pits shall be located at the centre of single residential lots and opposite the side boundaries of multi-unit lots.

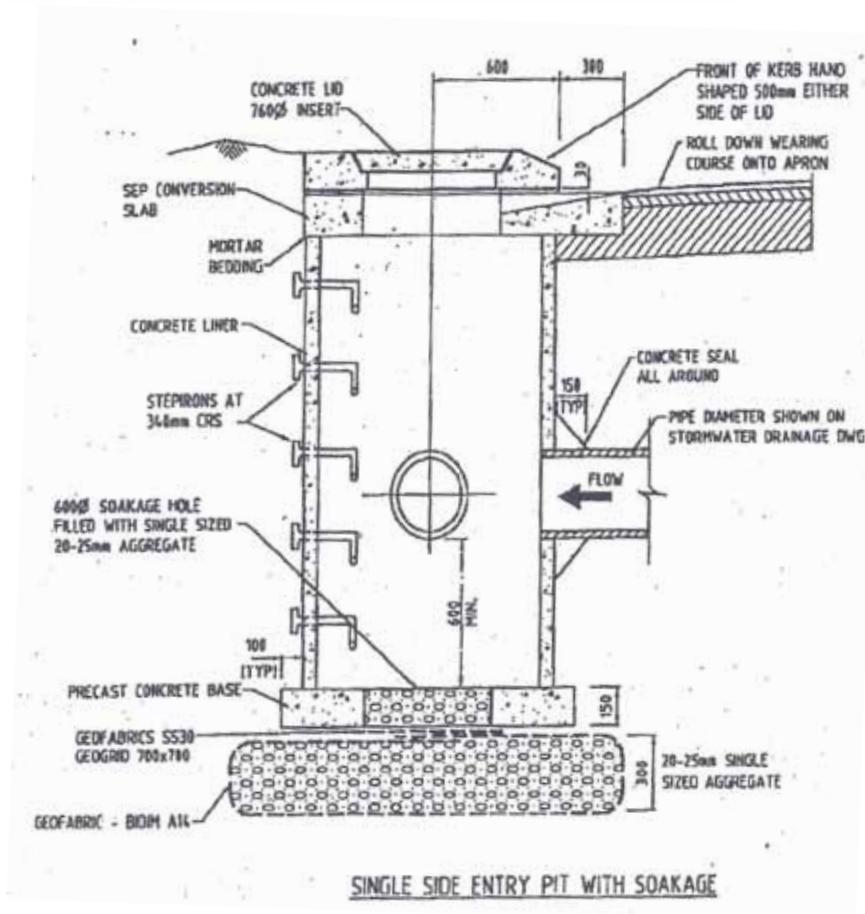
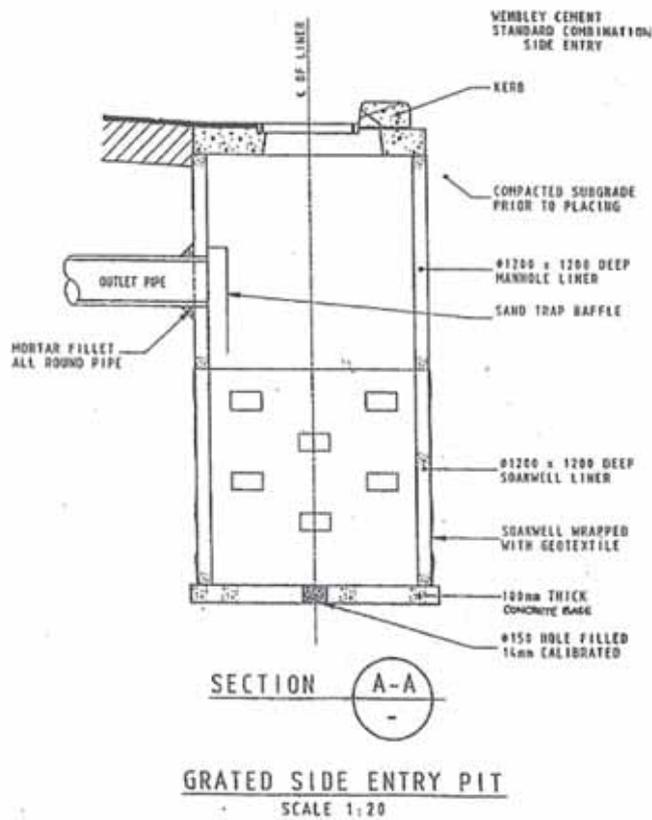
Grated gullies shall be designed to be safely traversed by cyclists.

The last gully before the drainage enters the main drainage line shall be fitted with an effective sand trap.

Gullies shall be designed as 'infiltration devices', unless this poses a threat to the road foundations or the soil is heavy clay which would retain water between rainfall events.

The geo-fabric under the pits is required for maintenance purposes. While there can be a clogging of the fabric it does prevent the aggregate below the pit from being sucked up during pit education and cleaning.

FIGURE 4.5: SIDE ENTRY PITS



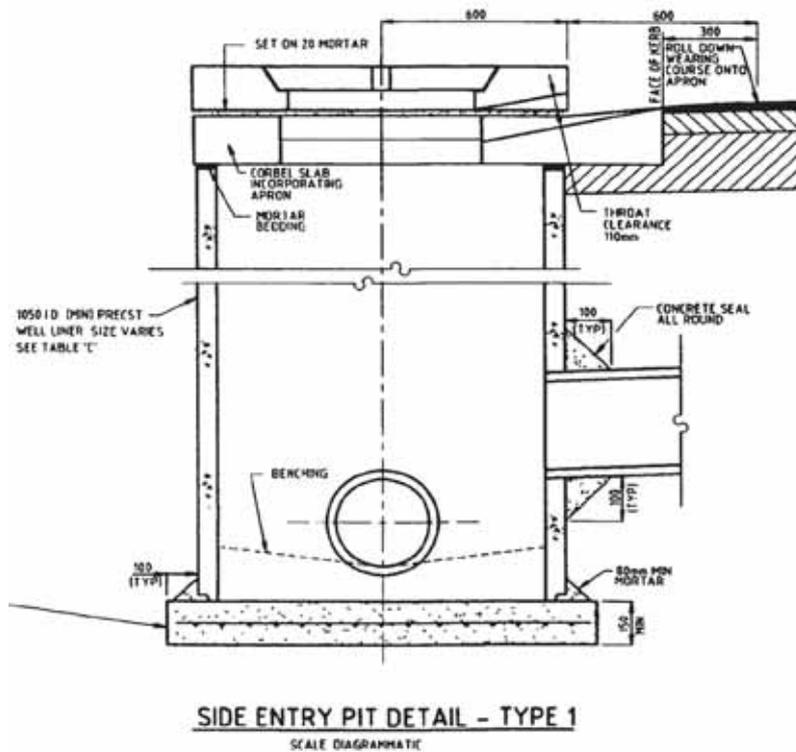
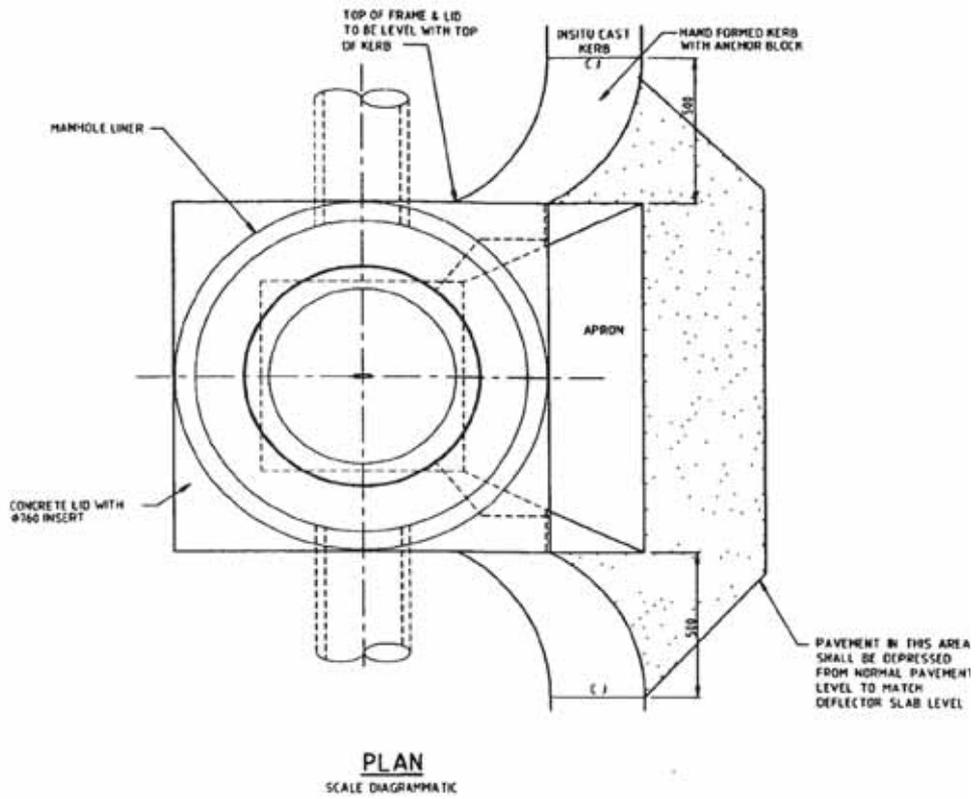
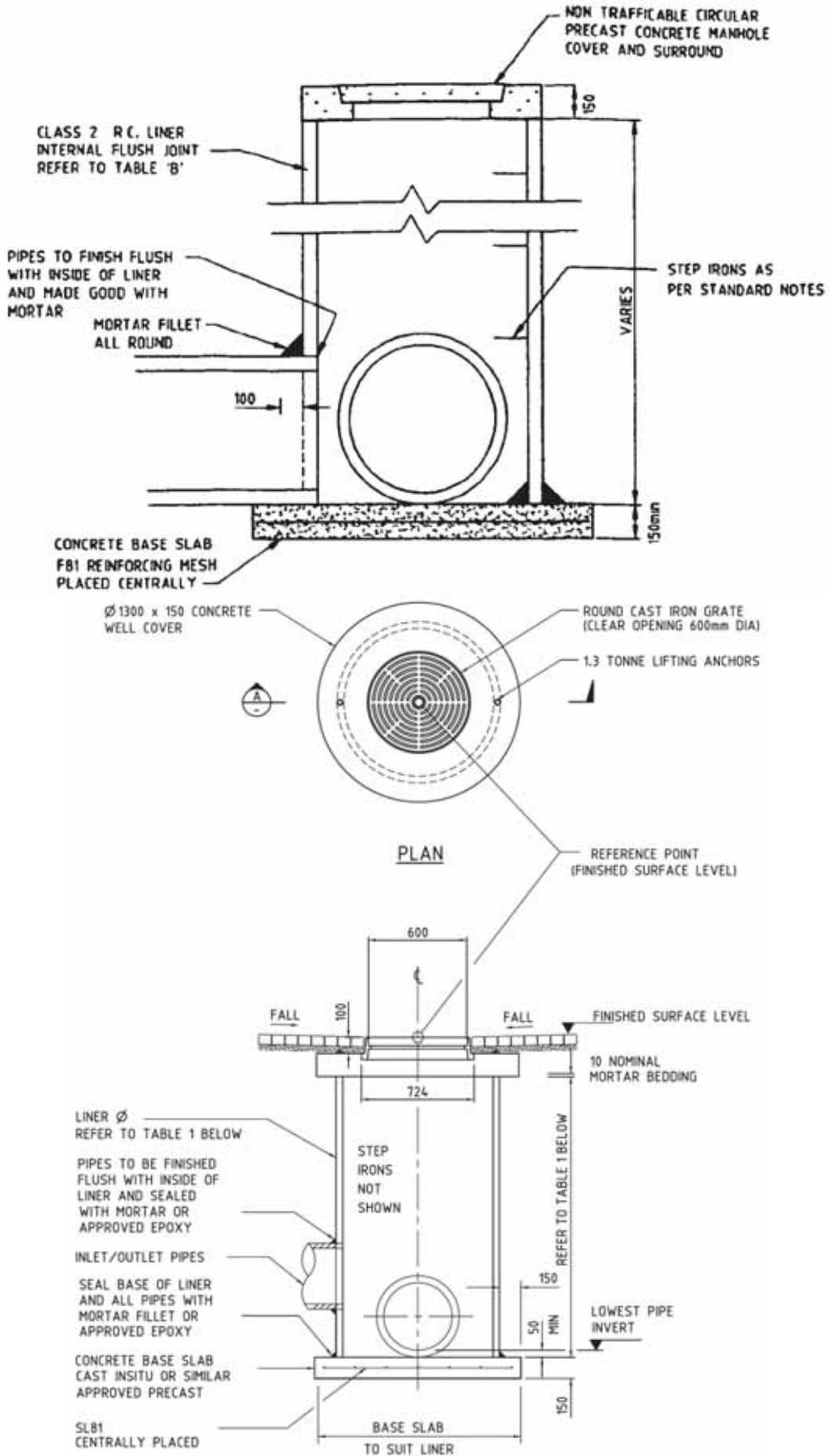


FIGURE 4.6: JUNCTION PITS



Source: City of Rockingham Guidelines for Drainage Design

4.3.3.4. Sub-soil drainage

Sub-soil drainage shall be generally provided as a complimentary system and enter the stormwater drainage system through a junction pit.

Sub-soil drainage lines may consist of perforated, slotted or open-jointed pipes of minimum diameter 150 millimetres or other system as may be approved. The sub-soil drainage shall be laid to control the water table to suit the requirements of the site.

Calibrated aggregate filter material to sub-soil pipes shall be placed to a minimum thickness of 100mm around the full circumference of the pipe. Trench widths shall be designed to allow for the effective compaction of backfill material around the pipe and/or the placement of sub-soil drainage filter material.

New drainage lines located over existing drainage lines, sewer lines or other structures shall be provided with an independent support structure.

4.3.3.5. Primary and district distributor road drainage

Where a primary or district distributor road reserve passes through or adjacent to a subdivision, and such road is not required to be constructed as part of the development, the developer shall provide the necessary infrastructure and system capacity to manage stormwater from the road reserve.

Junction pits shall be provided at the edge of the road reserve to serve as connection points between the subdivision drainage system and the road drainage system.

4.3.3.6. Open access flood storage/detention facilities

Open stormwater storage/detention structures and/or facilities shall comply with the following requirements where it is not proposed to restrict public access:

- maximum side slopes shall not exceed 16.5 per cent (one in six). Base of area shall have a minimum slope of 0.5 per cent, with low point for storage of up to one year event. This area may also incorporate the bio-retention treatment area for water quality management;
- the maximum water depth shall be 1.2 metres up to one-in-100 year ARI;
- the surface shall be suitably vegetated where the structure or facility is integrated into public open space;
- with the exception of ornamental lakes, all other structures or facilities shall be designed to only retain water during storm conditions and for a short time thereafter; and
- a stormwater pollutant trap should be installed at the end of the line prior to discharge.

Approved fencing shall be provided in cases where it is proposed to restrict public access or if the above requirements cannot be met.

4.3.3.7. Stormwater infiltration

Infiltration areas shall be sized according to the following criteria:

- the consultant shall undertake such tests as are necessary to ascertain the appropriate infiltration rates and shall provide the local government with the test results and calculations to support the design;
- the depth of the water table shall be carefully considered in calculating the area required for infiltration;
- permanent shallow water lying in the base of the infiltration area during the drier months shall be avoided;
- the areas of inundation shall be calculated in accordance with the requirements of *Liveable Neighbourhoods*, in order to determine the areas of restricted and unrestricted public open space to be provided in the development area; and

if an overland flow path has not been provided for the infiltration area then the overall public open space area shall be designed to accommodate the flow from a storm of 100 year recurrence interval without flooding any adjacent lots. Where 'at source' infiltration can be accommodated or is a requirement, then verge areas will need to be assessed for space for such infiltration structures to be installed. However, this requires the local government to assess such infiltration when the water management plans are being assessed at structure plan stage, not when detailed design is underway after subdivisional conditions have been issued by the WAPC.

4.3.4 Design in rural areas

Developers of rural or special rural subdivisions are required to provide for run-off from all areas in accordance with *Australian Rainfall and Run-off 2001*. Drainage will normally be accommodated by unlined open drains where grades and soil types permit.

Design shall be in accordance with water sensitive urban design principles – one, five and 100-year ARI events.

The minimum time of concentration shall be six minutes.

The top water level for the design water flows shall be greater than 300 millimetres below the level of the road shoulder.

Where stormwater discharges onto private property there is a need for an agreement to guarantee continual acceptance of road run-off.

4.3.4.1. Open channels

The maximum velocity of flow shall not exceed one metre per second in unlined open channels and two metres per second in lined drains. The longitudinal slope of open channels may be adjusted by means of bed control (riffle or drop) structures to maintain the velocity at the design flow within these limits.

Mortared stone pitching shall be provided in open drains at all junctions and bends greater than 22.5°.

Appropriate safety devices such as guide posts shall be provided at the road shoulder to protect and/or advise road users of the presence of the drain.

4.3.4.2. Crossover culverts

All culverts under roads and crossovers and all pipe entries and outfalls shall have approved headwalls. Protective works are required at culvert exits and entries to reduce the velocity to less than one metre per second and two metres per second for unlined and lined drains respectively.

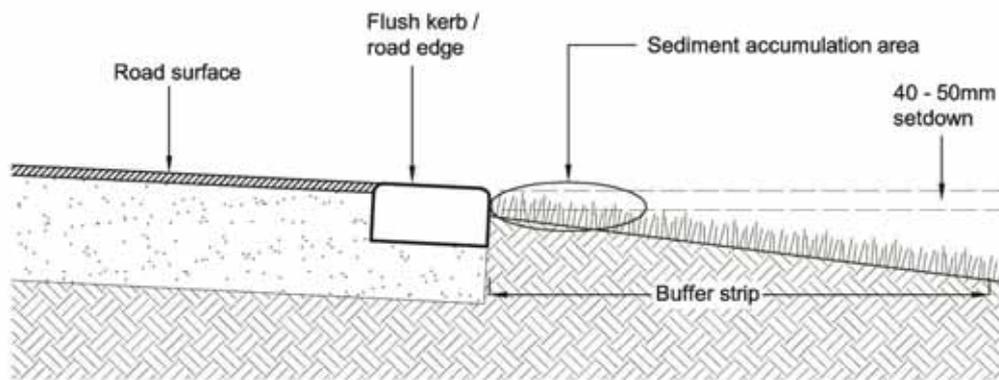
4.3.4.3. Overland flows

Detention storage areas shall be provided at suitable locations to reduce peak flow rates to the capacity of the downstream facilities.

Bio-retention systems and/or vegetated overland flow paths shall be provided prior to the entry of all drainage systems into a natural watercourse and at any other location where required by the appropriate water body management authority or by the local government.

Where road pavements are designed for direct runoff to adjacent swales, a sediment accumulation area should be provided by means of a set down from the edge of the flush kerb, generally in accordance with Figure 4.8.

FIGURE 4.8: FLUSH KERB EDGE DESIGN



Source: Department of Water

Module No. 5

Streetscape Guidelines

5 Module No.5 – Streetscape Guidelines

5.1 General requirements

Streetscape development creates a strong physical image for local government and has aesthetic, social and economic value for the community. Streetscapes help reinforce the identity of a place, provide facilities for passive recreation and create an environment for pedestrian activity.

Each local government has a range of natural landscapes that have intrinsic natural and cultural value, many of which occur around specific landforms and associations of native plants that form natural communities. Development of streetscapes should, where possible, take account of endemic plant communities and provide for the enhancement of ecological systems through introduction of new landscape development.

A commitment to environmental sustainability including conservation of flora, fauna and water, use of renewable resources and a preference for waterwise designs with optimum ongoing maintenance methods is required. Design of streetscape and landscape features is critical to complement public space in an attractive, functional and cost-effective manner.

For establishment or re-development of verges by private landowners, the *Liveable Neighbourhoods Guidelines* will be used by the WAPC as part of the development approval process (where the verge is being established or redeveloped in conjunction with a development proposal for the adjoining private land), or as a basis for advising landowners of local government's requirements (where there is no requirement for a development approval).

For development of road reserves (including footpaths, street lighting, medians and verges) as a part of subdivisional development, the *Liveable Neighbourhoods Guidelines* will be used by the WAPC as a basis for approval of design drawings submitted by developers in accordance with subdivision approval and clearance processes.

5.2 Policies and standards

5.2.1 Policies

- Residential R-Codes
WAPC, Perth (available online).
- *Liveable Neighbourhoods: 4th edition 2007*
WAPC, Perth (available online).
- Bicycle Planning, Development Control Policy 1.5 (February, 1990)
WAPC, Perth (available online).
- General Road Planning and Planning Bulletin 18 Development Control Policy 1.7
WAPC, Perth (available online).
- *Utility Providers Code of Practice*
released by the Public Utility Services Committee
WAPC, Perth (available online).

5.2.2 Standards

- Guide to Traffic Engineering Practice, Part 13 – Pedestrians (Austroads);
- Guide to Traffic Engineering Practice, Part 14– Bicycles (Austroads);
- Guidelines for the Design of Bicycle Facilities (Bikewest);
- The Australian National Cycling Strategy 2005–2010 (Austroads 2005);
- The Perth Bicycle Network Plan (DPI Bikewest);
- Design for Access and Mobility (AS1428 Parts 1 and 2);
- Street (Road) Lighting Code AS1158.

5.3 Design

5.3.1 Pedestrian and bicycle facilities

5.3.1.1. General

Provision of safe and convenient facilities for pedestrians and cyclists (and in rural or special rural areas, horses and riders) is a prime consideration in designing a road network within a residential, commercial and/or industrial neighbourhood. Pedestrians and cyclists have an important place in the street environment as they do not create the problems of safety, noise, pollution and disturbance caused by motor vehicles.

WAPC policy requires the developer to provide the local government with a plan indicating the proposed footpath, bicycle path, or bridle path network for the overall development area. In smaller subdivisions, the hierarchy classification of adjacent roads needs to be assessed in order to determine the necessity for such facilities.

Off-road facilities comprise footpaths, shared paths, bicycle-only paths and pedestrian access way paths. On-road facilities comprise cycle lanes and cycle routes constructed as an integral part of the road pavement.

Integrator roads and neighbourhood connector streets must have footpaths or shared paths on both sides, and constructed to an approved construction standard.

Access streets must have a footpath or shared path on one side. A footpath or shared path may be required on both sides where pedestrian activity is high, (ie. where the path forms part of a pedestrian link, near schools, shops or stations).

Footpaths in streets should be 1.5 metres minimum wide, and be widened to two metres minimum as a shared path in the vicinity (as determined by the local government) of schools, shops and other activity centres. Footpaths 1.5 metres wide are offset a minimum of 0.3 metres from the property boundary, or are built at 1.8 metres wide if abutting the property boundary or kerbline, provided the road has low traffic volumes. Pram crossings are required at all intersections and should have a maximum grade of 1:10.

Footpaths should be separated from the street pavement, and usually located against or close to the property boundary. Footpaths may only be located abutting kerbs where site constraints preclude alternative sites, and where vehicle volumes or road design speeds are low. If footpaths abut kerbs, verges may need to be widened to accommodate trees in

locations clear of services. Footpaths should be designed with a maximum grade of 1:14 and located taking into account pedestrian amenity, sun and shade, street lighting, postal deliveries and likely use patterns. Locations of paths must consider tree placement on order for the trees to provide shade during the hottest part of the day.

Footpath and dual use path construction should be continuous across driveways. Shared space for pedestrians, cyclists and vehicles should be designed and detailed to enable pedestrians and vehicles to share the same pavement, particularly in town and neighbourhood centres, with a sense of equal priority. Pedestrian crossings of integrator roads should be provided at-grade wherever practical.

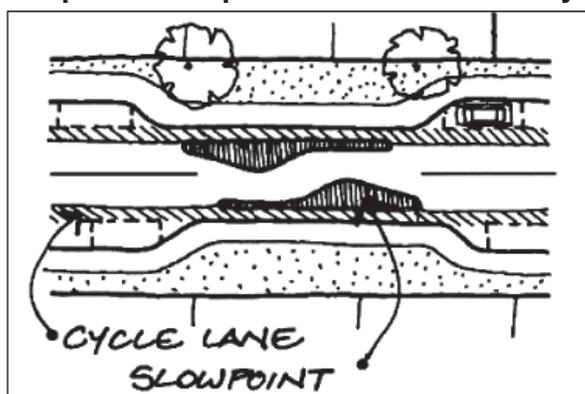
Grade-separated pedestrian crossings should only be used where topography can be used to advantage and is overlooked by adjacent development, or at freeways or other high speed distributor roads. Full height dividing fences must be avoided next to shared paths to improve driver sight lines at driveways. A safe, convenient and legible bike network should be provided for both experienced and less experienced cyclists. The network may comprise both on-road and off-road routes, planned in accordance with any State plan or local walking trail or bike plan and responding to:

- projected bike travel demand;
- expected vehicular traffic volumes and composition;
- linkages between trip attractors such as schools, local centres and other community facilities; and
- safety, security and convenience for users.

The local street network should provide a permeable network of routes for cyclists to promote on-pavement cycling to daily activities. Abutting cul-de-sac heads should have a foot and bike path connection. A continuous local street system for cyclists parallel to integrator streets to supplement paved shoulders and/or cycle lanes and shared paths along integrators should be provided wherever practical. In residential areas where projected traffic volume is less than 3000 vehicles per day, cycling should generally be on-street and shared with cars.

Cycle lanes should be provided on streets with projected traffic volumes of more than 3000 vehicles per day and near schools, stations, centres or where long distance commuter cycling and recreational cycling is likely. Additional shared paths may also be necessary for cyclist safety along streets with higher traffic volumes. Integrator roads should normally incorporate a cycle lane for on-street cyclists.

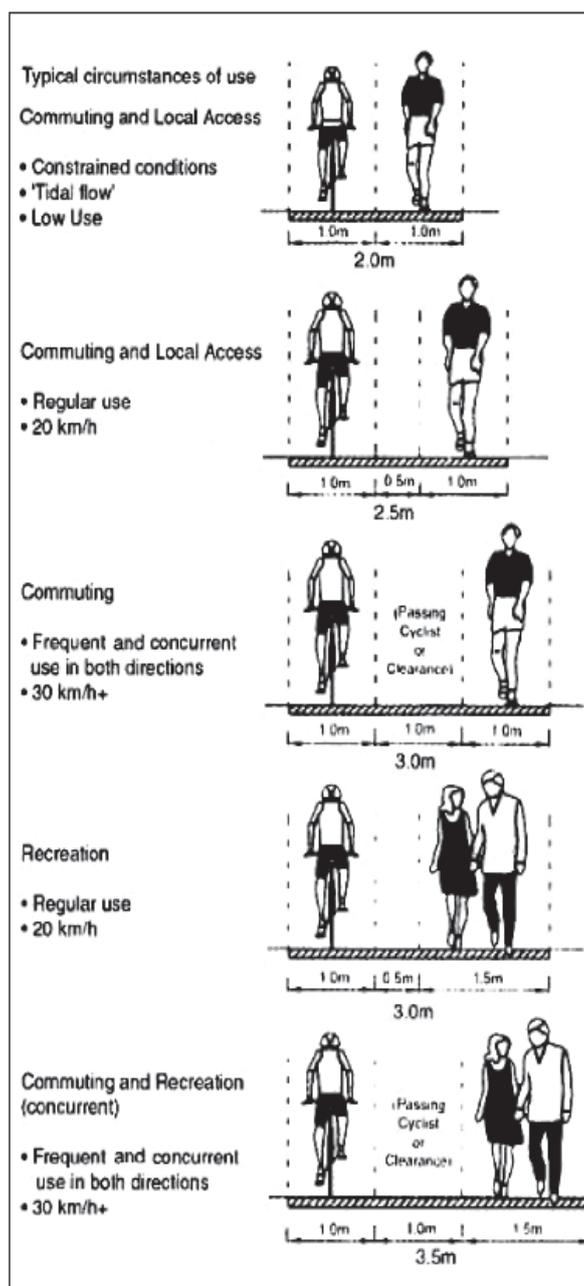
FIGURE 5.1: SLOW POINT DESIGN
Example of slow point to accommodate cyclists



End of trip facilities such as bike racks should be provided at parks, community centres, public transport hubs (train stations or along bus routes), schools and shopping centres and ideally when a subdivision is planned.

Off-street shared paths and bike paths should be designed to take into account the specific requirements of the route (eg. long distance commuter cycling and/or recreational cycling). Paths for the use of pedestrians, wheelchairs or motorised wheelchairs, and cyclists should be constructed in accordance with approved construction standards, and take into account safety requirements of all potential users.

FIGURE 5.2: SHARED PATHS



(Source: *Liveable Neighbourhoods*, and derived from Austroads Guide to Traffic Engineering Practice, Part 14: Bicycles, Figure 6.6. Shared paths on neighbourhood connectors or integrator routes providing major access to a school should desirably be 2.5 m wide and designated as a shared path in accordance with Austroads as cited above. The above diagram provides indicative dimensional criteria for shared paths.)

Shared paths must be provided with facilities for the separation of pedestrians and cyclists where appropriate (eg. meeting points or junctions on high-use activity areas).

Shared path width and design should cater for projected user types and volumes, and facilitate ease of use by the disabled, aged and the very young. Grade separations can be provided where topography assists or where a direct route is desirable and can be safely achieved.

Footpath and/or shared path construction

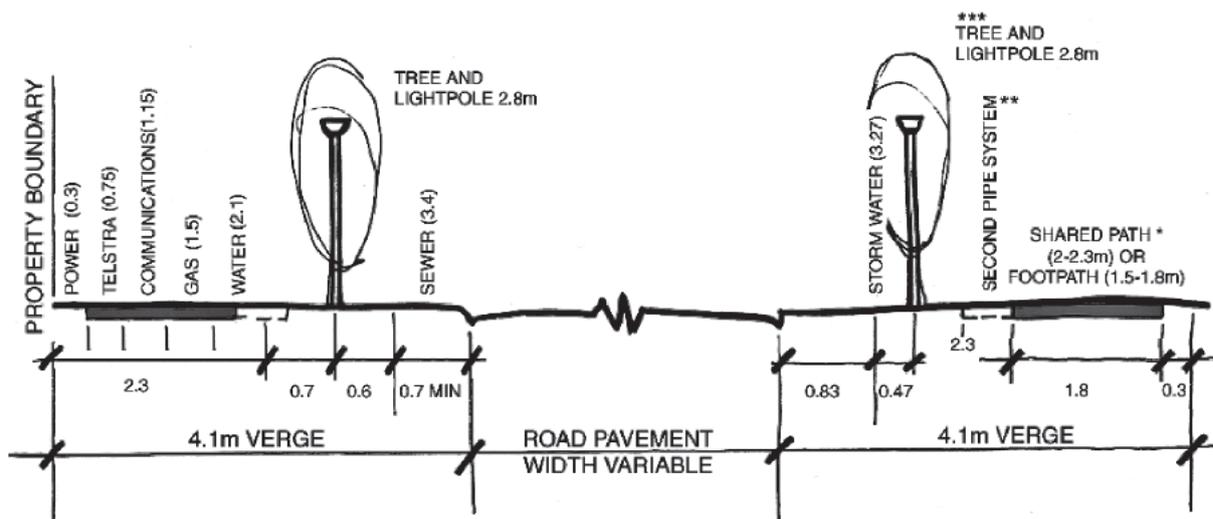
Footpaths and shared paths must have a durable, non-skid surface with tactile ground surface indicators at bus stops and traffic signals and at other road crossing points in activity centres, near stations and medical centres where there is high pedestrian usage. The path surface should be flush across crossovers.

5.3.1.2. Urban areas

Local government requires developers to provide facilities for pedestrians and cyclists in all new subdivisional developments in accordance with an overall network plan.

Paths and cycleways shall be designed in accordance with Australian Standards.

FIGURE 5.3: TYPICAL SERVICES, TREE AND PATH LOCATIONS IN 4.1-METRE VERGE



* In specific cases, wider shared paths may be required, and the verge width will need to be widened accordingly

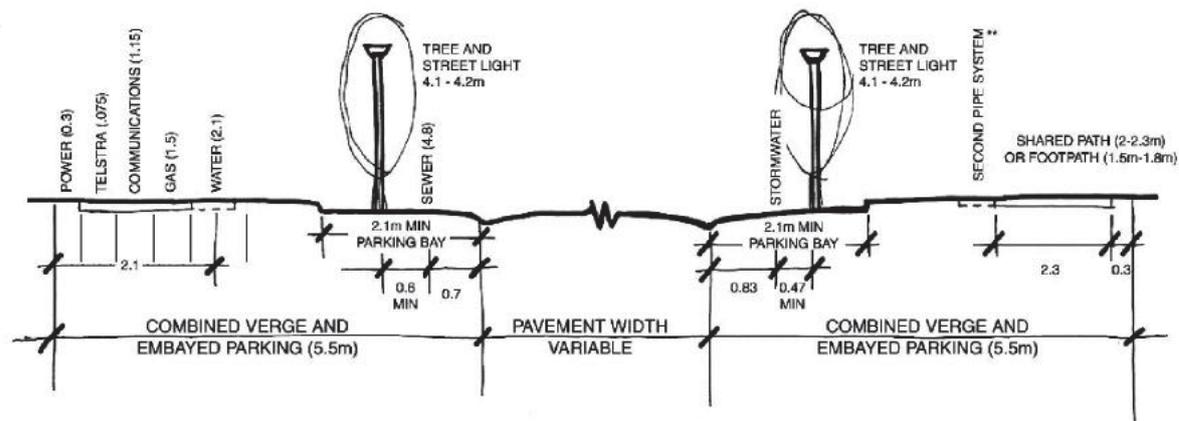
** Possible second pipe alignment

*** Trees may be located at 2.4 metres from property boundary where there is no shared path

Note local government reticulation or rising main to be located beyond the 3 metres alignment.

SOURCE: *Liveable Neighbourhoods*

FIGURE 5.4: TYPICAL SERVICES, TREE AND PATH LOCATIONS IN 5.5-METRE VERGE INCORPORATING INDENTED PARKING



* In specific cases, wider shared paths may be required and the verge width will need to be widened accordingly.
 * Possible second pipe alignment

Notes:

1. 0.3 metre clearance required to property boundary for minimum footpath width of 1.5 metres and minimum shared path of two metres. The footpath or shared path may be paved to the property boundary in addition to minimum width.
2. 0.5 metre clearance required between shared path and tree.
3. Setbacks shown to property boundary only. Road pavement may vary.
4. Trees and light poles are typically located three metres from property boundary in the minimum width verge of 4.1 metres.

SOURCE: *Liveable Neighbourhoods*

Walkable catchments, sometimes referred to as ‘pedsheds’, are maps showing the actual area in a five minute walking distance from any centre, or ten minutes from any major transport stop such as a railway station. The centre could be a neighbourhood or town centre.

The walkable catchment is simply a technique for comparative evaluation of how easy it is to move through an urban area in order to get to and from these centres or facilities. These maps are the best estimates of workability, and as such are an indication of energy efficiency.

Where approval is given for a cycleway to be an on-road facility on either a local or district distributor road, it shall be designed and constructed homogeneously with the road pavement. Where such facilities are provided for cyclists, a footpath shall be provided for pedestrians.

The developer may construct an approved path in a distributor road reserve with no frontage access, provided written assurance is supplied by the utility providers that services have been installed in the road reserve. It is the responsibility of the developer to obtain such assurances from the various utility providers.

5.3.1.2.1. Pedestrian access way

Pedestrian access ways shall be paved with approved materials as specified above and in accordance with the following:

- where the pedestrian access way is up to and including three metres wide, the paved section shall be the full width between the two front property lines, narrowing

to two metres for the section between the property line and the kerb line;

- where the pedestrian access way is wider than three metres, the paved section shall be a minimum of two metres wide for the full length between kerb lines. Any unpaved section within the access way shall be protected against erosion in an approved manner by the local government;
- designed to include adequate passive surveillance and clear sightlines to ensure Crime Prevention Through Environmental Design. Pedestrian access ways enable connectivity within an area and encourage active transport. Adequate lighting is required at night;
- vehicle barriers shall be installed at the entrance and exit to all pedestrian access ways as per Australia Standards, as they must not reduce accessibility or cause hazards for shared path users – especially gophers, bicycles, prams and wheelchairs;
- in deciding the locations and design of footpaths, cycleways and shared paths, the ultimate safety of pedestrians and cyclists shall be considered at all times; and
- all paths in pedestrian access ways and public open space shall be constructed at the time of subdivision by the developer. All public utility services shall be installed prior to the paving of the pedestrian access way.

Generally, footpaths and shared paths within the road reserve will be constructed prior to building development within the subdivision. Where it is not practicable to complete footpath or dual use path construction prior to the endorsement of the diagram of survey, the developer may obtain release of the subdivision by lodging a bond with the local government as part of Bonding Outstanding Works. Alternatively, the developer may pay to the local government the estimated cost of the paths for construction at a later date.

5.3.1.3. Rural areas

Footpaths and shared paths may be required in some rural or special rural developments in accordance with the WAPC and local government policies. Generally, urban area guidelines are applicable to rural developments. Bridle paths shall form part of an overall network located within the road reserve or in specifically designated reserves. The fire management plan for the development may utilise the reserves for fire breaks and access for fire fighting equipment. In addition, the local government may require provision of bridle paths in some special rural developments.

Specifications for materials, construction and the location of bridle paths should be confirmed with the local government prior to lodgement of detailed design drawings.

5.3.2 Footpaths and shared paths in rural developments

Footpaths and shared paths may be required in some rural or special rural developments in accordance with the WAPC and local government policies. Generally the urban area guidelines are applicable to rural developments. Bridle paths shall form part of an overall network located within the road reserve or in specifically designated reserves. The fire management plan for the development may utilise the reserves for fire breaks and access for fire fighting equipment. In addition the local government may require the provision of bridle paths in some special rural developments.

Specifications for materials, construction and the location of bridle paths should be confirmed with the local government prior to the lodgement of detailed design drawings.

5.3.3 Street name plates and community signs

The developer is responsible for the supply and erection of all street name plates in accordance with *AS 1742.5 Part 5: Street Name and Community Facility Name Signs and Section 4.16 Street Name Plates*.

Street name plates shall be of a design and colour scheme as determined by the local government and where applicable house numbers provided eg. '150–176'.

Street name plate sizes shall be in accordance with the road classification as follows:

- District Distributor B or higher – 200 mm deep with 150 mm lettering;
- Rural roads – 200 mm deep with 150 mm lettering;
- Local distributor or lower – 150 mm deep with 100 mm lettering.

Street name signs shall be erected at all intersections and junctions as shown on the drawings and shall include the names of both streets. Where two or more signs are affixed to one post, the signs shall be at two different levels.

Generally, individual signs indicating a street higher in the road hierarchy shall be installed above those of roads of a lower classification.

A 'No Through Road' sign plate shall be affixed below the street name plate where applicable.

5.3.4 Street and public area lighting

Lighting of streets, car parks, public transport stops, major pedestrian and bicycle links and public areas (including pedestrian access ways) that are likely to be well-used at night to assist in providing safe passage for pedestrians, cyclists and vehicles shall be provided to appropriate standards.

Street lighting shall be provided in all new developments to the requirements of the relevant categories of *AS1158: Road Lighting* and other specific requirements detailed herein.

Design proposals submitted must demonstrate compliance with *AS1158.1: Road Lighting – Vehicular traffic (Category V and P) lighting – Performance and installation design requirements* and Part 12 of Austroads guide to Traffic Engineering Practice and be designed by a suitably qualified lighting designer.

The recommended preference is for standard Western Power street lights. Modification of standard street lights is not recommended.

Decorative street lights may be considered where deemed appropriate. Poles and luminaries can be selected from Western Power's Street Vision Decorative Lighting series. Decorative lighting shall be subject to the defects liability period. Where a proposed subdivisional road extends from an adjoining road the street lights shall be consistent. Street light selection shall consider existing street lights on surrounding roads. Plans and specifications for roadway and public area lighting shall be submitted to both Western Power and the local government for approval.

5.3.4.1. Responsibilities

Responsibility for decorative or non-standard roadway or public area lighting, unless otherwise agreed in writing, is as follows:

Developer

- The Developer is responsible for providing all work and associated costs for the design, supply, installation, connection, commissioning and maintenance of the entire lighting installation until the subdivision is cleared.
- The Developer is responsible for ensuring compliance with all relevant standards and public utility requirements and obtaining the necessary approvals.
- At practical completion of the installation of non-standard street lights, the Developer shall provide to the local government the comprehensive Maintenance and Operating Handbooks.

Local government

- The local government shall be responsible for all energy costs from the approved date of practical completion.
- Public lighting should be designed with regard to energy efficient practices and technologies.
- Obtrusive and upwards waste lighting should be minimised in accordance with AS 4282 (1997).

5.3.4.2. Equipment locations

All equipment including pole foundations, poles, conduits, switchboards, luminaries and cable pits shall be located to prevent obstruction or interference with other constructed elements, services or utilities. All roadway lighting services shall be installed within the road reserves. Street lighting and tree alignment shall be as detailed in the *Utility Providers Code of Practice*.

Coordination and approvals shall be obtained from all relevant service authorities. Public area lighting shall be designed and located to prevent hazards to motor vehicles or injury to pedestrians as approved by the local government.

5.3.5 Bus shelters and seating

Detailed consultation with the Department of Planning, the Public Transport Authority and transport providers should occur at the structure planning stage. Attention needs to be given at the urban structure stage of development that will support public transport. New urban areas should facilitate significantly improved transit usage relative to conventional urban development.

Bus routes are generally to be located on integrators and neighbourhood connectors, which should provide a direct and convenient route through a neighbourhood. Consultation with the Public Transport Authority and/or bus operator at structural planning stage of design is recommended. The Authority's 2004 Design and Planning Guidelines for Public Transport Infrastructure Manuals are also relevant. However, approval from the Authority is not required unless it is making a funding contribution.

Location of bus stops is also an important issue to consider in the design of neighbourhoods. These need to be located in places with good pedestrian access, have clear site lines from nearby buildings, and located at key destinations. In addition, bus stops need to be located where there are safe pedestrian crossings to and from stops.

Design detailing of bus stops should make them a feature in the local area, such as providing identity (eg. by providing each stop with a name), and providing seats and shelters and bus embayments where applicable. Bus shelters and seats are required to meet universal access standards. Sufficient room is required to allow shared path users to pass the bus stop without bus stop infrastructure and bins creating a hazard. Developer contributions are encouraged as bus routes are often developed once the area is developed. (Bus stops are generally placed so the maximum distance a resident needs to walk is 500 metres to reach the closest bus stop).

Design of streets for buses should consider the comfort of passengers, and the efficiency of the route. In neighbourhood connectors and many integrator roads, buses will normally stop in the roadway, at extended kerbs, rather than in embayments. This ensures that the bus has priority in the traffic, and also enables the bus to provide a periodic traffic-calming function.

Developer contributions may be required as provided for in the WAPC's *Development Control Policy 1.7 General Road Planning and Planning Bulletin 18 Developer Contributions for Infrastructure (as amended)*.

5.3.6 Street trees and landscaping

Landscaping should provide attractive streetscapes which reinforce important functions of a street, and valuable public places that add value to the amenity of adjacent housing and developments. Street trees should be considered as part of the road construction.

Landscaping enables roads and verges to perform their designated functions in the street network, and the streetscape needs to be designed to discourage speeding vehicles.

Special attention needs to be given for the setback distance to trees from a moving travel lane.

These distances have been specified taking into account a range of factors. The design environment for urban streets is to create an environment of care, and the traffic-calming benefits of street trees relatively close to the pavement is an integral part of this. These clearances are therefore different to those typically specified for rural roads or urban highways and freeways where clear zones are established to cater for errant single vehicles at high speeds.

Setbacks need to comply with Main Roads WA policy and the *Utility Providers Code of Practice*.

Species and types of trees need to meet local government requirements that take into account existing plants and trees and local government policy.

5.3.7 Banner poles

Provision of banner poles is subject to the consideration and approval of the local government. Where their installation has been agreed, banner poles need to be constructed and located to meet Australian Standards.

5.3.8 Streetscape maintenance bond

Where the developer arranges for landscaping to take place, it shall be supported by a maintenance and watering period of at least two summer periods after planting to ensure that the vegetation is properly established. This condition shall be guaranteed by way of a bond in the form of cash or guarantee from a financial institution acceptable to the local government. The bond will be returned when the maintenance period has been satisfactorily completed. The amount of bond is detailed in Module 1, section 1.20: Bonding Outstanding Works.

5.4 Specifications

5.4.1 Footpath and/or shared path construction

Footpaths and shared paths must have a durable, non-skid surface with tactile ground surface indicators at bus stops and traffic signals and at other road crossing points in activity centres, near stations and medical centres where there is high pedestrian usage. Any crossing points such as pram ramps and crossovers should be smooth and flush from the path to the road surface to reduce trips and falls by all path users.

Paths may be constructed in concrete, asphalt, brick or block paving as approved by the local government with a minimum thickness as outlined below:

- concrete paths shall have a minimum thickness of 100 millimetres;
- asphalt paths shall have a minimum base course thickness of 150 millimetres with an asphalt thickness of 25 millimetres. Iron oxide and/or gravel mix asphalt is recommended where vision separation is required; and
- brick or block pavements shall incorporate bricks or blocks of minimum thickness and laying procedures in accordance with the manufacturers' recommendations.

Paths shall generally be laid with a minimum crossfall of two per cent towards the road carriageway. In steep terrain, crossfalls up to 6 per cent may be accepted.

5.4.2 Street trees

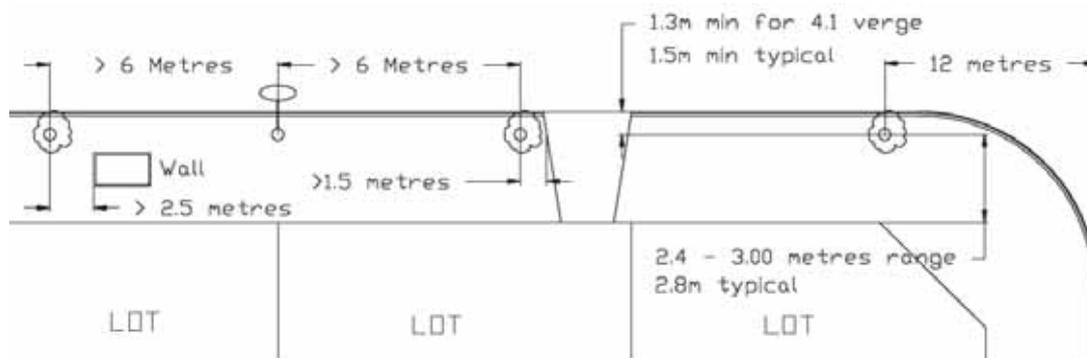
Street trees need to be chosen to reflect the local character and conditions and provide attractive streetscapes and public amenity in the form of shade, improved micro-climate and landscape amenity, and to ensure that trees do not interfere in the future with lighting, paving or other public infrastructure. In general:

- street tree species need to be approved by the local government. Alternatively the local government can provide the name of appropriate tree species for streetscapes;
- street trees should be spaced appropriately for the species selected. Species are to be selected and approved by the local government to ensure appropriate separation from crossovers and property boundaries. Street trees should not obstruct visibility at intersections or screen street lights. Generally one tree per property frontage is

recommended and two or three trees per side verge subject to width and length of verge;

- as a general guide, street trees shall be planted greater than six metres from a street light, unless otherwise approved;
- street trees are to be planted a minimum of 1.3 metres (for a slow speed road environment) but ideally 1.5 metres or greater from the front of the road kerb or crossover with a minimum of 2.5 metres from structural elements (ie. walls and foundations);
- street trees shall generally be planted on the 2.8 metres alignment but can be in a range of 2.4 metres to three metres depending on the verge width. This is set out in the *Utility Providers Code of Practice*. Greater clearance from property boundaries can be achieved in wider road reserves;
- adequate root protection needs to be provided unless justification is provided where root protection is not required;
- for corner properties, trees shall not be permitted within 12 metres of the intersecting kerb alignments. At major intersections this clearance may need to be increased to comply with sight distance requirements. Depending on the speed and type of road and tree, the local government may be receptive to reducing the street tree spacings; and
- tree plantings in roads controlled by Main Roads WA shall comply with its standards.

FIGURE 5.5: STREET TREE INDICATIVE LOCATIONS



5.4.3 Lighting categories for roadways and public areas

The following table is used to identify the lighting category applicable for each public area or roadway.

TABLE 5.1: LIGHTING CATEGORIES FOR ROADWAYS AND PUBLIC AREAS

ROAD HIERARCHY	LIGHTING CATEGORY (REFER TO AS1158)
Primary distributor roads	V3
Integrator roads <ul style="list-style-type: none"> • City Distributor Integrator A • City Distributor Integrator B 	V3 V5

Neighbourhood connector roads	P3
Access roads	P4
Laneways	P4–P5
Public areas	
Pedestrian thoroughfares, shared paths, underpasses	Refer to specific situations in AS 1158.3
<ul style="list-style-type: none"> Public car parks 	P11–P12

Note: For the values of light technical parameters of each of the above categories refer to AS 1158.1 or AS 1158.3.

Module No. 6

Public Open Space Guidelines

6 Module No.6 – Public Open Space Guidelines

6.1 General Requirements

Local government requires land suitable for public use as public open space.

6.2 Policies and standards

6.2.1 Policies

- *Liveable Neighbourhoods: A Western Australian government sustainable cities initiative, 4th edition 2007* (WAPC), Perth (available online).
- State Planning Policy 2.9 Water Resource 2006 WAPC, Perth (available online).
- Better Urban Water Management 2008 WAPC, Perth.
- Stormwater Management Manual for Western Australia Department of Water, 2004–2007 (available online).

6.2.2 Standards

- Decision process for stormwater management in Western Australia, Department of Water, 2009 (available online).
- Better Urban Water Management (2008), Department of Planning (available online).
- Department of Water 2004–2007, Stormwater management manual for Western Australia, Department of Water, Perth (available online).
- Department of Water 2007, Interim Position Statement: Constructed lakes. Department of Water, Perth (available online).
- Design in Urban Areas – Open Access Drainage Facilities. AS 4685.1–2004, General Safety requirements & test methods.
- AS 4685.2–2004, Swings.
- AS 4685.3–2004, Slides.
- AS 4685.4–2004, Runways.
- AS 4685.5–2004, Carousels.
- AS 4685.6–2004, Rocking equipment.
- AS/NZS 4422:1996, Playground surfacing – Specifications, requirements and test method.

6.3 Design

6.3.1 General

Liveable Neighbourhoods has provision to apply subdivision conditions for the development of open space to a minimum standard. If applied, this may include full earthworks, basic reticulation, grassing of key areas, pathways that form part of an overall pedestrian and/or cycle network and maintenance for two summers. This is a new subdivision condition and to date is not routinely applied.

Any development of public open space should be carried out in accordance with the standards and policies stated in 6.2.1 and 6.2.2 respectively to produce a landscape plan first approved by the local government. Any special public open space requirements and entry statements will need to be approved by local government. The WAPC may not require development of public open space where land is in a fragmented ownership, where it is restricted use public open space, or where climate variations do not require such development.

Passive surveillance of parklands by residents is of high importance especially where children's play equipment is located. This should be delivered through appropriate structure and design. Good visual amenity is also required to minimise the potential of vandalism. The public open space design also needs to consider future maintenance costs.

Mowing strips should be utilised at the base of walls and ease of mowing should be considered in the design.

Residential fencing abutting a public open space shall have visual permeability, conforming to the Residential Design Codes.

The public open space design and associated infrastructure shall conform to *AS1428 (set) – 2003: Design for Access and Mobility Set*.

Provision of landscaping in distributor road reserves by developers at the time of subdivision is encouraged, and the design shall incorporate considerations for cost effective long-term maintenance.

Where required by the WAPC as a condition of subdivision, or where agreed between the local government and the developer, public open space and other recreational reserves within the development shall be sustainably designed in accordance with the objectives in section 6.3.2.

6.3.2 Objectives

The guidelines provide a set of performance criteria and standards for provision of public space with a number of prime objectives being to:

- provide a consistent process for review and approval of designs in keeping with specific requirements and local government policy;
- ensure the design process takes into account local character and existing conditions;
- encourage the retention and enhancement of endemic vegetation and other natural features;

- provide for the needs of the community by ensuring that public space is functional, accessible and safe for its intended purpose;
- encourage provision of high quality designs that contribute to the built and natural environment and the special character of a place in a sustainable, amenity enhancing and cost-effective manner;
- encourage the use of endemic plant species, drought-tolerant exotic species and waterwise garden designs; and
- minimise requirements for irrigation and fertilisers.

Design and development of public open space should take into account the objectives of water-sensitive urban design and water balance as indicated in section 4.3.

Variations from these guidelines need to be justified on the basis that the design meets the intent, objectives and principles set out in the guidelines.

6.3.3 Public open space

6.3.3.1. Clearing

Where there is no approval for the subdivision of land, the clearing of significant vegetation may require a clearing permit from the Department of Environment and Conservation under the *Environment Protection Act* and the Native Vegetation Clearing Regulations, unless an exemption applies. Local government engineering staff should liaise with their council environmental officers or Department of Environment and Conservation officers for clearing permit advice.

6.3.3.2. Development in reserve areas

6.3.3.2.1. Management plan

Where required by the WAPC or otherwise specified by local government as a condition of subdivision or development, or where agreed between the local government and the developer or landowner, open space or reserve areas within the development shall be developed, rehabilitated or constructed in accordance with the local government's specifications. A management plan may be required in areas of natural vegetation or environmental sensitivity.

An overall concept development and management plan of development for the open space or reserve area shall be submitted to the local government for approval in principle prior to submitting detail working drawings.

Design plans shall show the following details:

- cadastral boundary of the site;
- existing services;
- survey marks;
- fences;
- significant vegetation and trees;
- existing and proposed contours;
- existing or proposed buildings;
- proposed access roads and parking areas;
- pedestrian and cyclist facilities;

- disabled access facilities;
- existing or proposed stormwater or drainage management facilities;
- playground equipment;
- proposed irrigation system; and
- other features pertinent to the development of the public open space.

The design drawings shall include a schedule of trees, plants and grass types suitable to the area.

Consultation with adjoining property owners and residents is required before commencement of the works. In the case of dispute or objection, the matter shall be referred to the local government.

6.3.3.2.2. Development process

The process for the development of public open space is as follows:

- the developer shall prepare and submit for approval a landscape master plan and relevant management plans;
- the developer shall prepare and submit for approval detailed landscape drawings prior to construction at the time of submitting civil design drawings;
- construction can commence only upon approval of the detailed landscape plans;
- on completion of the works, the developer shall arrange a practical completion inspection and where required, payment of the landscape maintenance bond;
- the developer is required to maintain the public open space reserve for a minimum two (2) year period from practical completion;
- three months prior to expiration of the maintenance period, the developer shall contact the local government to initiate the handover process, which shall commence with a joint inspection of the public open space. This should also include transfer of bore licenses, power accounts, maintenance tasks and legal responsibilities arising from these guidelines;
- once the local government is satisfied the public open space meets these guidelines, the local government shall accept responsibility for maintenance of the public open space;
- the developer is to comply with all requirements of the Department of Water in respect of bore installation and licensing; and
- the developer may negotiate with the local government for water budgets.

6.3.3.3. Landscape maintenance agreement

The long-term maintenance cost is an important factor in the design of local government facilities to minimise ongoing costs to the community. Landscape maintenance may also include monitoring.

The design of public open space should reflect features that provide for a safe, aesthetically pleasing and functional facility that can be maintained by the community at a sustainable cost.

A maintenance agreement based on the management plan shall be entered into by the developer with the local government as part of the approval.

The agreement shall be legal in nature and be prepared at the cost of the developer.

6.3.3.4. Landscape maintenance bond

All plantings shall be supported by a maintenance and watering period of at least two summer periods to ensure full establishment. This condition shall be guaranteed by way of a maintenance bond in the form of cash or guarantee from a financial institution acceptable to the local government.

The landscape maintenance bond can be expected to equal five per cent of the contract value for landscape works (excluding GST) as acceptable to the local government to be held in trust until handover of the public open space.

The bond will be returned when the maintenance period has been completed satisfactorily.

6.3.3.5. Power supply

The developer shall make provision for adequate power connection points for all public open space at the time of the initial power installation to allow for future anticipated lighting, building and/or irrigation requirements to satisfy the ultimate development of the facilities as established in the planning of the structure plan. This development outline shall be negotiated between the developer and the local government at or prior to subdivision or structure planning stage.

6.3.3.6. Planting

Plant species lists of the most common natural and other native species are available from the local government. The recommended working drawings and specifications to be approved by the local government shall include a schedule stating type, species, number, size of pot, seeds, trees, shrubs, ground-covers, herbs and grasses to be planted. The plan shall show the location and density of planting the specifications shall show detail on how the plants are to be planted, fertilised watered and protected.

6.3.3.7. Playground equipment and play opportunities

Playground equipment may be installed with the approval of the local government in each public open space development irrespective of active or passive use. Modular units are to be provided where a need is identified by the local government. Consultation, where applicable, will take place with adjoining land owners regarding the location and type of equipment.

All equipment and its installation shall meet AS 4685.1–2004 and the *Occupational Safety and Health Act* and Regulations. Play spaces that use natural elements such as wet/dry creek beds, mounds and slopes, sand and mud pits, sensory plants and trees for swinging and climbing should be encouraged to meet children's needs for play, learning and fun.

6.3.3.8. Lake areas

Any proposal for a constructed lake shall conform to the requirements of the *Interim Position Statement: Constructed Lakes, Department of Water July 2007* and be approved by the local government.

Lake areas (including floodwater storage areas with resident water for greater than 96 hours) constructed in public places shall conform to the following requirements:

- constructed lake banks, where practical, shall have barriers to delineate reeded sloped banks from grassed areas. The barriers will preferably consist of footpaths or kerbing;
- lake banks are not to be steeper than one in eight above the low water mark and extend for a distance of at least 10 metres. Below the low water mark, in order to provide a safe recovery zone, the slope shall preferably be one in eight, and shall not exceed one in six for a distance of five metres measured horizontally from the low water mark, and one in four thereafter. This is for public safety and to allow local reeds to establish;
- where slopes in excess of one in eight are unavoidable in the vicinity of a drainage structure, a fence shall be provided. The fence shall be 1.2 metres high and of open mesh construction, extending from the top of the bank to the low water mark on both sides of the structure;
- the banks up to five metres from the low water mark shall be reasonably firm to prevent persons sinking into soft mud. Suitable fill may need to be imported to achieve the necessary compaction of the banks;
- all slopes shall be seeded or planted to obtain stabilisation as quickly as possible; and
- excavation for 'in principle' approved irrigation lakes are not to intrude into the tree root preservation zone (for trees identified for retention). This zone is identified as a one metre radius for every 100 millimetres trunk diameter.

6.3.3.9. Use of reserves for drainage and floodwater storage purposes

Provision of piped drainage outfalls and flood storage areas is difficult in many areas due to flat grades, high groundwater tables or soil types and restrictions imposed by the Department of Water and the Department of Environment and Conservation with respect to the quantity and quality of stormwater being discharged into river and wetland systems. There is an expectation that development sites accommodate their drainage on site.

The use of proposed open space areas for drainage in new subdivisions will be determined by the WAPC at the time of subdivision, in accordance with *Liveable Neighbourhoods*.

In existing urban areas where drainage infrastructure upgrading or infill development is occurring, council may consider proposals to incorporate stormwater or drainage quantity and quality management measures within proposed or existing public open space, subject to the agreement of the landowner – which may be local government or private owners.

Such applications should have regard to the following:

- the proposal to use the recreation area for drainage is approved by local government and the relevant government agency with management responsibilities (if not local government);
- in the case of a developer, providing a written undertaking to develop the reserve as required and specified by the local government;

- the drainage purpose does not impact on current and planned recreational functions of the reserve unless authorised by the local government;
- mosquito management is addressed; and
- the drainage facility is not detrimental to the use of the reserve or to flora and fauna.

6.3.4 Tree planting

6.3.4.1. Trees in paved areas

Trees in the urban environment are subjected to stress. It should be assumed that feeder roots are concentrated in the top 500 to 600 millimetres of soil and extend to the drip-line of the tree canopy. Paving should be at least 20 per cent porous for this distance or a substantial area of exposed soil should be left to at least three (3) times the expected diameter of the tree. The area at the base of the tree should be able to be watered by run-off or trickle irrigation for at least the first two (2) summers or until established.

Protection of the exposed area is essential (use mulch or tree grates) to prevent soil compaction. Alternatively, removal and replacement of the surface paving with a metal tree grate and/or the application of mulching material is recommended.

Where possible, opportunities for natural infiltration of water and air should be maintained. That is, porous paving material (eg. brick and sand) should extend at least beyond the expected canopy area of the tree at maturity. The expected canopy should not interfere with lights, roofs, traffic or pedestrians.

Radial brick patterns provide bigger spaces between bricks than rectangular patterns, which will help reduce the likelihood of tree roots distorting the pavement.

Root shields may be used for intrusive types of trees to protect structures or piping.

6.3.4.2. Protection of trees from excavation works

It is likely that new structures built in close proximity to existing trees, will damage or destroy tree root systems and may lead to a reduction in the ability of a tree to withstand high winds. Buildings built close to trees may create higher wind speeds through wind tunnelling. Buildings built close to existing trees can stress the trees through an increase in reflected light and heat. An arboriculturist should be engaged to provide guidance on how to treat trees retained close to new buildings. This may be compensated by thinning or reducing the top of the tree by a corresponding amount during the coolest time of the year and by the use of substantial amount of watering.

Where structures are to be built close to trees, it may be possible to construct breaks in the foundations to save roots from being destroyed.

To prevent roots from damaging new work, it is essential to use appropriate pipes. Pipes laid near trees must have sealed joints and be flexible. Alternatively, pipes should be ductile or cast iron with a minimum of joints. The pipes should be strong enough to withstand the pressures of root growth.

When excavations are made for water, sewerage lines and service facilities, the trenches should be directed away from the trees. If it is impossible to locate the trenches away from the drip-line area, the best alternative is to excavate a tunnel, usually with a high-powered

soil auger, under the trees' root system rather than to the sides. A further alternative is the use of root shields. Backfilling should be carried out as soon as practically possible.

If raising of the pavers or pavement is required, a coarse porous wall of material such as stones or gravel topped with mulch should surround the tree so that water and air can penetrate to the original ground surface level.

If lowering of the pavers or pavement is required, the soil should be retained by either a battered slope or retaining wall with weep-holes left at the new surface to allow water to drain into the tree. If roots are cut, the tree should be pruned back, as the cutting of anchor roots can lead to windrow.

6.3.5 Site drainage

Trees growing in clay soils require the same amount of water. They may have smaller root systems due to reduced porosity in clay soils. Smaller root systems can make trees in clay soils more vulnerable to heat stress.

When planting in heavy to medium clay sub-soils, backfill the hole with a porous soil mixture and provide for drainage to prevent a sump forming. The addition of gypsum to clay soils will improve soil structure and improve drainage, if several applications are made over a two to three year period.

Introduction of a slotted-corrugated-PVC-agricultural field drain placed in the base of a tree pit prior to back filling can also be considered. A pump inserted into this pipe can drain or pump out tree pits to prevent logging for extended periods during the trees' establishment period. Such drains may also be of use for hand watering on clay soils during drought periods.

Over-watering of heavy textured soils leads to water-logging which reduces plant growth and can lead to tree losses. It should be noted that some trees can tolerate heavy soils and/or high water tables. Success will depend on species selection.

6.3.5.1. General

Foreshore areas require special attention and need to be determined in accordance with the Department of Water's Foreshore Policy No 1 – Identifying the Foreshore Area, 2002. Foreshores areas are generally more vulnerable to natural and human drainage. The objective of this section is to provide an outline of the salient points required of a coastal beach, dune, or watercourse management plan to cover both the developer's land and adjacent public lands. Local government or WAPC referral and approval is required for works on foreshore reserves, other than rehabilitation and maintenance. Foreshore reserves should generally not contain drainage.

6.3.5.2. Guidelines for construction of access to beaches

Erosion of beaches resulting from wave and wind action is a natural process. In some areas, after periods of erosion, reasonable stability is normally regained through the operation of natural forces. As development occurs and human influence becomes more evident on foreshore and coastal areas, accelerated erosion of beaches is likely to occur. Denuding vegetated frontal dunes by foot traffic and/or grazing results in wind transport of sand in an inland direction. This movement decreases the amount of sand in the 'sand cycle' between bay, beach and dunes, and can result in accelerated wave erosion due to the lowering in level of the beach and dunes. Structures such as walls and groynes may then be required to

protect the shore. Development setbacks are applied to reflect the ability of the coast and coastal protection structures to protect the shoreline.

Natural frontal dunes can be stabilised against wind erosion by vegetative measures or where erosion and resultant damage is extreme by engineering structures such as seawalls. Vegetative stabilisation is the cheaper and more natural type of dune stabilisation. Where this type of stabilisation is used, the points of access to the beach are susceptible to wind erosion. Fencing is usually required to direct access to the appropriate areas.

6.3.5.3. General requirements for beach access tracks

Effective access over a secondary and frontal dune system must comply with the following specific requirements (including river, estuary and wetland foreshores):

- access must be conveniently placed, so that it will be used by the public;
- where the access traverses sand, the sand surface must be so treated that it is not susceptible to wind or 'human' erosion. This usually entails surfacing of the tracks with compacted limestone gravel and bitumen, board and chain walkways, mulch, or steps;
- access tracks should be located over existing dunes and not through them. Care should be taken to ensure that dune height is not reduced to less than 2.5 metres Australian Height Datum. Location in this manner will help prevent the ocean overtopping the dune and the formation of blowouts along the track, or excessive accumulation of sand. It will also simplify vegetative stabilisation of the areas alongside the access tracks;
- provision should be made in the case of gravelled and sealed access tracks to minimise or prevent water erosion. This can be done by preventing excess run-off water on to the tracks, and by shaping the surface of the track to prevent concentration of water and enabling it to shed heavy rainfalls quickly;
- access tracks should be sited and aligned so that sand blown from the beach does not accumulate in them to any great extent. The tracks should be aligned to be at 45° from the most destructive winds – south west and north west. Width should not be less than 1.5 metres, and up to three metres where emergency vehicle access is required and the maximum slope should be 15 per cent; and
- tracks should be completely fenced off to prevent damage to the vegetation and to encourage use of the track with suitably worded and prominently placed signs.

6.4. Specifications

6.4.1. Clearing

Site plans shall be annotated to clearly show areas 'to be cleared'. Where approved, all standing timber, scrub and other vegetation, including roots to a depth of 300 millimetres, are to be removed and disposed of in accordance with local government requirements. Any trees designated for retention shall be protected from damage to roots and trunks. 100 millimetres of topsoil from all cleared areas to be earth-worked, shall be stripped and stockpiled for later respreading as directed by the local government.

Rehabilitation of disturbed or previously degraded areas will generally be required as a condition of approval for clearing or reserve development, or as a condition of development approval.

Some clearing may require the Department of Environment and Conservation approval as per legislation in Module 1.

6.4.2. Land or form – earthworks

Change to the land or form of reserves requires local government or WAPC approval. Once approved, the site shall be worked to the levels and grades shown on the approved drawings, suitable for the designated type of recreation activity or purpose, ie. active, passive or conservation.

6.4.3. Compaction

Fill, where applicable, shall be placed in layers not exceeding 300 millimetres in thickness, be watered and rolled to achieve a minimum compaction of the surrounding natural soil.

6.4.4. Irrigation

Design plans for irrigation of the public open space shall contain a list of approved sprinklers, valves, bore, electrical switch gear and other equipment used by the local government. Water quality will be acceptable to the local government or water treatment provided to improve water quality to a suitable level.

The design shall specify identical or compatible equipment in the design of the irrigation system. A plan of the proposed irrigation system shall form part of the design drawings and requires approval by the local government.

All fixed sprinkler systems shall overlap centre to centre.

Pipe classes shall be strictly in accordance with the manufacturer's recommendations for the design pressures within the system; however, no PVC pipe of class lower than Class 12 shall be used.

An 'as construction' plan of the irrigation system is required.

6.4.5. Watering systems in paved areas

6.4.5.1. Watering systems for trees in paved areas

An adequate watering programme can be provided manually, provided there is sufficient surface area to absorb a quickly delivered volume and provided a water source is available. A coil of flexible, slotted agricultural piping can be laid in a 'corkscrew' fashion around the root ball when planting, leaving a length (150 millimetres with cap) protruding above the soil level which can conveniently be filled manually.

Reliance on rain falling on paved surfaces and being directed into or past the exposed soil area round each tree is effective as a supplement. Where new paving is being constructed, gentle cambers and/or dish drains should be located appropriately. Use of porous paving such as bricks or concrete pavers laid on sand with a permeable membrane will also allow some water to filter through. Wetting agents may be required to ensure water penetration.

Drip irrigation, micro-irrigation and trickle irrigation systems are the modern approach to applying specific volumes of water to trees. They are water-efficient, as moisture is distributed by pipe to each tree and released through one or more drippers, trickle heads or micro-jets.

6.4.5.2. Basic guidelines for water system operation

Water should be delivered up to twice per week in the warmest weather, at a rate of 10 to 20 litres each application, or as varied to suit local conditions. In winter, natural rainfall should be adequate.

When adjusting the amount of watering in different seasons and weather, the frequency rather than the volume should be altered.

Young trees can be adequately watered by a single or double trickle outlet positioned about 500 millimetres from the trunk.

6.4.6. Post and rail fencing and bollards

Where so specified, the perimeter of reserves adjoining roads or where barriers are to be used on reserves of any public space for protection of vegetation or access control, are to be fenced with CCA-treated pine post bollards or post and rail fencing or other appropriate fencing in accordance with the following:

- nominal post diameter is not less than 150 millimetres;
- rail (where used) diameter is 100 millimetres to 150 millimetres, where required. The top of the rail shall be nominally 50 millimetres below the post top;
- seven millimetre diameter galvanised fixing round head bolts being used. Nuts and protruding bolts thread shall be countersunk and recessed;
- post spacing is to be 2.4 metres where rails are required, and rail length is to be 3.6 metres, and the gap between end of rails is to be 600 millimetres;
- post spacing is to be not greater than 1.5 metres between centres where bollards only are required;
- alternative materials including recycled materials can be used, provided they are approved by the local government;
- typical length for post and rail is to be 1200 millimetres, set 450 millimetres in the ground with 200 millimetres concrete to 100 millimetres below ground level for post and rail, and 900 millimetres above the ground. Bollards shall be 1200 millimetres to 1600 millimetres long. Where placed near car parks or road edges, bollards shall be 1100 millimetres above ground and 900 millimetres below. At park edges, bollards shall be 750 to 900 metres above ground and 450 to 600 millimetres below ground. An alternative to concreting posts into the ground is fixing an anchor to the bottom of the post to prevent withdrawal; and
- post tops and rail ends shall be chamfered.

Fencing requirements may vary depending on the local government.

6.4.6.1. Private property and reserve boundary fencing

Where private property adjoins reserves, fencing shall be one of the following types and as specified by the local government:

- open steel with masonry pillars;
- open picket on post and rail;
- solid masonry;
- pre-painted or powder coated steel; or
- painted Super Six.

The local government is not responsible, under the *Dividing Fences Act 1961*, for the cost of fencing boundaries of any reserve including public access way and road reserves adjoining private property. This is the responsibility of the adjoining landowner.

6.4.6.2. Vegetation protection fence

The standard minimum protection fence for vegetation is a three-strand plain wire white PVC coated and logged fence, set at the edge of vegetation. Posts 75–100 millimetres in diameter shall be spaced at not greater than four metres with strainers 150–175 millimetres in diameter, strutted and not greater than 100 metres spacing. Strainers shall be provided at each opening. Other fences may be approved as variations on the standard.

6.4.7. Specifications for access tracks

6.4.7.1. Base and surface

Access tracks should comply with the following:

- on sand 150 millimetre thickness or on gravel 100 millimetre thickness compacted fine gravel or fine crushed limestone base;
- light seal of fine aggregate and bitumen emulsion;
- 2–5 per cent cement stabilisation can be used on some gravels to reduce base depth or to strengthen the base in poor foundation soils;
- heavy layer of medium coarse mulch – mixed bark chip and leaves may be used for informal, low use paths;
- asphalt seal with moderately high bitumen content 25 millimetre thickness in limestone and 20 millimetres in gravel;
- boarded walk; and
- rubber mats, chained slats or sleepers.

6.4.7.2. Cross-section

Cross-sections for access tracks should be graded for drainage, one way two per cent crossfall, or with crown two per cent crossfall.

Module No. 7

Standard Drawing Guidelines

7 Module No.7 – Standard Drawing Guidelines

7.1. General requirements

The following sections outline details and general aspects that a developer and the consultant should supply when submitting drawings for development.

7.2. Policies and standards

7.2.1. Standards

The following standards need to be applied to subdivisional development drawings with all levels to be shown in Australian Height Datum unless specifically otherwise approved.

- AS 110 Drawing Standards;
- AS 1100.101–1992 – Technical drawing – General principles;
- AS 1100.101–1992/Amdt 1–1994 – Technical drawing – General principles;
- AS 1100.401–1984 – Technical drawing – Engineering survey and engineering survey design drawing;
- AS 1100.401–1984/Amdt 1–1984 – Technical drawing – Engineering survey and engineering survey design drawing;
- AS ISO 128.1–2005 – Technical drawings – General principles of presentation – Introduction and index;
- AS ISO 128.21–2005 – Technical drawings – General principles of presentation – Preparation of lines by CAD systems; and
- AS ISO 128.23–2005 – Technical drawings – General principles of presentation – Lines on construction drawings.

This list is not exhaustive and other publications may also give rise to drawing standards and specifications.

7.3. Design

7.3.1. Drawings

Design drawings shall show the following details:

- cadastral boundaries of the existing site and future subdivisional lots;
- existing and proposed services;
- fences;
- significant trees and vegetation;
- existing and proposed contours;
- existing and/or proposed buildings;
- proposed access roads and parking areas;
- pedestrian and cyclist facilities;

- disabled access facilities;
- existing or proposed drainage management facilities, including sub-soil drainage systems

The following section gives examples of the different aspects of design drawings and forms a set of drawing specifications which are suggestions only. There are several forms of drawing specifications and these should be discussed with the consultant and the local government.

7.3.1.1. Drawing lines and sets

Drawings may be prepared in colour, but must remain legible if photocopied and/or faxed in black and white.

The drawing number, title, revision letter, north point arrow, bar scale and scale at a nominated paper size shall all appear on every drawing. The local government's logo may also be required.

Sets of drawings shall be listed on a contents page at the same size and format as the drawing set.

7.3.1.2. Layer naming and layer discipline

All drawing layers produced by the consultant should be named commencing with the consultant's initials. Following the consultant's initials, all layers shall commence with one of the following prefixes:

- L (for line)
- H (for hatch)
- I (for image)
- T (for text).

These words should indicate the type of object on each layer respectively.

Following the object type, layers should describe the element represented on that layer. This should be as succinct as possible. For example:

- trees
- kerbs
- footpath
- buildings
- walls
- roads
- furniture
- drainage.

Following each element name, any specific quality of that element may be used to differentiate it. For example:

- trees proposed
- kerbs barrier
- footpath concrete
- buildings demolished
- walls retained

- roads asphalt
- furniture bench
- drainage.

The layer labelled 'LA L Trees Proposed' will therefore appear adjacent to 'LA Line Trees Felled', enabling all lines describing similar elements to be identified and grouped together in the layer control pane. The creator of each layer will also be clear by the use of initials, and all layers created by a single author will appear adjacent to each other.

Prior to issue each layer should be checked by the consultant using the layer isolate command on each layer in turn. Objects that appear on an inappropriate layer during this process should be moved to their correct layer.

7.3.1.3. Viewports

All viewports shall be locked, with the non-printing symbol checked on the layer control pane, and located on a layer described as 'VP'.

PSLTSCALE command setting shall be set at 0.

All layers shall be switched on in model space; unwanted layers in viewports shall be removed through viewport freezing. This allows all objects to be visible when the file is viewed in model space, avoiding the impression of information being lost on frozen or 'off' layers when the drawing is viewed in model space.

7.3.1.4. Plot styles

The plot style shall use the order of the colours in the default index colour bar to describe the gradual thickening of lines on the finished print. For example;



Line thickness shall be nominated by the author to suit the size and format of the drawing when printed (note the requirement for legibility at A3 pertains to this issue).

7.3.1.5. Hatching

Solid hatches shall be in non-index colours to allow expression of the colour in the printed document.

Non-solid hatches shall be in index colours so that they appear black when printed.

Text within hatched areas or overlying photographs shall employ a background mask to aid legibility of text when reproduced in black and white.

7.3.1.6. Raster images

Image frames shall be switched off prior to issuing drawings.

7.3.1.7. XRef files

XRef files shall not be greater than 4MB. To reduce file sizes, drawings may use XRef 'base' drawings to allow emailing to and from the City's officers. XRefs may be emailed separately and reinserted upon receipt of the drawing.

7.3.1.8. Coordinates

Ensure all 'Z' coordinates on 2D drawings are set at 0 to avoid errors in taking off quantities and errors in drafting (note that many topographical surveys are routinely made in 3D).

7.3.1.9. Polylines

Ensure all fragmented lines intended to be one object are joined, and all polygons are closed, by auditing the drawing with the properties manager prior to issuing the drawing.

7.3.1.10. Annotations and dimensions

All annotations and dimensions shall comply with the local government's style guide, and shall be inserted onto paper space. Dimensions shall be generated using the dimension command, and scaled in the dimension manager to suit the scale of the viewport.

7.4. Submission of documents for approval

Prior to commencement of construction of any subdivisional works, the developer shall submit the documents listed below to external government agencies and the local government for approval (eg. sign and linemarking plans by Main Roads WA and street lighting plans by Western Power).

This is required to satisfy engineering conditions imposed in the letter of conditional approval of the subdivision by the WAPC and as required under section 170 of the *Planning and Development Act 2005*. The following documents shall be submitted where appropriate or required:

- geotechnical investigation report;
- subdivision pre-calculation plan;
- earthworks grading plan;
- services plan (electricity, water, telecommunications, gas and sewer);
- roadworks and drainage layout plan, including service crossings;
- roadworks and drainage longitudinal profile drawings;
- roadworks typical cross section drawings;
- stormwater catchment and management plan;
- stormwater drainage calculations;

- standard drawings and details;
- landscape master plan;
- landscape and irrigation plans for public open space;
- Environment Protection Authority site classification assessment chart for dust control;
- soil stabilisation strategy;
- construction cost of the works;
- project schedule (including all works eg. water, sewerage, power, landscaping);
- specification for the works;
- traffic management plan;
- environmental management plan;
- emergency management plan;
- plan of existing significant vegetation;
- plan showing location, elevation and structural details of retaining walls, bridges and other similar structures;
- locality plan;
- street lighting plan;
- fire management plan;
- pavement design calculation; and/or
- urban water management plan.

All documents shall be submitted in duplicate. The local government will return one set to the consulting engineer either endorsed 'Approved', or with any modifications detailed. If significant modifications are required, the consulting engineer shall resubmit the documents incorporating the required modifications.

On final approval of the design, one set of approved drawings and specifications will be returned to the consulting engineer accompanied by a letter of approval indicating any conditions with respect to the drawings or specifications. One set will be retained by the local government.

No construction shall commence until all documents have received approval (ie. WAPC conditional approval has been received and the local government has approved the subdivisional engineering design documents and drawings).

The consulting engineer shall, in submitting the documents for approval, allow a reasonable time for the initial examination of the documents. The local government will be able to advise

the consulting engineer of the general adequacy of the submission and approximate time required for full assessment. A reasonable time for an initial assessment of adequacy and time frame for a full assessment is 10 working days. Refer to section 1.12 for information on the approval process.

All drawings shall show a north point.

7.5. Information to be shown on drawings

7.5.1. Scales for drawings

DRAWING		SCALE
Locality plan		1:5000
Pre-calculated plan		1:1000
Re-contouring and earthworks layout		1:1000
Overall layout plan		1:1000
Road, drainage plan, including services	<i>Preferred</i>	1:500
	<i>Minimum</i>	1:1000
Road profile	<i>Horizontal</i>	1:1000
	<i>Vertical</i>	1:100
Road cross-sections		1:250
Intersections		1:250
Traffic management devices		1:250
Culs-de-sac		1:250
Drainage plans	<i>Horizontal</i>	1:500
	<i>Vertical</i>	1:500
Standard drawings	Various as appropriate	
Stormwater catchment plan		1:1000
Landscape master plan		1:1000
Landscape and irrigation plans for public open space		1:500
Environment Protection Authority site classification assessment chart for dust control		1:1000

Where applicable or where such drawings will allow better information for approvals the turning movements for appropriate vehicles can be submitted for assessment of traffic management and turning movement details.

7.5.2. Locality plan

The locality plan shall show:

- existing roads including distributor roads;
- new roads;
- locality areas;
- service corridors; and
- any other significant features.

7.5.3. Pre-calculation plan

The pre-calculated plan shall show:

- lot numbers;
- areas and dimensions of lots;
- road reserve widths; and
- road names.

7.5.4. Re-contouring and earthworks layout plan

The re-contouring and earthworks plan shall show:

- all existing and proposed road and property boundaries;
- all existing and proposed contours with maximum intervals of 1 metre. However, there may be a need to reduce the interval to 0.25 metres at intersections;
- detailed areas of cut and fill;
- total earthworks or re-contoured area;
- levels along existing roads and property boundaries adjacent to the re-contoured area;
- details of ties to existing levels; and
- details of existing vegetation and extent of clearing and vegetation protection.

7.5.5. Layout plan

The layout plan shall show:

- existing and new streets and roads with allocated street names;
- pavement widths;

- lots with lot numbers;
- existing and proposed street drainage and allotment drains where required with any necessary easements;
- services and fence lines (where applicable);
- traffic management devices;
- footpaths, shared path, cycle paths and bridle paths (where applicable); and
- survey and bench marks.

7.5.6. Road plans

Each road to be constructed shall be drawn in plan and profile and cross sections shall be provided.

7.5.6.1. Street plans

The plan of the street shall show:

- width of all pavements, verges and medians;
- distances and stations along the centre of the road;
- existing services;
- street lighting;
- horizontal curve data;
- existing and proposed levels;
- existing and proposed street drainage including manholes and gullies;
- lots facing onto the street;
- proposed traffic management devices;
- existing and proposed services in the road reserve (where applicable);
- footpaths, footways, cycle paths and bridle paths (where applicable);
- location of street signs; and
- any other relevant information.

7.5.6.2. Longitudinal profile

The longitudinal profile of the road shall show:

- a running distance along the centre line of the road;

- natural surface levels along the road centre line and both property lines;
- design pavement levels along the centre line and both channels. Levels shall be at a maximum of 20-metre intervals on straight grades, and alignments and shall be at 10-metre intervals on vertical and horizontal curves. Levels shall also be shown at horizontal curve tangent points and any other salient locations;
- lengths of grade lines with grades expressed as a percentage;
- intersection and tangent points at change of grades;
- length of vertical curves; and
- transition and superelevation details.

7.5.6.3. Cross-section details

Cross-section details shall show the offset from the road reserve centre line and levels of the following points:

- road centre-line;
- toe and top of kerb;
- any change in crossfall;
- road reserve boundary.
- street tree alignments;
- street lighting alignments; and
- underground services.

7.5.6.4. Plans of other features

Plans of intersections, cul-de-sac heads, roundabouts and any other traffic management device(s) shall include the following information:

- all adjacent lot boundaries;
- geometric details;
- design levels at appropriate points;
- drainage and other services (where applicable); and
- specific features such as kerbing, pathways, signs, ramps, paving and so forth.

7.5.7. Drainage plans

All drainage lines shall be drawn in plan and profile, without compromising legibility, on the same drawing and where practical, on the same plan as the road longitudinal plan and profile.

Drainage plans shall show:

- existing and proposed drainage lines detailing channel flow cross-sectional area, pipe sizes, invert levels, hydraulic grades and top water levels, lengths, junction pits, gullies, sub soil drainage, other drainage structures and whether the pipes are slotted or solid;
- upstream and downstream levels on all existing drainage and outfalls to which connections are being made;
- existing and proposed sewer lines and any other services which may affect the drainage works;
- existing and proposed contours and spot levels;
- streets, street names and lot numbers;
- existing and proposed drainage easements including their description and width;
- stormwater connection points and the design discharges from lots where property drainage is applicable; and
- basins, open drains, table drains, outlets and overflow structures, headwalls and siphons.

Longitudinal section

The longitudinal section shall show:

- all pipe sizes and grades, the type and class of pipe and whether the pipe is solid or slotted;
- existing natural and finished surface levels on the pipe route;
- invert levels of the pipes and the depth to the invert from the finished surface;
- running distance and the distances between gullies, junction pits and other drainage structures;
- location and levels of other services, especially sewer line crossings; and
- details of all junction pits, gullies and other structures.

In some cases it may be more efficient to show drainage profiles on the road profile drawings, and this is acceptable.

7.5.8. Landscaping plans

Landscaping plans shall show:

- cadastral boundaries of the existing site and future subdivisional lots;
- existing and proposed services;
- fences;
- significant vegetation and trees;
- existing and proposed contours;
- existing and/or proposed buildings;
- proposed access roads and parking areas;
- pedestrian and cyclist facilities;
- disabled access facilities;
- existing or proposed drainage management facilities, including sub-soil drainage systems;
- significant environmental areas such as wetlands;
- playground equipment;
- proposed irrigation system; and
- other features pertinent to the development of the public open space.

Where landscaping drawings are required, they shall include a schedule of trees suitable to the area, other vegetation to be planted and grass types.

7.5.9. Drawings of standard details

Standard drawings shall show the following information:

- pavement and seal cross section;
- kerb cross-sections;
- street signs and name plates;
- pipe bedding and laying details;
- drainage structures, including side entry pits, junction pits, headwalls, aquifer recharge structures, detention basins, bubble-up pits, scour protection details and gross pollutant traps;
- fencing guide post locations;
- brick paving;

- sub-soil drainage;
- footpaths and dual use paths;
- lot connection pits where appropriate; and
- any other standard details appropriate to subdivisional works or details within the design area.

7.5.10. 'As-constructed' drawings

Prior to the release of the subdivision, the developer shall provide the local government with a full set of 'as-constructed' engineering drawings in hard copy and digital format on computer disk. These drawings shall be in a reproducible form, clearly marked 'As-constructed' and be certified by a licensed surveyor, as follows:

- road drawings to show details of any alterations made during construction;
- drainage drawings and grades against the design lines, levels and grades;
- street lighting drawings shall show light locations and luminaire details; and
- compatible computer disk of the pre-calculated plan to the satisfaction of the local government. Data should be in a digital format suitable for loading into geographic information and asset management systems.

Module No. 8

Construction Guidelines

8. Module No.8 – Construction Guidelines

8.1. General requirements

The guidelines contained within this section refer to construction techniques which can be amended depending on location and natural environments where the construction is taking place. However, they provide guidance for developers and government authorities when subdivisions take place. Contractors may also use these guidelines where applicable. It is recognised that innovations take place all the time, and new techniques will be included in updates of this document.

8.1.1. Noise Management

Noise emissions from the subdivision works shall comply with the Environmental Protection (Noise) Regulations 1997. An assessment of the noise anticipated to be caused by subdivisional works to determine whether a Noise Management Plan is needed must be undertaken by the Consulting Engineer using a suitable qualified and experienced person prior to the works commencing. The Noise Management Plan is to be in accordance with the Local Governments Noise Management Guidelines. The Noise Management Plan requires approval prior to commencing works.

8.1.2. Vibration Management

Vibration due to subdivision works must be managed in accordance with the provisions of the Local Governments Vibration Management Guidelines. The Vibration Management Plan requires approval prior to commencing works.

8.1.3. Traffic Management

Where work on existing roads is approved as part of a subdivisional development a traffic management plan shall be prepared and submitted for approval.

Traffic shall be managed in accordance with Main Roads WA Traffic Management for Road Works Code of Practice and AS 1742.3 Manual of Uniform Traffic Control Devices: Part 3 Traffic Control Devices for Works on Roads.

8.1.4. Road Closures

Where it becomes necessary to close an existing road to traffic to carry out approved construction works, the Developer shall apply to the Local Government for approval to close the road at least 21 days before the closure is required.

The application for a road closure shall include the following details:

- Location of closure
- Reason for closure
- Period of closure
- Route proposed for traffic detour (if any)
- Significant facilities affected by the closure (e.g. schools, hospitals, etc)
- Method of advertising the closure
- The Traffic Management Plan for the closure

The developer shall advise all emergency services and owners and occupiers affected by the proposed closure once the Local government approval has been obtained. The Developer shall comply with any conditions placed on the road closure approval.

If a closure is likely to exceed 7 days, public consultation is required, in which case the Developer shall make application at least 28 days before the closure is required. For closure in excess of 7 days a suitable Public Notice is to be placed in the local newspaper circulating in the area.

8.2. Acts and Standards

8.2.1. Acts

- *Bush Fires Act 1954;*
- *Environmental Protection Act 1986;*
- *Mines Regulation Act 1946 and*
- *Explosives and Dangerous Goods Act 1961.*

8.2.2. Standards

- AS 2187: Explosives – Storage, Transport and Use;
- AS 2188: Explosives – Relocatable Magazines for Storage;
- AS 1289: Methods of Testing Soils for Engineering Purposes;
- AS2157: Cutback Bitumen;
- AS1160: Bituminous Emulsions for Construction and Maintenance of Pavements;
- AS 2008: Residual Bitumen for Pavements;
- AS 2734: Asphalt (Hot-mixed) Paving – Guide to Good Practice;
- AS 1742.5: Street Name and Community Facility Name Signs;
- AS 1744: Forms of Letters and Numerals for Road Signs;
- AS 4058: Precast Concrete Pipes (Pressure and Non-Pressure);
- AS 1712: Fibre Cement Pipes;
- AS 1761: Helical Lock-seam Corrugated Steel Pipes;
- AS 1762: Helical Lock-seam Corrugated Steel Pipes – Design & Installation;
- AS 2566: Plastic Pipe laying Design;
- AS 3600: Concrete Structures;
- AS 1379: Specification and Supply of Concrete;
- AS 1597.1: Small Culverts;
- AS 3972: Portland and Blended Cement;
- AS 2758.1: Concrete Aggregates;
- AS 1302: Steel Reinforcing Bars for Concrete;
- AS 1303: Steel Reinforcing Wire for Concrete; and
- AS 1304: Welded Wire Reinforcing Fabric for Concrete;
- AS 2419: Fire Hydrant installations
- AS 3959: Construction of buildings in bush-fire prone areas

8.3. Specifications

8.3.1. Construction requirements

8.3.1.1. Codes and other applicable documents

Materials, workmanship, construction procedures and tests shall conform with the relevant Australian Standards and Codes published by Standards Australia. These documents shall apply generally as appropriate whether specifically referenced or not.

8.3.1.2. Survey preparation

The works shall be set out and constructed in accordance with the alignments, levels, grades, road chainages, distances and cross-sections shown on the approved drawings.

The works shall be set out, using appropriate survey equipment, from the pegs and bench marks given and these shall be used constantly during the progress of the works to check accuracy. Care shall be taken not to disturb any survey pegs, survey recovery pegs or survey marks.

Where it is necessary to cover a survey peg, it shall have a substantial stake (suggested 25 x 25 millimetres) driven beside it and this stake shall extend at least 75 millimetres above the finished surface and be appropriately marked to identify it. The developer shall be responsible for the accuracy of the setting out works.

Any State survey mark affected by the works shall be identified and reported to the Department of Lands Administration for replacement or relocation.

8.3.1.3. Clearing

Clearing of all shrubs and trees shall be completed only to an extent sufficient to facilitate the construction works. Natural vegetation shall be retained where possible.

All tree roots, boulders and other deleterious material shall be totally removed to a depth of 600 millimetres below the natural surface or finished cross-sectional levels of the road, whichever is the greater. Stumps shall be completely removed.

All holes and depressions resulting from clearing and grubbing shall be backfilled with approved material and compacted to at least the compaction of the surrounding undisturbed soil.

No material from clearing is to be pushed beyond the limits of the development site. Burning of cleared vegetation and timber or other combustible material is not permitted except in extraordinary circumstances and this material shall either be removed from site or disposed of in an approved manner (eg. chips or mulch for soil stabilisation).

Cleared vegetation burned for disposal on land development sites in a prescribed area of the Perth metropolitan area is prohibited under *Environmental Protection Regulations 1987*, Part 7A, Regulation 16B.

The developer shall be responsible for suppression and control of dust, sand drift and smoke pollution from development sites in accordance with "A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities". (Department of Environment and Conservation March 2011).

Clearing shall occur to the extent described on approved plan of subdivision. All other vegetation shall be protected and retained with fencing and notices as specified. Natural features and cultural artifacts and facilities identified for retention on the drawing shall be fenced off and sign posted as specified.

8.3.1.4. Topsoil

On completion of clearing operations, natural topsoil to a minimum depth of 100 millimetres may be stripped from road reserve areas of cut or fill and proposed utility services locations. Any topsoil should be stockpiled for re-spreading. Topsoil shall only be re-spread if the geotechnical report for the site indicates that it is suitable for such use. Often, this is not suitable in areas with highly plastic soils and high natural groundwater levels. It is also not suitable in areas of medium to high-risk acid sulphate soils.

Topsoil stockpiles should be a maximum 1.5 metres in height. Stockpiles should be hydromulched with sterile cereal rye to prevent wind blow and suppress weed growth. Topsoil stockpiles should be fenced off, sign posted and protected from compaction and pollution by waste materials.

Stockpiled topsoil should be kept weed-free and mulched to prevent wind erosion and movement.

When earthworks have been completed, the topsoil should be re-spread to a maximum compacted depth of 100 millimetres over all areas of earthworks to match approved finished surface levels.

Where excavated material is classified as unsuitable for use as topsoil by the Geotechnical Report it shall be disposed off-site in an approved manner.

8.3.1.5. Earthworks

8.3.1.5.1. General

Earthworks shall be completed to the requirements detailed in these guidelines, with tolerances set out and detailed on the drawings. Where there is existing infrastructure, the local government may require a dilapidation report to identify and measure any damage. Also refer to Module 1, section 1.2.2.1 and Module 2, section 2.2.1.1.

Roads shall be cut to the grades and cross-sections indicated on the approved drawings.

All fill shall be clean, 8.3.1.5.2 granular material obtained from general and roadwork excavations and shall not be contaminated with roots or other impurities. Fill for roadworks shall be placed in even layers not greater than 300 millimetres thick and each layer shall be compacted to 95 per cent of the modified maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes* and *AS 3798 – 2007 – (Incorporating Amendment 1) – Guidelines in Earthworks for Commercial and Residential Developments*. Depending on the location and compaction equipment used, greater layer thicknesses may be approved by the local government.

Where filling is under public open space and paths, the compaction can be reduced to 90 per cent and 95 per cent respectively of the modified maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes* and *AS 3798 – 2007 – (Incorporating Amendment 1) – Guidelines in Earthworks for Commercial and Residential Developments*.

Earthworks shall be trimmed to a neat finish to a tolerance of ± 50 millimetres so that the surface shall be even and conform to approved finished levels.

8.3.1.5.2. Lot filling

Where filling of lots is required as part of development, the fill area shall be cleared and stripped of all organic material and debris, and the filling placed and compacted to approved design levels. Tolerances on lot filling shall be ± 50 millimetres.

All fill material shall be clean and non-cohesive, sand should be free draining and free of all silty, organic or other deleterious materials, and which contains not more than five per cent by weight of soil fractions finer than 0.075 millimetres, with a zero plasticity index (ie. non-plastic). Where required by the local government, these properties should be confirmed through testing by a geotechnical laboratory certified by the National Association of Testing Authorities.

All filling shall be compacted and tested in accordance with *AS 3798 – 2007 – (Incorporating Amendment 1) – Guidelines in Earthworks for Commercial and Residential Developments and Amendment No. 1 – 8 May 2008*.

Requirements for stabilisation, dust control and sand drift shall be as detailed in section 4.5.5.

8.3.1.5.3. Limestone and rock

All cuttings through limestone and rock shall be excavated to a depth of 100 millimetres below sub-grade level and 200 millimetres below the verge finished level.

If trees and plants are to be planted and these depths of excavation are followed, it may be necessary to negotiate with the local government as to the required depths for plants and trees to survive in an appropriate cover material depth. This depth will need to take into account required depths for root systems of plants and trees as well as possible waterlogging of root systems in wet weather.

Increases in cover depths may be required where irrigation systems are to be installed for purposes of watering vegetation and similar.

Limestone or rock excavated shall be placed at the bottom of fills. No stone larger than 300 millimetres shall be placed in compacted fill. Large rock pieces shall be stockpiled where directed or disposed of at an approved disposal site.

8.3.1.5.4. Blasting

Excavation in rock or hard soil may be carried out by blasting, and a blasting permit can be obtained from the local government.

All explosives shall be stored and handled in accordance with requirements of the *Mines Regulation Act 1946*, the *Explosives and Dangerous Goods Act 1961*, *AS 2187: Explosives – Storage, Transport and Use* and *AS 2188: Explosives – Relocatable Magazines for Storage*.

Blasting shall only be carried out by a person holding a current Western Australian Mines Department Shot Firer's Permit. The shot-firer shall be responsible for repair of damage, legal liability or anything that may arise from blasting operations. Appropriate screens,

shields and matting necessary to prevent rock, stones, earth, debris or other material from scattering or blowing from the immediate site of blasting, shall be provided.

Blasting may be prohibited if geotechnical and other data demonstrate adverse effects as follows:

- vibration damage to existing developments;
- vibration may damage substrata weakening foundations for future development;
- damage to substrata may affect groundwater location and quantities;
- noise may disturb wildlife species protected within the area; and
- dust suppression may not be contained so as not to interfere with adjacent developments.

8.3.1.5.5. Soil stabilisation

The developer shall be responsible for the satisfactory control of dust, sand and soil drift or erosion from the development site.

Stabilisation of topsoil, sand or other material or matter subject to movement over or near the subdivision shall generally be carried out in accordance with *A Guideline for the Prevention of Dust and Smoke Pollution from Land Development Sites in Western Australia* (Department of Environment and Conservation, November 1996) both during the construction stages and upon completion of the subdivisional works.

Where initial stabilisation is carried out and subsequent works associated with the subdivisional works cause deterioration of effective stabilisation of the area, the affected area shall be restabilised appropriately as agreed by the local government. The developer shall effect a varying method of restabilisation should initial stabilisation be unsuitable.

Stabilisation disturbed by works other than subdivisional works shall be the responsibility of persons responsible for disturbance of stabilised areas (eg. builders, private lot owners and utility providers).

To avoid dust nuisance to adjacent owners, earthworks including stripping or replacing of topsoil, shall not be carried out when a wind is blowing towards the surrounding properties, which will cause sand drift or dust to reach these properties. All measures necessary shall be used to prevent the generation of dust from all such earthworks by watering cut and fill areas and stockpiles at intervals and times as required. A water tanker and spray equipment suitable for this purpose shall be available on site at all times.

Where adjacent occupied homes or trafficked roads are adversely affected by sand drift from construction works, a sand trapping fence shall be erected fronting the developed area, with the contractor retaining full liability for damages.

Where possible, effects of erosion and soil drift shall use as little water as possible and preferably only bore water where possible. Hydromulching and other soil stabilisation methods are preferred where little repeated disturbance of the earthworks will take place.

8.3.1.6. Sub-grade

The formation shall be excavated in conformity with profiles, dimensions, camber and depths

shown on the approved drawings.

Tolerance for sub-grade width shall be ± 100 millimetres.

The finished levels of sub-grade shall be within +5 to –30 millimetres of design levels.

The sub-grade shall be compacted to not less than 95 per cent of the maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

The sub-grade shall be approved by the local government before any sub-base material is placed.

8.3.1.7. Sub-base

8.3.1.7.1. Materials

The sub-base shall be constructed of limestone or a material complying with the requirements of the specification detailed in section 3.4.2 – Crushed Limestone, unless otherwise approved.

Materials other than limestone may be used, particularly in rural areas where limestone is not necessarily available. The only criterion for alternative materials is that their performance complies with the specification or mechanistic characteristics suiting the specification.

8.3.1.7.2. Spreading

The sub-base shall be placed so that the compacted sub-grade is not disturbed or broken up and the specified even thickness is achieved. Sub-base materials shall not be spread upon a waterlogged sub-grade.

8.3.1.7.3. Compaction

The sub-base shall be watered to optimum moisture content and compacted by rolling to a density not less than 95 per cent of the maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

The depth of sub-base after compaction shall be as specified on the approved drawings with a tolerance of +5 to –10 millimetres.

Where damage to adjoining properties may result, use of vibrating rollers will be permitted with care and by negotiation with the local government to ensure all measures are taken to protect adjacent properties.

It may be necessary to formulate a vibration plan in conjunction with the local government. The vibration plan would need to address vibration nuisance, potential damage and be approved by the Department for Environmental and Conservation, the consulting engineer and local government.

8.3.1.7.4. Acceptance

All irregularities in the longitudinal grade and cross-section and any imperfections or failures detected in the surface of the sub-base shall be corrected in an approved manner until the road sub-base is brought to a uniformly compacted, smooth and even surface. Unsatisfactory material shall be removed from the site and replaced with material as specified.

The sub-base construction shall be approved by the local government prior to the placement of the base course material.

8.3.1.8. Base course

8.3.1.8.1. Materials

The base course shall consist of either emulsion stabilised limestone, laterite gravel, recycled ferricrete or fine crushed rock (unless otherwise approved) complying with the following specifications:

- Section 3.4.3 – Bitumen emulsion
- Section 3.4.4 – Bitumen stabilised limestone
- Section 3.4.5 – Gravel
- Section 3.4.6 – Fine crushed rock (road base)
- Section 3.4.7 – Ferricrete
- Section 3.4.9 – Recycled materials for base course construction.

8.3.1.8.2. Spreading

Prior to laying of base material, all utility service crossings beneath roadways shall be installed. All road crossings shall be backfilled and compacted according to requirements for sub-grade and sub-base construction.

Base material shall be placed so that sub-base material is not disturbed or broken up and an even thickness as specified is obtained.

Base material shall be spread to the required compacted thickness by means of an approved mechanical spreader or by grading from continuous stacks deposited on the sub-base.

8.3.1.8.3. Compaction

Base course material shall be watered, compacted and cut to grade and crossfall specified in the approved drawings. Each course shall be rolled until it is compacted to a firm, even surface by appropriate self-propelled steel-wheel and pneumatic tyred rollers. The use of the pneumatic tyred roller is essential for the final passes to achieve compaction of immediate surface material. Where damage to adjoining properties results, use of vibrating rollers are not permitted.

Grading of loose material over a hard surface and/or compaction in a thin layer is not permitted. The base course shall be compacted to not less than 98 per cent of the maximum dry density when tested in accordance with *AS 1289: Method of Testing Soils for Engineering Purposes*.

Thickness of the base course after compaction shall be as specified on the approved drawings with a tolerance of +10 to 0 millimetres.

8.3.1.8.4. Acceptance

The surface course shall be tested for shape and level, and any irregularities greater than 10 millimetres, when tested with a straight edge three metres long, shall be made good by addition or removal of material and further rolling and cutting to grade until the specified cross-section is obtained.

Any imperfections or failures detected in the surface of the base course shall be corrected in an approved manner. Unsatisfactory material shall be removed from site and replaced with material as specified.

Base course construction shall be approved by the local government prior to the application of a primer seal.

8.3.1.9. Primer sealing of pavements

8.3.1.9.1. General

The surface of the base course shall be primer-sealed in accordance with *Bituminous Surfacing Volume 1, Sprayed Works* (Austroads, 1989) prior to application of the wearing course.

8.3.1.9.2. Preparation

The surface of the base course shall be swept free from loose stones, dust, dirt and foreign matter so as not to damage the finished surface of the base course prior to application of the binder.

Sweeping shall be completed immediately before the application of the primer. All sweepings shall be completely removed from the road and disposed of in an approved manner.

8.3.1.9.3. Binder

Bitumen emulsion

Bitumen emulsion in accordance with *AS1160: Bituminous Emulsions for Construction and Maintenance of Pavements*, shall be uniformly and evenly sprayed onto the existing surface at a rate determined by design but shall not be less than 1.3 litres/m² measured at 15.0°C.

Hot cut-back bitumen

A medium curing cut-back bitumen in accordance with *AS2157: Cutback Bitumen*, shall be applied at a rate determined by the design but shall not be less than 1.2 litres/m² measured at 15°C and at a temperature of 70°–120°C. The proportion of medium curing cutting oil and application rate shall depend on the condition of the base surface and traffic density.

The primer shall be applied by an approved mechanical sprayer which has been tested in accordance with *Testing of Mechanical Sprayers of Bituminous Material* (Austroads).

Where direct use of a mechanical spray is impracticable, the binder may be sprayed using a hand lance supplied from the mechanical sprayer.

Kerbs shall be protected from bitumen overspray at all times by adequately covering the kerbs with polythene sheeting or similar approved material. Any kerbing marked by bitumen overspray shall be made good by the contractor at the contractor's expense.

8.3.1.9.4. Aggregate

Immediately after spraying, the primer shall immediately after spraying be covered with five or seven millimetres of diorite, granite or basalt to the specification detailed in section 3.4.11 – Road Sealing Aggregate, so that all sprayed areas shall be completely covered within a

period of 15 minutes.

The aggregate shall be dry and free from dust and other deleterious material and be spread by means of an approved aggregate spreader capable of spreading a uniform layer of aggregate.

Rate of application shall be determined by design but shall not exceed 150 m² per cubic metre of metal, controlled so that only a sufficient amount is applied to give a uniform dense mat one stone thick. Additional aggregate may be added by hand spreading to any bare or insufficiently covered areas to produce the required uniform cover.

Within five minutes of application of the aggregate, rolling shall commence using self-propelled steel wheel and pneumatic tyred rollers and continue until the aggregate is well embedded in the binder and a uniform surface obtained.

8.3.1.10. Hot sprayed bitumen seal

8.3.1.10.1. General

This section covers application of a single coat aggregate wearing course seal to either a bitumen emulsion stabilised limestone base course or surface primer sealed. The application shall be designed and carried out in accordance with *Bituminous Surfacing Volume 1, Sprayed Work (Austroads, 1989).4.10.2 – Surface Preparation*.

The surface shall be lightly swept free of all loose stones, dust, dirt and foreign material. Any sections of the surface which are loose or damaged shall be repaired and finished to the approved level.

8.3.1.10.2. Materials

The binder and medium curing cutting oil shall comply with *AS2008: Residual Bitumen for Pavements, AS2157: Cutback Bitumen* and the specification detailed in section 3.4.9 Bitumen.

The proportion of medium curing cutting oil to be added to the binder is dependent on the anticipated road temperature at the time of spraying but shall not exceed eight per cent.

The aggregate shall consist of crushed diorite or granite stone of 10 or 14 millimetres nominal size to the specification detailed in section 3.4.11 Road Sealing Aggregate.

Bitumen laminated paper of sufficient width and strength to prevent overspray and spillage during removal, or other suitable protective material, shall be applied to start, finish and taper operations.

8.3.1.10.3. Binder

The developer shall give the local government at least 48 hours notice of intention to apply the binder, and approval shall be obtained before any spraying proceeds. The surface to be sealed shall be dry and no binder shall be applied whilst the pavement temperature is less than 25°C or during wet or rainy conditions, or when adverse weather conditions may prevail at any time during such work.

The binder shall be applied by an approved mechanical sprayer which has been tested for uniformity of transverse distribution and calibrated for overall rates of application in accordance with *Testing of Mechanical Sprayers of Bituminous Material (Austroads)*.

Where direct use of the mechanical sprayer is impracticable, the binder may be applied by using a hand lance supplied from the mechanical sprayer.

Binder application rates shall be determined by design, but should generally fall within the range of 1.6–2.6 litres residual bitumen per square metre measured at 15°C for 14 millimetres diorite and granite aggregate.

The binder shall be sprayed at the design application rate for the full length of each run, including start and finish lines. Appropriate precautions shall be taken to ensure no binder is applied beyond the start and finish lines or beyond other limits of the works. Bitumen laminated paper and any spilt bitumen shall be removed and disposed of in an approved manner.

The binder edge shall not deviate from the desired edge lines by more than 50 millimetres. The rate of deviation of the binder edge from the desired edge lines shall not exceed 1:400. All necessary precautions shall be taken to prevent the binder from adhering to any existing structure. Any damage or defacement shall be made good immediately after sealing in that section has been completed and no payment will be made for the cleaning work.

Kerbs shall be protected from bitumen overspray at all times by adequately covering the kerbs with polythene sheeting or similar approved material. Any kerbing marked by bitumen spray shall be made good by the contractor at the contractor's expense.

8.3.1.10.4. Aggregate

The aggregate shall be dry and free from dust and other foreign material at the time of application (pre-coated where necessary) and shall be uniformly spread over the sprayed area by means of an approved mechanical spreader.

All sprayed areas, with the exception of approved lapping strips, shall be covered with aggregate within 10 minutes of spraying the binder.

Additional aggregate may be applied by hand spreading to any bare or insufficiently covered areas to produce the required uniform cover.

Rate of application of the aggregate shall be determined by design, but shall not exceed 100 m² per cubic metre of 14 millimetres diorite or granite aggregate, controlled so that only sufficient is applied to give a uniform dense mat one stone thick.

The spread aggregate shall immediately be rolled into the binder using approved equipment and continued until the aggregate is well embedded in the binder and a uniform surface is obtained.

Any loose aggregate not incorporated in the seal after the completion of rolling shall be lightly swept from the surface in a manner that will not disturb the embedded aggregate and disposed of in an approved manner.

8.3.1.11. Two-coat seal

Application of a consecutive two-coat aggregate wearing course seal may be approved on submission of a fully detailed specification.

8.3.1.11.1. Measurement and recording of application rates

Binder

All loads of bitumen shall be sampled in accordance with the following Australian Standards:

- AS 1160: Bitumen Emulsions for Construction and Maintenance of Pavements;
- AS 2008: Residual Bitumen for Pavements; and
- AS 2157: Cutback Bitumen.

The following records shall be kept of all spray runs:

- spray width;
- start distance – finish distance;
- side of road (left or right);
- road temperature;
- bitumen temperature;
- volume of bitumen used; and
- average bitumen application rate.

Aggregate

The actual application rate of cover aggregate shall be calculated from the measured volumes spread and the actual area measured on site, and expressed as the number of square metres per cubic metre of aggregate.

8.3.1.12. Asphalt seal

8.3.1.12.1. General

Material for the wearing course shall be asphalt consisting of a combination of course aggregate, fine aggregate and mineral filler, uniformly coated and mixed with bituminous binder. The course shall be composed of materials to the specification detailed in section 3.4.12 – Asphalt and laid in accordance with AAPA/IPWEA specification.

8.3.1.12.2. Preparation of surface

Surface preparation, which includes sweeping, chipping and burning off rich fat areas, shall be carried out immediately before applying the tack coat. No asphalt shall be placed upon any area which contains an excess of binder in such quantity that there is any possibility of the binder coming to the surface of the new work.

8.3.1.12.3. Tack coat

The tack coat shall be laid in accordance with *AS 2734: Asphalt (Hot-mixed) Paving – Guide to Good Practice*. The bituminous emulsion shall comply with requirements of *AS 1160: Bituminous Emulsions for Construction and Maintenance of Pavements*. Anionic or cationic bitumen may be used depending on the site conditions and the time of the year. The application rate shall generally be sufficient to fully coat the surface with a residual binder content of 0.1 litres per square metre. The application rate may be varied or even omitted to satisfy particular conditions.

No asphalt shall be laid on the tack coat until the emulsion has broken and the water has substantially evaporated.

Any pools of tack coat which may have formed in surface depressions shall be brushed out. No traffic other than trucks delivering the asphalt shall be permitted to travel over the tack coat.

8.3.1.12.4. Placing of asphalt

Asphalt shall be laid upon a base which is clean and dry and in dry weather conditions with the atmospheric temperature above 10°C.

Prior to the delivery of asphalt to the construction site, the prepared base shall be cleaned of all loose or foreign material. The mixture shall be delivered on site in accordance with requirements of *AS 2150 – Hot Mix Asphalt* and *AS 2734 – Asphalt (Hot-mixed) Paving – Guide to Good Practice*, unless otherwise approved.

The mixture shall be spread to such line, level and camber detailed in the approved drawings in a single layer and compacted to give the average compacted thickness specified.

Thickness tolerance shall be +5 to –2 millimetres.

Spreading shall be by an approved self-propelled paver unless otherwise approved.

Mixing and placing asphalt will not be permitted when the surface of the road is wet, or cold winds chill the mix to the extent that spreading and compaction are adversely affected. The surface on which the asphalt is to be laid shall be free from ponding water.

The temperature of the mix when it is tipped into the spreader shall not be less than 135°C. Spreading shall proceed without undue delay and initial rolling of the mix shall commence at a temperature of not less than 120°C.

Uniform compaction to the required density shall be achieved before the temperature of the mix falls to 80°C.

The contractor shall ensure that the complete operation from mixing to final compaction is maintained within the specified temperature ranges.

8.3.1.12.5. Joints

Asphalt shall be spread in such a manner as to minimise the number of joints in the surface, and unless otherwise specified, the layout of joints shall conform to the following requirements.

Transverse joints

In any individual layer, transverse joints in adjoining paver runs shall be displaced longitudinally by not less than two metres.

Transverse joints in any layer shall be longitudinally displaced from any transverse joints in the underlying layer by not less than two metres.

Transverse joints shall be at right angles to the direction of spreading and cut to a straight vertical face for the full depth of the layer.

Longitudinal joints

Longitudinal joints shall be continuous, parallel and coincident within 150 millimetres of line of change of crossfall.

Longitudinal joints shall be offset by at least 150 millimetres from joints in underlying layers and located away from traffic wheel paths. Where feasible, longitudinal joints should be located beneath proposed traffic line markings.

Special care shall be taken in the forming of longitudinal joints at all intersections to avoid joint layouts and an appearance that would tend to misdirect traffic from the design travel paths.

Longitudinal and transverse joints shall be made in a careful manner, be well-bonded and sealed. Joints between old and new pavements, or between successive paver runs, shall be carefully made to ensure a thorough and continuous bond between old and new surfaces. The edge of the previously laid course shall be cut back to its full depth so as to expose a fresh surface, after which the hot mixture shall be placed in contact with it and raked to the specified depth and grade. Hot smoothers or tampers shall be employed to heat up the old pavement sufficiently without burning to ensure an effective bond.

Before placing the mixture against surfaces of longitudinal joints, kerbs, gutters, headers, junction pits or other surfaces, the contact surfaces shall be painted with a thin uniform coating of hot or cutback bitumen.

Where asphalt is required to match an existing surface, road or other fixture, the contractor shall place the material in such a manner as to provide a smooth riding surface across the junction.

8.3.1.12.6. Compaction of asphalt

The density of the asphalt as specified in section 3.4.12 shall be achieved using approved equipment and techniques and in accordance with *AS 2734: Asphalt (Hot-mixed) paving – Guide to Good Practice*.

The surface of the finished course shall be free from depressions exceeding five millimetres as measured with a three-metre straight edge.

8.3.1.12.7. Acceptance of asphalt seal

Testing

Asphalt testing shall be undertaken by a laboratory approved by the National Association of Testing Authorities. All tests shall be made on a single test lot which consists of one sample of loose asphalt extracted on site and six random core samples taken from the compacted asphaltic mat. A test lot may be a day's paving on the subdivision, the entire subdivisional stage or a selection of suspect pavement surfaces. All tests shall be carried out in accordance with the current Australian Standard and/or Main Roads WA standards.

Grading and bitumen content

Where the in situ job mix (aggregate grading, bitumen content and film thickness) fails to meet specification requirements, the work may be rejected; alternatively, with the agreement of the local government, the contractor shall provide to the local government, a five-year guarantee of asphalt performance from the date of paving. The contractor shall remove and

replace or overlay the entire area should the surface show signs of distress during the guarantee period.

When the results of an individual audit test or field testing shows that the mix does not meet requirements of the specification, the contractor's process control records shall be considered before a decision is made on an appropriate course of action.

Marshall characteristics

The Marshall characteristics (stability, flow and quotient) of a test lot, when tested in accordance with the current Australian Standard and/or Main Roads WA standards, shall form part of the determination for asphalt quality level.

The Marshall Quotient is the calculated ratio of stability to flow which represents an approximation of the ratio of load to deformation and may be used as a measure of the asphalt's resistance to permanent deformation under load.

If stability and flow are both within or equal to specification parameters, the asphalt is deemed conforming to specification and is acceptable.

If the stability or flow is less than the minimum specified value, the mix shall be deemed non-conforming.

Where flow exceeds the maximum value and the stability of the mix is high, the mix shall be considered conforming – providing the minimum Marshall Quotient value is met, and the flow does not exceed the maximum specified value by more than one millimetre.

Where the mix is non-conforming, the contractor shall arrange, at the contractor's expense, for the test lot to be removed and replaced with fresh asphalt and retested. Removal shall be carried out so as not to damage underlying layers or any road fixtures, such as gully gratings. Any such damage shall be repaired at the contractor's expense.

Density

When tested in accordance with Clause 9.4 of *AS 2734: Asphalt (Hot-Mixed) Paving – Guide to Good Practice*, the Characteristic Percent Marshall Density (Compaction) for any test lot of a minimum of six Marshall Density tests shall be deemed to be conforming if they attain the minimum value required for the mix type as shown in Table 8.1.

TABLE 8.1: DENSITY REQUIREMENTS

Marshall Blows	Characteristic Marshall Density (Rc percentage)
35	95.0
50	94.5
75	94.0

Asphaltic mat voids

Asphaltic mat voids is the relationship between maximum density and the mean core density of a sample test lot. It is calculated as follows:

$$AMV = \left(\frac{MD - CD}{MD} \right) \times 100$$

Where:

AMV = Asphaltic mat voids
MD = Maximum density of a test lot
CD = Mean core density of a test lot

In the case of 35 blow mixes where the asphaltic mat voids is greater than or equal to 2.5 and less than or equal to 10.0, it shall be deemed as conforming.

In the case of 50 blow mixes where the asphaltic mat voids is greater than or equal to 3.5 and less than or equal to 10.0, it shall be deemed as conforming.

In the case of 75 blow mixes where the asphaltic mat voids is greater than or equal to 3.5 and less than or equal to 11.0, it shall be deemed as conforming.

Where for any individual core the asphaltic mat voids is less than 3.0 for 75 blow mix or 2.5 for 50 blow or 2.0 for 35 blow mixes, additional testing shall be carried out to determine the extent of unstable asphalt. This asphalt shall be removed and replaced at the contractor's expense.

Thickness

When tested for thickness, any test lot of a minimum six core samples shall be deemed to be conforming if the mean core thickness is greater than the minimum specified thickness less 15 per cent.

Should any one of the six core samples be less than the minimum thickness specified by more than 20 per cent, then additional cores may be taken at the contractor's expense to establish that an area of thin pavement exists. Cores shall be taken at locations halfway between existing random cores and/or additional thickness determining cores to determine the extent of the thin pavement.

The contractor shall arrange, at the contractor's expense, to have the area of thin pavement overlaid or removed and replaced with fresh asphalt, and retested. Where it is necessary to overlay or remove and replace asphalt, minimum overlay or layer thickness shall not be less than 20 millimetres. Removal shall be carried out so as not to damage the underlying layers or any road fixtures, such as gully gratings. Any such damage shall be repaired at the contractor's expense.

Shape

Where the base pavement conforms with the appropriate standard, the shape shall conform to the values for freeways and highways as detailed in Table 9.1 of *AS.2734: Asphalt (Hot-mixed) Paving – Guide to Good Practice*.

8.3.1.13. Interlocking segmental pavements (block paving)

8.3.1.13.1. General

Work covered by this section comprises construction of brick or segmental concrete pavement surfaces. Preparation of the sub-grade, sub-base and base courses shall be as detailed in sections 2.3.1, 3.4.2 and 3.4.6 respectively. Pavement design for sub base and

base course shall be based on soaked CBR values.

8.3.1.13.2. Segmental paving blocks

Concrete paving units

Concrete paving units shall comply with the Concrete Masonry Association of Australia Specification for Segmental Paving Units (MA20).

Clay paving units

Clay paving units shall be fired at high temperature with exposed faces of an extruded, wire-cut or pressed finish and shall comply with the specification detailed in section 3.4.13 – Clay Paving Units.

8.3.1.13.3. Edge restraint

All interlocking segmental pavements shall be constrained on all edges by the construction of extruded concrete kerbing.

Extruded Concrete Kerbing. Edge restraints which separate interlocking block pavement from adjacent flexible pavement shall be flush with the top of the pavements and reinforced.

8.3.1.13.4. Bedding sand

The bedding course is the layer of sand between the base course and the paver. Bedding sand shall conform to sieve gradings in Table 8.2 below.

TABLE 8.2: BEDDING SAND

SIEVE SIZE	PERCENTAGE PASSING
9.52 mm	100
4.75 mm	90–100
2.36 mm	80–100
1.18 mm	50–90
600 microns	30–60
300 microns	10–30
150 microns	5–15
75 microns	0–5

The sand shall be non-plastic and shall not contain stones, clay lumps, organic matter, soluble salts, any other deleterious materials or any contaminants which can cause, or contribute to, efflorescence. The bedding sand shall have a uniform moisture content of between four and eight per cent by weight.

The bedding sand shall be spread loosely to a uniform depth and screeded to the nominated design profile with sufficient surcharge to allow for compaction to a uniform thickness of 30 millimetres, with a tolerance of ± 5 millimetres.

Bedding sand shall be screeded slightly ahead of the laying face and protected from pre-compaction. Any pre-compacted, water saturated or pre-screeded sand (left overnight) shall be removed and replaced with fresh loose sand.

8.3.1.13.5. Laying segmental paving blocks

All paving shall be laid by competent contractors accredited with proper quality control practices to ensure that their work is completed in accordance with the specified requirements.

Pavers shall be laid on uncompacted bedding sand and shall be placed so that units are not in direct contact with each other. Pavers shall be laid with a two millimetre (minimum) to three millimetre (maximum) gap between pavers. This two to three millimetre gap is an essential feature of the interlocking pavement.

All rectangular interlocking pavers shall be laid in a 45° herringbone configuration.

Full pavers shall be laid first and gaps at the pavement edge shall be neatly filled by saw cutting pavers to fit. Only full bricks or blocks shall be laid against all edge restraints.

8.3.1.13.6. Segmental paving block compaction

Immediately after laying, the pavers shall be compacted and brought to design level by not less than three passes of a vibrating plate compactor. The plate shall have sufficient area to simultaneously cover 12 pavers and pavers shall be protected from damage by the placement of a suitable pad between the vibrating plate and the pavement. Pavers damaged during compaction shall be immediately replaced. Compaction shall continue until a smooth surface is produced.

The top of compacted paving shall finish five to eight millimetres above abutting drainage inlet structures.

8.3.1.13.7. Joint filling

Immediately after compaction is completed and prior to acceptance of traffic, the two to three millimetre gaps between pavers shall be filled with dry joint filling sand which conforms to the following sieve grading:

TABLE 8.3: JOINT FILLING

SIEVE SIZE	PERCENTAGE PASSING
2.36 mm	100
1.18 mm	80–100
600 microns	65–90
300 microns	30–70
150 microns	10–35
75 microns	0–10

Joint filling sand shall be free of all soluble salts and contaminants likely to cause efflorescence.

Pavements subject to stormwater run-off, gutter flow or any other movement of water shall be protected from scouring. Scour protection shall be provided by means of dry cement grouting of the paver joints for a width of 300 millimetres from the edges of interlocking pavements. The joint filling grout shall consist of a 4:1 mix of 1.18 millimetres sieve dry sand and dry cement. The joint filling grout and the pavement shall be dry to ensure that the pavement is not stained by the grout.

The pavement shall receive one or more passes of a plate compactor and joints shall be completely refilled with sand in accordance with the previous sections.

8.3.1.13.8. Daily finishing of pavements

At the end of each day's laying of pavement, the total area of laid pavement shall be compacted and sanded in accordance with Sections 8.3.1.13.3 and 8.3.1.13.6 to ensure interlocking of the total pavement area. Suitable signage and barricades shall be erected to ensure that no traffic uses the area until compaction and sanding has been completed as specified.

8.3.1.13.9. Minimum paver size

Where pavers form part of the general surface and are not part of the border paving, the minimum size of a paver should be not less than one-third (1/3) of the size of a normal block. This applies to the standard paver size; however, where large sized pavers are used, the minimum size should be no less than a size that will not crack, break into smaller segments or chip on the edges. It may also be relevant to ensure that pavers are of a size enabling them to lock into position without cementing in place.

8.3.1.13.10. Permeable paving

General pavers (even clay pavers) in an interlocking pattern are not to be considered as being permeable. With time, it is possible that joints become less permeable and surface prevents water infiltration.

There are specific pavers that can be used as a permeable surface and assist with drainage and reduction of run-off of water from paved surfaces. Generally, corners have a 20 by 20 millimetre chamfer to allow for infiltration.

8.3.1.13.11. Acceptance of interlocking segmental pavements

The completed pavement shall satisfy the following criteria prior to acceptance:

- the completed pavement surface shall be constructed in accordance with design profiles and shall drain freely;
- pavers shall not be cracked, damaged or distorted;
- a maximum of one per cent of spalled pavers may be accepted;
- surface texture shall be uniform and shall be free from abrasion or wear;
- colour of the pavement shall be uniform and any colour variations in batches of pavers shall be eliminated by batch mixing to produce a uniform colour grading;
- the pavers shall be laid such that the maximum deviation from the bottom of a 3 metre straight edge shall be 10mm and the level of adjacent pavers shall not differ by greater than 2 mm; and
- during the defects liability period, the stability of the pavement to be such that creep movements by the bricks do not create joints greater than 4mm in width nor affect the location or stability of the kerbing or adjacent bituminised pavements. The sand filter should be stable so as not to be eroded under normal conditions. Rotation of bricks to be minimal with no other detrimental effects permitted.

8.3.1.14. Extruded concrete kerbing

8.3.1.14.1. General

Road kerbing shall be constructed of extruded concrete kerbing using an approved extrusion machine equipped with an automatic levelling device. Kerbing to small radii that cannot be placed with the extrusion machine shall be cast in situ to the same cross-section as the extruded kerbing.

8.3.1.14.2. Materials

All concrete used shall be supplied in a ready mixed state and shall comply with requirements of *AS 1379: Specification and Supply of Concrete*. All concrete used in the works shall develop a minimum compressive strength of 32 MPa at 28 days with a maximum slump of 90 millimetres.

Where flush kerbing is to be used which could carry loadings on a regular basis from traffic, the strength should be to 32 MPa at 28 days with steel reinforcing.

8.3.1.14.3. Preparation and placement

The road surface shall be thoroughly swept clean of all loose material prior to the kerb being extruded to ensure the maximum bond between the kerb and pavement material.

The finished alignment shall conform to requirements of the approved drawings.

The first 150 millimetres of any new pour shall be cut away and removed. Any gap between the old and new work shall be filled by hand-placing, rodding and shaping of the concrete until a uniform shape and finish has been obtained.

8.3.1.14.4. Tolerances

The finished product shall be true to the dimensions specified and shall be to a smooth finish. Tolerances for kerbing shall be in accordance with the following requirements:

- the top surface of the kerb shall be parallel to the ruling grade of the pavement and free from depressions exceeding five millimetres when measured with a three-metre straight edge;
- level ± 5 millimetres;
- line ± 10 millimetres to face of kerb or gutter line; and
- cross-section dimensions ± 5 millimetres.

8.3.1.14.5. Contraction joints

Contraction joints shall be constructed at 2.5-metre intervals along the new kerblines. Contraction joints shall be five millimetres wide and shall be cut through the kerb above the road surface level with an approved tool immediately after extrusion. Care shall be taken to avoid disturbing joint edges, with any disturbance made good immediately.

8.3.1.14.6. Expansion joints

Not less than 24 hours after kerb placement, expansion joints shall be formed by completely cutting through the kerb with a suitable cutting wheel at five-metre intervals along the new kerblines, at sides of drainage gullies, at tangent points of all small radius horizontal curves and at junctions with existing kerbing. Expansion joints shall be 10 millimetres wide.

Each expansion joint shall be filled with an approved butyl mastic compound filler and foam or polyurethane backing.

All joints should be cut prior to the laying of asphalt unless the local government has approved designs where the kerbing is laid on the asphalt running surface.

8.3.1.14.7. Curing

Within two hours of surface finishing, all exposed faces of the completed kerb shall be protected from moisture loss for a period of not less than four days after extrusion by covering with plastic sheeting or spraying with an approved curing compound.

8.3.1.14.8. Backfilling

Backfilling to the kerbing shall be placed after curing the concrete and acceptance of the kerbing. Backfill material shall be free draining sand or a similar material to the local topsoil, free from debris and compacted to a thickness not less than that of the surrounding natural surface.

8.3.1.14.9. Keyed kerbing

Where keyed kerbing is specified on approved drawings, excavation of the base shall be by an approved method. The primed road surface beyond the line of the face of kerb shall not be disturbed.

Provision shall be made in the base key for extension of the expansion joint through the complete kerb section.

8.3.1.15. Concrete footpaths and shared paths

8.3.1.15.1. General

The developer shall be responsible for the construction of footpaths or dual-use paths in accordance with the approved drawings.

8.3.1.15.2. Materials

The pavement shall be constructed using pre-mixed concrete complying with *AS 1379: Specification and Supply of Concrete*, and the following requirements:

TABLE 8.4: PAVEMENT CONSTRUCTION

Item	Value
Compressive Strength	Minimum 25 MPa at 28 days
Aggregate Size	Maximum 20 mm
Slump	Maximum 75 mm at delivery

High early strength additive in accordance with *AS 1478: Chemical Admixtures for Concrete*, may be used. No other additives or admixtures of any kind shall be used without written

approval.

8.3.1.15.3. Preparation and placement

The excavation, fill, backfill and trimming shall be carried out to required levels and grades and surplus materials resulting from the works shall be removed and disposed of in an approved manner.

Earthworks shall be carried out in accordance with approved design alignments, grades and levels.

The sub-grade shall be evenly graded and free of rocks, organic matter and any other deleterious material. The sub-grade shall be compacted so as to provide even compaction to a depth of 450 millimetres. Compaction shall be not less than 98 per cent of maximum dry density when measured in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

Before placement of concrete, the boxed-out alignment shall be watered to provide a thoroughly moistened, but not flooded, sub-grade.

The concrete pavement shall be consolidated using a mechanical vibrating screed spanning the width of the path and supported by rigid side forms.

After consolidation, the concrete shall be screeded perpendicular to the side forms to provide a straight surface between forms and a smooth, even surface profile along the path alignment.

To prevent premature drying of the surface of screeded concrete in hot weather conditions, addition of water to the surface of the screeded concrete using a fog spray may be permitted. Approval of the addition of water in this manner is conditional upon the integrity of the mix being maintained in accordance with its specification.

The finished concrete pavement shall have a non-slip, broomed surface. The broomed grooving (approximately two millimetres deep) shall be aligned at 90° to the edge of the pavement.

For dual use paths, transverse lips or ridges of concrete, such as may be formed during jointing works, are not permitted and the broomed finish surface shall be maintained at joints.

Dry cement shall not be added to the surface of the pavement.

8.3.1.15.4. Expansion joints

Transverse expansion joints shall be placed at five-metre intervals for footpaths and dual use paths along the full length of the pavement. The joints shall be 10 millimetres wide and extend the full depth and width of the pavement, and be filled with approved expansion joint filler. The joint filler shall not exude bituminous material when compressed in hot weather. The following materials are approved:

- Non-Porite – Bitumen impregnated by cold solvent process
- Expandite – Flexicell
- Meljoint – Melcann.

Other expansion joint fillers may be approved such as lock joints. Expansion joints shall be installed where the pathway abuts kerbing, utility service structures, drainage pits and/or

existing crossovers.

8.3.1.15.5. Contraction joints

Transverse contraction joints shall be placed at 1.25-metre intervals for footpaths and 2.5-metre intervals for dual use paths, equally spaced between expansion joints. The contraction joint shall be aligned at 90° to the pavement alignment and be a minimum of five millimetres deep, and provide a vertical plane of weakness through the pavement. The joint shall be made in plastic concrete by depressing an approved grooving tool into the surface of the pavement.

8.3.1.15.6. Edge treatment

Edges of the footpath shall be polished smooth and rounded using an edger of radius 10 millimetres. Edges shall be free from irregularities of alignment and/or level. Edges of the dual use path shall retain the non-slip broom finish surface and shall not be rounded.

8.3.1.15.7. Protection

The contractor shall provide and maintain protection of pavement against damage of every kind during the period of setting and curing of the concrete.

The contractor shall be responsible for appropriate signage and public safety.

8.3.1.15.8. Backfilling and reinstatement of the verge

The verge shall be backfilled to the established grading from the top of kerb to the road reserve boundary and flush with the edges of the pavement using material excavated from the boxed-out alignment of the pathway which is free of foreign material. Residual and unwanted material shall be removed off site in an approved manner.

The contractor shall reinstate all existing verge features and treatments to their original condition.

8.3.1.16. Asphalt pathways

8.3.1.16.1. General

Dual use paths using an asphalt wearing course shall be constructed to the lines, levels and pavement design as detailed on the approved drawings.

8.3.1.16.2. Sub-grade

The sub-grade shall be boxed out and compacted to provide even compaction to a depth of 450 millimetres. Compaction shall not be less than 95 per cent of maximum dry density when measured in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

8.3.1.16.3. Base course

Crushed limestone rubble shall be laid in accordance with section 3.4.2 or fine crushed rock in accordance with section 3.4.6. Minimum thickness shall be 150 millimetres and width shall extend 200 millimetres beyond the edge of the asphalt wearing course.

8.3.1.16.4. Wearing course

A 30 millimetre thick wearing course of seven millimetres nominal aggregate asphalt shall be laid in accordance with section 3.4.12.

8.3.1.16.5. Edge restraints

A 100-millimetre wide and 150 millimetres deep concrete edge restraint shall be constructed to the outside edges of asphalt pavements in areas subject to soil erosion and weed intrusion (public open space and reticulated verges). The surface of the edge restraint shall be non-slip broomed finish and shall be flush with the surface of the asphalt pavement.

Use of alternative edge restraints such as paving blocks or similar materials may be approved.

8.3.1.17. Street name plates

8.3.1.17.1. Location

Street name plates shall be erected at all road junctions and intersections as indicated on approved drawings and in accordance with *AS 1742.5: Street Name and Community Facility Name Signs*.

8.3.1.17.2. Dimensions

Street name plates shall be extruded 'I' sections constructed from non-corrosive aluminium not less than three millimetres thick. Plates shall have a minimum depth of 150 millimetres and a minimum length of 500 millimetres. Minimum letter height shall be 100 millimetres.

8.3.1.17.3. Colour

Plate colours shall be in accordance with the local government's colour requirements. Background colour application shall be reflectorised and applied so as to cover the entire plate surface.

8.3.1.17.4. Legend

Plate legend lettering and numerals shall be in accordance with *AS 1744: Forms of Letters and Numerals for Road Signs*.

8.3.1.17.5. Mounting

Mounting brackets shall be adjustable clamps, fixed to both top and bottom of the name plates and suitable for attachment to approved structures.

8.3.1.17.6. Post colour and fixing

The street name plate support pole shall be 57 millimetres Outside Diameter galvanised unless otherwise approved. The galvanised steel post may be either retained as galvanised or painted in accordance with the local government's colour requirements.

The post shall be set vertically and located on the 2.75-metre street alignment (boundary offset distance).

The lowest part of the street name plate shall be a minimum of 2.7 metres and a maximum of

three metres above the prevailing verge ground level.

The post shall be set into a concrete footing of sufficient dimension and in such a manner as to ensure rigidity of the post and prevent rotation.

8.3.1.18. Stormwater drainage

8.3.1.18.1. General

Drainage shall be set out and constructed in accordance with alignments, levels and grades shown on the approved drawings.

8.3.1.18.2. Materials

Pipes

Drainage pipes within the road reserve shall be reinforced concrete pipes unless otherwise approved by the local government.

All pipes shall conform to the appropriate Australian Standards:

- AS 4058 Precast Concrete Pipes (Pressure and Non-Pressure);
- AS 1712 Fibre Cement Pipes;
- AS 1761 Helical Lock-seam Corrugated Steel Pipes;
- AS 1762 Helical Lock-seam Corrugated Steel Pipes – Design & Installation;
- AS 2566 Plastic Pipe laying Design;
- AS 2439.1 – 2007 Perforated plastics drainage and effluent pipe and fittings – Perforated drainage pipe and associated fittings.

Sub-soil drainage pipes shall conform to the above standards, and except in the case of reinforced concrete pipes, shall have 250 x 5 millimetre slots cut through the pipe on alternate sides at 100°, so that total length of slots is approximately half that of the pipe.

Reinforced concrete pipes shall be of spigot and socket type unless otherwise approved.

Strength class for reinforced concrete and fibre-reinforced cement pipes shall be Class 2 unless otherwise approved.

Concrete

Concrete used for in situ work shall conform to *AS 3600: Concrete Structures*, and be provided either by a pre-mix concrete supplier conforming with *AS 1379: Specification and Supply of Concrete*, or mixed on-site, using materials and equipment as approved.

Concrete for pits, headwalls, end walls and keels shall have a minimum compressive strength of 20 MPa at 28 days.

The slump shall not exceed 70 millimetres or be less than 30 millimetres.

Maximum size of aggregate shall be 20 millimetres.

Cement

All cement used shall be Portland cement in accordance with *AS 3972: Portland and Blended Cement*, and obtained from an approved manufacturer.

Cement shall be delivered to the site fresh and in sealed bags and stored in a weatherproof shed until such time that it is to be used. Any bag showing signs of deterioration or setting shall be rejected.

Concrete aggregate

Fine aggregate shall be well-graded, clean, sharp and free from clay and organic impurities in accordance with *AS 2758.1: Concrete Aggregates*.

Coarse aggregate shall be crushed granite, diorite or basalt clear and free from all impurities and dust in accordance with *AS 2758.1: Concrete Aggregates*.

Water

Water for use in concrete and mortar shall be of potable quality, free from any impurities harmful to concrete, mortar or steel.

Sand

Sand for mortar shall be crushed stone or natural sand – free from all deleterious substances with a uniform grading.

Sand for bedding or backfilling shall be clean sand – free from roots, clay or any deleterious matter.

Steel

Steel-reinforcing fabric and bars for concrete shall comply with the requirements of the following Australian Standards:

- AS 1302 Steel Reinforcing Bars for Concrete;
- AS 1303 Steel Reinforcing Wire for Concrete; and
- AS 1304 Welded Wire Reinforcing Fabric for Concrete.

Bricks

Bricks shall be hard, well-burnt, pressed or wire-cut clay brick in accordance with *AS/NZS 4455: Masonry Units and Segmental Pavers* and *AS 3700: Masonry in Buildings*. The bricks shall have a minimum ultimate strength of 30 MPa, and absorb not more than 10 per cent of their own weight of water when saturated.

Bricks shall be of uniform shape and size, carefully conveyed and unloaded at the site. No chipped or broken bricks shall be used, and pieces of brick may only be used where necessary as closures.

Calibrated aggregate

Calibrated aggregate (granite or diorite) shall be free from roots, clay and foreign material and conform to the following sieve grading:

TABLE 8.5: CALIBRATED AGGREGATE

SIEVE SIZE	PERCENTAGE PASSING
19.0	100
13.2	98–100
9.5	80–90
6.7	53–40
2.4	5–14
0.6	0–3

Junction pit liners

Junction pit liners shall be circular precast concrete liners from approved manufacturers capable of withstanding anticipated design loadings.

Junction pit covers

Junction pit covers located in the carriageway shall be equipped with purpose-built reinforced concrete surrounds a minimum of 150 millimetres thick and fitted with an approved cast iron frame and lid.

Junction pit covers located elsewhere in the road reserve shall be equipped with a purpose-built reinforced concrete surround 150 millimetres thick.

All junction covers shall be equipped with a 600-millimetre square or circular access point with tapered inserts. Both cover and insert shall have approved lifting points installed.

Junction pit covers located in easements shall be of a thickness as determined by design loading but be not less than 100 millimetres.

Grated covers

Grated cover surrounds shall be 150 millimetres thick reinforced concrete with a minimum compressive strength of 20 MPa at 28 days.

The steel insert shall be contained within a steel surround firmly embedded in the concrete and hinged on one side to permit opening with the steel surround protruding above the concrete surround by 25 millimetres.

Grated covers with parallel bars shall be installed with the bars at 90° to the kerbline.

All grated gully covers shall be of heavy duty construction and shall be load tested to full Austroads Highway Loading Conditions 90kN Wheel Load applied as per *AS 1597.1: Small Culverts*. Where there is any likelihood of cycle traffic crossing the road perpendicular to the centreline of the road in the vicinity of gullies, 25 x 3 millimetres mild steel straps shall be welded to the bars at 100-millimetre centres across the full length of the grate or other approved method.

Step irons

Steel step irons shall be installed in the walls of all junction pits over one metre deep at approximately 300-millimetre spacings or at every fourth course of brickwork. Step irons shall be of an approved design with a minimum diameter of 12 millimetres. The surface of these steps shall be adequately protected against rust by galvanising or similar treatment.

8.3.1.18.3. Installation of junction pits and gullies

Junction pits shall be constructed from either circular precast concrete sections with a minimum internal diameter of 1050 millimetres or the square or rectangular equivalent.

All junction pit covers shall overhang the external edge of the liner or walls by a minimum of 100 millimetres. Covers of all junction pits shall be flush with either the pavement level or the finished ground level and set at appropriate crossfalls where necessary.

Junction pits shall be embedded on sand compacted to not less than 95 per cent of the maximum dry density when tested in accordance with *AS1289: Methods of Testing Soils for Engineering Purposes*.

Gullies shall be of either a side entry pit design, a steel grate design or other approved design.

8.3.1.18.4. Headwalls

Where a piped drain interfaces with an open drain, a suitable headwall structure shall be provided to prevent entry of loose material into the pipe and erosion of surrounding ground. In the case of pipes exceeding a 600-millimetre diameter, suitable structures shall be fitted to the inlet of the pipe drainage system to prevent access. A Gross Pollutant Trap may be required prior to the head wall depending where the stormwater is entering a water sensitive area.

All headwalls shall be constructed using either concrete with 20 MPa compressive strength, mortared stonework or brickwork. The headwall should be designed to aesthetically fit with the surrounding environment.

For mortared stonework, each stone shall weigh in excess of 10 kilograms and the largest dimension of any stone shall not exceed 1.5 times its least dimension.

Headwalls located on outlet pipes exceeding 300 millimetres diameter shall include suitable erosion protection in the form of aprons and edge beams.

8.3.1.18.5. Excavation

The ground shall be excavated to the dimensions and depth required for safe construction and installation of pipe work. Trenches shall be cut to the line, depth and gradient required. If any pipe trench is excavated deeper than required, the extra depth shall be filled with an approved material and compacted to a density exceeding that of the natural surrounding material.

Width of the trench shall be kept to the minimum, consistent with bed width requirements and the need for adequate working space and shoring.

Any excavation carried out on public or private roads shall be arranged so that pedestrian and vehicle access are maintained at all times cause minimum disruption. If work requires road closure, approval of the local government shall be obtained.

Excavation for junction pits and gullies shall be completed to the approved depth and to dimensions allowing the use of adequate shoring or battered sides.

Free water in excavations shall be controlled to a level sufficiently low so as not to interfere with construction works. Such control shall be exercised by pumps or a well point dewatering

system. Pumps shall be operated in such a manner to cause a minimum of noise disturbance to the local neighbourhood.

8.3.1.18.6. Shoring

Excavation of trenches with irregular shaped sides shall be avoided. Where this occurs or if there is any danger of sides collapsing, approved shoring shall be placed. Approved shoring shall be used where the drain is within two metres, plus drain depth to a building or load bearing structure.

8.3.1.18.7. Blasting

Excavation in rock or hard soil may be carried out by blasting, and a blasting permit shall be obtained from the local government.

All explosives shall be stored and handled in accordance with the requirements of the *Mines Regulation Act 1946*, the *Explosives and Dangerous Goods Act 1961*, *AS 2187: Explosives – Storage, Transport and Use* and *AS 2188: Explosives – Relocatable Magazines for Storage*.

Blasting shall only be carried out by a person holding a current Western Australian Mines Department Shot Firer's Permit. The shot-firer shall be responsible for repair of damage, legal liability or anything that may arise from the blasting operators. Approved screens, shields and matting are necessary to prevent rock, stones, earth, debris or other material from scattering or blowing from the immediate site of blasting shall be provided.

8.3.1.18.8. Pipe laying and backfilling

No pipes shall be laid on filled ground until such ground has been compacted to a minimum of 95 per cent of its maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

Extra excavation shall be taken out at the bottom of the trench at all joints, so that pipes will be bearing uniformly on the foundation for their entire length.

Bedding of pipes shall be carried out evenly and thoroughly. Piling, keeling or importation of bedding material may be required. In the case of rock occurring in the bottom of the trench, the trench shall be excavated to a depth of 75 millimetres below the depth required for the pipe. The trench shall be backfilled to grade with approved material and compacted to specification.

During construction, no sand or other material shall be allowed to enter the drainage system. Junction pits shall be covered to prevent this occurring.

No part of the works or any length of pipes or fittings shall be covered until they have been inspected, tested and approved by the local government.

All backfilling shall be placed in such a way that no pipes or joints or other works are displaced or damaged.

Backfilling up to 300 millimetres above the top of pipes shall be of approved readily compactable material such as sand or fine gravel, and shall be free from stones retained on a 25-millimetre sieve, clay lumps, building rubbish, tree roots and other vegetable matter.

Backfilling of trenches and excavations shall be carried out as far as possible with excavated

material, except that no organic and other materials, articles or substances which might cause uneven settlement or voids shall be used. Former topsoil shall be used as the top layer of backfilling.

Backfilled material in the pipe trench shall be thoroughly rammed and compacted in 150-millimetre layers using appropriate equipment. Required compaction shall be at least the density of the adjoining soil in situ.

Immediately after a trench has been filled, the surface shall be restored and all surplus earth and other materials removed and disposed of in an approved manner.

The surface of fields, grassland and all other similar land shall be restored to the condition in which it was found. Surface soil and sub-soils shall be stored separately and later reinstated to their natural order. All areas disturbed by drainage works shall be stabilised in accordance with section 2.2.1.5.3 Soil Stabilisation.

8.3.1.18.9. Excavation in roadways

Backfilling and interim restoration of trenches in roadways shall be completed immediately after acceptance of drainage work. Material used for backfilling pipe trenches and pits in roadways shall be a clean granular material and compacted to a maximum of 300-millimetre layers to a density not less than 98 per cent of the maximum dry density when tested in accordance with *AS 1289: Methods of Testing Soils for Engineering Purposes*.

For trenches in existing roadways, the top 280 millimetres of trench shall be backfilled with limestone to surface level and compacted to 98 per cent of the maximum dry density tested in accordance with AS 1289. The trench surface shall be kept in safe and reasonable condition for traffic until permanent road reinstatement is carried out. All subsidence shall be made good with fresh approved material. Unless otherwise stated, interim restoration and maintenance of private roads or right of ways shall be carried out as if they were public roads.

Final restoration requires removal of the top 130 millimetres of limestone and replacement of base course material (100 millimetres) and asphalt wearing course (25 millimetres minimum) in accordance with sections 3.4.2, 3.4.6 and 3.4.12 respectively.

8.3.1.18.10. Open drains

Open drains shall be formed to lines and levels shown on the approved drawings.

Excavated material from open drains shall be disposed of in an approved manner.

Over-excavation is corrected by filling with material in situ and compacting to a density exceeding that of the natural surrounding material.

8.3.1.18.11. Stone pitching

Surfaces shall be protected by hand-placed pitching stones. Stones shall be hard, sound and durable and generally weigh in excess of 10 kilograms each. The largest size of any stone shall not exceed 1.5 times its least dimension. Geofabric may be used to prevent subsidence or wash-outs.

Stones shall be set on a sand bed in a close fitting pattern, watered and rammed into position.

Where specified as mortared stone pitching, joints between stones shall be raked for their full depth and grouted with three parts sand to one part Portland cement mortar.

8.3.1.19. Subdivisional materials sampling

Sampling regimes for most subdivisional materials can be assessed using methods suggested by Main Roads WA, which set out sampling a basic testing method for items such as:

- numerical testing methods
- soils
- aggregates
- in situ
- concrete or cement
- bituminous materials or oils
- road making materials
- chemicals.

These methods can be found in the materials engineering section at <http://standards.mainroads.wa.gov.au/NR/mrwa/frames/standards/standards>

Module No. 9

Glossary, References and Further Reading

9. Module No. 9 – Glossary, References and Further Reading

9.1. Glossary of terms

The following meanings apply to these guidelines.

Western Australian Planning Commission (WAPC)

The agency delegated with powers to approve and impose conditions upon subdivision development within Western Australia, as outlined by the *Planning and Development Act 2005*.

Local government

The local government representing the interests of the local community, when a local government is nominated by the WAPC, to administer and clear certain conditions of subdivision imposed by the WAPC.

Subdivider/developer

The subdivider/developer is the owner(s) of, or the company nominated to improve, the land proposed for subdivision and development. The subdivider/developer is responsible for engaging consultants and contractors responsible for investigating, designing and construction of the subdivision.

Planning officer

A planning officer is normally given delegated responsibility by the local government. The planning officer is responsible for administering any WAPC subdivision non-engineering conditions and is the coordinating officer for the local government on each subdivision approval or clearance.

Engineering Officer

An engineering officer will be an engineering employee or engineering consultant for the local government. The engineering officer is responsible for administering subdivision conditions relating to engineering.

The engineering officer will inform the planning officer of progress towards the completion of engineering conditions.

Consulting surveyor

The consulting surveyor is a licensed surveyor engaged by the developer to prepare the deposited plan, for submission when requesting clearance after all WAPC conditions of subdivision have been satisfied.

Consulting engineer

The consulting engineer is a professional employed by the Developer to meet the requirement of the local government pursuant to the *Local Government Act 1995* and associated legislation.

The consultant engineer is to be eligible for corporate membership of the Institution of Engineers Australia or registration in the National Professional Engineers Register and is responsible to the developer for the detailed investigation and design of the civil engineering works to satisfy the relevant WAPC conditions of subdivision to the approval of the local government.

Superintendent

The superintendent is the person employed by the developer to oversee the progress and standard of construction by the contractor. The consultant engineer frequently undertakes the role of superintendent.

The superintendent is responsible to the developer for ensuring that the contractor completes the subdivision works to the approved drawings and specifications.

Contractor

The person employed by the developer to construct the subdivision works in accordance with the approved drawings and specifications.

The contractor is responsible to the developer, and carries out the works overseen by the superintendent. There is no contractual or supervisory relationship between the contractor and the local government

Construction commencement date

Construction commencement date is the date on which first stage of construction, which is generally clearing of vegetation for works to be undertaken.

Maintenance bond

Where the developer and the local government negotiate that the developer will maintain certain stages or parts of the subdivision for a period, the two parties may agree to a maintenance bond in case the developer does not carry out the maintenance works within the agreed time lines for such works. This type of bond generally applies to landscaping rather than roadworks and drainage works.

Maintenance period

This period is also a negotiated period between the developer and the local government for maintaining certain aspects of the works for an agreed period. Again, this generally applies to subdivision where major landscaping or streetscape works have been carried out but need to be maintained to assess the rate of attrition of plants over multiple summers.

Payment in-lieu

Payment in lieu is generally associated with subdivisions where the developer cannot develop if land for public open space was to be given up. This is generally specified in the Department of Planning conditions, so the development can proceed but the local government receives a payment in lieu of areas of public open space.

9.2. References and additional reading

Module 1 Legal framework and contract administration

- A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities, Department of Environment and Conservation, March, 2011.
- Regarding Planning for Bushfire Protection and fire protection standards: FESA Manager Bushfire and Environment.
- Regarding WAPC Policy DC 3.7 and the referral process: FESA Manager Fire Services Planning.

Module 2 Site preparation guidelines

Module 3 Road guidelines

- Main Roads WA, Methods for Sampling and Testing of Asphalt.
-
- Technical Specification, tender form and schedule for supply and laying of hot asphalt road surfacing (IPWEA and AAPA [WA Branch], April 2002).

Module 4 Drainage management guidelines

- A Blueprint for Water Reform in Western Australia: Final Advice to the Western Australian Government (Water Reform Implementation Committee, Perth Western Australia, 2006);
- Disposal of Water (paper by Geoff Cocks for IPWEA State Conference, March 2007);
- Government's Response to the Report of the Irrigation Review Steering Committee, (Department of the Premier and Cabinet, Perth Western Australia, 2005);
- Guidelines for ecological water requirements for urban water management (in preparation) (Department of Water, Perth, Western Australia);
- Healthy Rivers Action Plan (Swan River Trust, 2008), and the draft SRT/D4 Stormwater Management Policy (Swan River Trust, 2009),
- Peel–Harvey coastal catchment Water Sensitive Urban Design Technical Guidelines 2007 (Peel Development Commission, Mandurah) (available online);
- Peel–Harvey Water Sensitive Urban Design Local Planning Policy 2006 (Peel Development Commission, Mandurah) (available online);

- Protecting Wetlands using Stormwater Management (Department of Environment and Conservation);
- State Planning Strategy (WAPC, Perth Western Australia, 2006);
- Stormwater management manual for Western Australia 2004–2007 (Department of Water, Perth Western Australia);
- The Decision Process for Stormwater Management in WA (Department of Water, Perth Western Australia, 2009).

Module 5 Streetscape guidelines

Module 6 Public open space

AS 1012	Methods of Testing Concrete.
AS 1074	Steel Tubes and Tubular for Ordinary Services.
AS /NZS 1111	ISO Metric Hexagon Commercial Bolts and Screws.
AS /NZS 1112	ISO Metric Hexagon Nuts, Including Thin Nuts, Slotted Nuts and Castle Nuts.
AS 1273	Unplasticised PVC (UPVC) Downpipe and Fittings for Rainwater.
AS 1397	Steel Sheet and Strip Hot Dipped Zinc Coated or Aluminium/Zinc Coated.
AS /NZS 1554	Structural Steel Welding.
AS /NZS 1580	Paints and Related Materials – Methods of Test.
AS /NZS 1594	Hot Rolled Steel Flat Products.
AS 1604	Timber – Preservative Treated – Sawn and Round.
AS 1722	Pipe Threads of Whitworth Form.
AS 1725	Galvanized Rail-less Chain wire Security Fences and Gates.
AS /NZS 1734	Aluminium and Aluminium Alloys – Flat Sheet, Coiled Sheet and Plate.
AS 1742	Manual of Uniform Traffic Control Devices.
AS 1743	Road Signs – Specifications.
AS 1744	Forms of Letters and Numerals for Road Signs.
AS /NZS 1906	Retro reflective Materials and Devices for Road Traffic Control Purposes.
AS 2009	Glass Beads for Road Marking Materials.
AS 2423	Galvanized Wire Fencing Products.
AS /NZS 2433	Plastics – Method for Exposure to Ultraviolet Lamps.
AS 2700	Colour Standards for General Purposes.
AS 3730.14	Guide to Properties of Paints for Buildings – Undercoat – Solvent Borne – Exterior/Interior.
AS 4025.1	Paints for Equipment Including Ships – Solvent – Borne - Interior and Exterior – Full Gloss Enamel.
AS 4049.2	Paints and Related Materials –Thermoplastic Road Marking Materials.
AS/NZS 4049.3	Paints and Related Materials – Road Marking Materials – Waterborne Paint – For use with Drop on Beads.
AS/NZS 4680	Hot Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles.
APAS 0041/4	Road Marking Paint, Thermoplastic.
APAS 0041/5	Road Marking Paint, Water Borne.
HB 136:2004,	Waterwise Land Development Guidelines, Water Corporation. Safety aspects – Guidelines for child safety.

AS/NZS 4360:2004, Risk management.
AS 4989–2006, Trampolines – Safety aspects:
http://www.saiglobal.com/Publishing/Shop/Promotions/Child_safety_Standards.htm – top#top.
AS/NZS ISO 8124.1:2002, Safety of toys – Safety aspects related to mechanical and physical properties (ISO 8124.1:2000, MOD).

Module 7 Standard drawings guidelines

Module 8 Construction guidelines

AS 2734: Asphalt (hot mixed) Paving – Guide to good practice.

9.3. Abbreviations

Common abbreviations and acronyms used in these Guidelines are listed below.

Abbreviation/Acronym	Detail
AAPA	Australian Asphalt Pavement Association
ARI	Annual Recurrence Interval
AS	Australian Standards
Austrroads	Association of Australian and New Zealand Road Transport and Traffic Authorities
ESA	Equivalent Standard Axles
ESL	Emergency State Locations
FESA	Fire and Emergency Services Australia
GST	Goods and services tax
IPWEA	Institute of Public Works Engineering Australia
Main Roads WA	Main Roads Western Australia
MRS	Metropolitan Regional Scheme
SAT	State Administrative Tribunal
WAPC	Western Australian Planning Commission

ITEM NO: 9.2

TRANSPORT ASSESSMENT GUIDELINES

WAPC OR COMMITTEE: Statutory Planning Committee

REPORTING AGENCY: Department of Planning
REPORTING OFFICER: Senior Planning Officer, Strategy, Policy and Projects
AUTHORISING OFFICER: Planning Director, Infrastructure and Land Use
Coordination
AGENDA PART: A
FILE NO: 406/1/1/26PV
DATE: 06 June 2012
ATTACHMENT(S): Transport Assessment Guidelines

RECOMMENDATION:

That the Statutory Planning Committee requests the Department of Planning to initiate the update and review of the Transport Assessment Guidelines prior to its endorsement.

SUMMARY:

- The requirement to develop guidelines for transport impact assessment was mandated in 1999 by the then Department of Transport and Ministry for Planning.
- The Transport Assessment Guidelines (referred herein as the Guidelines) were developed by the then Department of Planning and Infrastructure and included significant stakeholder consultation.
- The Guidelines were published on the Western Australian Planning Commission (WAPC) web site in 2006 as a version for “trial and evaluation”.
- The Guidelines provide detailed advice on the transport information to be submitted in support of planning applications, consistent with the requirements of Liveable Neighbourhoods and associated DC policies.
- The Guidelines have been used and referred to by developers and their transport consultants as well as Local and State Government officers.
- They are quoted in other WAPC documents such as the Metropolitan Region Scheme – Instrument of Delegation (DEL 2011/02 Powers of Local Governments).
- It is recommended that the Department of Planning (DoP) reviews and updates the Guidelines and eventually deletes its status from being “for trial and evaluation”.

BACKGROUND:

In 1999, the then Department of Transport and Ministry for Planning identified a lack of consistency in transport information that was provided by applicants in support of development proposals. In 2006, after a lengthy consultation, the Guidelines were adopted by the WAPC for trial and evaluation, with the intent of adopting the Guidelines as a working document within 12 months. The Guidelines have since been published and made available to the public, at the WAPC's web site, as a "trial and evaluation" document.

LEGISLATION / STRATEGIC PLAN / POLICY:

Legislation *Planning and Development Act 2005*

Section: Part 3

Strategic Plan

Strategic Goal: 2 - Planning

Outcomes: State-wide integrated policy frameworks

Strategies: 1. Develop State and Regional Policy frameworks

Policy

Number and / or Name: State Planning Policy 1 – State Planning Framework

DETAILS:

Over the last six years, there has been an informal growing demand by transport planning practitioners to adopt the Guidelines as a working document. The majority of development applications submitted to the WAPC for consideration are now referring to and acknowledging the Guidelines as a source of information for the applicant's supporting transport assessment.

This working document appears to have been well received and adopted within the WA's transport planning industry. However, the "trial and evaluation" status of the Guidelines have not been amended to reflect its continuous use. This presents the risk of the Guidelines being partially used by developers whilst avoiding critical transport impact elements and subsequent key findings. As long as the status of the Guidelines remains as "trial and evaluation", the full and correct application of the Guidelines remains discretionary.

The objectives of this report are to:

- inform this Committee about the status of the Guidelines over the last few years has been "for trial and evaluation";
- highlight to the Committee that the full implementation of the Guidelines is currently at the discretion of the developer; and
- seek the Committee's support for the review and update of the Guidelines and ultimately endorsing the Guidelines as a working document by ending the "for trial and evaluation" period.

Once the Guidelines are endorsed, they will become a formal requirement within the statutory process clearly identifying:

- Which developments require supporting transport information;
- The level of information required; and
- The format in which it should be presented.

GOVERNMENT AND CORPORATE IMPLICATIONS:

The need for a transport impact assessment guideline was identified in 1999. Since its introduction, the Guidelines have successfully contributed to its intended purpose. However, after nearly a decade, the State still does not have a formally adopted guideline for transport assessments. An adopted set of Guidelines will provide the following advantages:

- Better consistency and efficiency in assessing proposed land use developments within the 90 days timeframe.
- Ability to request land developers to provide the correct information in an orderly and timely manner.
- Optimum internal resource management through less staff time being spent covering the gap when inadequate or no transport impact assessment is undertaken to support land use developments.
- Strengthen capacity to formally refer to the Guidelines in a State Administrative Tribunal process.
- Ensure appropriate transport impact assessment is carried out for land use developments and sufficient information is submitted for consideration where developments are determined by a Development Assessment Panel.

CONSULTATION:

The draft Guidelines were distributed for comment to external stakeholders in August 2005 and feedback was incorporated into the current Guidelines. The Guidelines were then endorsed by the WAPC Sustainable Transport Committee for voluntary trial and evaluation in June 2006. They were since then made available at the WAPC web page with a departmental officer's name and contact details for feedback purposes.

The Guidelines have been used as a template in the preparation of Transport Impact Assessment reports that developers have been submitting along their proposed land use developments. They have been quoted and referred at national and international level, namely in Austroads publication titled "Guide to Traffic Management – part 12: traffic impacts of development" and Auckland Regional Transport Authority's publication – Guidelines for undertaking Transport Assessments in New Zealand and Australia (2006).

OFFICER'S COMMENTS:

The Committee should note that no changes were made to the Guidelines between 2006 and now. During that time, some references within the Guidelines have become out dated. Hence, the proposed update and review of the Guidelines to the Statutory Planning Committee are practical.

Once endorsed, the Guidelines will form part of the planning framework for undertaking and presenting transport impact assessment reports to State and Local Governments. It will streamline the planning process through promoting a coordinated approach to delivering and submitting transport impact assessment reports. Potentially, the endorsement of the Guidelines will reduce delays in assessing development applications as a result of inadequate transport information supplied by applicants.

Transport Assessment Guidelines For Developments

Introduction

Version for Trial & Evaluation

August 2006

Prepared by the Department for Planning and Infrastructure
on behalf of the Western Australian Planning Commission



Guidelines Structure

Introduction

Volume 1 – General Guidance

Appendix A - Checklists

Volume 2 – Structure Plans

Volume 3 – Subdivisions

Part A – The assessment process

Part B – Transport statement

Part C – Transport assessment

Volume 4 – Individual Developments

Part A – The assessment process

Part B – Transport statement

Part C – Transport assessment

Volume 5 – Technical Appendix

INTRODUCTION

Contents	Page
1.0 Introduction	3
2.0 Background	3
3.0 Current status	4
4.0 Guidelines structure	5
5.0 Policy context	6
6.0 Better transport outcomes	6
7.0 Links between volumes	7
8.0 Feedback / contact details	7

1.0 Introduction

These guidelines have been prepared by the Department for Planning and Infrastructure (DPI), on behalf of the Western Australian Planning Commission (WAPC), to assist those in the planning and transport fields undertake transport assessments of land use planning and development proposals.

Development is used in the broader sense, covering structure plans, subdivisions and individual development applications.

The purpose of the guidelines is to clearly identify which developments require supporting transport information, the level of information required and the format in which it should be presented.

2.0 Background

A draft of the guidelines was released for comment in August 2005. The comments received have been incorporated into the latest revision and include:

- a more structured approach to assessment covering the broad brush, wider area structure planning, more detailed subdivisions through to very detailed individual development assessment – each stage providing direction to the more detailed next stage of land use planning.
- stand alone sections for structure plans, subdivisions and individual developments
- linking the guidelines more directly to development control policy, in particular the DC series and Liveable Neighbourhoods
- more detailed “step-by-step” guidance on how to undertake a transport assessment
- greater guidance on the extent of area for assessment, for both transport statements and full transport assessments
- greater guidance on how to assess pedestrian, cycle and public transport access /amenity

3.0 Current Status

The current version of the guidelines (August 2006) is intended as a “working” document for voluntary trial and evaluation.

Transport officers within the DPI will be using the guidelines to assist them in assessing the transport implications of land use development proposals. Transport officers within local government are encouraged to do likewise.

Proponents of land use developments, and their planning/transport consultants, are also encouraged to trial the guidelines to assist them in determining the transport infrastructure required to support their development and the potential transport impacts on the surrounding area.

The Department would appreciate feedback on the guidelines, including

- their ease of use and understanding,
- the appropriateness of the thresholds for levels of assessment (Volume 1, Table1),
- the appropriateness of the level of information requested
- the ease of obtaining / availability of the data requested
- areas of assessment in the guidelines that are not considered necessary
- areas of assessment missing from the guidelines that should be included
- the overall value of the guidelines.

Much of the above feedback can only be provided by using the guidelines. All stakeholders in the land use planning industry are therefore encouraged to trial the guidelines and provide feedback that will be used to further improve the guidelines.

It should be noted that the guidelines provide clarification of and expand on the transport information required to be submitted in support of land use proposals under current planning policy. They therefore do not introduce any new or additional requirements and are fully consistent with current policy.

Feedback on the guidelines, or requests for further information, should be directed to:

Gary McCarney
DPI – Spatial Information and Research
469 Wellington Street
Perth WA 6000
(gary.mccarney@dpi.wa.gov.au or phone 9264 7712).

4.0 Guidelines Structure

The guidelines are intended for use by a wide range of stakeholders within the land use planning and development industry; from developers through state and local government planning officers to transportation specialists.

Each has a different role in the development planning process and the guidelines have been structured to accommodate this as well as the differing levels of land use planning, ie. structure plans, subdivisions and individual developments.

The guidelines are divided into five volumes.

- Volume 1 – General Guidance
- Volume 2 - Structure Plans
- Volume 3 – Subdivisions
- Volume 4 – Individual Developments
- Volume 5 – Technical Appendix

Volume 1 – General Guidance

Volume 1 is intended primarily for use by developers and planning officers. It sets the context of the guidelines within WAPC development control and planning policy and provides general guidance on the level of transport assessment that should be undertaken in support of a development proposal.

Volume 2 – Structure Plans

Volume 2 is targeted at land use and transport planners and transportation specialists. It provides technical advice on the scale and content of the transport assessment that should be undertaken as part of a structure planning exercise.

Volume 3 – Subdivisions

Volume 3 is also targeted at land use and transport planners and transportation specialists. It provides technical advice on the scale and content of the transport assessment that should be submitted to the approving authority in support of a subdivision application.

Volume 4 – Individual Developments

Volume 4 is targeted more at transportation specialists. It provides detailed technical advice on the scale and content of the transport assessment that should be submitted to the approving authority in support of an individual development application.

Volume 5 – Technical Appendix

Volume 5 is also targeted mainly at transportation specialists. It provides additional advice and guidance on the technical aspects of undertaking a detailed transport assessment.

5.0 Policy Context

Western Australia's land use planning and development requirements are contained within a range of WAPC policy including development control policy (the DC series) and, more recently, *Liveable Neighbourhoods*. The policies require a range of transport issues to be addressed as part of any development.

These transport assessment guidelines provide further guidance on the level of transport assessment required and the scope and content of the assessment, to satisfy the above policies.

The guidelines should therefore be read in conjunction with *Liveable Neighbourhoods* and the DC policies. (Where appropriate, the guidelines include cross-references to the above policies.)

6.0 Better transport outcomes

It should be noted that the guidelines are not intended to be 'better practice' transport guidelines in that they do not present measures to reduce car use or set targets for the non-car mode share. They simply provide a method to assess the transport components of a development proposal on a more consistent basis.

They should nevertheless assist officers assessing a development proposal to determine whether the development meets the relevant policy requirements with respect to land use and transport integration, promotion of non-car modes, sustainability and universal access.

In addition, the clearer guidance given to developers and planners on how to assess the transport components of their development for all modes is likely to result in better consideration of non-car modes and therefore a more sustainable development.

Notwithstanding the above, proponents of large developments are encouraged to consider traffic demand management measures to reduce private vehicle trips and hence any potential adverse transport impacts. Proposals supported by such measures, eg. green transport plans, would be viewed favourably by the approving authority. (A discussion of traffic demand management measures and green transport plans is outside the scope of these guidelines).

7.0 Links between volumes

There is a significant level of commonality between the information required and methods of assessment for structure plans, subdivisions and individual developments.

In many cases the information required is essentially the same with only the area to be covered or level of detail changing. In other cases, there may be a different requirement for say a subdivision than for an individual development.

For clarity and ease of use, the structure plan, subdivision and individual development sections, (Volumes 2, 3 and 4 respectively), have been written as “stand alone” volumes, removing the need to cross-reference back and forth between volumes.

For example, the requirements for a transport statement for a subdivision are set out in Volume 3 Part B. The requirements for an individual development transport statement, while very similar to those for a subdivision, are set out in their entirety in Volume 4 Part B, with no reference back to the subdivision requirements.

There is therefore a significant level of duplication of content within the three volumes but it is hoped that this approach will make the guidelines easier to understand and to use.

This approach has also been adopted because the guidelines are not intended to be read from first page to last. Instead, the intent is for the proponent to refer to that part of the guidelines relevant to their particular development, eg. Volume 3 Part C for a large subdivision requiring a full transport assessment.

It is likely that most users will not work their way sequentially through the guidelines, ie. will not start with a structure plan assessment, proceed through both levels of subdivision assessment and finally the two levels of individual development assessment.

Knowledge of the earlier content cannot therefore be assumed and the guidelines have been structured accordingly.

8.0 Contact details

Feedback on the guidelines, or requests for further information, should be directed to:

Gary McCarney
DPI – Spatial Information and Research
469 Wellington Street
Perth WA 6000
(gary.mccarney@dpi.wa.gov.au or phone 9264 7712).

Transport Assessment Guidelines For Developments

Volume 1 – General Guidance

Version for Trial & Evaluation

August 2006

Prepared by the Department for Planning and Infrastructure
on behalf of the Western Australian Planning Commission



VOLUME 1 – GENERAL GUIDANCE

Contents	Page
1.0 Introduction	1
2.0 Background	1
2.1 The land use / transport process	1
2.2 Transport component	2
2.3 Changes in development patterns	3
3.0 Level of assessment – Structure plans	3
3.1 Policy issues	3
3.2 Transport information required	4
4.0 Level of assessment – Subdivisions	4
4.1 Policy issues	4
4.2 Transport information required	5
5.0 Level of assessment – Individual developments	7
5.1 Policy issues	7
5.2 Transport information required	7
6.0 Submission of transport information	8

Appendix A - Checklists

Disclaimer

This document has been published by the Western Australian Planning Commission. Any representation, statement, opinion or advice expressed or implied in this publication is made in good faith and on the basis that the government, its employees and agents are not liable for any damage or loss whatsoever which may occur as a result of action taken or not taken (as the case may be) in respect of any representation, statement, opinion or advice referred to herein. Professional advice should be obtained before applying the information contained in this document to particular circumstances.

Volume 1 – General Guidance

1.0 Introduction

Volume 1 of the guidelines is intended primarily for use by developers and planning officers. It sets the context of the guidelines within WAPC development control and planning policy and provides general guidance on the transport information that should be provided in support of a development proposal.

Volume 1 should be used by developers to determine whether or not their land use / development proposal requires supporting transport information and if so, the level of information that should be provided.

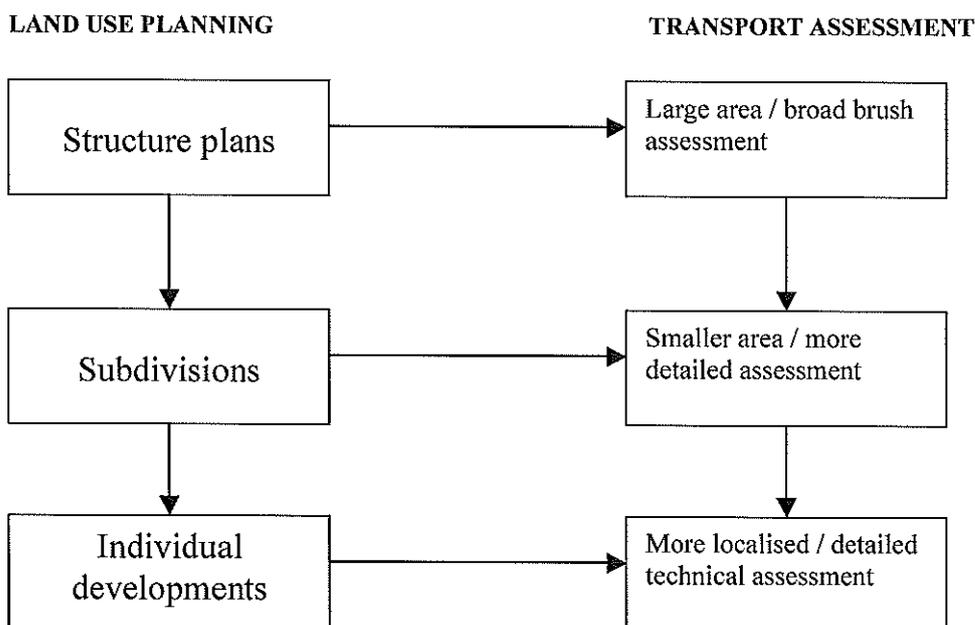
Equally, it should be used by planning officers within the approving authority to determine whether or not the appropriate level of transport information has been provided in support of the land use proposal or development application.

2.0 Background

2.1 The land use/transport process

The standard land use planning process starts with the identification of likely future land use requirements, proceeds to the development of structure plans, then subdivision layouts and finally the submission of individual development applications. At each stage of this process, the transport requirements of the proposed land uses and the potential transport impacts on the surrounding area need to be assessed. The process is illustrated on Figure 1.

Figure 1 – The land use/transport planning process



The land use/transport process should be an iterative one. The initial stage is the development of the desired land use outcome. The required transport infrastructure to support that land use proposal should then be determined and the economic, social and environmental implications of providing this infrastructure assessed.

These implications may be sufficient to warrant changes to the initial land use proposal. This may include changes to the proposed land uses themselves and/or changes in densities, plot ratios and the spatial separation of the uses (eg. mixed uses rather than segregated uses).

The transport implications of this revised land use scenario should then be reassessed and further changes made if required until an acceptable (desirable) solution is reached.

The objectives of this integrated process from a transport perspective include:

- a reduction in the transport task and therefore the infrastructure required;
- a corresponding reduction in the potential adverse impacts;
- a more sustainable overall land use/transport solution (in line with Government's sustainability agenda);
- the provision of high levels of accessibility for those without ready access to the private car, those who chose not to drive and those who are unable to do so due to a disability; and
- the provision of high quality and viable alternatives to the car for those that do have ready access to a car to encourage a mode shift away from the car.

2.2 Transport component

The transport component of this process requires the transport implications to be determined at each stage of the process. The level of detail will be different for each reflecting the level of land use detail in each stage, as shown in Figure 1.

It is particularly important that the transport infrastructure requirements and the transport impacts, particularly on the surrounding area, are identified as early as possible in the land use planning process. This allows a transport strategy to be developed that then provides the transport direction and guidance for the later planning stages.

Developing these transport strategies at an early stage, and getting the appropriate local and/or state government approval, should have the added benefit of streamlining the later stages, particularly the development application stage as the major issues will have already been addressed and agreed upon.

2.3 Changes in development patterns

In the past, land use development has concentrated on development at the urban fringe, with the urban fabric simply being 'rolled out' as urban development expands outwards. This allows the transport infrastructure to be planned and developed to match the demand generated by the land uses. This is the land use/transport process described in Sections 2.1 and 2.2 above.

Development patterns are now changing, with an increasing emphasis on development within, and redevelopment of, existing urban areas, including infill development, intensification of existing uses, (eg. increasing residential densities), and changes of uses to more intensive uses, (eg. from light industry to bulky goods retail).

These developments within the existing urban fabric could potentially have a significant impact on the surrounding transport network, a network that may be constrained by adjacent land uses and therefore have less potential for significant improvements.

It is particularly important that the potential transport impacts of these developments are adequately assessed at rezoning stage or when up-coding of residential land or higher plot ratios are being considered. This will identify the changes to the existing transport infrastructure required to accommodate the proposed land use changes and determine whether or not these would have an adverse impact on existing land uses.

For example, a proposal to up-code a residential area from R10 to R40 may require a road to be widened from two lanes to four. The existing road reservation may not be wide enough and land take adversely affecting existing frontage properties may be required. This adverse impact may be sufficient to revise the proposal, eg. to reduce the size of the area to be upcoded, or even to reject the proposal.

These guidelines cover both the assessment of (re)development within existing urban areas and the assessment of more traditional development on the urban fringe.

3.0 Level of assessment - structure plans

3.1 Policy issues

The WAPC's *State Planning Policy No1 (SPP1 February 2006)* sets out the key principles relating to environment, community, economy, infrastructure and regional development which should guide the way in which future planning decisions are made. The objective of the infrastructure component is:

"to facilitate strategic development by making provision for efficient and equitable transport and public utilities."

Assessment of the transport infrastructure needed to support proposed land use development is therefore required for all levels of land use planning.

This requirement is expanded upon in the *Guidelines for the preparation of local structure plans for urban release areas (June 1992)*. These require (in section 3.4.2) a traffic assessment to be undertaken and pedestrian/cyclist networks and public transport routes to be considered.

The WAPC has an alternative operational policy – *Liveable Neighbourhoods (Edition 3 October 2004)*. This also requires a transport assessment to be undertaken as part of the structure planning process. The requirements are summarised in the checklist in Table 1 under Movement Networks as:

- Traffic volumes and street hierarchy
- Street cross-sections
- Traffic Management
- Public transport
- Pedestrians, cyclists and disabled

Advice on how to design structure plans to satisfy the transport components of Liveable Neighbourhoods is provided in Element 2 - Movement Network and the accompanying traffic management guidelines document.

3.2 Transport information required

The above indicates that all structure plans require a supporting transport assessment under current WAPC policy. Guidance on how to undertake the assessment is provided in **Volume 2** of these transport assessment guidelines.

4.0 Level of assessment - subdivisions

4.1 Policy issues

Current WAPC development control policy requires subdivision applications to be supported by transport information. The requirements under DC policy are contained within a number of policies including:

- DC1.1 Subdivision of Land - General Principles (June 2004)
- DC1.2 Development Control – General Principles (August 2004)
- DC1.5 Bicycle Planning (July 1998)
- DC1.6 Planning to Support Transit Use...(January 2006)
- DC2.2 Residential Subdivision (July 2003)
- DC2.6 Residential Road Planning (June 1998)
- DC4.1 Industrial Subdivision (July 1988)

Key transport objectives within these policies include:

- to facilitate appropriate access and movement systems for all modes of transport;
- to integrate the development with the surroundings land uses and transport networks;
- to provide high quality pedestrian and cycle networks both within the development and connected to the surrounding area; and
- to ensure adequate consideration is given to public transport access.

The transport assessment requirements under *Liveable Neighbourhoods* are similar to those required above for structure plans, but at a greater level of detail – reflecting the more detailed planning aspects of a subdivision.

The level of transport information required in support of subdivision applications to satisfy the above policy objectives is discussed below.

4.2 Transport information required

Subdivisions can range from very large scale right down to the subdivision of a single residential lot into two lots. Obviously, each would have widely different transport implications and a “one size fits all” assessment process would not be appropriate.

A three level assessment process has been developed to accommodate this diversity. The levels are, in order of the level of information required:

- | | |
|-------------------|---------------------------|
| • Low impact | No assessment |
| • Moderate impact | Brief transport statement |
| • High impact | Full transport assessment |

The process for determining the level of assessment required is illustrated in Figure 2. Table 1 presents these levels in terms of land use units, (eg. number of dwellings or retail floor space), for the main land use categories, based on standard trip generation rates.

Further guidance on how to determine the appropriate level of assessment and detailed guidance on how to undertake the various levels of assessment to satisfy *Liveable Neighbourhoods* and DC policy is provided in **Volume 3** of these transport assessment guidelines.

Figure 2 – Process to determine level of transport assessment required

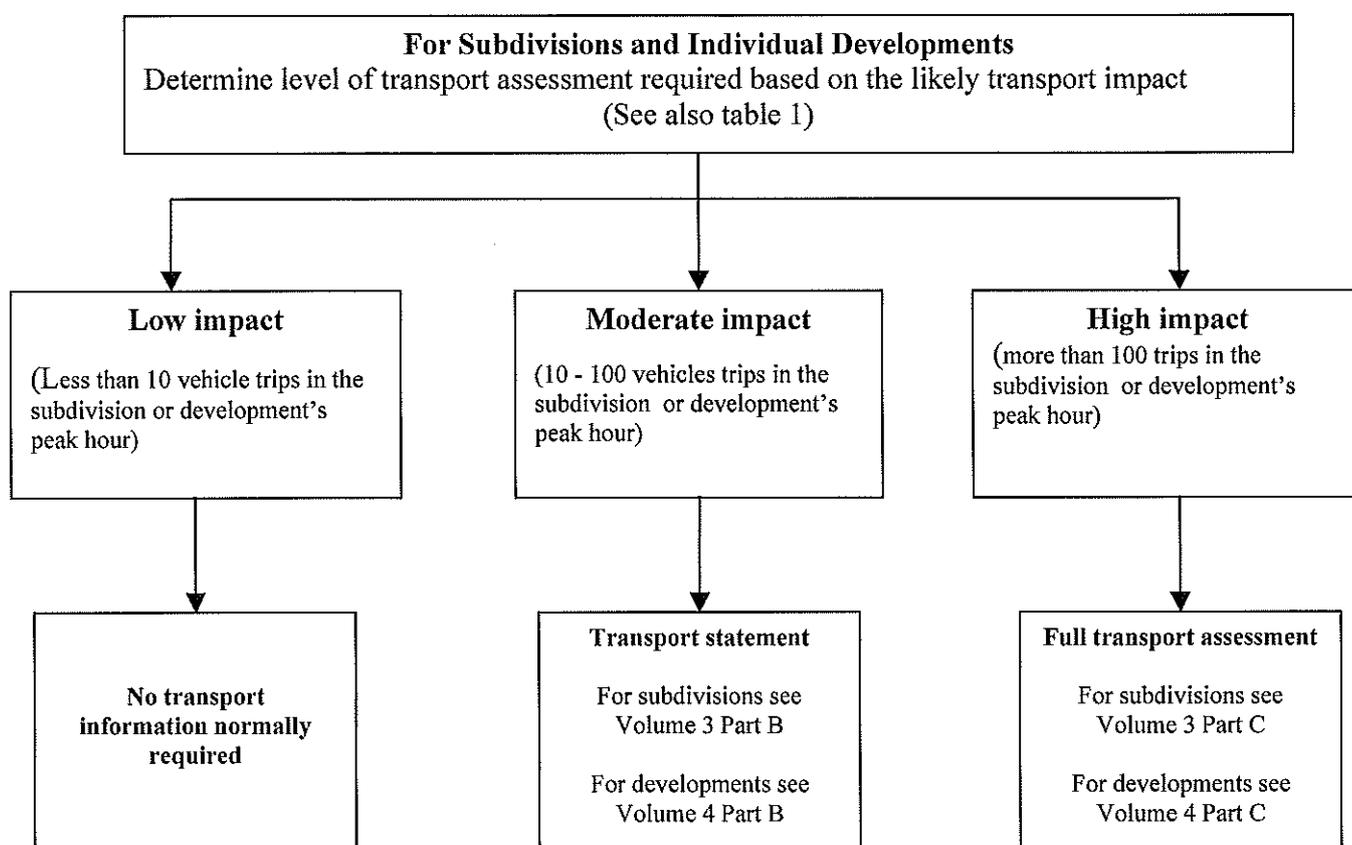


Table 1: Level of transport assessment required by land use and size

LAND USE	MODERATE IMPACT	HIGH IMPACT
	Transport statement required	Transport assessment required
	10 – 100 vehicle trips in the peak hour	> 100 vehicle trips in the peak hour
Residential	10 - 100 dwellings	>100 dwellings
Schools	10 - 100 students	>100 students
Entertainment venues, restaurants, etc.	100 - 1000 persons (seats) OR 200 – 2000 m ² gross floor area	>1000 persons (seats) OR > 2000 m ² gross floor area
Fast food restaurants	50- 500 m ² gross floor area	>500 m ² gross floor area
Food retail / Shopping centres with a significant food retail content	100 - 1000 m ² gross floor area	>1000 m ² gross floor area
Non food retail	250 - 2500 m ² gross floor area	>2500 m ² gross floor area
Offices	500 - 5000 m ² gross floor area	>5000 m ² gross floor area
Industrial	1000 – 10,000 m ² gross floor area	>10,000 m ² gross floor area
Other Uses	Discuss with approving authority	Discuss with approving authority

See Volume 5 Part B for the derivation of the threshold values in Table 1.

5.0 Level of assessment - individual development applications

5.1 Policy issues

Current WAPC development control policy requires individual development applications to be supported by transport information. The transport objectives and requirements for individual developments under DC policy are similar to those outlined above for subdivisions.

In particular, DC1.2, Development Control – General Principles (August 2004) sets out the requirements for the transport information to be provided in support of individual development applications.

Section 3.1 of the policy outlines what the WAPC needs to consider in making its decision. This includes:

- *integration of development into the site and its surroundings;*
- *transport and traffic impacts; and*
- *vehicular and non vehicular access, circulation and car parkin.;*

Appendix 2 of Policy DC1.2 outlines what needs to be submitted to the WAPC in support of a DA.

The transport information is:

1 (v) The existing & proposed means of access and egress for pedestrians and vehicles to and from the site;

1 (vi) The location, number, dimensions and layout of all car parking spaces intended to be provided, including provision for the disabled;

1 (vii) The location and dimensions of any area proposed to be provided for the loading and unloading of vehicles carrying goods or commodities to and from the site and the means of access to and from those areas; and

3 Any specialist studies that the responsible authority may require the applicant to undertake in support of the application such as traffic ...

The level of transport information required in support of an individual development application to satisfy the above policy objectives is discussed below.

5.2 Transport information required

As with subdivisions, individual developments can range from very large scale, generating large volumes of traffic over a wide area, to small developments, generating minimal traffic at a very localised level. Again, each would have widely different transport implications and a “one size fits all” assessment process would not be appropriate.

A similar three level assessment process has been developed to accommodate this diversity. The levels are, in order of the level of information required:

- Low impact No assessment
- Moderate impact Brief transport statement
- High impact Full transport assessment

The process for determining the level of assessment required is the same as for subdivisions, as illustrated in Figure 2 and Table 1.

Further guidance on how to determine the appropriate level of assessment and detailed guidance on how to undertake the various levels of assessment to satisfy DC policy is provided in **Volume 4** of these transport assessment guidelines.

6.0 Submission of transport information

The transport information should be submitted to the same approval authority as the application or proposal it relates to. If possible the transport information and the application or proposal should be submitted together, with a single covering letter. If the transport information is submitted separately the covering letter should clearly identify the application or proposal to which it relates.

The covering letter should also clearly identify who has been consulted (agencies and officers' names) during the course of preparing the assessment so that copies can be referred to the most appropriate officers and agencies. It should also clearly identify who should be contacted if the assessing officers need to discuss details of the assessment.

Checklists are provided in Appendix A for each stage of development and the levels of assessment within each stage. The appropriate checklist should be filled in and signed by both the proponent and the person undertaking the transport assessment to indicate that all items have been addressed and submitted with the transport information.

The suggested standard requirement is for one copy of the transport information to be provided if it is brief and can be readily copied. Three copies should be provided for longer reports and/or if there are plans, maps etc that cannot be readily copied.

Appendix A

Checklists for:

A - Structure plans

B – Subdivisions

B1 - Transport statement

B2 - Transport assessment

C - Individual developments

C1 - Transport statement

C2 - Transport assessment

A - Checklist for a transport assessment of a structure plan

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
- Provide brief comments on any relevant issues
 - Provide brief description of any proposed transport improvements, eg. new bus routes or new traffic signals or extending existing footpath to the site.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
Structure plan proposal		
regional context		
proposed land uses		
table of land uses and quantities		
major attractors/generators		
specific issues		
Existing situation		
existing land uses within structure plan		
existing land uses within 800 metres of structure plan area		
existing road network within structure plan area		
existing pedestrian/cycle networks within structure plan area		
existing public transport services within structure plan area		
existing road network within 2 (or 5) km		

of structure plan area		
traffic flows on roads within structure plan area (PM and/or AM peak hours)		
traffic flows on roads within 2 (or 5) km of structure plan area (AM and/or PM peak hours)		
existing pedestrian/cycle networks within 800m of structure plan area		
existing public transport services within 800m of structure plan area		
Proposed internal transport networks		
changes/additions to existing road network or proposed new road network		
road reservation widths		
road cross-sections & speed limits		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport routes		
Changes to external transport networks		
road network		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
trip attractors/generators within 800 metres		
proposed changes to land uses within 800 metres		
travel desire lines from structure plan to these attractors/generators		
adequacy of external transport networks		
deficiencies in external transport networks		
remedial measures to address deficiencies		
Analysis of internal transport networks		

B1 - Checklist for a transport statement for a subdivision

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comments column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an intersection.

Item	Status	Comments/Proposals
Proposed subdivision		
proposed land uses		
existing land uses		
context with surrounds		
Vehicular access and parking		
access arrangements		
public, private, disabled parking set down / pick up		
Service vehicles (non-residential subdivisions only)		
access arrangements		
on/off-site loading facilities		
Traffic volumes and vehicle types (non-residential subdivisions only)		
daily or peak traffic volumes		
type of vehicles (eg cars, trucks)		
Traffic management on frontage		

B2 - Checklist for a transport assessment of a subdivision

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an intersection.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
name of applicant and consultant		
subdivision location and context		
brief description of subdivision		
key issues		
background information		
Subdivision proposal		
regional context		
proposed land uses		
table of land uses and quantities		
major attractors/generators		
any specific issues		
Existing situation		

existing land uses within structure plan		
existing land uses surrounding the subdivision		
existing road network within subdivision		
existing road network surrounding the subdivision		
traffic flows on roads within subdivision (AM and PM peak hours)		
traffic flows on roads surrounding the subdivision (AM and PM peak hours)		
existing pedestrian/cycle networks within the subdivision		
existing pedestrian/cycle networks surrounding the subdivision		
existing public transport services within the subdivision		
existing public transport services surrounding the subdivision		
Proposed internal transport networks		
changes/additions to existing road network		
road reservation widths		
road cross-sections & speed limits		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport routes		
Changes to external transport networks		
road network		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
surrounding attractors/generators		

proposed changes to surrounding land uses		
travel desire lines from subdivision to these attractors/generators		
adequacy of existing transport networks		
deficiencies in existing transport networks		
remedial measures to address deficiencies		
Analysis of internal transport networks		
assessment years and time periods		
subdivision generated traffic		
extraneous (through) traffic		
design traffic flows		
road cross-sections		
intersection sight distances		
intersection operation and method of control		
frontage access strategy		
pedestrian / cycle networks		
safe walk/cycle to school assessment (residential subdivisions only)		
pedestrian permeability & efficiency		
access to public transport		
Analysis of external transport networks		
base flows for assessment years		
total traffic flows		
road cross-sections		
intersection operation		
pedestrian/cycle networks		

C1 - Checklist for a transport statement for a development

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an existing intersection.

Item	Status	Comments/Proposals
Proposed development		
proposed land uses		
existing land uses		
context with surrounds		
Vehicular access and parking		
access arrangements		
public, private, disabled parking set down / pick up		
Service vehicles (non-residential)		
access arrangements		
on/off-site loading facilities		
Service vehicles (residential)		
rubbish collection and emergency vehicle access		
Hours of operation (non-residential only)		
Traffic volumes		
daily or peak traffic volumes		

C2 - Checklist for a transport assessment of a development

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an existing intersection.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
name of applicant and consultant		
development location and context		
brief description of development proposal		
key issues		
Background information		
Development proposal		
regional context		
proposed land uses		
table of land uses and quantities		
access arrangements		
parking provision		

end of trip facilities		
any specific issues		
Existing situation		
existing site uses (if any)		
existing parking and demand (if appropriate)		
existing access arrangements		
existing site traffic		
surrounding land uses		
surrounding road network		
traffic management on frontage roads		
traffic flows on surrounding roads (usually AM and PM peak hours)		
traffic flows at major intersections (usually AM and PM peak hours)		
operation of surrounding intersections		
existing pedestrian / cycle networks		
existing public transport services surrounding the development		
crash data		
Changes to surrounding transport networks		
road network		
intersection layouts and controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
surrounding major attractors/generators		
proposed changes to land uses within 1200 metres		

travel desire lines from development to these attractors/generators		
adequacy of existing transport networks		
deficiencies in existing transport networks		
remedial measures to address deficiencies		
Analysis of transport networks		
assessment years		
time periods		
development generated traffic		
distribution of generated traffic		
parking supply & demand		
committed developments and transport proposals		
base and "with development" traffic flows		
analysis of development accesses		
impact on surrounding roads		
impact on intersections		
impact on neighbouring areas		
traffic noise and vibration		
road safety		
public transport access		
pedestrian access / amenity		
cycle access / amenity		
analysis of pedestrian / cycle networks		
safe walk/cycle to school (for residential and school site developments only)		
traffic management plan (where		

Transport Assessment Guidelines For Developments

Volume 2 – Structure Plans

Version for Trial & Evaluation

August 2006

Prepared by the Department for Planning and Infrastructure

on behalf of the Western Australian Planning Commission



VOLUME 2 – STRUCTURE PLANS

Contents	Page
1.0 Introduction	1
2.0 The structure plan stage	1
3.0 Policy context	2
4.0 Role of the guidelines	2
5.0 Sustainability issues	3
6.0 Transport assessment objectives	4
7.0 Format of assessment	4
7.1 Introduction	4
7.2 Checklist	4
7.3 Report structure	5
7.4 Scale of assessment	5
8.0 Details of Content	5
8.1 Introduction	5
8.2 Summary	6
8.3 Introduction and background	6
8.4 Structure plan proposal	6
8.5 Existing situation	6
8.6 Proposed internal transport networks	7
8.7 Changes to external transport networks	8
8.8 Integration with surrounding area	8
8.9 Analysis of transport networks - general advice	9
8.10 Analysis of internal transport networks	12
8.11 Analysis of external transport networks	20
8.12 Conclusions	24

Appendix A – Structure plan transport assessment checklist

Appendix B – Data sources

Disclaimer

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Volume 2 – Structure Plans

1.0 Introduction

Volume 2 of the guidelines is targeted at land use and transport planners as well as transportation specialists. It provides advice on the scale and content of the transport assessment that should be undertaken as part of a structure planning exercise. It also provides technical guidance on how to undertake the assessment.

Volume 2 should be read in conjunction with Volume 1, that provides general guidance on the transport assessment process, and Liveable Neighbourhoods and WAPC development control policies, that set out the transport related and requirements for structure planning.

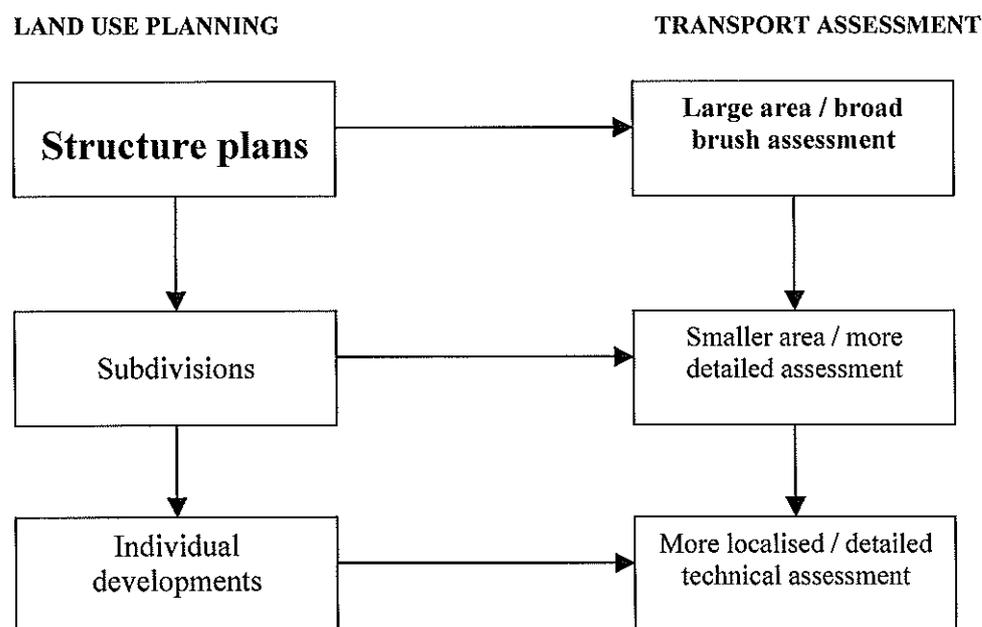
2.0 The structure plan stage

Structure planning forms the highest, and earliest, stage of the land use planning process. It involves planning at a strategic level, often over large areas and with the potential to significantly impact on the surrounding land uses.

It is therefore important that the transport aspects, in particular the land use/transport integration, are adequately assessed at this early stage in the land use planning process. This assessment should then be used to provide direction in the later, more localised but more detailed, planning stages of subdivisions and individual developments.

The role of structure planning in the land use / transport planning process is illustrated on Figure 1.

Figure 1 – The land use/transport planning process



3.0 Policy context

The WAPC's *State Planning Policy No1 (SPP1 February 2006)* sets out the key principles relating to environment, community, economy, infrastructure and regional development which should guide the way in which future planning decisions are made. The objective of the infrastructure component is:

"to facilitate strategic development by making provision for efficient and equitable transport and public utilities."

Assessment of the transport infrastructure needed to support proposed land use development is therefore required for the higher levels of land use planning down.

This requirement is expanded upon in the *Guidelines for the preparation of local structure plans for urban release areas (June 1992)*. These require (in section 3.4.2) a traffic assessment to be undertaken and pedestrian/cyclist networks and public transport routes to be considered.

The WAPC has an alternative operational policy – *Liveable Neighbourhoods (Edition 3 October 2004)*. This also requires a transport assessment to be undertaken as part of the structure planning process. The requirements are summarised in the checklist in Table 1 under Movement Networks as:

- Traffic volumes and street hierarchy
- Street cross-sections
- Traffic Management
- Public transport
- Pedestrians, cyclists and disabled

Advice on how to design structure plans to satisfy the transport components of Liveable Neighbourhoods is provided in Element 2 - Movement Network and the accompanying traffic management guidelines document.

Therefore, **all structure plans** require a supporting transport assessment under current WAPC policy.

4.0 Role of the guidelines

The above policy documents provide broad advice on designing the transport components of structure plans and indicate the supporting transport information that should be provided. **Volume 2** of these transport assessment guidelines has been prepared to provide greater clarity and further guidance on how the transport assessment should be undertaken and what information should be provided in support of a structure plan proposal.

The guidelines are not intended to specifically address policy issues such as sustainability, appropriateness of the proposed land uses or the potential mode split, although structure plans that encompass sustainability are likely to have less adverse transport impact. Nevertheless, the fact that developers and planners are required to

assess the transport impacts across all modes means that a more sustainable development is likely to result.

Transport assessments are therefore a means of assessing the transport implications of a structure plan proposal, rather than necessarily dictating or changing the proposal. They will assist transport and land use planners in determining whether the implications are likely to be acceptable and the proposal is consistent with policy.

If not, amendments to either the proposed land uses, (including the distribution and densities/plot ratios) and/or to the proposed transport system, (eg better public transport services) may be required to achieve a more desirable integrated land use / transport outcome.

5.0 Sustainability issues

While these guidelines do not consider sustainable transport per se, issues worth considering in the preparation of a structure plan to achieve a more sustainable transport outcome include:

- mixed land use;
- higher densities/plot ratios close to transport nodes/routes;
- locating appropriate land uses (ie. those with high public transport potential) close to transport nodes/routes;
- not locating inappropriate land uses (ie. those with low public transport potential) close to transport nodes/routes;
- providing a wide range of facilities locally, to reduce the need to travel outside the area;
- providing a higher number of small facilities rather than fewer large facilities, (eg. food stores), to reduce trip lengths and encourage walking and cycling;
- providing high quality public transport, pedestrian and cycle networks, both within the structure plan area and integrated with surrounding areas;
- providing a road layout with good connectivity and legibility for pedestrians, cyclists and people with disabilities; and
- ensuring major roads are not barriers to pedestrian and cycle movement by providing frequently spaced, high quality crossing facilities.

Further advice on these issues is provided in the two Liveable Neighbourhood documents published by the WAPC:

- *Liveable Neighbourhoods Edition 3 (October 2004)*
Draft Operational Policy
- *Liveable Neighbourhoods – Street Layout, Design and Traffic Management Guidelines (June 2000).*

6.0 Transport assessment objectives

The key objectives of a transport assessment for a structure plan are:

- to assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes, ie. vehicle, public transport, pedestrian and cyclist;
- to assess the level of transport integration between the structure plan area and the surrounding land uses;
- to determine the impacts of the traffic generated by the structure plan area on the surrounding land uses; and
- to determine the impacts of the traffic generated by the structure plan area on the surrounding transport networks.

7.0 Format of assessment

7.1 Introduction

This section provides advice on the general format of a transport assessment of a structure plan. It is recommended that the assessment follows this general format as it will simplify the processing of the proposal by the assessing officers and reduce the time required for approval.

The assessment should be written in a clear and simple style as some of the people reading it may not be familiar with technical terms. Where appropriate, technical details should be provided in appendices with the main findings and conclusions summarised in the body of the report. Maps, plans and diagrams should be used wherever possible for clarity of presentation and to avoid the need for lengthy descriptions.

All analysis should be fully explained to allow the reviewer to trace the steps followed in the process. Conclusions should follow logically in the order in which issues were addressed so that they can be reviewed easily based on the information provided.

All data sources used should be referenced to allow for retrieval of relevant information if required at a later date. Results of data collection and related detailed analysis should be attached as technical appendices. Electronic copies of data and/or analysis should be provided as part of the report where appropriate.

7.2 Checklist

A checklist of the typical information required is provided in Appendix A of Volume 1. This checklist is to be filled out, signed by the proponent and the person who undertook the transport assessment and submitted with the transport assessment, as part of the structure plan proposal.

7.3 Report structure

While there is scope for some flexibility in preparing a transport assessment of a structure plan, the recommended general structure is along the lines of the following:

- Summary
- Introduction and background
- Structure plan outline
- Existing situation
- Internal transport networks
- External transport networks
- Integration with surrounding area
- Analysis of internal transport networks
- Analysis of external transport networks
- Conclusions

Guidance on the content of each of the above is provided in the following sections.

7.4 Scale of assessment

Structure planning can range from the large scale/ lower detail level of regional plans, through district plans to the smaller scale, greater detail of local structure plans. *Table 1 of Liveable Neighbourhoods* defines regional or district structure plans as those generally greater than 300 hectares in area, with local structure plans less than 300 hectares.

These guidelines generally adopt this definition but it should be recognised that the division is fairly blurred. Some district structure plans may provide a significant level of detail while some local structure plans may provide less detail.

All structure plan transport assessments should cover the items in Section 7.3, as detailed below. The level of detail will however depend upon the level of detail within the structure plan itself. For example, if the road network only goes down to the neighbourhood collector level (the requirement for larger structure plans), then the assessment of the road, public transport and pedestrian / cycle networks can only go down to this level.

In these cases, the additional level of detail required should be provided at the next level of planning, ie. at the local structure plan or subdivision stage. This should draw on the earlier assessment made at the higher level planning stage.

8.0 Details of Content

8.1 Introduction

This section details what should be provided in each of the items in Section 7.3. The key information to be provided is shown in a box, followed by further guidance on what should be provided and how to undertake the assessment, as appropriate.

8.2 Summary

Provide a summary of the transport assessment including a brief description of the structure plan proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks.

8.3 Introduction and background

Provide a brief description of the structure plan and the purpose and contents of the transport report including any appropriate background information.

The introduction should include the following information:

- the name of the applicant/agent/proponent for the structure plan and the consultant who prepared the transport assessment;
- a description of the structure plan location and a location map showing the site area in context;
- a brief description of the land use proposal;
- a summary of key issues to be addressed; and
- background information, eg. previous reports or earlier planning proposals for the site.

8.4 Structure plan proposal

Provide details of the proposed structure plan including:

- its regional context
- the proposed land uses
- a table of the quantum of each land use type proposed (eg. number of dwellings, hectares of industrial etc)
- any major non-residential attractors and generators of traffic (eg. shopping centres, schools, hospitals)
- any specific issues

8.5 Existing situation

Describe / show on a plan the existing situation including:

- existing land uses within the structure plan area
- existing land uses within a minimum of 800metres from the boundaries of the structure plan area
- existing transport networks within the structure plan area for:
 - road
 - pedestrian/cyclist
 - public transport
- existing road network within a minimum of 5 kilometres (for large structure

plans, ie. generally ≥ 300 Ha) and 2 kilometres (for smaller structure plans, ie. < 300 Ha) from the boundaries of the structure plan area (See note 1)

- available traffic counts on existing roads in, and within 5km or 2km of, the structure plan area, based on the above structure plan areas. (See note 2).
- existing pedestrian / cyclist and public transport networks within a minimum of 800metres from the boundaries of the structure plan area. (See note 3).

Note 1

The 5km or 2km distances for the road network and traffic flows are fairly arbitrary. The intent is to provide road information for the full area likely to be materially affected by the traffic generated by the structure plan land uses.

The process to determine this is an iterative one. Both the existing traffic flow and the structure plan traffic need to be known for a section of road to decide whether or not the structure plan traffic would have a material impact on operation or safety.

As a general guide, an increase in traffic of less than 10 percent would not normally be likely to have a material impact, but increases over 10 percent may and further assessment may be warranted.

Section 8.11 provides further guidance on this and there may be a need to expand the area covered here based on the detailed assessment of the extent of impact.

Note 2

The traffic counts should generally be for at least the PM peak hour, (and preferably both the AM and PM peak hours), and by direction, where available. (See section 8.9.3 for further guidance).

Note 3

The 800 metre distance for external land uses and external pedestrians / cyclists and public transport networks equates to a 10 minute walk time from the edge of the structure plan area. This is somewhat arbitrary and it may be appropriate to vary this, up or down, depending upon the nature and size of the structure plan and the nature and form of the surrounding land uses and transport networks.

8.6 Proposed internal transport networks

Describe / show on a plan the proposed internal transport networks including:

- changes / additions to the existing road network
- road reservation widths
- road cross-sections (eg two lane or four lane) & speed limits
- intersection controls
- pedestrian / cycle networks and crossing facilities, eg. signalised pedestrian crossings
- public transport routes

The details of any discussions / agreements with the local authority, Main Roads Western Australia (MRWA) or the Public Transit Authority (PTA) with respect to the above proposals should be provided.

This includes any discussions / agreements with:

- the local authority over local road networks and pedestrian and cycle facilities;
- MRWA regarding intersections with, or direct access onto, roads under their jurisdiction; and
- PTA/Transperth on new bus services or extensions / alterations to existing bus services to serve the structure plan area.

A list of potential contacts is provided in Appendix B.

8.7 Changes to external transport networks

Describe / show on a plan any committed or proposed changes or additions to the external transport networks including:

- the road network
- intersection controls
- pedestrian / cycle networks and crossing facilities
- public transport services

These changes could be those committed or proposed by others, eg. MRWA or local authority, or by the proponent as part of the structure plan.

Discussions are likely to be required with the affected local authority(ies), MRWA and PTA to determine whether or not they are proposing, or considering, any potential changes.

The details of any discussions / agreements with the above agencies regarding any proposals by the proponent should also be provided.

8.8 Integration with surrounding area

Describe the level of integration with the surrounding area by:

- identifying the major attractors and generators within 800 metres of the boundaries of the structure plan area . (See note 1)
- identifying any proposals for major changes to the land uses within 800 metres of the boundaries of the structure plan area
- determining the main desire lines between the structure plan land uses and these external attractors and generators
- assessing whether the existing transport networks, plus any proposed changes, would adequately match these desire lines, particularly for pedestrians, cyclists and public transport users. (See note 2)

- identifying any deficiencies in the surrounding transport networks and/or areas where improvements could be made. (See note 2)
- proposing/suggesting remedial measures to address these deficiencies

The intent of this section is to identify how well the proposed structure plan integrates with the surrounding land uses with respect to transport links and accessibility. This is to be a qualitative assessment of the level of accessibility and integration between the structure plan area and the surrounding land uses. A quantitative analysis of the external transport networks is to be undertaken later, in Section 8.11

Note 1

Major generators would be those external land uses, primarily residential, from which people would be attracted to land uses within the structure plan area, eg. to schools, shopping centres or sports facilities.

Major attractors would be those external land uses (eg. schools, shopping centres or sports facilities) that would attract people from within the structure plan area, ie. primarily from the residential areas.

Note 2

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. It should identify whether there are any existing public transport services or whether any are proposed.

Potential deficiencies, or areas for improvement, could include missing sections of footpath and/or cycle path, the absence of safe crossing facilities where major roads need to be crossed and the absence of public transport links.

8.9 Analysis of transport networks – General advice

8.9.1 Introduction

The assessment to date has provided a description and an inventory of the structure plan proposal and surrounding area with respect to land uses and transport networks. The next two sub-sections (8.10 and 8.11) require a more detailed quantitative analysis of the proposed internal and external transport networks to demonstrate that they will provide a high level of accessibility and safety for all modes.

Much of this analysis should already have been undertaken as part of the process of determining and designing the required transport networks. It should therefore be more a matter of presenting this design assessment than undertaking a new assessment.

8.9.2 Assessment year(s)

Structure planning is usually a longer term process, with the development of the structure plan area occurring over a number of years, often 15 or 20 years or more into the future. The analysis of the transport networks should therefore be undertaken for the (assumed) year of full development.

It is recommended that, for analysis purposes, the assessment year matches one of the years modelled in the MRWA and DPI transport models, ie. 2011, 2016, 2021 or 2031. This would allow, where appropriate, future year volumes on the surrounding road network to be extracted from either MRWA's transport model (ROM) or DPI's transport model (STEM), or indeed for the structure plan land uses to be assessed using the transport models.

For large structure plans and/or structure plans likely to be staged over a longer time period, it may be appropriate to also undertake assessments at key stages of development. This would provide information on the timing and level of transport infrastructure required to support the various stages of development.

8.9.3 Daily versus peak hour traffic

It has been normal practice to assess the road network requirements for a structure plan based on projected daily, ie. 24 hour, traffic flows. These guidelines recommend that peak hour traffic flows be used for two reasons.

The first is that the structure plan assessment is intended to provide the basis for the design of the traffic components of the later, more detailed land use planning stages, ie. the subdivision and then individual development stage.

A peak hour operational analysis of the road network will be required at the individual development stage and preferably also at the subdivision stage. It therefore makes more sense to undertake a broad brush peak hour assessment at the structure plan stage that can then be refined and revised as required at the subdivision and development stages.

The second reason is that road networks should be, and generally are, designed to provide a certain level of service during the peak hour, rather than to accommodate daily flows. This is because two roads carrying the same daily flow can have significantly different peak hour flows, as illustrated below for two roads carrying 20,000 vehicles per day.

Example of differing peak hour volumes for same daily volume

Assume two roads are both carrying 20,000 vehicles per day

For a road serving an industrial area, the traffic is usually concentrated in the AM and PM peak periods and is very tidal, ie. a lot more vehicles arrive in the AM peak than depart, and vice versa for the PM peak.

Assuming the PM peak hour is 12% of the daily flow equates to 2400 vehicles (two way) in the PM peak hour. Assuming a directional split of 20% in/80% out in the PM peak hour results in 1920 vehicles departing in the PM peak hour.

BUT

For a road serving a shopping centre, the traffic is spread more evenly over the day and is usually more evenly balanced between vehicles heading to the shopping centre and vehicles leaving the shopping centre.

Assuming the PM peak hour is 8% of the daily equates to 1600 vehicles (two way) in the PM peak hour. Assuming a directional split of 40% in/60% out results in 960 vehicles departing the shopping centre in the PM peak hour.

Note: The percentages used above are for illustrative purposes only and should not be assumed to be correct for an actual transport assessment.

The example illustrates that the percentage of daily flow occurring in the peak hour and the directional split can vary significantly depending on a road's function and location. In the example, this results in the industrial road having peak hour directional flows more than double those on the road serving a shopping centre.

Designing the road based on daily flows could therefore result in an over-provision of road space, eg. four lanes when only two are required, in the case of the road to the shopping centre, or conversely, an under provision for the road serving the industrial area.

8.9.4 Design traffic hour

The choice of peak hour(s) will depend to some degree on the land uses within the structure plan and its location. In most cases, for the structure plan area as a whole, the busiest hours are likely to be the normal AM and PM peak hours on the surrounding highway network.

There may be parts of the structure plan area with land uses generating significant volumes of traffic outside these peaks. These should be noted at the structure plan stage and then addressed at the subdivision and/or individual development stages that concentrate on smaller areas in more detail.

For structure plan assessments a single design hour would normally be sufficient for the broad brush transport network assessment. For structure plans with a significant retail component, the PM peak is suggested rather than the AM peak as shopping areas generate more traffic in the PM than in the AM.

For structure plans that are primarily residential and contain schools, the AM peak hour may be more appropriate as the commuter and school peaks tend to overlap more in the AM than the PM.

Professional judgement should therefore be used to determine the more appropriate peak for assessment purposes.

At the later more detailed planning stages, particularly at the individual development stage, it is likely that both AM and PM peak hour assessments will be required. It is therefore recommended that both AM and PM peak hour volumes, where available, be obtained at the structure planning stage, to assist in the later planning stages.

Note that the PM (and/or AM) peak hour assessment is to take the place of the traditional daily traffic assessment, ie. a daily traffic assessment is NOT required under these guidelines.

8.10 Analysis of internal transport networks

8.10.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the proposed internal transport networks.

8.10.2 Assessment parameters

Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.

The assessment year(s) and the time period(s) for analysis should be determined in accordance with the advice provided in Section 8.9.

8.10.3 Structure plan generated traffic

Project the peak hour traffic volumes that would be generated by the structure plan land uses on the internal roads. A suggested approach is to:

- divide the structure plan area into a number of smaller zones
- determine the quantum of each land use in each zone
- determine peak hour vehicle trip generation rates for each land use type. (See note 1 below)
- apply the trip rates to the land uses in each zone to obtain inbound and outbound trips for each zone
- determine the internal / external split of vehicle trips for each zone (See note 2

- below)
- distribute trips onto the internal and external road networks

It is recommended that peak hour volumes be determined for both the AM and PM peak hours and distributed on the surrounding road networks, to assist the later planning stages as discussed in Section 8.9.4.

Note 1 - Trip rates

Vehicle trip generation rates are to be based on surveys of comparable land uses or extracted from recognised land use traffic generation databases such as:

- *Land Use Traffic Generation Guidelines*, March 1987 - Director General of Transport, South Australia;
- *Guide to Traffic Generating Developments* Version 2.2, October 2002 - Roads and Traffic Authority, New South Wales; and
- *Trip Generation* 7th edition, 2003 - Institute of Transportation Engineers, Washington, USA.

As a guide, typical (average) trip rates extracted from these sources are shown in Table 1 below for the main land use types.

Table1 - Typical land use vehicle trip rates

Land Use	Unit	AM peak hour trip rate		PM peak hour trip rate	
		In	Out	In	Out
Residential	Dwellings	0.2	0.6	0.5	0.3
School	Pupils	0.5	0.5	0.5	0.5
Commercial	100m2 GFA	1.6	0.4	0.4	1.6
Food retail ^{ab}	100m2 GFA	2	0.5	5	5
Non-food retail ^b	100m2 GFA	1	0.25	2	2
Industrial	100m2 GFA	0.8	0.2	0.2	0.8

GFA = gross floor area

a – These rates should be applied to retail developments/ shopping centres that have a significant food retail component.

b – The trip rates for both food and non-food retail stores can vary significantly depending upon a number of issues including type of goods sold, location and size. Caution should be used in applying these rates arbitrarily.

The table shows typical (average) vehicle trip rates for the various land uses. While rates can vary significantly, especially for retail developments, these variations tend to be balanced out over the larger areas contained in a structure plan. For example, it is unlikely that all individual developments in an industrial area would generate at a low rate, or alternatively at a high rate.

At the later, more detailed planning stages, (ie. subdivision and individual development), when the specific uses are better defined, the variations in trip

generation within a particular land use may be more significant and should be assessed on an individual basis.

The rates in the above table are based on number of dwellings or metres squared gross floor area (GFA). Structure plans usually define land uses in terms of residential densities or hectares for non-residential uses. These will therefore need to be converted into either dwellings, based on the residential density, or metres squared GFA based on the relevant plot ratios in the appropriate town planning scheme.

Further advice on determining the trip generation of the structure plan land uses is provided in Volume 5 – Technical appendix

Note 2 – Internal vehicle trips

A proportion of the vehicle trips generated by the structure plan uses are likely to be attracted to other uses within the structure plan area, eg. trips from a residential area to the local shops or school. These would only appear on the internal road network and can be described as internal trips. The remaining trips would be attracted to land uses outside the structure plan area, eg. to the Perth CBD or a regional shopping centre. These can be considered as external trips.

This split of internal to external trips is likely to be different for each structure plan and is dependent upon a number of factors including size of the structure plan, the range of land uses and facilities within it and the land uses in the surrounding areas.

For example, a smaller structure plan that is predominantly residential would have a very high proportion of external trips. A large structure plan with a wide range of land uses and facilities, eg. schools, medical facilities, shops, employment and recreation as well as residential, would have high proportion of internal trips.

Structure plans based on *Liveable Neighbourhoods* principles would therefore be likely to have a higher proportion of internal trips than a structure plan based on more conventional design principles.

It is not possible within these guidelines to provide firm guidance on what proportions to use for internal / external trips as each structure plan will be different. The transport assessor should therefore use professional judgement when determining an appropriate internal / external split backed up with supporting information, data, surveys etc where available.

In some cases where the potential adverse impacts on the surrounding land uses and transport networks may be significant, sensitivity testing of a range of possible internal/external splits may be appropriate.

8.10.4 Non structure plan traffic

Assess the potential for extraneous (ie. through) traffic to use the roads within the structure plan area.

Depending upon the structure plan layout, there may be existing traffic passing through the site on existing roads and/or the new road layout may attract traffic from surrounding roads. This potential for extraneous traffic should be assessed for the structure plan assessment year(s).

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it is only required for one peak at the structure plan stage.

8.10.5 Design traffic flows

Determine the traffic flows to use to design the internal road network by adding the extraneous traffic (Section 8.10.4) to the structure plan generated traffic (Section 8.10.3).

8.10.6 Roads and intersections

Determine the road cross-sections required, eg two lane or four lane, to accommodate the above design traffic flows.

Determine the intersection controls required, eg. priority, roundabout or traffic signals, to accommodate the above design traffic flows.

The road cross-sections should be in accordance with *Liveable Neighbourhoods* and Austroads design guidelines, in particular the *Guide to Traffic Engineering Practice (GTEP) series*.

The intersection assessment should be undertaken in accordance with *GTEP parts 5 – Intersections at grade, 6 – Roundabouts and 7 – Traffic signals*. It should be sufficient to demonstrate that the proposed methods of control are appropriate and would satisfy operational and safety requirements.

Note that this is to be a broad brush assessment that should be reviewed and revised as required at the later subdivision and individual development transport assessment stages. At this structure plan level an assessment for a single design period (generally the PM peak hour) would be adequate.

8.10.7 Access to frontage properties

Develop strategies to provide access to properties fronting all roads carrying more than 500 vehicles per hour. Strategies to be considered include:

- individual direct access
- shared access (between two properties)
- service lanes
- no frontage access

The 500 vehicles per hour threshold is based on the *Liveable Neighbourhoods Element 2* advice that vehicles reversing directly out of driveways should be avoided on roads carrying more than 5000 vehicles per day.

It is important that an overall access strategy is developed as early as possible in the land use planning process. The access strategy should determine the principles upon which individual lots should be accessed, eg. one access per lot, shared access, service road or no frontage access.

This should be based on the function of the road and its projected traffic volumes. This strategy then forms the basis for the individual lot access arrangements at the subdivision stage and then for individual developments.

Developing the access strategy at the structure planning stage, and getting the appropriate local and/or state government approval, should have the added benefit of streamlining the later stages, particularly the development application stage as the major issues will have already been addressed and agreed upon.

8.10.8 Pedestrian / cycle networks

Undertake an analysis of the operation and safety of the pedestrian / cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross
- identifying where safe crossing facilities should be provided
- indicating where safe crossing facilities are proposed

The key component of the analysis is the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross major roads to access bus stops and train stations.

The analysis should identify which roads are likely to have traffic volumes that would adversely impact on the efficiency and safety of pedestrians trying to cross. This depends upon the road cross-section as shown in Table 2.

Table 2 – Traffic volumes affecting pedestrian crossing amenity

Road cross-section	Traffic volume affecting ability of pedestrians to cross * (vehicles per hour – two way)
2 lane undivided	1100 vph
2 lane divided (or with pedestrian refuge islands)	2800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1600 vph

* See the Pedestrian assessment section of Volume 5 for details on how the above volume thresholds were determined.

Note that four lane undivided roads without pedestrian refuge islands are the most difficult to cross, the difficulties occurring at lower volumes than for a two lane road. This is due to the longer time required to cross the road, requiring a longer gap in the traffic. For this, and other safety reasons, four lane undivided roads should not be considered in any new road network planning.

The analysis should also identify where safe crossing facilities should be provided and indicate where they are proposed, concentrating on:

- key locations on the pedestrian network (ie. along major pedestrian desire lines and routes identified in Sections 8.4 and 8.6)
- proposed bus stop locations, if known, or potential bus stop locations

In addition, to ensure an efficient and safe pedestrian / cyclist network, safe crossing facilities should be considered at intervals no greater than shown in Table 3 for the roads identified above as posing difficulties for pedestrians.

Table 3 - Maximum desirable spacings for safe pedestrian crossings.

Road type	Maximum spacing of safe pedestrian crossing facilities**
Arterial – minimal frontage activity	400 metres
Arterial – significant frontage activity	200 metres
Local distributor / Neighbourhood connector	100 metres

** See the Pedestrian assessment section of Volume 5 for the rationale behind these spacings.

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 2)
- zebra crossings
- signalised pedestrian crossings (mid-block)
- crossing facilities at signalised intersections
- overpasses / underpasses (where appropriate)

Note that for undivided roads carrying greater volumes than those in Table 2, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

8.10.9 Safe walk/cycle to school assessment

Undertake a safe walk/cycle to school assessment by :

- identifying all schools within the structure plan area and those within 800 metres of the structure plan area.
- identifying the potential catchment for each school
- identifying the most likely walk and cycle routes to each school from the catchment areas
- determining any potential deficiencies, or areas where improvements could be made, along these routes
- proposing measures to address these deficiencies

As an extension to the general pedestrian / cycle network analysis, an analysis of the accessibility by foot/cycle of the schools within the structure plan area and those within 800 metres (10 minutes walk) of its boundaries should be undertaken.

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. Potential deficiencies, or areas for improvement, could include missing sections of footpath and/or cycle path and the absence of safe crossing facilities where major roads need to be crossed.

The intent of the assessment is to develop preliminary safe routes to schools for pedestrians and cyclists that will form the basis for more detailed assessment at the later planning stages. This process may identify major deficiencies such as the need for primary school children to cross major roads. There may be opportunities to address this at the structure planning stage by relocating the proposed schools and/or revising the road layout.

Indeed, a safe walk/cycle to school assessment should be an integral component of any decision on where to locate a school.

8.10.10 Pedestrian permeability and efficiency

For those structure plans where sufficient road network detail is provided, ie. down to the local road level, undertake a pedshed analysis in accordance with *Liveable Neighbourhoods Appendix 3* for;

- all neighbourhood or town centres within the structure plan
- all existing or proposed bus stops within the structure plan
- all existing or proposed train stations within the structure plan

Note that while this is a requirement for those structure plans designed and submitted in accordance with *Liveable Neighbourhoods*, it is suggested that pedsheds also be undertaken for those structure plans designed in accordance with DC policy.

The pedshed analysis, as described in *Liveable Neighbourhoods Appendix 3*, is a good way of assessing the permeability and efficiency of the proposed pedestrian network. *LN (Element 2 R37 and R38)* states that:

- At least 60 percent of dwellings within a 400m radius of an existing or potential neighbourhood or town centre should be within 400m safe walking distance
- At least 60 percent of dwellings within an 400m radius of an existing or potential bus stop should be within 400m safe walking distance
- At least 60 percent of dwellings within an 800m radius of an existing or potential railway station to be within 800m safe walking distance

To undertake a pedshed analysis at this scale, a detailed road network is required, ie. down to the local street level. Most larger, and many smaller local structure plans are unlikely to provide this level of detail.

In these cases, the pedshed analysis will need to be deferred until either the local structure plan or subdivision stage, ie. at the first stage where details of the local road network are provided. The pedshed analysis should then be undertaken in accordance with *LN Appendix 3*.

8.10.11 Access to public transport

Determine the level of access to public transport by calculating the percent of proposed residential dwellings that are within 400 metres straight line distance of an existing or proposed bus route. The higher the percentage, the higher the level of access.

The PTA in its *Design and Planning Guidelines for Public Transport Infrastructure – Bus Route Planning and Transit Streets* gives an indication of the desired level of access. The Guidelines state that:

The Transperth Ten-Year Plan service coverage goal is that there will be a bus stop within 500 metres of where 95 percent of Perth's population lives.

At the structure plan stage bus stops locations and the local road networks are unlikely to be well defined. The assessment above is therefore based on a straight line distance to a bus route.

It is recommended that a figure of at least 90 percent be achieved at the structure plan stage to ensure the above requirements would be able to be satisfied at the local structure plan or subdivision stages, ie. when the local road network and bus stop locations are known.

8.11 Analysis of external transport networks

8.11.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the transport networks surrounding the structure plan area.

8.11.2 Extent of analysis

The area to be analysed is generally to be:

For the road network:

- all sections of road where the structure plan traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour (See note 1)

For the pedestrian/cyclist and public transport networks:

- 800 metres (10 minutes walk) from the boundaries of the structure plan area.

Note 1 – The 100vph threshold equates to around 10 percent of the mid-block capacity of an urban arterial lane (*Austroroads GTEP Part 2*), ie. the level at which the traffic increase may have a material impact.

Most structure plans are of a large size, could generate significant volumes of traffic and therefore could potentially have an impact over a wide area.

The nature of the surrounding road network could also affect the extent of impact. For example, a dense road network would be likely to quickly disperse traffic and therefore dilute its impact, whereas a limited road network would provide fewer opportunities for the traffic to disperse, increasing the area materially affected.

It is important that the analysis covers a sufficiently wide area to ensure that this potential impact is adequately assessed. It is not possible to specify a set area for all structure plans within these guidelines as this will vary from one structure plan to another.

In Section 8.5 information on the existing road network was to be provided for a distance of 5 kilometres from the structure plan boundary for large (over 300 Ha) structure plans and 2 kilometres for smaller (300 Ha or less) structure plans.

These are arbitrary distances and should be considered as “starting points” for determining the area for analysis, adjusted as required based on the likely impact of the structure plan being assessed.

As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis.

For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore any section of road where the structure plan traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.

The 800 metre distance for external pedestrians / cyclists and public transport networks equates to a 10 minute walk time from the edge of the structure plan area. This is somewhat arbitrary and it may be appropriate to vary this, up or down, depending upon the nature and size of the structure plan and the nature and form of the surrounding land uses and transport networks.

For example, if there is a major attractor such as a train station or major shopping centre, say, 1 kilometre away, it should be included, or for an isolated site with only one attractor/generator within 800 metres the analysis could be limited to the route between the structure plan area and that one attractor/generator.

Note that the public transport network assessment relates to access to public transport rather than the bus/train services themselves, ie. walk/cycle access to bus stops and train stations. (The adequacy of the public transport services has already been considered - in Section 8.8).

It should be noted that inclusion of a particular road, intersection or other feature in the study area does not necessarily imply that the proponent will be responsible for all improvements that the assessment might recommend at that location.

Such decisions are beyond the scope of the guidelines. They are subject to other policies and current practice and may require detailed negotiation with the approval authority. For further information see *WAPC Policy DC1.7 General Road Planning and Planning Bulletin No. 18 Developers Contributions for Infrastructure*.

8.11.3 Surrounding network base flows

Determine the base, ie without structure plan, flows on the surrounding road network.

The existing traffic flows on the roads around the structure plan area were obtained in Section 8.4 of this assessment. These are to be factored up to the structure plan assessment year(s) by:

- obtaining future year volumes from the MRWA or DPI transport models, if available; or

- applying a growth factor, agreed with the approving authority, to existing traffic volumes; or
- using a recognised traffic engineering technique, as agreed with the approving authority

Note that traffic projections from the MRWA model, if available, are daily flows and need to be converted to peak hour flows.

This section should also take into consideration the proposed or possible changes to the external road network identified in Section 8.7. Where these changes may or may not occur, scenarios for both situations may need to be considered.

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it may only be required for one peak at the structure plan stage.

8.11.4 Total flows on external road network

Determine the total traffic flows on the external road network by adding the structure plan generated traffic (Section 8.10.3) to the above base flows.

It is again recommended that this be done for both the AM and PM peaks (to assist later planning stages) although it is only required for one peak at the structure plan stage.

8.11.5 Roads and intersections

Assess whether the existing road cross-sections, eg two lane or four lane, would be adequate to accommodate the above design traffic flows. If not, indicate what improvements would be required.

Assess whether the existing intersection controls eg. priority, roundabout or traffic signals, would be able to accommodate the above design traffic flows. If not, indicate what improvements would be required.

The road cross-sections should be in accordance with Austroads design guidelines, in particular the *Guide to Traffic Engineering Practice (GTEP) series* and, where appropriate, with *Liveable Neighbourhoods*.

The intersection assessment should be undertaken in accordance with *GTEP parts 5 – Intersections at grade, 6 – Roundabouts and 7 – Traffic signals*. It should be sufficient to demonstrate that the proposed methods of control are appropriate and would satisfy operational and safety requirements.

Note that this is to be a broad brush assessment that should be reviewed and revised as required at the later subdivision and individual development transport assessment stages. At this structure plan level an assessment for a single design period (generally the PM peak hour) would normally be adequate.

8.11.6 Pedestrian / cycle networks

Undertake an analysis of the operation and safety of the external pedestrian / cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross
- identifying where safe crossing facilities should be provided
- indicating where safe crossing facilities are proposed

This analysis is comparable to that undertaken in Section 8.10.8 for the internal transport networks but is to concentrate on the pedestrian and cycle networks within 800 metres, or 10 minutes walk, of the boundaries of the structure plan area.

The key component of the analysis is again the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross the road to access bus stops. It should consider both the pedestrians and cyclists generated by the structure plan land uses and the impact of the structure plan traffic on existing pedestrians and cyclists.

The analysis should identify which roads are likely to have traffic volumes that would potentially have an adverse impact on the efficiency and safety of pedestrians trying to cross, per Table 4. (This table is the same as Table 2 in Section 8.10.8 but is repeated here for ease of use). The traffic volumes are to be as determined in Section 8.11.4.

Table 4 – Traffic volumes affecting pedestrian crossing amenity

Road cross-section	Traffic volume affecting ability of pedestrians to cross * (vehicles per hour – two way)
2 lane undivided	1100 vph
2 lane divided (or with pedestrian refuge islands)	2800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1600 vph

* See the Pedestrian assessment section of Volume 5 for details on how these volumes were derived.

While the analysis should concentrate on the network within 800 metres of the site, there may be roads further afield where flows have increased to above those in Table 4 due to the structure plan traffic. The potential need for safe crossings on these roads should also be identified.

The analysis should also identify where adequate safe crossing facilities are already provided, where they may be required and indicate where any new facilities are proposed. The analysis should concentrate on:

- key locations on the pedestrian network (ie. along major pedestrian desire lines identified in Section 8.7)
- existing bus stop locations
- proposed or potential bus stop locations

In addition, to ensure an efficient and safe pedestrian / cyclist network safe crossing facilities should be considered at intervals no greater than shown in Table 5 for the roads identified above as posing difficulties for pedestrians. (Note that Table 5 is the same as Table 3 in Section 8.10.8 but is also repeated for ease of use).

Table 5 - Maximum desirable spacings for safe pedestrian crossings.

Road type	Maximum spacing of safe pedestrian crossing facilities
Arterial – minimal frontage activity	400 metres
Arterial – significant frontage activity	200 metres
Local distributor / Neighbourhood collector	100 metres

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 4)
- zebra crossings
- signalised pedestrian crossings (mid-block)
- crossing facilities at signalised intersection
- overpasses / underpasses (where appropriate)

Note that for undivided roads carrying greater volumes than those in Table 4, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

8.12 Conclusions

Provide a summary of the findings and conclusions of the transport assessment.

Appendix A

Structure Plan Transport Assessment

Checklist

A - Checklist for a transport assessment of a structure plan

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or new traffic signals or extending existing footpath to the site.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
Structure plan proposal		
regional context		
proposed land uses		
table of land uses and quantities		
major attractors/generators		
specific issues		
Existing situation		
existing land uses within structure plan		
existing land uses within 800 metres of structure plan area		
existing road network within structure plan area		
existing pedestrian/cycle networks within structure plan area		
existing public transport services within structure plan area		

existing road network within 2 (or 5) km of structure plan area		
traffic flows on roads within structure plan area (PM and/or AM peak hours)		
traffic flows on roads within 2 (or 5) km of structure plan area (AM and/or PM peak hours)		
existing pedestrian/cycle networks within 800m of structure plan area		
existing public transport services within 800m of structure plan area		
Proposed internal transport networks		
changes/additions to existing road network or proposed new road network		
road reservation widths		
road cross-sections & speed limits		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport routes		
Changes to external transport networks		
road network		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
trip attractors/generators within 800 metres		
proposed changes to land uses within 800 metres		
travel desire lines from structure plan to these attractors/generators		
adequacy of external transport networks		
deficiencies in external transport networks		
remedial measures to address deficiencies		

Analysis of internal transport networks		
assessment year(s) and time period(s)		
structure plan generated traffic		
extraneous (through) traffic		
design traffic flows (ie. total traffic)		
road cross-sections		
intersection controls		
access strategy		
pedestrian / cycle networks		
safe routes to schools		
pedestrian permeability & efficiency		
access to public transport		
Analysis of external transport networks		
extent of analysis		
base flows for assessment year(s)		
total traffic flows		
road cross-sections		
intersection layouts & controls		
pedestrian/cycle networks		
Conclusions		

Proponent's name

Company

Signature

Date

Transport assessor's name

Company

Signature

Date

Appendix B

Data sources

The following table provides a summary of the main sources of data required for a transport assessment.

Data	Source
Existing traffic flows	<p>MRWA Asset and Network Information Branch Ph 08 9323 4621 (Customer service officer) email: roadinfo@mainroads.wa.gov.au</p> <p>Daily data available in <i>Average Weekday Traffic Flow</i> document (also available on MRWA website – www.mainroads.wa.gov.au)</p> <p>Local councils may have some data</p>
Public transport services	<p>Public Transit Authority (PTA) Ph 08 9326 2600 Website www.pta.wa.gov.au Email enquire@pta.wa.gov.au</p>
Cycle routes/facilities	<p>Local councils</p> <p>Department for Planning and Infrastructure (DPI) Ph 08 9216 8000 Website www.dpi.wa.gov.au/cycling Email cycling@dpi.wa.gov.au</p>
Crash data	<p>MRWA Asset and Network Information Branch Ph 08 9323 4111</p> <p>Some data available on the MRWA website under safety/research (www.mainroads.wa.gov.au)</p>
Other proposed developments	<p>Local council</p> <p>DPI – Statutory Planning Ph 08 9264 7777</p>
Other transport proposals	<p>MRWA - ph 08 9323 4111</p> <p>Local councils</p> <p>PTA (for public transport proposals – see above)</p>

Transport Assessment Guidelines For Developments

Volume 3 – Subdivisions

Version for Trial & Evaluation

August 2006

**Prepared by the Department for Planning and Infrastructure
on behalf of the Western Australian Planning Commission**



VOLUME 3 - SUBDIVISIONS

Contents	Page
Part A – The assessment process	
1.0 Introduction	1
2.0 The subdivision assessment stage	1
3.0 Prior transport assessments	2
3.1 Introduction	2
3.2 Structure plan assessments consistent with guidelines	2
3.3 Structure plan assessments not consistent with guidelines	3
3.4 No prior structure plan assessment	3
4.0 Policy context	4
5.0 Transport assessment components	5
6.0 Level of assessment	5
6.1 Size of subdivision	5
6.2 Assessment levels	5
6.3 Vehicle trips versus person trips	7
6.4 Advice from approving authority	7
6.5 Application of table	8
6.6 Detailed guidance	8
Part B – Transport statement	
1.0 Introduction	9
2.0 Checklist	10
3.0 Prior structure plan assessment	10
4.0 Extent of assessment	10
5.0 Content	10
5.1 Introduction	10
5.2 Proposed subdivision	11
5.3 Vehicle access and parking	11
5.4 Provision for service vehicles	11
5.5 Daily traffic volumes and vehicle types	12
5.6 Traffic management on frontage streets	12
5.7 Public transport access	12
5.8 Pedestrian access	12

5.9	Cycle access	13
5.10	Site specific issues	13
5.11	Safety issues	13

Part C – Transport assessment

1.0	Introduction	14
2.0	Checklist	14
3.0	Prior structure plan assessment	14
4.0	Background	15
5.0	Extent of assessment	15
6.0	Agreement on scope of assessment	17
6.1	Introduction	17
6.2	Scope	17
6.3	Parameters	18
7.0	Format of assessment	18
7.1	Introduction	18
7.2	Structure	18
8.0	Details of content	19
8.1	Summary	19
8.2	Introduction and background	19
8.3	Subdivision proposal	19
8.4	Existing situation	20
8.5	Proposed internal transport networks	20
8.6	Changes to external transport networks	21
8.7	Integration with surrounding area	21
8.8	Analysis of transport networks - general advice	22
8.9	Analysis of internal transport networks	24
8.10	Analysis of external transport networks	32
8.11	Safety issues	35
8.12	Conclusions	36

Appendix A – Subdivision assessment checklists

Appendix B – Data sources

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Volume 3 – Subdivisions

Part A – The assessment process

1.0 Introduction

Volume 3 of the guidelines is intended for use by land use and transport planners as well as transportation specialists.

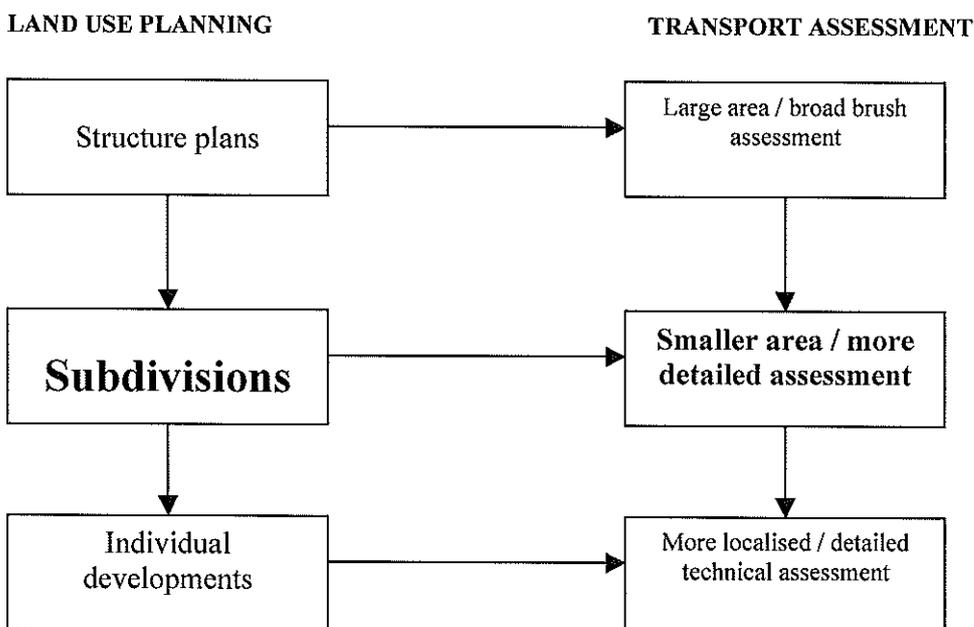
It provides advice on the scale and content of the transport information that should be submitted to the approving authority in support of a subdivision application. It also provides detailed technical advice on how to undertake the transport assessment.

Volume 3 should be read in conjunction with Volume 1 that provides general guidance on the transport assessment process, and *Liveable Neighbourhoods* and WAPC development control policies, that set out the transport related objectives, measures and requirements for subdivisions.

2.0 The subdivision assessment stage

The subdivision assessment is the second stage of the land use / transport assessment process as illustrated in Figure 1. It provides more detail over a smaller area compared to the structure plan, for both the land use and transport proposals.

Figure 1 – The land use/transport planning process



The intent of the of the subdivision transport assessment is to:

- demonstrate that the proposal is consistent with the overall structure planning;
- provide a greater level of detail on the subdivision and its more immediate surrounds; and
- provide details of any transport issues specific to the subdivision not covered in the structure plan.

For residential subdivisions with no individual lot having more than 10 units (dwellings), this stage is likely be the final transport assessment stage. For non-residential subdivisions, and for residential lots with more than 10 units, a further transport assessment is likely to be required at the development application stage. (Further advice on individual development assessments is provided in Volume 4 of these guidelines.)

3.0 Prior transport assessments

3.1 Introduction

Most current or recent structure plans include some form of a transport assessment. As these guidelines are being introduced, the existing assessments are unlikely to provide the same level of information or be in the format required under the guidelines.

Over time, however, as the guidelines are applied, a greater consistency in the transport assessment accompanying structure plans should result. In the interim, the following approach is recommended.

3.2 Structure plan assessment consistent with guidelines

Some subdivisions may be part of a structure plan for which a transport assessment has been carried out in accordance with these guidelines. (Volume 2 provides details on transport assessments for structure plans.)

In these cases reference should be made to the structure plan transport assessment when preparing the transport assessment for the subdivision. The relevant information should generally be extracted from the prior structure plan assessment and expanded as required; the prior assessment having been carried out at a broader brush level and most likely covering a potentially larger area at a lower level of detail than is required for the subdivision.

On some limited occasions it may be sufficient to briefly summarise the relevant information and provide a reference back to the prior assessment. It may also be appropriate to provide a copy of the prior assessment when submitting the subdivision application.

3.3 Structure plan assessment not consistent with guidelines

Where a “non-guidelines” transport assessment has been made at the structure plan stage, the subdivision assessment should draw on any appropriate information and expand as required.

Where the required information is not available from the structure plan assessment, it should be provided at the subdivision stage. This may require expansion of the area of assessment beyond that normally required for a subdivision.

In other words, the first stage of the subdivision assessment may be to expand the existing structure plan assessment to provide the information required for structure plans under these guidelines. This information can then be used to prepare the subdivision assessment.

This expansion of the existing structure plan assessment may not need to be as comprehensive as a full guidelines structure plan assessment. It should concentrate on those parts of the surrounding structure plan area that would impact most on the subdivision. For example, the surrounding land uses may generate traffic that would use the subdivision roads and there may be the potential, or need, for bus routes and pedestrian/ cycle networks to pass through the subdivision.

This approach is recommended to ensure that individual subdivisions within a structure plan area are not developed in isolation but are consistent with the overall structure planning.

When the prior structure plan assessment is less recent, (as a guide, more than five years old), it may be appropriate to review those parts of the assessment relevant to the subdivision to ensure that they are still current and valid. It is recommended that the proponent discuss this with the approving authority prior to commencing the subdivision assessment.

3.4 No prior structure plan assessment

In the cases where no previous structure plan assessment has been undertaken, it is recommended that a structure plan transport assessment be undertaken prior to undertaking the subdivision assessment.

Again, this assessment may not need to be as comprehensive as a full structure plan assessment as it should concentrate on those parts of the surrounding structure plan area that would impact most on the subdivision.

For subdivisions in built up areas not covered by structure planning, this preliminary structure planning assessment may not be required. The subdivision assessment must, nevertheless, address the context of the subdivision with respect to, and its integration with, the surrounding land uses.

4.0 Policy context

Current WAPC development control policy requires subdivision applications to be supported by transport information. The requirements under DC policy are contained within a number of policies including:

- DC1.1 Subdivision of Land - General Principles (June 2004)
- DC1.2 Development Control – General Principles (August 2004)
- DC1.5 Bicycle Planning (July 1998)
- DC1.6 Planning to Support Transit Use...(January 2006)
- DC2.2 Residential Subdivision (July 2003)
- DC2.6 Residential Road Planning (June 1998)
- DC4.1 Industrial Subdivision (July 1988)

Key transport objectives within these policies include:

- to facilitate appropriate access and movement systems for all modes of transport;
- to integrate the development with the surroundings land uses and transport networks;
- to provide high quality pedestrian and cycle networks both within the development and connected to the surrounding area; and
- to ensure adequate consideration is given to public transport access.

The requirements under the WAPC's alternative operational policy, *Liveable Neighbourhoods*, are similar to those for structure plans but at a greater level of detail, reflecting the more detailed planning aspects of a subdivision. They are summarised in the checklist in Table 1 of *Liveable Neighbourhoods* under Movement Networks as:

- Traffic volumes and street hierarchy
- Street cross-sections
- Traffic Management
- Public transport
- Pedestrians, cyclists and disabled

Advice on how to design subdivisions to satisfy the transport components of *Liveable Neighbourhoods* is provided in *Element 2 - Movement Network* and the accompanying *traffic management guidelines* document.

The level of transport information required in support of subdivision applications to satisfy the above policy objectives is detailed in the following sections.

5.0 Transport assessment components

The key components of a transport assessment for a subdivision are essentially the same as those for a structure plan, namely:

- to assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes, ie. vehicle, public transport, pedestrian and cyclist;
- to assess the level of transport integration between the subdivision area and the surrounding land uses;
- to determine the impacts of the traffic generated by the subdivision on the surrounding land uses; and
- to determine the impacts of the traffic generated by the subdivision on the surrounding transport networks.

The assessment will however provide greater detail at a more localised level.

6.0 Level of assessment

6.1 Size of subdivision

Subdivisions can range from very large scale with either a single land use (eg. residential) or a range of land uses, (eg. mixed use residential/commercial/retail) down to the subdivision of a single residential lot into two lots. Obviously, each would have widely different transport implications and a “one size fits all” assessment process would not be appropriate.

Therefore, under these guidelines, the level of transport assessment required is related to the level of transport impact the proposed subdivision would be likely to have on the surrounding land uses and transport networks.

This depends upon a number of factors including type and quantities of land uses, catchment and location, the surrounding road network and public transport and accessibility for pedestrians, cyclists and people with disabilities.

6.2 Assessment levels

A three level assessment process has been developed to accommodate this diversity. The levels are, in order of the level of information required:

- | | |
|-------------------|---------------------------|
| • Low impact | No assessment |
| • Moderate impact | Brief transport statement |
| • High impact | Full transport assessment |

The process for determining the level of assessment required is illustrated in Figure 2.

Figure 2 – Process to determine level of transport assessment required

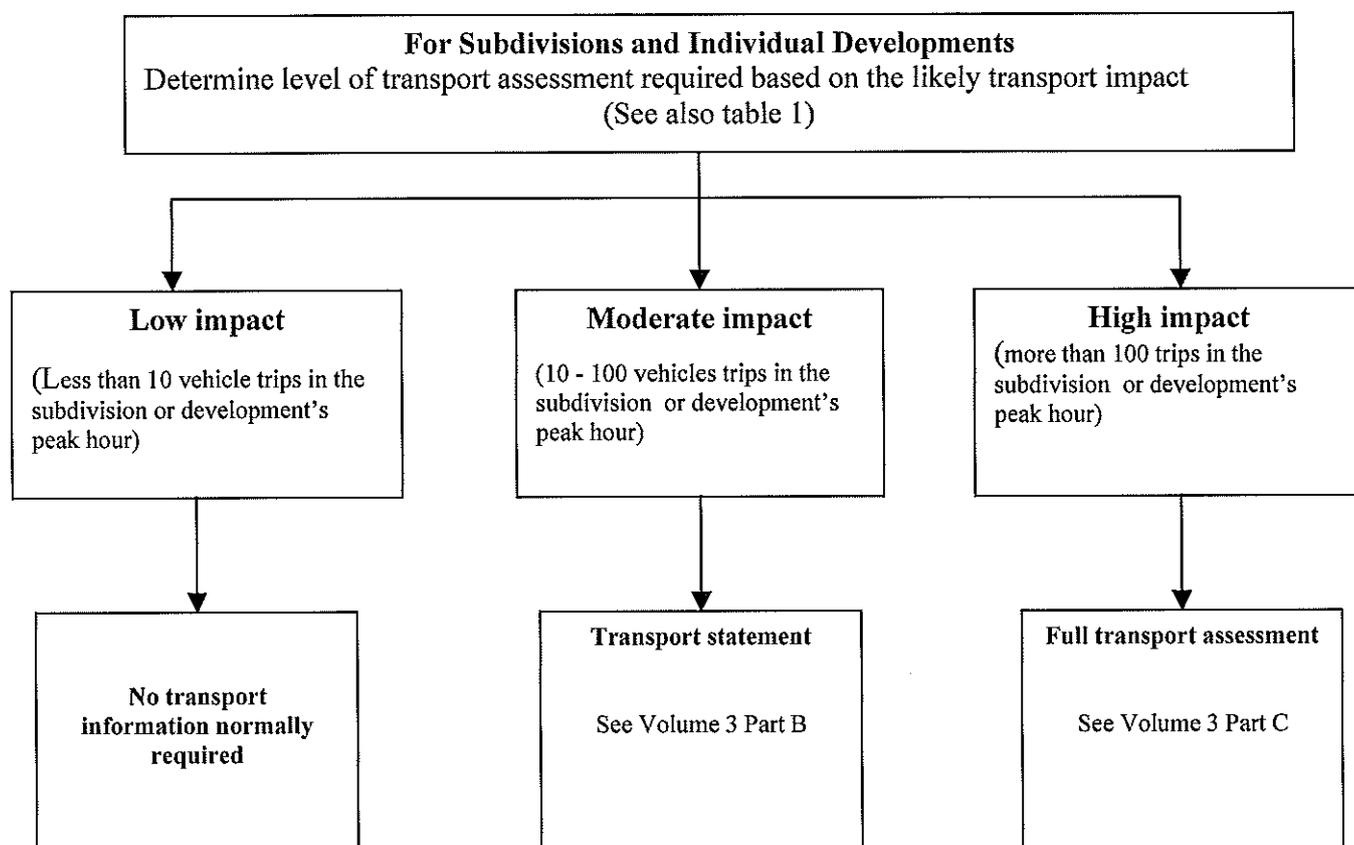


Table 1: Level of transport assessment required by land use and size

LAND USE	MODERATE IMPACT	HIGH IMPACT
	Transport statement required 10 – 100 vehicle trips in the peak hour	Transport assessment required > 100 vehicle trips in the peak hour
Residential	10 - 100 dwellings	>100 dwellings
Schools	10 - 100 students	>100 students
Entertainment venues, restaurants, etc.	100 - 1000 persons (seats) OR 200 – 2000 m ² gross floor area	>1000 persons (seats) OR > 2000 m ² gross floor area
Fast food restaurants	50- 500 m ² gross floor area	>500 m ² gross floor area
Food retail / Shopping centres with a significant food retail content	100 - 1000 m ² gross floor area	>1000 m ² gross floor area
Non food retail	250 - 2500 m ² gross floor area	>2500 m ² gross floor area
Offices	500 - 5000 m ² gross floor area	>5000 m ² gross floor area
Industrial	1000 – 10,000 m ² gross floor area	>10,000 m ² gross floor area
Other Uses	Discuss with approving authority	Discuss with approving authority

See Volume 5 Part B for the derivation of the threshold values in Table 1.

Table 1 presents the three assessment levels in terms of land use units, (eg number of dwellings or retail floor space), for the main land use categories, based on standard trip generation rates.

Note that the level of traffic generated relates to the number of vehicle trips generated by the subdivision during its busiest hour(s) of operation. This peak hour(s) may or may not occur at the same time as the peak periods on the surrounding roads.

6.3 Vehicle trips versus person trips

The use of vehicle trips generated to determine the level of assessment required should be seen as a proxy for person trips as there are no land use types that generate high volumes of non-car trips but very low volumes of car trips.

There may be a specific development in a specific location that would generate high person trips but low car trips, eg. a retail development in the CBD. Typically, however, retail land uses generate high levels of car trips.

Take, for example, two retail subdivisions of 2000m², one in the suburbs and one in the Perth CBD. Both would require a full assessment under the guidelines. The suburban subdivision would be likely to generate mainly car trips and (in most cases) typical retail car trip rates would be used in the transport assessment.

The CBD subdivision would be likely to generate a (much) lower number of car trips but a (much) higher number of public transport trips and walk trips (from people already in the CBD). The CBD subdivision transport assessment would adopt a lower car trip rate and would also need to address the higher than normal non-car mode share.

By applying standard vehicle trip generation rates for the land use within the subdivision, (retail in this case), the appropriate level of assessment required will be identified.

6.4 Advice from approving authority

While the level of assessment should generally be in accordance with these guidelines, it is recommended that the level required be confirmed with the approving authority.

Advice from the approving authority to proponents on the level of assessment required is to be given, and taken, on a without prejudice basis. This does not preclude the approving authority requesting further information, at its discretion.

This particularly applies to transport statements where the information provided may indicate that specific issues require more detailed assessment or that the impact is greater than initially anticipated and a full transport assessment is required.

While this may result in a degree of uncertainty for the proponent, it is considered that some flexibility is required for approving authorities to ask for further information, when the preliminary assessment raises additional issues or concerns.

If approving authorities were to be bound by their initial advice on the level and extent of assessment and the parameters for the assessment they would be likely to err on the side of caution. For example, they may ask for a larger study area just in case the impacts extend beyond what would normally be expected. This would result in unnecessary work for the proponent in many cases.

By allowing approving authorities some powers to request additional information after the initial assessment it is considered that their initial requests for assessment will be more reasonable, thereby reducing the level of unnecessary work required to be undertaken by proponents.

6.5 Application of table

The level of assessment required under table 1 is to be based on the size of the ultimate subdivision so that the full potential impact is assessed. For large subdivisions where staging is proposed, it may be appropriate to also assess each stage individually to determine when various transport infrastructure may be required.

For subdivisions smaller in size than those in the transport statement column, no transport information would generally be required. The applicant is nevertheless recommended to confirm this with the relevant approving authority prior to submitting the application.

For mixed use subdivisions a pro rata approach should be used to determine the level of assessment required. For example, a subdivision with 70 dwellings and 500m² of retail would be likely to generate more than 100 trips in the peak hour, requiring a full transport assessment.

6.6 Detailed guidance

Detailed guidance on how to undertake the two levels of assessment above is provided in this volume as follows:

Part B – Transport statement

Part C – Transport assessment

Part B – Transport statement

1.0 Introduction

A transport statement is required for those subdivisions that would be likely to generate moderate volumes of traffic and therefore would have a moderate overall impact on the surrounding land uses and transport networks, (per table 1).

A transport statement is a brief statement outlining the transport aspects of the proposed subdivision. The intent of the statement is to provide the approving authority with sufficient transport information to confirm that the proponent has adequately considered the transport aspects of the subdivision and that it would not have an adverse transport impact on the surrounding area.

Of particular relevance is the accessibility of the subdivision by non-car modes, in accordance with Government's sustainable development objectives, and its integration with the surrounding area.

The transport statement should also address any issues specific to the particular subdivision. This allows these specific issues to be assessed in detail without requiring a full transport assessment to be undertaken - an unnecessary requirement for most subdivisions of this size.

The site specific issues to be assessed should be discussed and agreed with the approving authorities prior to commencing the transport statement and may include:

- the generation of traffic past sensitive uses such as schools or hospitals;
- the generation of traffic on low volume residential roads;
- particular intersections or sections of road that may be adversely affected;
- the potential for rat-running, especially through residential areas;
- issues associated with the heavy vehicles generated by the development;
- developments operating outside normal business hours in/near residential areas;
- subdivisions with a potentially high non-car mode share; and
- subdivisions close to major transport nodes.

It is envisaged that the transport statement will generally be from 2/3 pages up to several pages in length, but this will depend upon the number and nature of any specific issues that need to be addressed.

It is expected that most of, if not all, the information to be provided will be of a non-technical nature, ie will not require input from a specialist in transportation planning or traffic engineering. This will however depend upon the nature of the specific issues to be addressed and specialist technical input may be required on occasions.

The level of information sought and the format for providing the information are set out below.

2.0 Checklist

A checklist of the typical information required is provided in Appendix A. This checklist is to be filled out, signed by the proponent, (and transport specialist where appropriate), and submitted with the transport statement, as part of the subdivision application.

3.0 Prior structure plan assessment

The subdivision may be part of a larger structure plan for which a transport assessment has already been undertaken. If this is the case, the transport statement should extract the relevant information and revise or expand as appropriate.

Where there is no prior transport assessment, the transport statement may need to provide additional information on the surrounding land uses and transport networks.

Further advice on prior assessments is provided in Part A Section 3.0 of this volume.

4.0 Extent of assessment

The area to be covered by the transport statement is to include, as a minimum:

- the proposed subdivision;
- all roads fronting the subdivision, for the extent of the site frontage plus 100 metres beyond the boundaries of the subdivision;
- pedestrian routes to the nearest bus stops (for all bus routes passing within 400 metres of the boundaries of the subdivision);
- pedestrian routes to nearest train station(s) (if within 800 metres);
- pedestrian/cycle routes to any major attractors within 400 metres, (five minutes walk) of the boundaries of the subdivision, eg. for a small residential subdivision attractors could be a corner shop, the primary school and the nearby park; and
- the area likely to be affected by the site specific issue(s).

5.0 Content

5.1 Introduction

The statement is intended to be an informal, non-technical statement of the transport aspects of the subdivision. Its format is therefore relatively flexible but should include the following sections;

- Proposed subdivision
- Vehicle access and parking
- Provision for service vehicles
- Daily traffic volumes and vehicle types
- Traffic management on frontage streets

- Public transport access
- Pedestrian access
- Cycle access
- Site specific issues
- Safety issues

The information required for each section is outlined below. Note that some of the information may be better provided graphically on a map and/or plan rather than by a text description.

5.2 Proposed subdivision

Describe/show the proposed subdivision land uses and their quantities (eg retail floorspace, no. of dwellings etc).

Comment on any existing uses or changes of use.

Describe/show the subdivision's relationship/context with the surrounding land uses.

5.3 Vehicle access and parking

Describe/show the vehicle access arrangements to the subdivision from the frontage road(s) and the road layout within the subdivision.

Indicate the number of public and/or private car and disabled parking spaces proposed and provision for set down, pick up and taxis (if appropriate).

For many subdivision proposals, little or no information on parking is likely to be available. In these cases, the required information should be provided at the next planning stage, ie. at the individual development application stage.

5.4 Provision for service vehicles

For the non-residential subdivisions (or the non-residential components for mixed use subdivisions), briefly describe/show the access arrangements and on-site loading or unloading facilities for service vehicles.

Again, for many subdivision proposals, little or no information on servicing is likely to be available. In these cases, the required information should be provided at the next planning stage, ie. at the individual development application stage.

5.5 Daily traffic volumes and vehicle types

For non-residential subdivisions only and where possible, provide a rough estimate of the likely daily, and/or peak, traffic volumes generated by the subdivision and the types of vehicle, eg. car, light commercial or heavy commercial.

Note that this is not intended to be a comprehensive assessment carried out by a transport specialist but a rough guide only to the amount and type of traffic likely to be generated.

5.6 Traffic management on the frontage streets

Describe/show the existing traffic management on the roads fronting the subdivision and for 100 metres either side of the subdivision.

Information to include:

- road width / number of lanes
- footpaths / cycleways
- any parking provision or restrictions
- posted traffic speed
- intersections and type of control (eg. give way, roundabout etc)
- accesses / driveways to properties

5.7 Public transport access

Identify/show the nearest bus and train routes to the subdivision and the locations of the nearest bus stops and train stations.

Describe/show briefly the pedestrian and cycle links between the subdivision and the bus stops and train station.

See Section 4.0 for advice on the extent of the area to be covered.

5.8 Pedestrian access

Describe/show the existing pedestrian facilities, eg. footpaths, signalised crossings, within the subdivision (if any).

Describe/show any proposed pedestrian facilities within the subdivision.

Describe/show the pedestrian facilities on the roads surrounding the subdivision.

Outline any proposals by the applicant to improve pedestrian access.

See Section 4.0 for advice on the extent of the area to be covered.

5.9 Cycle access

Describe/show any existing cycle facilities, (eg. dual use paths, cycle lanes) within the subdivision.

Describe/show any proposed cycle facilities within the subdivision.

Describe/show any existing cycle facilities on the roads surrounding the subdivision.

Outline any proposals by the applicant to improve cycle access.

See Section 4.0 for advice on the extent of the area to be covered.

5.10 Site specific issues

Provide details of any site specific transport issues.

Some flexibility is required here to address these specific issues, as they will be different for each site. The general approach should be along the lines of:

- Describe any transport issues specific to the subdivision, as discussed and agreed with the approving authority.
- Demonstrate that these will not have an adverse impact on the surrounding area, or, if they may, propose remedial measures to redress these impacts.
- Alternatively, the specific issues may relate to demonstrating that the subdivision satisfies a certain policy objective, eg. that a subdivision close to a major train station provides a high level of access to the station and would encourage increased use of the train.

5.11 Safety issues

Identify and discuss any existing or potential safety issues.

Where appropriate suggest remedial measures.

The previous sections may have identified existing or potential safety issues that should be expanded upon. Examples of possible safety issues include:

- a new access to the subdivision crossing a busy footpath, especially one used by school children;
- the subdivision increasing traffic through a busy priority intersection; and
- the need for pedestrians / cyclists to cross a busy road to access the subdivision

Possible measures to address these issues should be discussed.

Part C – Transport assessment

1.0 Introduction

A transport assessment is a detailed assessment of the transport aspects of a subdivision. It is to be submitted as part of all larger subdivision applications, in accordance with Table 1 of Part A of this document.

It is a detailed technical assessment and is therefore likely to require input from a transportation specialist. The intent of a transport assessment is to clearly demonstrate to the approving authority that the subdivision would:

- provide safe and efficient access for all modes;
- be well integrated with the surrounding land uses;
- not adversely impact on the surrounding area; and
- not adversely impact on the surrounding transport networks and the users of those networks.

It should also demonstrate that the proposed subdivision is consistent with the transportation aspects of the structure planning for the area.

Residential subdivisions with no individual lot with more than 10 dwellings will not normally require a further transport assessment at the development application stage under the guidelines. The subdivision assessment will most probably be the final level of transport assessment and a high level of detail addressing all issues is required.

For non-residential subdivisions, and the non-residential components of mixed use subdivisions, a further level of assessment is likely to be required at the development application stage.

The level of information sought in a transport assessment and the format of that information are set out below.

2.0 Checklist

A checklist of the typical information required is provided in Appendix A. This checklist is to be filled out, signed by the proponent and the transport specialist and submitted, with the transport assessment, as part of the subdivision application.

3.0 Prior structure plan assessment

The subdivision may be part of a larger structure plan for which a transport assessment has already been undertaken. If this is the case, the subdivision transport assessment should extract the relevant information and revise or expand it as appropriate.

Where there is no structure plan transport assessment, the subdivision transport assessment may need to provide additional information on the surrounding land uses and transport networks.

Further advice on prior assessments is provided in section 3.0 of Part A of this volume.

4.0 Background

In the past, traffic impact assessments have been carried out on a somewhat ad hoc basis, mainly for large subdivisions and concentrating on the vehicular traffic impacts, often with little or no consideration of the accessibility by, or impact on, non-car modes.

In more recent times, there has been a move towards more sustainable development and the need to consider and cater for modes other than the private car. The terms 'transport impact assessment' or 'transport assessment' have been adopted to differentiate between this multi-modal approach and the more conventional vehicular traffic impact assessment.

The transport assessment therefore encompasses all modes of transport, that is, public transport, walking and cycling as well as private motor vehicles and freight movements.

5.0 Extent of assessment

The transport assessment should cover, as a minimum:

- all sections of road where the subdivision traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour (See note 1)
- all intersections where flows on any leg would increase by 10%, or any movement by 20%
- pedestrian routes to the nearest bus stop (for all bus routes passing through, or within 400 metres of the boundaries of, the subdivision)
- pedestrian routes to the nearest train station(s), (if within 800 metres of the boundaries of the subdivision)
- pedestrian routes to any major attractors within 400 metres, (5 minutes walk), of the boundaries of the subdivision
- cycle routes to any major attractors within 1200 metres, (5 minutes cycle), of the boundaries of the subdivision

Note 1 – The 100vph threshold equates to around 10 percent of the mid-block capacity of an urban arterial lane (*Austroads GTEP Part 2*), ie. the level at which the traffic increase may have a material impact.

The transport assessment should cover all parts of the transport network that would be likely to be materially affected by the proposed land uses.

The study area will typically be larger than just the area of the subdivision. It should include, at the very least, all abutting roads and is likely to extend significantly further along particular roads or other transport corridors.

As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis.

For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore any section of road where the structure plan traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.

For sensitive areas, (eg. past schools), or where a significant proportion of the subdivision traffic is likely to be heavy commercial vehicles, a lower threshold than the above might trigger the need for assessment.

An intersection would generally be considered to be materially affected if flows on any leg increase by more than 10% or any individual movement would increase by more than 20%. For already congested intersections, lower thresholds may again trigger the need for assessment.

Other factors that should be taken into consideration when determining the study area include:

- change of intersection control type (eg from priority to traffic signals);
- new or modified intersections or crossovers;
- new or widened roads, shared paths, etc; and
- new or modified bus routes or bus stop locations.

For pedestrian and cycle routes, the area to be assessed is based on five minute walk and cycle times to bus stops and major attractors / generators and a 10 minute walk to train stations. The objective of this component of the assessment is to identify how well the subdivision is integrated with the surrounding area and would encourage non-car modes.

The above criteria are guidelines only and the extent of the initial study area should be discussed with the approval authority prior to commencement of the assessment.

The study area may need to be revised, in agreement with the approving authority, during the course of the assessment. For example, the initial assessment may indicate that a development would have a wider impact than initially thought requiring expansion of the study area, or conversely less impact allowing a reduction in the study area.

It should be noted that inclusion of a particular road, intersection or other feature in the study area does not necessarily imply that the proponent will be responsible for all improvements that the assessment might recommend at that location.

Such decisions are beyond the scope of the guidelines. They are subject to other policies and current practice and may require detailed negotiation with the approval authority. For further information see *WAPC Policy DC1.7 General Road Planning and Planning Bulletin No. 18 Developers Contributions for Infrastructure*.

6.0 Agreement on scope of assessment

6.1 Introduction

Prior to commencement of the assessment, the proponent is strongly recommended to contact the appropriate approving authority or authorities to discuss and where possible agree its scope.

This is particularly important for subdivisions where no prior transport assessment has been undertaken, ie. at the structure plan stage. It is also important when there is a structure plan assessment as some of the assessment parameters are likely to be different. For example, a different assessment year may be appropriate and the subdivision may generate its peak traffic outside the period adopted for the overall structure plan assessment.

It is also possible that there have been changes to the structure planning since the prior assessment that should be accounted for at this subdivision stage.

It should be noted that any agreements on the scope of the assessment are given by the approving authority on a without prejudice basis. The approving authority reserves the right to require the proponent to amend or expand the scope or to amend the parameters used depending upon the outcomes of the initial assessment. (See also Section 6.4 of Part A).

6.2 Scope

Issues to be discussed in determining the scope of the assessment include:

- extent of the area to be assessed;
- intersections to be assessed in detail;
- assessment years;
- assessment time periods;
- issues specific to the subdivision and/or location that need to be addressed;
- any specific safety issues to be addressed;
- any committed or proposed developments in the area that need to be taken into consideration; and
- any committed or proposed improvements to the surrounding transport infrastructure that need to be taken into consideration.

6.3 Parameters

Parameters to be discussed include:

- trip generation rates
- proportions of pass-by, diverted and new trips
- directional distribution of trips
- future year base flows
- traffic growth rates.

7.0 Format of assessment

7.1 Introduction

This section details the information that would normally be included in a transport assessment. It is recommended that the assessment follows the general format and sequence suggested in the guidelines. When reports follow a standard format, processing by the assessing officers is simplified and the time required for approval is likely to be reduced.

The assessment should be written in a clear and simple style as some of its readers may not be familiar with technical terminology. Where appropriate, technical details should be provided in appendices with the main findings and conclusions summarised in the body of the report. Maps, plans and diagrams should be used wherever possible for clarity of presentation and to avoid the need for lengthy descriptions.

The analysis should be fully explained to allow the reviewer to trace the steps followed in the process. Conclusions should follow logically in the order in which issues were addressed so that they can be reviewed easily based on the information provided.

Data sources should be referenced, to allow retrieval of relevant information if required at a later date. Results of data collection and related detailed analyses should be attached as technical appendices. Electronic copies of data and/or analyses should be provided as part of the report where appropriate.

7.2 Structure

While there is scope for some flexibility in preparing a transport assessment the recommended general structure is along the lines of the following:

- Summary
- Introduction and background
- Subdivision proposal
- Existing situation
- Proposed internal transport networks
- Changes to external transport networks
- Integration with surrounding area
- Analysis of internal transport networks
- Analysis of external transport networks
- Conclusions

Each of the above is discussed in Section 8.0. The key information to be provided is shown in a box, followed by further guidance on what should be provided and how to undertake the assessment, as appropriate.

8.0 Details of content

8.1 Summary

Provide a summary of the transport assessment including a brief description of the subdivision proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks.

8.2 Introduction and background

Provide a brief description of the subdivision and the purpose and contents of the transport report including any appropriate background information.

The introduction should include the following information:

- the name of the applicant/agent/proponent and the consultant who prepared the transport assessment;
- a description of the subdivision location and a location map showing the site area in context;
- a brief description of the proposed land uses;
- whether or not there is a current structure plan transport assessment covering the area;
- a summary of key issues to be addressed;
- background information, eg. previous reports or earlier planning proposals for the site.

8.3 Subdivision proposal

Provide details of the proposed subdivision including:

- its regional / structure plan context
- the proposed land uses
- a table of the quantum of each land use type proposed (eg. number of dwellings, hectares of industrial land etc)
- major attractors and generators of traffic
- any specific issues

8.4 Existing situation

Describe / show on a plan the existing situation including:

- existing land uses within the subdivision area (if any)
- existing land uses surrounding the subdivision
- existing road network within the subdivision (if any)
- existing road network surrounding the subdivision
- available traffic counts on existing roads within the subdivision
- available traffic counts on roads surrounding the subdivision
- existing pedestrian/cyclist networks within the subdivision
- existing pedestrian/cyclist networks surrounding the subdivision
- existing public transport routes and bus stops/train stations within the subdivision
- existing public transport routes and bus stops/train stations surrounding the subdivision

See Section 5.0 for advice on the extent of the area to be covered.

The traffic counts should be for the AM and PM peak hours and by direction, where available. (See section 8.8.3 for further guidance).

8.5 Proposed internal transport networks

Describe / show on a plan the proposed internal transport networks including:

- changes / additions to the existing road network
- road reservation widths
- road cross-sections (eg two lane or four lane) & speed limits
- intersection controls
- pedestrian/cycle networks and crossing facilities, eg. signalised pedestrian crossings
- public transport routes and bus stops/train stations

The details of any discussions / agreements with the local authority, Main Roads Western Australia (MRWA) or the Public Transit Authority (PTA) with respect to the above proposals should be provided.

This includes any discussions / agreements with:

- the local authority over local road networks and pedestrian and cycle facilities;
- MRWA regarding intersections with, or direct access onto, roads under their jurisdiction; and
- PTA on new bus services or extensions / alterations to existing bus services to serve the subdivision.

A list of potential contacts is provided in Appendix B.

8.6 Changes to external transport networks

Describe / show on a plan any committed or proposed changes or additions to the external transport networks including:

- the road network
- intersection controls
- pedestrian / cycle networks and crossing facilities
- public transport routes and bus stops/train stations

These changes could be those committed or proposed by others, eg. MRWA or local authority, or by the proponent as part of the subdivision.

Discussions are likely to be required with the affected local authority(ies), MRWA and PTA to determine any proposed or potential changes.

Details of any discussions / agreements with the above agencies regarding any proposals by the proponent should also be provided.

8.7 Integration with surrounding area

Describe the level of integration with the surrounding areas by:

- identifying the major attractors and generators within 800 metres of the boundaries of the subdivision (See note 1)
- identifying any proposals for major changes to the land uses within 800 metres of the boundaries of the subdivision
- determining the main desire lines between the subdivision land uses and these external attractors and generators
- assessing whether the existing transport networks, plus any proposed changes, would adequately match these desire lines, particularly for pedestrians, cyclists and public transport users (See note 2)
- identifying any deficiencies in the surrounding transport networks and/or areas where improvements could be made (See note 2)
- proposing/suggesting remedial measures to address these deficiencies

See Section 5.0 for advice on the extent of the area generally to be covered.

The intent of this section is to identify how well the proposed subdivision integrates with the surrounding land uses with respect to transport links and accessibility. This is to be a qualitative assessment of the level of accessibility and integration between the subdivision and the surrounding land uses. A quantitative analysis of the transport networks is to be undertaken later, in Section 8.10

Note 1

Major generators would be those external land uses, primarily residential, from which people would be attracted to land uses within the subdivision, eg. to schools, shopping centres or sports facilities.

Major attractors would be those external land uses (eg. schools, shopping centres or sports facilities) that would attract people from within the subdivision, ie. primarily from the residential areas.

Note 2

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. It should identify whether there are any existing public transport services or whether any are proposed.

Potential deficiencies, or areas for improvement, could include missing or substandard sections of footpath and/or cycle path, the absence of safe crossing facilities where major roads need to be crossed and the absence of public transport links.

8.8 Analysis of transport networks – General advice

8.8.1 Introduction

The assessment to date has provided a description and an inventory of the subdivision proposal and surrounding area with respect to land uses and transport networks. The next two sub-sections (8.9 and 8.10) require a more detailed quantitative analysis of the proposed internal and external transport networks to demonstrate that they will provide a high level of accessibility and safety for all modes.

Much of this analysis should already have been undertaken as part of the process of determining and designing the required transport networks. It should therefore be more a matter of presenting this design assessment than undertaking a new assessment.

8.8.2 Assessment years

The assessment years will generally be the year of full development of the subdivision plus the assessment year adopted for the structure plan. If there is no structure plan assessment, then 10 years after full opening of the subdivision is suggested for the post full subdivision development assessment.

It is recommended that the applicant discuss and agree the appropriate years for assessment with the approving authority in advance of undertaking the assessment.

The “year of full development” assessment will provide a measure of the transport impact once the subdivision is fully developed. The “post full development” assessment, (structure plan year or 10-year after opening), will provide a measure of the ability of the proposed transport infrastructure to accommodate subdivision flows plus further growth in the surrounding traffic, as the rest of the structure plan area is developed over time.

Some of this additional traffic may use the subdivision roads, as well as the roads immediately surrounding the subdivision. The post full subdivision development assessment is therefore an important component of the subdivision transport assessment.

Where there is a prior structure plan assessment, the post full development assessment should consider whether the subdivision is substantially unchanged from that assumed in the structure plan assessment. If it is unchanged, the “post” assessment can simply be extracted from the structure plan assessment. If it is significantly changed, then a revised assessment is required.

Where there is no prior structure plan assessment, a more detailed assessment of the post full development scenario is required to determine the potential medium to longer term impacts of the subdivision on the surrounding transport networks and of the development of the surrounding area on the subdivision itself.

8.8.3 Time periods for assessment

The subdivision should generally be assessed for the following peaks:

- peak period(s) on the surrounding road network
- peak period(s) for the subdivision

The peaks on the surrounding roads are generally the weekday morning (7am - 9am) and evening (4pm - 6pm) periods. These may be different closer to specific land uses or in specific locations, for example roads near beaches may be busiest during summer weekends. The appropriate highway peaks should therefore be agreed in advance with the approving authority if there is any doubt.

For subdivisions near schools it may also be appropriate to assess the afternoon end of school period, eg. 2.30pm – 3.30pm.

The peak period(s) for the subdivision depends upon the type of land uses within it. The appropriate peak(s) is likely to be identified as part of determining the trip generation in Section 8.9.3 and should, if there is any doubt, also be agreed with the approving authority.

Further advice on the appropriate time periods is provided in Volume 5 – Technical appendix.

8.9 Analysis of internal transport networks

8.9.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the proposed internal transport networks.

8.9.2 Assessment parameters

Determine the years for assessment and the time periods for the traffic flow analysis.

The assessment years and the time periods for analysis should be in accordance with the advice provided in Section 8.8.

8.9.3 Subdivision generated traffic

Project the traffic volumes that would be generated by the subdivision land uses, for the assessment years and time periods determined in Section 8.9.2. A suggested approach is to:

- divide the subdivision into a number of smaller zones
- determine the quantum of each land use in each zone
- determine vehicle trip generation rates for each land use type (See note 1 below)
- apply the trip rates to the land uses in each zone to obtain inbound and outbound trips for each zone
- determine the internal / external split of vehicle trips for each zone (See note 2 below)
- distribute trips onto the internal and external road networks

Note 1 - Trip rates

Vehicle trip generation rates are to be based on surveys of comparable land uses or extracted from recognised land use traffic generation databases such as:

- *Land Use Traffic Generation Guidelines*, March 1987 - Director General of Transport, South Australia;
- *Guide to Traffic Generating Developments Version 2.2*, October 2002 - Roads and Traffic Authority, New South Wales; and
- *Trip Generation* 7th edition, 2003 - Institute of Transportation Engineers, Washington, USA.

As a guide, typical (average) trip rates extracted from these sources are shown in the table below for the main land use types.

Table 2 - Typical land use vehicle trip rates

Land Use	Unit	AM peak hour trip rate		PM peak hour trip rate	
		In	Out	In	Out
Residential	Dwellings	0.2	0.6	0.5	0.3
School	Pupils	0.5	0.5	0.5	0.5
Commercial	100m2 GFA	1.6	0.4	0.4	1.6
Food retail ^{ab}	100m2 GFA	2	0.5	5	5
Non-food retail ^b	100m2 GFA	1	0.25	2	2
Industrial	100m2 GFA	0.8	0.2	0.2	0.8

a -- These rates should be applied to retail developments/ shopping centres that have a significant food retail component.

b -- The trip rates for both food and non-food retail stores can vary significantly depending upon a number of issues including type of goods sold, location and size. Caution should be used in applying these rates arbitrarily.

The table shows typical (average) vehicle trip rates for the various land uses. These rates can vary significantly, especially for retail developments and professional judgement should be used when determining appropriate trip rates.

Wherever more details are known on a particular development within the subdivision, a trip rate appropriate to that specific development should be used rather than the generic rates above.

Further advice on determining appropriate trip rates is provided in Volume 5.

Note 2 – Internal vehicle trips

Some of the vehicle trips generated by the subdivision land uses are likely to be attracted to other uses within the subdivision area, eg. trips from a residential area to the local shops or school. These would only appear on the internal road network and can be described as internal trips. The remaining trips would be attracted to land uses outside the subdivision area, eg. to the district shopping centre. These can be considered as external trips.

This split of internal to external trips is likely to be different for each subdivision and is dependent upon a number of factors including size of the subdivision, the range of land uses and facilities within it and the land uses in the surrounding areas.

For example, a subdivision that is predominantly residential would have a very high proportion of external trips. A large subdivision with a wide range of land uses and facilities, eg. schools, shops, employment and recreation as well as residential, would be likely to have a high proportion of internal trips.

A subdivision based on *Liveable Neighbourhoods* principles would therefore be likely to have a higher proportion of internal trips than a subdivision based on more conventional design principles.

It is not possible within these guidelines to provide firm advice on what proportions to use for internal / external trips as each subdivision will be different. The transport assessor should therefore use professional judgement when determining an appropriate internal / external split backed up with supporting information, data, surveys etc where available.

In some cases where the potential adverse impacts on the surrounding land uses and transport networks may be significant, sensitivity testing of a range of possible internal/external splits may be appropriate.

8.9.4 Non subdivision traffic

Assess the potential for extraneous (ie. through) traffic to use the roads within the subdivision.

Depending upon the subdivision layout, there may be existing traffic passing through the site on existing roads and/or the new road layout may attract traffic from surrounding roads. This potential for extraneous traffic should be assessed for the subdivision assessment years and time periods.

8.9.5 Design traffic flows

Determine the traffic flows to use to design the internal road network by adding the extraneous traffic (Section 8.9.4) to the subdivision generated traffic (Section 8.9.3).

8.9.6 Roads and intersections

Determine the road cross-sections required, eg two lane or four lane, to accommodate the above design traffic flows.

Demonstrate that adequate sight distance is provided at each intersection.

Undertake a detailed intersection operational analysis.

Determine the intersection controls required, eg. priority, roundabout or traffic signals, to accommodate the above design traffic flows.

The road cross-sections should be in accordance with *Liveable Neighbourhoods* and/or Austroads design guidelines, in particular the *Guide to Traffic Engineering Practice (GTEP) series*.

The intersection analysis should be undertaken in accordance with *GTEP parts 5 – Intersections at grade, 6 – Roundabouts and 7 – Traffic signals*. It should be

sufficient to demonstrate that adequate sight distances are provided for intersections within the subdivision and for new intersections providing access to the subdivision.

It should demonstrate that the proposed methods of control are appropriate and would satisfy operational and safety requirements. (Table 8.1 of *GTEP Part 2* provides indicative volumes above which an intersection analysis should be carried out).

The intersection analysis should demonstrate that the delays would be less than shown in Table 3. If they are not, improvements to the intersection layout and/or changes to the method of control, (eg. from priority to signals), should be proposed.

Table 3 - Guideline thresholds for intersection operation

Criteria	Average Delay (secs/veh)
<u>Signalised intersections</u>	
Average delay for all vehicles passing through the intersection	<55 secs
Average delay for any individual vehicle, pedestrian or cyclist movement	<65 secs
<u>Priority intersections</u> (roundabouts, give way and stop)	
Average delay for all vehicles on the non-priority arms (ie. have to give way or stop)	<35 secs
Average delay for any individual vehicle, pedestrian or cyclist movement	<45 secs
<u>Right turn lanes</u>	
Exclusive turning movement queue length	Less than available storage length (95th percentile queue)

NOTE- This table is based on the US Highways Capacity Manual's level of service approach. The delays above equate to the upper limit delay of Level of Service D for intersections as a whole and the middle of Level of Service E for individual movements.

8.9.7 Access to frontage properties

Develop/revise strategies to provide access to properties fronting all roads carrying more than 500 vehicles per hour. Strategies to be considered include:

- individual direct access
- shared access (between two properties)
- service lanes
- no frontage access

The 500 vehicles per hour threshold is based on the *Liveable Neighbourhoods Element 2* advice that vehicles reversing directly out of driveways should be avoided on roads carrying more than 5000 vehicles per day.

If access strategies were developed at the structure plan stage, they should be reviewed and revised as necessary. If not, they should be developed at this stage.

The access strategies should determine how individual lots should be accessed, eg. one access per lot or shared access or service road. This should be based on the function of the road and its projected traffic volumes. This strategy then forms the basis for the individual lot access arrangements at the individual development application stage.

8.9.8 Pedestrian / cycle networks

Review/undertake an analysis of the operation and safety of the pedestrian / cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross
- identifying where safe crossing facilities should be provided
- indicating where safe crossing facilities are proposed

The key component of the analysis is the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross the road to access bus stops.

The analysis should include identifying which roads within the subdivision are likely to have traffic volumes that would adversely impact on the efficiency and safety of pedestrians trying to cross. This depends upon the road cross-section as shown in Table 4.

Table 4 – Traffic volumes affecting pedestrian crossing amenity

Road cross-section	Traffic volume affecting ability of pedestrians to cross * (vehicles per hour – two way)
2 lane undivided	1100 vph
2 lane divided (or with pedestrian refuge islands)	2800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1600 vph

* See the Pedestrian assessment section of Volume 5 for details on how the above volume thresholds were determined.

Note that four lane undivided roads without pedestrian refuge islands are the most difficult to cross, the difficulties occurring at lower volumes than for a two lane road. This is due to the longer time required to cross the road, requiring a longer gap in the traffic. For this, and other safety reasons, (eg. greater potential for head on collisions), four lane undivided roads should not be considered in any new road network planning.

The analysis should also identify where safe crossing facilities should be provided and indicate where they are proposed, concentrating on:

- key locations on the pedestrian network (ie. along major pedestrian desire lines identified in Sections 8.3 and 8.5)
- proposed bus stop locations, if known, or potential bus stop locations

In addition, to ensure an efficient and safe pedestrian / cyclist network safe crossing facilities should be considered at intervals no greater than shown in Table 5 for the roads identified above as posing difficulties for pedestrians.

Table 5 - Maximum desirable spacings for safe pedestrian crossings.

Road type	Maximum spacing of safe pedestrian crossing facilities**
Arterial – minimal frontage activity	400 metres
Arterial – significant frontage activity	200 metres
Local distributor / Neighbourhood connector	100 metres

** See the Pedestrian assessment section of Volume 5 for the rationale behind these spacings.

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 2)
- zebra crossings
- signalised pedestrian crossings (mid-block)
- crossing facilities at signalised intersections
- overpasses / underpasses (where appropriate)

Note that for undivided roads carrying greater volumes than those in Table 5, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

8.9.9 Safe walk/cycle to school assessment (residential subdivisions only)

Undertake an assessment of the walk/cycle routes to schools by:

- identifying all schools within the subdivision and those within 800 metres of the boundaries of the subdivision.
- identifying the potential catchment for each school
- identifying the most likely walk and cycle routes to each school from the catchment areas
- determining any potential deficiencies, or areas where improvements could be made, along these routes
- proposing measures to address these deficiencies

This is an extension of the general walk/cycle assessment undertaken above, but concentrating on the walk/cycle routes to school. The key component is again the ability to safely cross major roads. The assessment should be based on the analysis method of Section 8.9.8 but with recognition that school children, particularly primary school children may experience difficulties at lower traffic levels.

The analysis should therefore identify locations where potential crossing difficulties are likely and recommend remedial measures. These measures could include signalised pedestrian crossings or a children's crossing with a warden. The latter should include a discussion on whether the required type A or B crossing warrants would be likely to be met.

The assessment should also identify any missing or substandard sections of footpath / cycleway along these routes.

8.9.10 Pedestrian permeability and efficiency

Undertake a pedshed analysis in accordance with *Liveable Neighbourhoods Appendix 3* for;

- all neighbourhood or town centres within the subdivision
- all existing or proposed bus stops within the subdivision
- that part of the subdivision within 400 metres of an external existing or proposed bus stop
- all existing or proposed train stations within the subdivision
- that part of the subdivision within 800 metres of an external existing or

proposed train station

Note that while this is a requirement for those subdivisions designed and submitted in accordance with *Liveable Neighbourhoods*, it is suggested that pedsheds also be undertaken for those subdivisions submitted in accordance with DC policy.

The pedshed analysis, as described in *Liveable Neighbourhoods Appendix 3*, is a good way of assessing the permeability and efficiency of the proposed pedestrian network. *LN (Element 2 R37 and R38)* states that:

- At least 60 percent of dwellings within a 400m radius of an existing or potential neighbourhood or town centre should be within 400m safe walking distance
- At least 60 percent of dwellings within an 400m radius of an existing or potential bus stop should be within 400m safe walking distance
- At least 60 percent of dwellings within an 800m radius of an existing or potential railway station should be within 800m safe walking distance

Some bus stops and/or train stations may be outside the subdivision itself but still within reasonable walking distance. A pedshed analysis of those parts of the subdivision within 400 metres of the bus stops and 800 metres of the train stations should be undertaken to demonstrate that the proposed pedestrian network within the subdivision provides a high level of permeability to these external transport nodes.

8.9.11 Access to public transport

Determine the level of access to public transport by calculating the percentage of proposed residential dwellings that are within 400 metres walk of an existing or proposed bus route, (or 500 metres from bus stops if known). The higher the percentage, the higher the level of access.

The PTA in its *Design and Planning Guidelines for Public Transport Infrastructure – Bus Route Planning and Transit Streets* gives an indication of the desired level of access. The Guidelines state that:

The Transperth Ten-Year Plan service coverage goal is that there will be a bus stop within 500 metres of where 95 percent of Perth's population lives.

At the subdivision stage bus routes, existing and proposed are likely to be known but new bus stop locations may not. The assessment should therefore be based on a 400 meter walk distance to bus routes if bus stop locations are unknown, or 500 meters walk to bus stops, if their locations are known.

It is recommended that a figure of at least 90 percent be achieved in the “walk distance to bus routes” case either case to ensure the above requirement would be able to be satisfied when bus stop locations are being determined.

8.10 Analysis of external transport networks

8.10.1 Introduction

This section presents the steps recommended to undertake and present the analysis of the transport networks surrounding the subdivision.

8.10.2 Extent of analysis

The extent of analysis of the external road networks is to be in accordance with Section 5.0.

8.10.3 Design traffic flows on external road network

Determine the design traffic flows on the external road network for the assessment years and time period(s) of Section 8.9.2.

This task will depend upon whether or not there is a prior structure plan transport assessment undertaken in accordance with these guidelines.

If there is, the external road network traffic flows should be extracted from the structure plan assessment and adjusted as required for any changes to the proposed subdivision compared to that assumed in the structure plan.

Where the structure plan and subdivision assessment years and/or time periods differ, the structure plan assessment should be used as a basis for determining the required subdivision period flows.

If there is no prior assessment, or if the assessment did not include projected flows on external roads, the following approach is suggested:

- Extract the existing traffic flows (from section 8.4).
- Adjust these to the subdivision assessment years by:
 - obtaining future year volumes from the MRWA or DPI transport models, where available; or
 - applying a growth factor, agreed with the approving authority, to existing traffic volumes; or
 - using a recognised traffic engineering technique, as agreed with the approving authority
- Adjust for any committed or proposed developments in the surrounding area (as discussed and agreed with the approving authority – Section 6.2)).

- Adjust for any committed or proposed transport network changes, (as discussed and agreed with the approving authority – Section 6.2).
- Add the traffic generated by the subdivision (from Section 8.9.3).

Note that the MRWA or DPI transport models may or may not contain the proposed subdivision land uses. If flows are extracted from either of the models, they may need to be adjusted to allow for any variations in the assumed subdivision land uses.

8.10.4 Impact on external roads

Assess whether the existing road cross-sections, eg. two lane or four lane, would be adequate to accommodate the above design traffic flows.

If not, indicate what improvements would be required.

The impact of changes in traffic flows on the roads surrounding the subdivision is to be assessed based on *Liveable Neighbourhoods*, where appropriate, or by using the relevant volumes of the Austroads *Guides to Traffic Engineering Practice* or a recognised alternative technique as agreed with the approving authority.

The assessment is to consider the capacity of the links to carry the projected volumes, the likely change in level of service and, where appropriate, the impact on travel times and safety.

8.10.5 Impact on external intersections

Assess whether the existing intersection controls eg. priority, roundabout or traffic signals, would be able to accommodate the above design traffic flows.

If not, indicate what improvements would be required.

The analysis of intersections is a major component of the assessment of the external road network as the greatest impacts of a subdivision's traffic would be likely to occur at intersections.

The operation of all relevant intersections in the study area should be evaluated for each time period in the assessment years, with and without the proposed subdivision.

This should identify the changes in operation, eg. delays and queue lengths, due to the subdivision traffic, and determine whether the subdivision traffic could be accommodated under the current intersection layout or whether remedial measures (improvements) may be required.

The thresholds for consideration of remedial measures are as shown in Table 3. These are guideline thresholds only and remedial measures may be required, at the discretion of the approving authority, even when the thresholds have not been reached.

When any of the thresholds are exceeded in the 'with development' scenario, the developer should identify and assess remedial measures to achieve the following.

- Where the thresholds are exceeded in the base flow scenario, the proposed remedial measures should return conditions to their 'without development' levels.
- Where thresholds are not exceeded in the base scenario, the proposed remedial measures should reduce conditions to no more than the above threshold levels.

The objective of the remedial measures is therefore for the operation of the intersections to remain within the thresholds or, if the thresholds will be exceeded even without the addition of the proposed subdivision, conditions should be made no worse by the proposed subdivision than they would be without it.

8.10.6 Pedestrian / cycle networks

Undertake an analysis of the operation and safety of the external pedestrian / cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross
- identifying where safe crossing facilities should be provided
- indicating where safe crossing facilities are proposed

This analysis is comparable to that undertaken in Section 8.9.8 for the internal transport networks but is to concentrate on:

- pedestrian routes to attractors within 400 metres (5 minutes walk);
- pedestrian routes to bus stops within 400 metres (5 minutes walk);
- pedestrian routes to train stations within 800 metres (10 minutes walk); and
- cycle routes to attractors within 1200 metres (5 minutes cycle)

The key component of the analysis is again the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross the road to access bus stops. It should consider both the pedestrians/cyclists generated by the subdivision land uses and the impact of the subdivision traffic on existing pedestrians and cyclists.

The analysis should identify which roads are likely to have traffic volumes that would adversely impact on the efficiency and safety of pedestrians trying to cross, per Table 4. The traffic volumes are to be as determined in Section 8.10.3.

Note that, while the analysis should concentrate on the network outlined above, there may be roads further afield where flows have increased to above those in Table 4 due to the subdivision traffic. The potential need for safe crossings on these roads should also be identified.

The analysis should also identify where adequate safe crossing facilities are already provided, where they may be required and indicate where any new facilities are proposed. The analysis should concentrate on:

- key locations on the pedestrian network (ie. along major pedestrian desire lines identified in Section 8.8)
- existing bus stop locations
- proposed or potential bus stop locations

In addition, to ensure an efficient and safe pedestrian / cyclist network safe crossing facilities should be provided at intervals no greater than shown in Table 5 for the roads identified above as posing difficulties for pedestrians.

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 4)
- zebra crossings
- signalised pedestrian crossings (mid-block)
- crossing facilities at signalised intersections
- overpasses / underpasses (where appropriate)

Note that for undivided roads carrying greater volumes than those in Table 5, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

8.11 Safety issues

Identify and discuss any existing or potential safety issues raised by the proposed subdivision.

Where appropriate, propose remedial measures to address the safety concerns.

The previous sections may have identified existing or potential safety issues that should be expanded upon. Examples of possible safety issues include:

- a new access to the subdivision crossing a busy footpath, especially one used by school children;
- the subdivision increasing traffic through a busy priority intersection; and

- the need for pedestrians / cyclists to cross a busy road to access the subdivision.

The assessment should examine any particular intersections or other locations that may be of concern, ie. either identified during the transport assessment or raised by the approval authority, (Section 6.2).

If the subdivision proposal would worsen conditions at existing locations with safety issues or raise new safety concerns at other locations, then appropriate measures should be investigated to minimise the adverse impacts.

Note that a road safety audit is not a standard component of a transport assessment and would not normally be required. However, in cases where the subdivision would significantly increase traffic volumes and/or major changes to the transport infrastructure are proposed, the approving authority may require the applicant to submit a road safety audit to assess any safety implications. The road safety audit would need to be prepared by accredited road safety auditors and should be presented separately.

8.12 Conclusions

Provide a summary of the findings and conclusions of the transport assessment.
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Appendix A

Transport Information Checklists for Subdivisions

B1 - Transport statement

B2 - Transport assessment

B1 - Checklist for a transport statement for a subdivision

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comments column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an intersection.

Item	Status	Comments/Proposals
Proposed subdivision		
proposed land uses		
existing land uses		
context with surrounds		
Vehicular access and parking		
access arrangements		
public, private, disabled parking set down / pick up		
Service vehicles (non-residential subdivisions only)		
access arrangements		
on/off-site loading facilities		
Traffic volumes and vehicle types (non-residential subdivisions only)		
daily or peak traffic volumes		
type of vehicles (eg cars, trucks)		
Traffic management on frontage		

streets		
Public transport access		
nearest bus/train routes		
nearest bus stops/train stations		
pedestrian/cycle links to bus stops/train station		
Pedestrian access/facilities		
existing pedestrian facilities within the subdivision (if any)		
proposed pedestrian facilities within subdivision		
existing pedestrian facilities on surrounding roads		
proposals to improve pedestrian access		
Cycle access/facilities		
existing cycle facilities within the subdivision (if any)		
proposed cycle facilities within subdivision		
existing cycle facilities on surrounding roads		
proposals to improve cycle access		
Site specific issues		
Safety issues		
identify issues		
remedial measures		

Proponent's name

Company

Signature

Date

Transport assessor's name

Company

Signature

Date

B2 - Checklist for a transport assessment of a subdivision

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an intersection.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
name of applicant and consultant		
subdivision location and context		
brief description of subdivision		
key issues		
background information		
Subdivision proposal		
regional context		
proposed land uses		
table of land uses and quantities		
major attractors/generators		
any specific issues		
Existing situation		

existing land uses within structure plan		
existing land uses surrounding the subdivision		
existing road network within subdivision		
existing road network surrounding the subdivision		
traffic flows on roads within subdivision (AM and PM peak hours)		
traffic flows on roads surrounding the subdivision (AM and PM peak hours)		
existing pedestrian/cycle networks within the subdivision		
existing pedestrian/cycle networks surrounding the subdivision		
existing public transport services within the subdivision		
existing public transport services surrounding the subdivision		
Proposed internal transport networks		
changes/additions to existing road network		
road reservation widths		
road cross-sections & speed limits		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport routes		
Changes to external transport networks		
road network		
intersection controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
surrounding attractors/generators		

proposed changes to surrounding land uses		
travel desire lines from subdivision to these attractors/generators		
adequacy of existing transport networks		
deficiencies in existing transport networks		
remedial measures to address deficiencies		
Analysis of internal transport networks		
assessment years and time periods		
subdivision generated traffic		
extraneous (through) traffic		
design traffic flows		
road cross-sections		
intersection sight distances		
intersection operation and method of control		
frontage access strategy		
pedestrian / cycle networks		
safe walk/cycle to school assessment (residential subdivisions only)		
pedestrian permeability & efficiency		
access to public transport		
Analysis of external transport networks		
base flows for assessment years		
total traffic flows		
road cross-sections		
intersection operation		
pedestrian/cycle networks		

Appendix B

Data sources

The following table provides a summary of the main sources of data required for a transport assessment.

Data	Source
Existing traffic flows	<p>MRWA Asset and Network Information Branch Ph 08 9323 4621 (Customer service officer) email: roadinfo@mainroads.wa.gov.au</p> <p>Daily data available in <i>Average Weekday Traffic Flow</i> document (also available on MRWA website – www.mainroads.wa.gov.au)</p> <p>Local councils may have some data</p>
Public transport services	<p>Public Transit Authority (PTA) Ph 08 9326 2600 Website www.pta.wa.gov.au Email enquire@pta.wa.gov.au</p>
Cycle routes/facilities	<p>Local councils</p> <p>Department for Planning and Infrastructure (DPI) Ph 08 9216 8000 Website www.dpi.wa.gov.au/cycling Email cycling@dpi.wa.gov.au</p>
Crash data	<p>MRWA Asset and Network Information Branch Ph 08 9323 4111</p> <p>Some data available on the MRWA website under safety/research (www.mainroads.wa.gov.au)</p>
Other proposed developments	<p>Local council</p> <p>DPI – Statutory Planning Ph 08 9264 7777</p>
Other transport proposals	<p>MRWA - ph 08 9323 4111</p> <p>Local councils</p> <p>PTA (for public transport proposals – see above)</p>

Transport Assessment Guidelines For Developments

Volume 4 – Individual Developments

Version for Trial & Evaluation

August 2006

**Prepared by the Department for Planning and Infrastructure
on behalf of the Western Australian Planning Commission**



VOLUME 4 – INDIVIDUAL DEVELOPMENTS

Contents	Page
Part A – The assessment process	1
1.0 Introduction	1
2.0 The development application stage	1
3.0 Prior transport assessments	2
3.1 Introduction	2
3.2 Prior assessment consistent with guidelines	2
3.3 Prior assessment not consistent with guidelines	3
3.4 No prior assessment	3
4.0 Policy context	4
5.0 Transport assessment components	5
6.0 Level of assessment	5
6.1 Size of development	5
6.2 Assessment levels	5
6.3 Vehicle trips versus person trips	7
6.4 Advice from approving authority	7
6.5 Application of table	8
6.6 Detailed guidance	8
Part B – Transport statement	9
1.0 Introduction	9
2.0 Checklist	10
3.0 Prior transport assessment	10
4.0 Extent of assessment	10
5.0 Content	10
5.1 Introduction	10
5.2 Proposed development	11
5.3 Vehicle access and parking	11
5.4 Provision for service vehicles	11
5.5 Hours of operation	12

5.6	Daily traffic volumes and vehicle types	12
5.7	Traffic management on frontage streets	12
5.8	Public transport access	12
5.9	Pedestrian access	13
5.10	Cycle access	13
5.11	Site specific issues	13
5.12	Safety issues	14
Part C	– Transport assessment	15
1.0	Introduction	15
2.0	Checklist	15
3.0	Prior structure plan assessment	15
4.0	Background	16
5.0	Extent of assessment	16
6.0	Agreement on scope of assessment	18
6.1	Introduction	18
6.2	Scope	18
6.3	Parameters	18
7.0	Format of assessment	19
7.1	Introduction	19
7.2	Structure	19
8.0	Details of content	20
8.1	Summary	20
8.2	Introduction and background	20
8.3	Development proposal	21
8.4	Existing situation	21
8.5	Changes to surrounding transport networks	24
8.6	Integration with surrounding area	25
8.7	Analysis of transport networks - general advice	26
8.8	Assessment years	26
8.9	Time periods for assessment	27
8.10	Development generation and distribution	27
8.11	Parking	28
8.12	Committed developments and other transport proposals	29
8.13	Base and “with development” traffic flows	29
8.14	Analysis of development accesses	31
8.15	Impact on surrounding roads	32
8.16	Impact on intersections	32
8.17	Impact on neighbouring areas	33

8.18	Traffic noise and vibration	33
8.19	Road safety	34
8.20	Public transport access	34
8.21	Pedestrian access / amenity	35
8.22	Cycle access / amenity	36
8.23	Analysis of pedestrian / cycle networks	37
8.24	Safe walk/cycle to school	39
8.25	Traffic management plan	40
8.26	Conclusions	40

Appendix A – Development transport information checklists

Appendix B – Data sources

Disclaimer

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Volume 4 – Individual Developments

Part A – The assessment process

1.0 Introduction

Volume 4 of the guidelines is intended for use by land use and transport planners and transportation specialists.

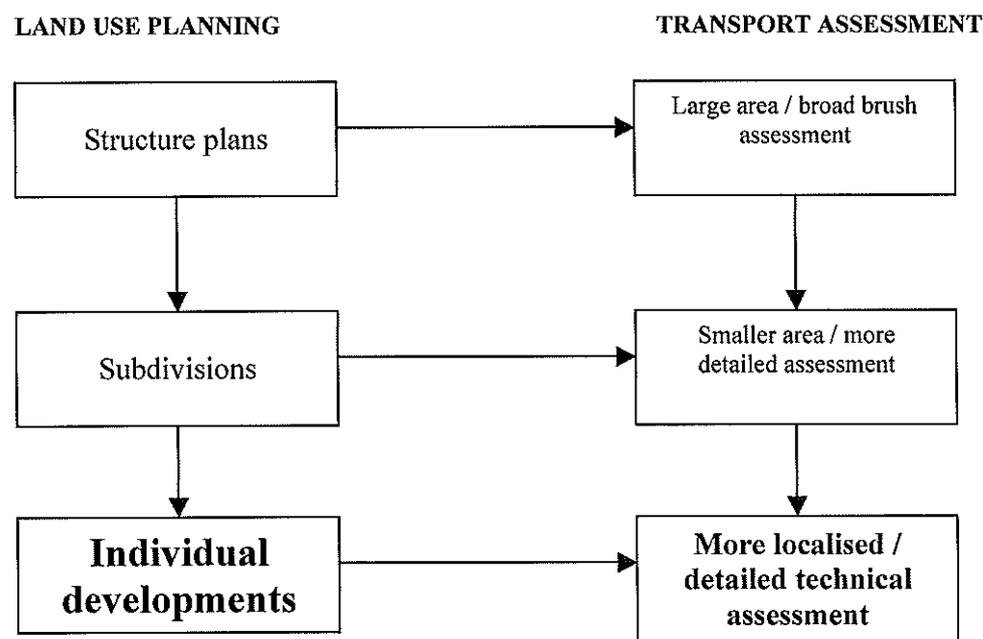
It provides advice on the scale and content of the transport information that should be submitted to the approving authority in support of an individual development application. It also provides detailed technical advice on how to undertake the transport assessment.

Volume 4 should be read in conjunction with Volume 1 that provides general guidance on the transport assessment process, and Liveable Neighbourhoods and WAPC development control policies, that set out the transport related objectives, measures and requirements for individual developments.

2.0 The development application stage

The individual development application is the third and final stage of the land use / transport assessment process as illustrated in Figure 1. It generally provides much more detail over a smaller area compared to the structure plan and subdivision stages, for both the land use and transport proposals.

Figure 1 – The land use/transport planning process



The objectives of the transport assessment of an individual development are:

- to demonstrate that the proposal is consistent with the overall structure and subdivision planning;
- to provide a greater level of technical detail on the development and its immediate surrounds; and
- to provide details of any transport issues specific to the development not covered in the subdivision assessment.

3.0 Prior transport assessments

3.1 Introduction

Many individual developments are likely to be part of a local structure plan and/or subdivision for which transport assessments may have already been carried out. (Volume 2 provides details on transport assessments for structure plans and Volume 3 for subdivisions.)

As these guidelines are being introduced, the existing assessments are unlikely to provide the same level of information or be in the format required under the guidelines.

Over time, however, as the guidelines are applied, a greater consistency in the transport assessment accompanying structure plans and subdivisions should result. In the interim, the following approach is recommended.

3.2 Prior assessment consistent with guidelines

Some developments may be part of a local structure plan or subdivision for which a transport assessment has been carried out in accordance with these guidelines.

In these cases reference should be made to the prior transport assessment when preparing the transport assessment for the development. The relevant information should generally be extracted from the prior assessment and expanded as required; the prior assessment having been carried out at a broader brush level and most likely covering a potentially larger area at a lower level of detail than is required for the development assessment.

On some limited occasions it may be sufficient to briefly summarise the relevant information and provide a reference back to the prior assessment. It may also be appropriate to provide a copy of the prior assessment when submitting the development application.

3.3 Prior assessment not consistent with guidelines

Where a “non-guidelines” transport assessment has been made at the structure plan or subdivision stage, the development assessment should draw on any appropriate information and expand as required.

Where the required information is not available from the prior assessment, it should be provided at the development stage. This may require expansion of the area of assessment beyond that normally required for a development.

In other words, the first stage of the development assessment may be to expand the prior assessment to provide the information required for local structure plans / subdivisions under these guidelines. This information can then be used to prepare the development assessment.

This expansion of the prior assessment may not need to be as comprehensive as a full guidelines structure plan / subdivision assessment. It should concentrate on those parts of the surrounding area that would impact most on the development. For example, the surrounding land uses may generate traffic that would use the roads fronting the development and there may be the potential, or need, for bus routes and pedestrian/ cycle networks to pass directly in front of the development.

This approach is recommended to ensure that individual developments within a structure plan / subdivision area are not developed in isolation but are consistent with the overall structure and subdivision planning.

When the prior assessment is less recent, (as a guide, more than five years old), it may be appropriate to review those parts of the assessment relevant to the development to ensure that they are still current and valid. It is recommended that the proponent discuss this with the approving authority prior to commencing the development assessment.

3.4 No prior assessment

In the cases where no prior transport assessment has been undertaken, it is recommended that a local structure plan or subdivision (as appropriate) transport assessment be undertaken prior to undertaking the development assessment.

Again, this assessment may not need to be as comprehensive as a full structure plan / subdivision assessment as it should concentrate on those parts of the surrounding area that would impact most on the development.

For developments in built up areas not covered by structure planning or are not part of a larger subdivision, this preliminary assessment may not be required. The development assessment must, nevertheless, address the context of the development with respect to, and its integration with, the surrounding land uses.

4.0 Policy context

Current WAPC development control policy requires individual development applications to be supported by transport information. The transport objectives for individual developments under DC policy are similar to those for subdivisions, namely:

- to facilitate appropriate access and movement systems for all modes of transport;
- to integrate the development with the surroundings land uses and transport networks;
- to provide high quality pedestrian and cycle networks both within the development and connected to the surrounding area; and
- to ensure adequate consideration is given to public transport access

In particular, DC1.2, Development Control – General Principles (August 2004) sets out the requirements for the transport information to be provided in support of individual development applications.

Section 3.1 of the policy outlines what the WAPC needs to consider in making its decision. This includes:

- *integration of development into the site and its surroundings;*
- *transport and traffic impacts; and*
- *vehicular and non vehicular access, circulation and car parking;*

Appendix 2 of Policy DC1.2 outlines what needs to be submitted to the WAPC in support of a DA.

The transport information is:

1 (v) The existing & proposed means of access and egress for pedestrians and vehicles to and from the site;

1 (vi) The location, number, dimensions and layout of all car parking spaces intended to be provided, including provision for the disabled;

1 (vii) The location and dimensions of any area proposed to be provided for the loading and unloading of vehicles carrying goods or commodities to and from the site and the means of access to and from those areas; and

3 Any specialist studies that the responsible authority may require the applicant to undertake in support of the application such as traffic ...

The following sections provide further guidance on the transport information required under DC 1.2 and other appropriate WAPC policy to support a development application.

5.0 Transport assessment components

The key components of a transport assessment for a development are:

- to assess the proposed access arrangements for all modes, ie. vehicle, public transport, pedestrian and cyclist;
- to assess the level of transport integration between the development and the surrounding land uses;
- to determine the impacts of the traffic generated by the development on the surrounding land uses; and
- to determine the impacts of the traffic generated by the development on the surrounding transport networks.

6.0 Level of assessment

6.1 Size of development

Individual developments can range from very large scale with either a single land use (eg. retail) or a range of land uses, (eg. mixed use residential/commercial/retail) down to the development of a single dwelling or small shop. Obviously, each would have widely different transport implications and a “one size fits all” assessment process would not be appropriate.

Therefore, under these guidelines, the level of transport assessment required is related to the level of transport impact the proposed development would be likely to have on the surrounding land uses and transport networks.

This depends upon a number of factors including type and quantities of land uses, location and catchment, the surrounding road network and public transport and accessibility for pedestrians, cyclists and people with disabilities.

6.2 Assessment levels

A three level assessment process has been developed to accommodate this diversity. This process is essentially the same as for subdivisions, although the level of detail required and area of assessment will be different.

The levels are, in order of the level of information required:

- | | |
|-------------------|---------------------------|
| • Low impact | No assessment |
| • Moderate impact | Brief transport statement |
| • High impact | Full transport assessment |

The process for determining the level of assessment required is illustrated in Figure 2.

Figure 2 – Process to determine level of transport assessment required

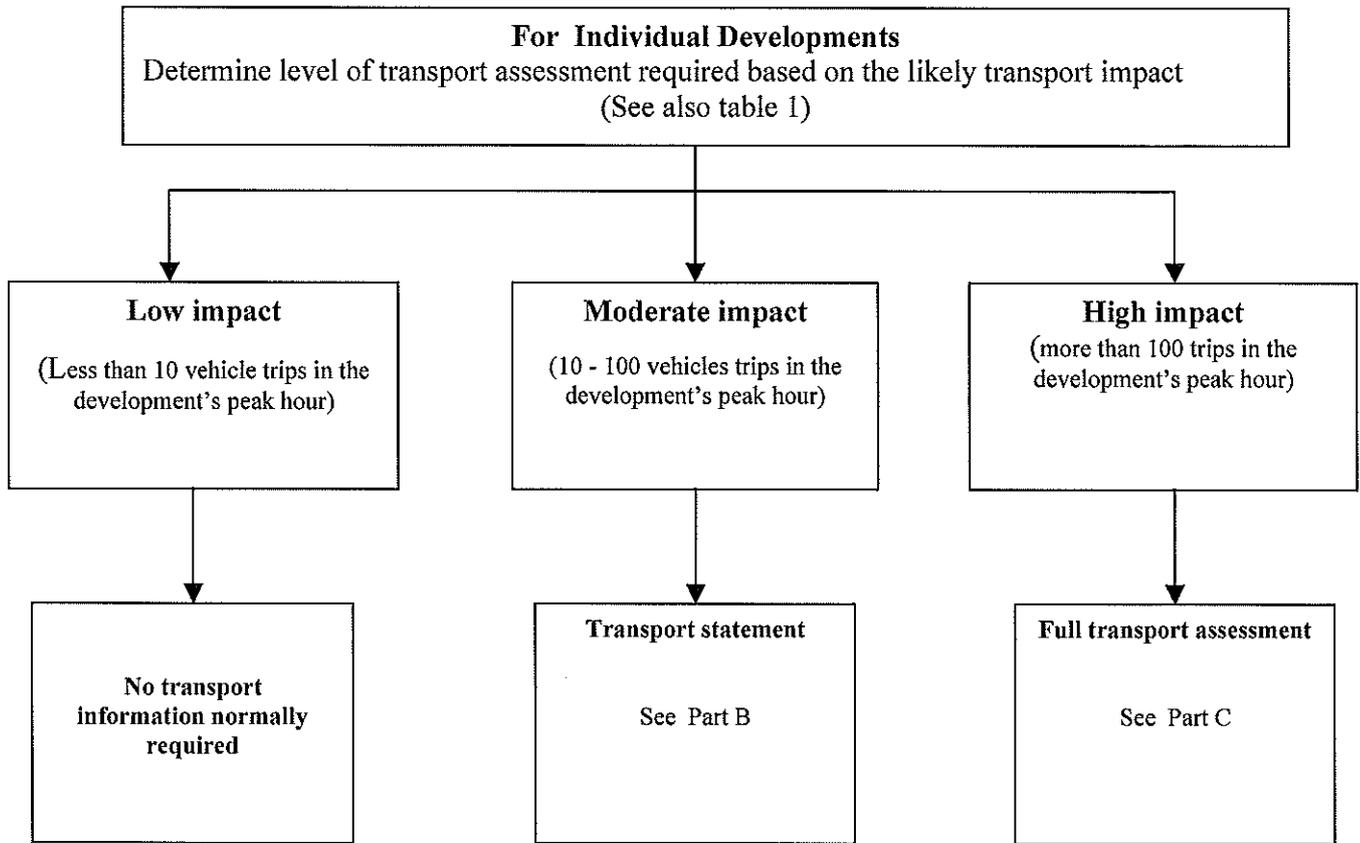


Table 1: Level of transport assessment required by land use and size

LAND USE	MODERATE IMPACT	HIGH IMPACT
	Transport statement required	Transport assessment required
	10 – 100 vehicle trips in the peak hour	> 100 vehicle trips in the peak hour
Residential	10 - 100 dwellings	>100 dwellings
Schools	10 - 100 students	>100 students
Entertainment venues, restaurants, etc.	100 - 1000 persons (seats) OR 200 – 2000 m ² gross floor area	>1000 persons (seats) OR > 2000 m ² gross floor area
Fast food restaurants	50- 500 m ² gross floor area	>500 m ² gross floor area
Food retail / Shopping centres with a significant food retail content	100 - 1000 m ² gross floor area	>1000 m ² gross floor area
Non food retail	250 - 2500 m ² gross floor area	>2500 m ² gross floor area
Offices	500 - 5000 m ² gross floor area	>5000 m ² gross floor area
Industrial	1000 – 10,000 m ² gross floor area	>10,000 m ² gross floor area
Other Uses	Discuss with approving authority	Discuss with approving authority

See Volume 5 Part B for the derivation of the threshold values in Table 1.

Table 1 presents these levels in terms of land use units, (eg. number of dwellings or retail floor space), for the main land use categories, based on standard trip generation rates.

Note that the level of traffic generated relates to the number of vehicle trips generated by the development during its busiest hour(s) of operation. This peak hour(s) may or may not occur at the same time as the peak periods on the surrounding roads.

6.3 Vehicle trips versus person trips

The use of vehicle trips generated to determine the level of assessment required should be seen as a proxy for person trips as there are no land use types that generate high volumes of non-car trips but very low volumes of car trips.

There may be a specific development in a specific location that would generate high person trips but low car trips, eg. a retail development in the CBD. Typically, however, retail generates high levels of car trips.

Take, for example, two retail developments of 2000m², one in a suburban shopping centre and one in the Perth CBD. Both would require a full assessment under the guidelines. The suburban development would be likely to generate mainly car trips and (in most cases) typical retail car trip rates would be used in the transport assessment.

The CBD development would be likely to generate a (much) lower number of car trips but a (much) higher number of public transport trips and walk trips (from people already in the CBD). The CBD development transport assessment would adopt a lower car trip rate and would also need to address the higher than normal non-car mode share.

By applying standard vehicle trip generation rates for the land use within the development (retail in this case), the appropriate level of assessment required will be identified.

6.4 Advice from approving authority

While the level of assessment should generally be in accordance with these guidelines, it is recommended that the level required be confirmed by the approving authority.

Advice from the approving authority to proponents on the level of assessment required is to be given, and taken, on a without prejudice basis. This does not preclude the approving authority requesting further information, at its discretion.

This particularly applies to transport statements where the information provided may indicate that specific issues require more detailed assessment or that the impact is greater than initially anticipated and a more detailed transport assessment is required.

While this may result in a degree of uncertainty for the proponent, it is considered that some flexibility is required to allow approving authorities to ask for further information, when the preliminary assessment raises additional issues or concerns.

If approving authorities were to be bound by their initial advice on the level and extent of assessment and the parameters for the assessment they would be likely to err on the side of caution. For example, they may ask for a larger study area just in case the impacts extend beyond what would normally be expected. This would be an overkill in many cases.

By allowing approving authorities some powers to request additional information after the initial assessment it is considered that their initial requests for assessment will be more reasonable, thereby reducing the level of unnecessary work required to be undertaken by proponents.

6.5 Application of table

The levels in Table 1 are to be applied to the ultimate development so that the full potential impact is assessed. For large developments where staging is proposed, it may be appropriate to also assess each stage individually to determine when various transport infrastructure may be required. The level of assessment required is, however, to be determined by the size of the ultimate development.

For developments smaller in size than those in the transport statement column, no transport information will generally be required. The applicant is nevertheless recommended to confirm this with the relevant approving authority prior to submitting the application.

For mixed use developments a pro rata approach should be used to determine the level of assessment required. For example, a development with 70 dwellings and 500m² of retail would be likely to generate more than 100 trips in the peak hour, requiring a full transport assessment.

6.6 Detailed guidance

Detailed guidance on how to undertake the two levels of assessment above is provided in this volume as follows:

Part B – Transport statement

Part C – Transport assessment

Part B – Transport statement

1.0 Introduction

A transport statement is required for those developments that would be likely to generate moderate volumes of traffic and therefore would have a moderate overall impact on the surrounding land uses and transport networks, (in accordance with Table 1).

A transport statement is a brief statement outlining the transport aspects of the proposed development. The intent of the statement is to provide the approving authority with sufficient transport information to confirm that the proponent has adequately considered the transport aspects of the development and that it would not have an adverse transport impact on the surrounding area.

Of particular relevance is the accessibility of the development by non-car modes, in accordance with Government's sustainable development objectives, and its integration with the surrounding area.

The transport statement should also address any issues specific to the particular subdivision, but without requiring a full transport assessment to be undertaken - an unnecessary requirement for most developments of this size.

The site specific issues to be assessed should be discussed and agreed with the approving authorities prior to commencing the transport statement and may include:

- the generation of traffic past sensitive uses such as schools or hospitals;
- the generation of traffic on low volume residential roads;
- particular intersections or sections of road that may be adversely affected;
- the potential for rat-running, especially through residential areas;
- issues associated with the heavy vehicles generated by the development;
- developments operating outside normal business hours in/near residential areas;
- developments with a potentially high non-car mode share; and
- developments close to major transport nodes.

It is envisaged that the transport statement will generally be from 2 to 3 pages up to several pages in length, but this will depend upon the number and nature of any specific issues that need to be addressed.

It is expected that most, if not all, of the information to be provided will be of a non-technical nature, ie. will not require input from a specialist in transportation planning or traffic engineering. This will however depend upon the nature of the specific issues to be addressed and specialist technical input may be required on occasions.

The level of information sought and the format for providing the information are set out in Section 5.0.

2.0 Checklist

A checklist of the typical information required is provided in Appendix A. This checklist is to be filled out, signed by the proponent, (and the transport specialist where appropriate), and submitted with the transport statement, as part of the development application.

3.0 Prior transport assessment

The development may be part of a structure plan or subdivision for which a transport assessment has already been undertaken. If this is the case, the transport statement should extract the relevant information and revise or expand it as appropriate.

Where there is no prior transport assessment, the transport statement may need to provide additional information on the surrounding land uses and transport networks.

Further advice on prior assessments is provided in Section 3.0 of Part A of this volume.

4.0 Extent of assessment

The area to be covered by the transport statement is to include, as a minimum:

- the proposed development site;
- all roads fronting the site, for the extent of the site frontage plus 100 metres beyond the site;
- pedestrian routes to the nearest bus stops (for all bus routes passing within 400 metres of the site);
- pedestrian routes to nearest train station(s) (if within 800 metres);
- pedestrian/cycle routes to any major attractors within 400 metres, (five minutes walk) of the site, eg. for a small residential development attractors could be a corner shop, the primary school and the nearby park; and
- the area(s) likely to be affected by the site specific issue(s).

5.0 Content

5.1 Introduction

The statement is intended to be an informal, non-technical statement of the transport aspects of the development. Its format is therefore relatively flexible but should include the following sections.

- Proposed development
- Vehicle access and parking
- Provision for service vehicles

- Hours of operation (if applicable)
- Daily traffic volumes and vehicle types
- Traffic management on frontage streets
- Public transport access
- Pedestrian access
- Cycle access
- Site specific issues
- Safety issues

The information required for each section is outlined below. Note that some of the information may be better provided graphically on a map and/or plan rather than by a text description.

5.2 Proposed development

Describe/show the proposed development land uses and their quantities (eg. retail floorspace, no. of dwellings etc).

Comment on any existing uses or changes of use.

Describe/show the development's relationship/context with the surrounding land uses.

5.3 Vehicle access and parking

Describe/show the vehicle access arrangements to the development from the frontage road(s)

Show the locations and indicate the number of proposed public and/or private car and disabled parking spaces and the provision for set down, pick up and taxis (if appropriate).

5.4 Provision for service vehicles

For the non-residential developments (or the non-residential components of mixed use developments), briefly describe/show the access arrangements and on-site loading or unloading facilities for service vehicles.

For residential developments, discuss/show the access to the site for rubbish collection and emergency vehicles.

5.5 Hours of operation

For non-residential developments only, outline the proposed hours of operation.

5.6 Daily traffic volumes and vehicle types

For non-residential developments only and where possible, provide a rough estimate of the likely daily, and/or peak, traffic volumes generated by the development and the types of vehicle, eg. car, light commercial or heavy commercial.

Note that this is not intended to be a comprehensive assessment carried out by a transport specialist but a rough guide only to the amount and type of traffic likely to be generated.

5.7 Traffic management on the frontage streets

Describe/show the existing traffic management on the roads fronting the development and for 100 metres either side of the development.

Information to include:

- road width / number of lanes
- footpaths / cycleways
- any parking provision or restrictions
- posted traffic speed
- intersections and type of control (eg. give way, roundabout etc)
- accesses / driveways to properties

5.8 Public transport access

Identify/show the nearest bus and train routes to the development and the locations of the nearest bus stops and train stations.

Describe/show briefly the pedestrian and cycle links between the development and the bus stops and train station.

See Section 4.0 for advice on the extent of the area to be covered.

5.9 Pedestrian access

Describe/show the existing pedestrian facilities, eg footpaths, pedestrian crossings, within the development (if any).

Describe/show any proposed pedestrian facilities within the development.

Describe/show the pedestrian facilities on the roads surrounding the development.

Outline any proposals by the applicant to improve pedestrian access.

See Section 4.0 for advice on the extent of the area to be covered.

5.10 Cycle access

Describe/show any existing cycle facilities, (eg cycle parking) within the development.

Describe/show any proposed cycle facilities within the development.

Describe/show any existing cycle facilities on the roads surrounding the development.

Outline any proposals by the applicant to improve cycle access.

See Section 4.0 for advice on the extent of the area to be covered.

5.11 Site specific issues

Provide details of any site specific transport issues.

Some flexibility is required here to address these specific issues, as they will be different for each development. The general approach should be along the following lines:

- Describe any transport issues specific to the development, as discussed and agreed with the approving authority.
- Demonstrate that these will not have an adverse impact on the surrounding area, or, if they may, propose remedial measures to redress these impacts.
- Alternatively, the specific issues may relate to demonstrating that the development satisfies a certain policy objective, eg that a development close to a major train station provides a high level of access to the station and would encourage increased use of the train.

5.12 Safety issues

Identify and discuss any existing or potential safety issues.

Where appropriate suggest remedial measures.

The previous sections may have identified existing or potential safety issues that should be expanded upon. Examples of possible safety issues include:

- an access to the development crossing a busy footpath, especially one used by school children;
- the development increasing traffic through a busy priority intersection;
- direct access onto a busy road; and
- the need for pedestrians/cyclists to cross a busy road to access the development.

Possible measures to address these issues should be discussed.

Part C – Transport assessment

1.0 Introduction

A transport assessment is a detailed assessment of the transport aspects of a development. It is to be submitted as part of all large development applications, in accordance with Table 1 of Part A of this volume.

It is a detailed technical assessment and is therefore likely to require input from a transportation specialist. The intent of a transport assessment is to clearly demonstrate to the approving authority that the development would:

- provide safe and efficient access for all modes;
- be well integrated with the surrounding land uses;
- not adversely impact on the surrounding land uses; and
- not adversely impact on the surrounding transport networks and the users of those networks.

It should also demonstrate that the proposed development is consistent with the transportation aspects of the structure and subdivision planning for the area.

The level of information sought in a transport assessment and the format of that information are set out below.

2.0 Checklist

A checklist of the typical information required is provided in Appendix A. This checklist is to be filled out, signed by the proponent and the transport specialist and submitted, with the transport assessment, as part of the development application.

3.0 Prior structure plan or subdivision assessment

The development may be part of a structure plan or subdivision for which a transport assessment has already been undertaken. If this is the case, the development transport assessment should extract the relevant information and revise or expand it as appropriate.

Where there is no prior transport assessment, the development transport assessment may need to provide additional information on the surrounding land uses and transport networks.

Further advice on prior assessments is provided in section 3.0 of Part A of this volume.

4.0 Background

In the past, traffic impact assessments have been carried out on a somewhat ad hoc basis, mainly for large developments and concentrating on the vehicular traffic impacts, often with little or no consideration of the accessibility by, or impact on, non-car modes.

In more recent times, there has been a move towards more sustainable development and the need to consider and cater for modes other than the private car. The terms 'transport impact assessment' or 'transport assessment' have been adopted to differentiate between this multi-modal approach and the more conventional vehicular traffic impact assessment.

The transport assessment therefore encompasses all modes of transport, that is, public transport, walking and cycling as well as private motor vehicles and freight movements.

5.0 Extent of assessment

The transport assessment should cover, as a minimum:

- all sections of road where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour (See note 1)
- all intersections where flows on any leg would increase by 10%, or any movement by 20%
- pedestrian routes to the nearest bus stop (for all bus routes passing within 400 metres of the development)
- pedestrian routes to the nearest train station(s), (if within 800 metres of the development)
- pedestrian routes to any major attractors within 400 metres, (5 minutes walk), of the development
- cycle routes to any major attractors within 1200 metres, (5 minutes cycle), of the development

Note 1 – The 100vph threshold equates to around 10 percent of the mid-block capacity of an urban arterial lane (*Austroads GTEP Part 2*), ie. the level at which the traffic increase may have a material impact.

The transport assessment should cover all parts of the transport network that would be likely to be materially affected by the proposed land uses.

The study area will typically be larger than just the site area. It should include, at least, all abutting roads and is likely to extend significantly further along particular roads or other transport corridors.

As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but

increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis.

For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore any section of road where the structure plan traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.

For sensitive areas, (eg. past schools), or where a significant proportion of the subdivision traffic is likely to be heavy commercial vehicles, a lower threshold than the above might trigger the need for assessment.

An intersection would generally be considered to be materially affected if flows on any leg increase by more than 10% or any individual movement by more than 20%. For already congested intersections, lower thresholds may again trigger the need for assessment.

Other factors that should be taken into consideration when determining the study area include:

- change of intersection control type (eg from priority to traffic signals);
- new or modified intersections or crossovers;
- new or widened roads, shared paths, etc; and
- new or modified bus routes or bus stop locations.

For pedestrian and cycle routes, the area to be assessed is based on five minute walk and cycle times to bus stops and major attractors / generators and a 10 minute walk to train stations. The objective of this component of the assessment is to identify how well the development is integrated with the surrounding area and would encourage non-car modes.

The above criteria are guidelines only and the extent of the initial study area should be discussed with the approval authority prior to commencement of the assessment.

The study area may need to be revised, in agreement with the approving authority, during the course of the assessment. For example, the initial assessment may indicate that a development would have a wider impact than initially thought requiring expansion of the study area, or conversely less impact allowing a reduction in the study area.

It should be noted that inclusion of a particular road, intersection or other feature in the study area does not necessarily imply that the proponent will be responsible for all improvements that the assessment might recommend at that location.

Such decisions are beyond the scope of the guidelines. They are subject to other policies and current practice and may require detailed negotiation with the approval authority. For further information see *WAPC Policy DC1.7 General Road Planning and Planning Bulletin No. 18 Developers Contributions for Infrastructure*.

6.0 Agreement on scope of assessment

6.1 Introduction

Prior to commencement of the assessment, the proponent is strongly recommended to contact the appropriate approving authority or authorities to discuss and where possible agree its scope.

This is particularly important for developments where no prior transport assessment has been undertaken. It is also important when there is a prior assessment as some of the assessment parameters are likely to be different. For example, a different assessment year may be appropriate and the development may generate its peak traffic outside the period adopted for the structure plan or subdivision assessment.

It is also possible that there have been changes to the structure and/or subdivision planning since the prior assessment that should be accounted for at this development stage.

It should be noted that any agreements on the scope of the assessment are given by the approving authority on a without prejudice basis. The approving authority reserves the right to require the proponent to amend or expand the scope or to amend the parameters used depending upon the outcomes of the initial assessment. (See also Section 6.4 of Part A).

6.2 Scope

Issues to be discussed in determining the scope of the assessment include:

- extent of the area to be assessed;
- intersections to be assessed in detail;
- assessment years;
- assessment time periods;
- issues specific to the development and/or its location that need to be addressed;
- any specific safety issues to be addressed;
- any committed or proposed developments in the area that need to be taken into consideration; and
- any committed or proposed improvements to the surrounding transport infrastructure that need to be taken into consideration.

6.3 Parameters

Parameters to be discussed include:

- trip generation rates
- proportions of pass-by, diverted and new trips
- directional distribution of trips
- future year base flows

- traffic growth rates.

7.0 Format of assessment

7.1 Introduction

This section details the information that would normally be included in a transport assessment. It is recommended that the assessment follows the general format and sequence suggested in the guidelines. When reports follow a standard format, processing by the assessing officers is simplified and the time required for approval is likely to be reduced.

The assessment should be written in a clear and simple style as some of the people reading it may not be familiar with technical terminology. Where appropriate, technical details should be provided in appendices with the main findings and conclusions summarised in the body of the report. Maps, plans and diagrams should be used wherever possible for clarity of presentation and to avoid the need for lengthy descriptions.

The analysis should be fully explained to allow the reviewer to trace the steps followed in the process. Conclusions should follow logically in the order in which issues were addressed so that they can be reviewed easily based on the information provided.

Data sources should be referenced, to allow retrieval of relevant information if required at a later date. Results of data collection and related detailed analysis should be attached as technical appendices. Electronic copies of data and/or analysis should be provided as part of the report where appropriate.

7.2 Structure

While there is scope for some flexibility in preparing a transport assessment the recommended general structure is along the lines of the following:

- Summary
- Introduction and background
- Development proposal
- Existing situation
- Changes to surrounding transport networks
- Integration with surrounding area
- Assessment years and time periods
- Development generation and distribution
- Parking
- Committed developments and other transport proposals
- Design traffic flows
- Analysis of development accesses
- Impact on surrounding roads
- Impact on intersections

- Impact on neighbouring areas
- Traffic noise and vibration
- Road safety
- Public transport access
- Pedestrian access/amenity
- Cycle access / amenity
- Analysis of pedestrian / cycle networks
- Safe routes to school (where appropriate)
- Traffic management plan (where appropriate)
- Conclusions

Note that while the non-car modes are towards the end of the assessment this does not imply that they are any less important than the vehicle based assessment. This order is required because the impact of the development generated vehicular traffic on pedestrian and cycle amenity and safety needs to be assessed. The vehicle traffic volumes on the surrounding roads therefore need to be determined first.

Each section above is discussed in Section 8.0 below. The key information to be provided is shown in a box, followed by further guidance on what should be provided and how to undertake the assessment, as appropriate.

Where appropriate, a reference to additional technical advice in Volume 5 – Technical appendix is also provided.

8.0 Details of Content

8.1 Summary

Provide a summary of the transport assessment including a brief description of the development proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks.

8.2 Introduction and background

Provide a brief description of the development and the purpose and contents of the transport report including any appropriate background information.

The introduction should include the following information:

- the name of the applicant/agent/proponent and the consultant who prepared the transport assessment;
- a description of the development location and a map showing the site area in context;
- a brief description of the proposed land uses;

- whether or not there is a current structure plan or subdivision transport assessment covering the area;
- a summary of key issues to be addressed; and
- background information, eg. previous reports or earlier planning proposals for the site.

8.3 Development proposal

Provide details of the proposed development including:

- its regional / structure plan context
- the proposed land uses
- a table of the quantum of each land use type proposed (eg. number of dwellings, square metres of retail floorspace, etc)
- any proposed staging of development
- access arrangement for cars, service vehicles, public transport, pedestrians and cyclists and people with disabilities;
- the locations of pedestrian entrances to the building(s)
- car and cycle parking provision;
- end of trip facilities for walking and cycling (eg lockers and showers).
- any specific issues

8.4 Existing situation

Describe / show on a plan the existing situation including:

- existing site uses, if any
- existing parking provision and, if appropriate, demand
- existing access arrangement
- existing site traffic generation (See note 1)
- existing land uses surrounding the development
- surrounding road network (See note 2)
- traffic management on frontage roads (See note 3)
- available traffic counts on existing roads surrounding the development (See note 4)
- available traffic counts at major intersections surrounding the development (See note 4)
- operation of surrounding intersections (site observations and analysis) (See note 5)
- existing pedestrian/cyclist networks surrounding the development
- existing public transport routes and bus stops/train stations surrounding the development
- public transport - routes, frequencies and bus stop/train station locations surrounding the site

- crash data for surrounding roads (See note 6)

See Section 5.0 for advice on the extent of the area generally to be covered.

Note 1 - Existing site traffic generation

For other than vacant or greenfield sites, provide details of the current levels of traffic generated by the existing uses on the site. For small sites, an estimate of the likely level of traffic would normally be sufficient.

For large and/or high generating sites this should be determined by traffic surveys and include, as appropriate, counts of cars, commercial vehicles, public transport users, pedestrians and cyclists.

If in doubt, the developer should confirm the requirements with the approving authority in advance of any survey or assessment.

The time periods for assessment/survey will generally be the peak period(s) for the surrounding roads and the peak for the proposed development as determined in Sections 8.10. In situations where the peak generation of the existing uses occurs at a different time to the proposed development or highway peaks, an assessment of the existing uses peak period(s) may also be appropriate.

The traffic figures for the existing uses are to be used later in the assessment to estimate the likely increase in traffic, or in some cases a possible reduction in traffic, resulting from the change in use of the site.

In most situations it will be this difference in traffic generation, ie between the new and existing uses, that the proponent will need to demonstrate can be accommodated on the surrounding road network, or will need to provide improvements to accommodate.

Note 2 - Surrounding road network

The existing road network in the study area should be documented in the text and shown on appropriate maps and plans. The information required includes:

- road hierarchy and jurisdiction (eg. Main Roads or local government)
- road network – basic cross-section, number of lanes, widths, posted speed
- intersection layout and traffic control including traffic signals/roundabouts lane configuration, movement/turning restrictions, etc
- heavy vehicle/freight restrictions, if any

Note 3 – Traffic management on frontage roads

Describe/show the existing traffic management on the roads fronting the development and for 100 metres either side of the development. Information to include:

- road width / number of lanes

- footpaths / cycleways
- parking provision or restrictions
- posted traffic speed
- intersections and type of control (eg. give way, roundabout etc)
- accesses / driveways to properties (for roads fronting development only)

Note 4 – Traffic data

Traffic counts are to be provided for the main roads and intersections surrounding the development. The counts are to be by direction for the roads and turning movement counts for the intersections.

The traffic data should be for the following periods:

- the peak period(s) on the surrounding roads (generally the AM and PM weekday peak hours)
- the peak period(s) for the proposed development (See also Section 8.10)

The required data can be obtained either from existing traffic flow databases or from traffic surveys. The two main sources of existing data are Main Roads Western Australia(MRWA) and local councils.

Further advice on obtaining the required data is provided in the Traffic Data section of Volume 5 -Technical appendix.

Note 5 – Operation of surrounding intersections

The main intersections around the site should be analysed using approved techniques under existing traffic flows for the peak periods above. The result of the intersection analysis should be compared with and calibrated against observed traffic conditions during the peaks. This comparison should include average delays, queue lengths and levels of service as appropriate.

For traffic signals, the analysis should use actual signal timings and saturation flow measurements may be required to calibrate the relevant analysis models.

These intersection analysis models will form the basis of the analysis of the impact of the development generated traffic and of any proposed intersection improvements. It is therefore important that the initial models accurately represent the actual intersection operation.

See Volume 5 – Assessment of intersections for further guidance on appropriate analytical techniques for the intersection analysis.

Note 6 - Traffic Crash Data

The analysis of traffic crash data should be undertaken in accordance with the *Austroads Guide to Traffic Engineering Practice Part 4 – Road Crashes*.

Aggregated and summarised crash data for the study area for the last five years can be obtained from MRWA Asset and Network Information Branch. (See appendix B for contact details).

The crash locations should be plotted on a plan of the study area and any areas with a significant crash record identified. The crash data at these locations should be analysed to identify any patterns in crashes and hence potential safety issues and possible remedial measures.

Care should be exercised in assessing five-year crash data with regards to any other developments and/or changes to the road network configuration that may have occurred during this time period.

Note that the absolute number of crashes at an intersection or on a road is not necessarily an indication of the relative safety of that location but that the volume of traffic passing through the intersection, or along the road, should also be taken into consideration.

As appropriate, compare the crash rates at these locations against recognised average rates for the type of intersection or road and traffic flow. The MRWA website (under safety/research) provides a useful query tool to establish the rankings of intersections by crash frequency and cost, (although it does not link the number of crashes to traffic volumes).

8.5 Changes to surrounding transport networks

Describe / show on a plan any committed or proposed changes or additions to the surrounding transport networks including:

- the road network
- intersection layouts and/or traffic controls
- pedestrian / cycle networks and crossing facilities
- public transport routes and bus stops/train stations

These changes could be those committed or proposed by others, eg. MRWA or local authority, or by the proponent as part of the development.

Discussions are likely to be required with the relevant local authority(ies), MRWA and PTA to determine any proposed or potential changes. Details of any discussions /agreements with the above agencies regarding any proposals by the proponent should also be provided.

8.6 Integration with surrounding area

Describe / show the level of integration with the surrounding area by:

- identifying the major attractors and generators surrounding the development. (See note 1)
- identifying any proposals for major changes to the surrounding land uses
- determining the main desire lines between the development and these external attractors and generators
- assessing whether the existing transport networks, plus any proposed changes, would adequately match these desire lines, particularly for pedestrians, cyclists and public transport users (See note 2)
- identifying any deficiencies in the surrounding transport networks, and/or areas where improvements could be made (See note 3)
- suggesting remedial measures to address these deficiencies

See Section 5.0 for advice on the extent of the area generally to be covered

Note 1

Major generators would be those external land uses, primarily residential, from which people would be attracted to the development.

Major attractors would be those external land uses (eg. schools, shopping centres or sports facilities) that people from the development would be attracted to.

Note 2

The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. It should identify whether there are any existing public transport services or whether any are proposed.

Note 3

Potential deficiencies, or areas for improvement, could include missing or substandard sections of footpath and/or cycle path, the absence of safe crossing facilities where major roads need to be crossed and the absence of public transport links.

The intent of this section is to identify how well the proposed development integrates with the surrounding land uses with respect to transport links and accessibility. Note that this is to be a qualitative assessment of the level of accessibility between the development and the surrounding land uses. A quantitative analysis of the transport networks is to be undertaken in the following sections.

8.7 Analysis of transport networks – General advice

The assessment to date has provided a description and an inventory of the development proposal and surrounding area with respect to land uses and transport networks. The next sub-sections require a more detailed quantitative analysis of the impact of the development generated traffic on the surrounding transport networks.

The analysis should also demonstrate that the proposed development would provide a high level of accessibility and safety for all modes. The recommended steps to undertake and present the analysis are outlined below.

8.8 Assessment years

Determine the appropriate years for assessment. These are generally to be:

- the year of full opening of the development
- 10 years after full opening, (or a similar year if one is available from the prior structure plan or subdivision assessments).

It is recommended that the applicant discuss and agree the assessment years with the approving authority in advance of undertaking the assessment.

The year of full opening assessment will provide a measure of the transport impact once the development is fully developed.

The post full development assessment, (10-year after opening or similar), will determine the medium to longer term impacts of the proposed development on the surrounding road network, ie. it will provide a measure of the ability of the transport infrastructure to accommodate development flows plus further growth in the surrounding traffic.

It will therefore provide the approving authority with advice on whether or not the development is likely to trigger the need for additional improvements to the transport networks over the next ten years or so, or bring forward any planned improvements.

Where there is a prior structure plan / subdivision assessment, the post full development assessment should consider whether the development is substantially unchanged from that assumed in the structure plan / subdivision assessment. If it is unchanged, the “post” assessment may be able to be extracted from the structure plan / subdivision assessment. If it is significantly changed, then a revised assessment is required.

Where there is no prior assessment, a more detailed assessment of the post full development scenario is required to determine the potential medium to longer term impacts of the development on the surrounding transport networks.

8.9 Time periods for assessment

Determine the appropriate time periods for assessment. These are generally to be:

- the peak period(s) on the surrounding road network
- the peak period(s) for the development

It is recommended that the applicant discuss and agree the time periods for assessment with the approving authority in advance of undertaking the assessment

The peaks on the surrounding roads are generally the weekday morning (7am - 9am) and evening (4pm - 6pm) periods. These may be different closer to specific land uses or in specific locations, for example roads near beaches may be busiest during summer weekends. The appropriate highway peaks should therefore be agreed in advance with the approving authority if there is any doubt.

For developments near schools it may also be appropriate to assess the afternoon end of school period, eg. 2.30pm – 3.30pm.

The peak period(s) for the development depends upon the type of land uses within it. The appropriate peak(s) is likely to be identified as part of determining the trip generation in Section 8.10 and should, if there is any doubt, also be agreed with the approving authority.

Further advice is provided in the Time periods for analysis section of Volume 5.

8.10 Development generation and distribution

Determine the trip generating potential of the development.

Determine the proportions of new, pass-by and diverted trips.

Distribute these trips on the surrounding road network.

The trip generating potential of the development is to be determined for the assessment years and time periods. The trips rates used should be based on surveys of comparable developments or extracted from recognised land use traffic generation databases.

Not all trips attracted to the development will be new to the surrounding road network. Depending upon the type of development, a proportion will already be on the network passing directly in front of or nearby the development and will simply divert in. An example of this is PM peak period shopping trips where customers may shop on the way home from work.

Some developments will generate relatively few totally new trips, eg petrol stations and some fast food outlets. Most of their customers are drawn from cars directly passing, or passing very close to, the development. The traffic impact of these types of developments is therefore usually very localised, often just at the accesses themselves.

The development generated traffic should therefore be split into these three trip types, ie. pass-by, diverted and new trips. These three trip types should then be distributed onto the surrounding road network based on survey data or using a recognised transport engineering technique.

The trip generation rates, the level of new versus diverted (pass-by) trips and the directional distribution of the development trips should be discussed, and where possible, agreed in advance with the approving authority.

For greenfield or vacant sites, ie. sites with no existing uses, the development flows will simply be those generated by the proposed uses. For brownfield sites, ie. sites with existing uses, the “effective” development flows, ie. the net impact of the development, would be the difference between the traffic generated by the existing uses and that by the proposed development.

Further technical guidance on trip generation rates, mode choice, trip types and trip distribution is provided in Volume 5.

8.11 Parking

For non-residential developments only;

Assess the demand for parking.

Determine whether the proposed parking supply is appropriate.

Parking may need to be considered for individual developments at the development application stage, especially for retail developments, public institutions such as hospitals and universities and major sporting and cultural developments, ie those sites likely to generate significant levels of public parking. If there is any doubt, the proponent should confirm whether parking needs to be addressed with the approving authority.

An assessment of the parking demand of the development is to be made based on surveys of comparable developments or extraction from recognised land use traffic generation databases. Consideration should be given to the location of the development, eg. CBD, inner or outer suburbs, and accessibility by non-car modes.

Comparison should be made between the projected demand and the proposed supply and with reference to the provision required, or recommended, by the appropriate town planning scheme.

Where there is discretion under the town planning scheme with respect to the parking provision, justification for the proposed provision should be provided.

Where a reduced parking provision is proposed, compared to that generally required or recommended by the town planning scheme, an assessment of the potential impact of any overflow parking on the surrounding streets should be provided.

Further advice is provided in the Parking section of Volume 5.

8.12 Committed developments and other transport proposals

Identify any other committed or proposed developments in the vicinity of the proposed development.

Identify any committed or proposed changes to the surrounding transport networks.

The relevant local authorities should be approached to obtain information on any significant developments in the area that have received planning approval but have not yet been completed, or are within the planning system awaiting approval. The potential transport impact of these developments should then be considered in the transport assessment.

Equally, the relevant authorities, (eg. MRWA, local authority or PTA / Transperth), should be approached to identify any existing transport proposals in the area such as road widening, intersection improvements, cycle lanes and new bus routes. These should also, where appropriate, be included in the transport assessment.

For developments and/or proposals that may or may not be implemented, the assessment may need to consider scenarios where they are constructed and scenarios where they are not.

A list of potential contacts is provided in Appendix B.

8.13 Base and “with development” traffic flows

Determine the base and “with development” traffic flows on the surrounding road network for each of the assessment years and time periods.

This task will depend upon whether or not there is a prior transport assessment undertaken in accordance with these guidelines.

If there is, the surrounding road network traffic flows should be extracted from the assessment and adjusted as required for any changes to the proposed development compared to that assumed in the structure plan or subdivision assessment.

Where the development assessment years and/or time periods differ from those in the prior assessment, the prior assessment should be used as a basis for determining the required development time period flows.

If there is no prior assessment, or if the assessment did not include projected flows on the surrounding roads, the following approach is suggested.

8.13.1 Base flows

The base, ie. without development, flows can be determined by:

- Extracting the existing traffic flows (from section 8.4)
- Adjusting these to the development assessment years and time periods by:
 - obtaining future year volumes from the MRWA or DPI transport models, if available; or
 - applying a growth factor, agreed with the approving authority, to existing traffic volumes; or
 - using a recognised traffic engineering technique, as agreed with the approving authority.
- Adjusting for any committed or proposed developments
- Adjusting for any committed or proposed transport network changes

Note that the MRWA or DPI transport models may or may not contain the proposed development land uses. Flows extracted from the two models may therefore need to be adjusted to allow for any variations in the assumed land uses.

8.13.2 “With development” flows

The with development flows can be determined from the base flows by:

- Subtracting the traffic generated by any existing land uses on the development site that are being removed, (from Section 8.4)
- Adding the traffic generated by the proposed development (from Section 8.10)

8.14 Analysis of development accesses

Demonstrate that adequate sight distance is provided at each proposed access.

Undertake an analysis of the operation of each access to demonstrate that it would be able to accommodate the projected development generated traffic.

The development access analysis should be undertaken in accordance with *Austrroads Guide to Traffic Engineering Practice series (GTEP) Parts 5 – Intersections at grade, 6 – Roundabouts and 7 – Traffic signals.*

It should demonstrate that adequate sight distances would be provided at each access to the development and that the proposed methods of control are appropriate and would satisfy operational and safety requirements.

The key measure of whether a proposed access would operate satisfactorily is the length of delay for the various movements. To ensure an adequate level of service is provided the analysis should demonstrate that delays would be less than shown in Table 1.

Table 1 - Guideline thresholds for intersection / access operation

Criteria	Average Delay (secs/veh)
<u>Signalised intersection / access</u>	
Average delay for all vehicles passing through the intersection / access	<55 secs
Average delay for any individual vehicle, pedestrian or cyclist movement	<65 secs
<u>Priority intersection / access</u> (roundabouts, give way and stop)	
Average delay for all vehicles on the non-priority arms (ie have to give way or stop).	<35 secs
Average delay for any individual vehicle, pedestrian or cyclist movement	<45 secs
<u>Right turn lanes</u>	
Exclusive turning movement queue length	Less than available storage length (95th percentile queue)

NOTE- This table is based on the US Highways Capacity Manual's level of service approach. The delays above equate to the upper limit delay of Level of Service D for intersections as a whole and the middle of Level of Service E for individual movements.

8.15 Impact on surrounding roads

Assess whether the existing road cross-sections, eg. two lane or four lane, would be adequate to accommodate the above design traffic flows.

If not, indicate what improvements would be required.

The impact of changes in traffic flows on the roads surrounding the development are to be assessed using the appropriate volumes of the *Austroads Guides to Traffic Engineering Practice* or a recognised alternative technique as agreed with the approving authority.

The assessment is to consider the capacity of the links to carry the projected volumes, and, where appropriate, the likely change in level of service or impact on travel times and safety.

8.16 Impact on intersections

Assess whether the existing intersections would be able to accommodate the above design traffic flows.

If not, indicate what improvements would be required.

The analysis of intersections will be a major component of the assessment of the surrounding road network as the greatest impacts of a development's traffic usually occur at intersections.

The operation of all relevant intersections in the study area, (see Section 5.0), should be evaluated for each time period in the assessment years for the without and with proposed development scenarios.

The two scenarios should be compared to identify the changes in operation, (eg. delays and queue lengths), due to the development. The analysis should indicate whether the development traffic could be accommodated under the current intersection layout and control or whether remedial measures (improvements) may be required.

The thresholds for consideration of remedial measures are shown in Table 1. These are guideline thresholds only and remedial measures may be required, at the discretion of the approving authority, even when the thresholds have not been reached.

When any of the thresholds are exceeded in the 'with development' scenario, the developer should identify and assess remedial measures to achieve the following.

- Where the thresholds are exceeded in the base flow scenario, the remedial measures should return conditions to their 'without development' levels.
- Where thresholds are not exceeded in the base scenario, the remedial measures should reduce conditions to no more than the above threshold levels.

The objective of the remedial measures is therefore for the operation of the intersections to remain within the thresholds or, if the thresholds will be exceeded even without the addition of the proposed development, conditions should be made no worse by the proposed development than they would be without it.

Further advice on assessing intersections is provided in Volume 5.

8.17 Impact on neighbouring areas

Identify whether the proposed development traffic has the potential to adversely impact on surrounding residential areas.

The potential for traffic generated by the proposed land uses to impact on surrounding residential areas is often a sensitive issue that needs to be considered by the approval authority.

Where the traffic assignment indicates additional traffic flows in such areas the assessment should address this issue directly. The capacity thresholds in section 8.15 and 8.16 should form part of this discussion but the assessment should also consider the potential social, and in some cases environmental, impacts. Possible treatments to minimise potential problems should be discussed.

8.18 Traffic noise and vibration

Identify whether the proposed development is likely to generate any traffic noise or vibration issues.

A detailed assessment of the change in traffic noise and vibration levels due to the development and the impact of that change on the surrounding area is not usually undertaken as part of a transport assessment. The potential for vehicular traffic noise from the development to have an impact on the surrounding land uses should nevertheless be considered.

Where a potential impact is identified, this should be outlined in the assessment to allow the approving authority to determine whether a detailed noise and vibration

assessment is required. Examples of where traffic noise may be an issue include industrial developments close to residential areas operating overnight and at weekends and those generating high levels of heavy vehicle movements.

8.19 Road safety

Determine whether the development generated traffic could potentially raise any road safety issues.

If so, propose remedial measures to address the safety concerns.

The assessment should examine any particular intersections or other locations that have been identified as black spots or may be of concern, (ie. identified from examination of the existing crash data in Section 8.4, identified as part of the assessment, or raised by the approval authority).

If the land use proposal would worsen conditions at black spots (eg. by increasing traffic volumes on hazardous movements) or potentially raise safety concerns at other locations, then the transport assessment should present proposals to address these concerns.

A road safety audit is not a standard component of a transport assessment and would not normally be required. However, in cases where the development would significantly increase traffic volumes and/or major changes to the transport infrastructure are proposed, the approving authority may require the applicant to submit a road safety audit to assess any safety implications. The road safety audit would need to be prepared by accredited road safety auditors and should be presented separately.

8.20 Public transport access

Describe the level of access to the site by public transport, including;

- the route number, general route (origin / destination / mid-points), frequency and hours of service for all routes passing within 400 metres of the site
- the locations of the nearest bus stops for all routes passing within 400 metres of the site
- the location of any train stations within 800 metres of the site
- the existing pedestrian/cycle routes between the site and the nearest bus stops / train stations (if within 400 metres for bus stops and 800metres for train stations)

Describe any proposals to improve public transport access.

The main issue to be addressed in the assessment is whether access from the development to the nearest bus stops and/or railway station is direct, safe and convenient. Factors that may be considered include:

- conflicts between pedestrian and vehicle movements;
- the ability to cross major roads;
- directness of pedestrian routes;
- adequacy of street lighting and shelter;
- bus stop location(s); and
- building orientation and access points.

In some cases it may also be appropriate to consider whether additional initiatives to encourage public transport use should be incorporated in the proposal, eg. the development of a green transport plan. One trigger for such consideration might be if the impact of traffic generated from the proposed development is considered unacceptable by the approval authority and needs to be reduced.

Public transport capacity is usually not an issue for individual development applications but should be addressed for any development likely to generate larger public transport demand than would be considered typical of development within the study area.

Developments that will generate large 'special event' travel demands should address public transport capacity issues and also consider whether additional initiatives to encourage public transport use should be incorporated in the proposal.

The assessment should describe any proposals by the proponent to improve public transport accessibility, including new or improved services, new or relocated bus stops and new or improved pedestrian links between the development and the nearby bus stops and train stations. This should include details of any discussions the proponent has had with the PTA, Transperth, MRWA or the local authority regarding these proposals.

8.21 Pedestrian access / amenity

Describe/show the existing level of access/amenity for pedestrians, including;

- existing pedestrian facilities/routes within the site (from Section 8.3)
- existing pedestrian access to the site (from Section 8.4)
- existing pedestrian facilities on the surrounding roads (from Section 8.4)
- any potential deficiencies or areas where improvements may be warranted or of benefit, eg missing sections of footpath or uncontrolled crossings of major roads (from Section 8.7).

Describe/show any proposals to improve access / amenity for pedestrians, including;

- pedestrian facilities within the development (from Section 8.3)
- pedestrian access to the site (from Section 8.3)

- pedestrian facilities on the surrounding roads (from Section 8.6)

This section essentially combines the pedestrian information provided earlier in a number of separate sections into a single section. It therefore provides an inventory of existing and proposed pedestrian access and amenity.

The pedestrian network is to be analysed in Section 8.23.

Note on designing for improved pedestrian access

For many developments it is normal practice for developers to locate the building to the rear of the site with car parking to the front and sides. This reduces accessibility by non-car modes and should be discouraged.

Buildings should wherever possible front onto roads providing direct access for pedestrians and public transport users. If the site is on a bus route, consideration should be given to the location of existing bus stops and whether these provide an adequate level of access (per Section 8.20).

If appropriate, new bus stops or the relocation of existing stops so that they are close to the entrance to the development should be considered. The locations of the bus stops should also consider how passengers would cross the road to the bus stop on the opposite side or from the bus stop on the opposite side to the development.

Pedestrian entrances to buildings, where practical, should be adjacent to pedestrian crossing facilities on the frontage roads. This is particularly relevant to large corner sites on major roads where the intersection is signalised. Providing pedestrian access at the corner encourages pedestrians to access the site via the signalised intersection where crossing facilities will already be in place or can more readily be provided.

The design of the pedestrian access should include consideration that Australia has an ageing population and it is expected that the number of people with mobility disabilities will also increase.

8.22 Cycle access / amenity

Describe/show the existing level of access/amenity for cycles, including;

- existing cycle facilities/routes within the site (from Section 8.3)
- existing cycle access to the site (from Section 8.4)
- existing cycle facilities on the surrounding roads (from Section 8.4)
- any potential deficiencies or areas where improvements may be warranted or of benefit, eg. missing sections of cycle paths or lanes or uncontrolled crossings of major roads (from Section 8.7).

Describe/show any proposals to improve access / amenity for cycles, including;

- cycle facilities within the development (from Section 8.3)
- cycle access to the site (from Section 8.3)
- cycle facilities on the surrounding roads (from Section 8.6)

This section essentially combines the cycle information provided earlier in a number of separate sections into a single section. It therefore provides an inventory of existing and proposed cycle access and amenity

Note that it may be appropriate for, and provide greater clarity if, this information is put on the same plan as the above pedestrian information, (and possibly public transport information)

The cycle network is to be analysed in Section 8.23.

8.23 Analysis of pedestrian / cycle networks

Undertake an analysis of the operation and safety of the external pedestrian/cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross
- identifying where safe crossing facilities should be provided
- indicating where safe crossing facilities are proposed

Further to Sections 8.21 and 8.22, an analysis of the operation and safety of the pedestrian and cycle networks is required. The extent of the assessment is to be as outlined in Section 5.0, ie:

- pedestrian routes to attractors within 400 metres (5 minutes walk)
- pedestrian routes to bus stops within 400 metres (5 minutes walk)
- pedestrian routes to train stations within 800 metres (10 minutes walk)
- cycle routes to attractors within 1200 metres (5 minutes cycle)

The key component of the analysis is the ability of pedestrians/cyclists to cross major roads and at intersections. This includes the ability of public transport users to cross the road to access bus stops. It should consider both the pedestrians/cyclists generated by the development land uses and the impact of the development traffic on existing pedestrians and cyclists.

The analysis should identify which roads are likely to have traffic volumes that would adversely impact on the efficiency and safety of pedestrians trying to cross, per Table 2. The traffic volumes are to be as determined in Section 8.14.

Table 2 – Traffic volumes affecting pedestrian crossing amenity

Road cross-section	Traffic volume affecting ability of pedestrians to cross * (vehicles per hour – two way)
2 lane undivided	1100 vph
2 lane divided (or with pedestrian refuge islands)	2800 vph
4 lane undivided (without pedestrian refuge islands)	700 vph
4 lane divided (or with pedestrian refuge islands)	1600 vph

* See the Pedestrian assessment section of Volume 5 for details on how the above volume thresholds were determined.

Note that four lane undivided roads without pedestrian refuge islands are the most difficult to cross, the difficulties occurring at lower volumes than for a two lane road. This is due to the longer time required to cross the road, requiring a longer gap in the traffic. For this, and other safety reasons, (eg. greater potential for head on collisions), four lane undivided roads should not be considered in any new road network planning.

While the analysis should concentrate on the network outlined above, there may be roads further afield where flows have increased to above those in Table 2 due to the development traffic. The potential need for safe crossings on these roads should also be identified.

The analysis should also identify where adequate safe crossing facilities are already provided, where they may be required and indicate where any new facilities are proposed. The analysis should concentrate on:

- key locations on the pedestrian network (ie. along major pedestrian desire lines identified in Section 8.7)
- existing bus stop locations
- proposed or potential bus stop locations

In addition, to ensure an efficient and safe pedestrian / cyclist network safe crossing facilities should be provided at intervals no greater than shown in Table 3 for the roads identified above as posing difficulties for pedestrians.

Table 3 - Maximum desirable spacings for safe pedestrian crossings.

Road type	Maximum spacing of safe pedestrian crossing facilities**
Arterial – minimal frontage activity	400 metres
Arterial – significant frontage activity	200 metres
Local distributor/Neighbourhood connector	100 metres

** See the Pedestrian assessment section of Volume 5 for the rationale behind these spacings.

Safe crossing facilities are:

- pedestrian refuge islands (up to the volumes shown in Table 2)
- zebra crossings
- signalised pedestrian crossings (mid-block)
- crossing facilities at signalised intersections
- overpasses / underpasses (where appropriate)
-

Note that for undivided roads carrying greater volumes than those in Table 2, the provision of pedestrian refuge islands may not provide an acceptable level of service to pedestrians and one of the other facilities above may need to be considered.

8.24 Safe walk/cycle to school (as appropriate)

For residential and school site developments only, undertake a safe walk/cycle to school assessment by:

For residential developments only;

- identifying all schools within 800 metres of the development.
- identifying the most likely walk and cycle routes to each school from the development
- determining any potential deficiencies along these routes
- proposing measures to address these deficiencies

For school sites only;

- identifying the school's potential walk catchment, ie. residential areas within 800 metres of the school.
- identifying the most likely walk and cycle routes to the school from the residential catchments
- determining the existing walk/cycle facilities along these routes
- determining any potential deficiencies along these routes
- proposing measures to address these deficiencies

The key component of the safe routes to school assessment is the assessment of the ability to safely cross major roads. This should be based on the analysis method of Section 8.23 but with recognition that school children, particularly primary school children, may experience difficulties at lower traffic levels.

The analysis should therefore identify locations where potential crossing difficulties are likely and recommend remedial measures. These could include signalised pedestrians crossings or a children's crossing with a warden. The latter should include a discussion on whether the required type A or B crossing warrants would be likely to be met.

The assessment should also identify any missing or substandard sections of footpath / cycleway along these routes.

8.25 Traffic management plan (for appropriate developments only)

For all school sites, and other developments as requested by the approving authority;

Prepare a traffic management plan for the frontage roads, showing;

- parking provision
- parking restrictions / time limits
- set down / pick up areas
- taxi stands
- loading zones
- bus stops / lay over areas
- pedestrian facilities / crossings
- cycle facilities / crossings
- pedestrian accesses to the development

Some developments generate high levels of activity on the roads fronting the development. This is particularly the case for schools but may also apply to other land uses, especially in older urban areas where on site parking may be more constrained. In these locations more parking, set down / pick up etc. is likely to take place on street.

Therefore for all schools sites, and other developments as requested by the approving authority, the proponent is to prepare a traffic management plan for the frontage roads and extending 100 metres along the roads beyond the development boundaries.

8.26 Conclusions

Provide a summary of the findings and conclusions of the transport assessment.

Appendix A

Individual Development Transport Information Checklists

C1 – Transport statement

C2 – Transport assessment

C1 - Checklist for a transport statement for a development

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an existing intersection.

Item	Status	Comments/Proposals
Proposed development		
proposed land uses		
existing land uses		
context with surrounds		
Vehicular access and parking		
access arrangements		
public, private, disabled parking set down / pick up		
Service vehicles (non-residential)		
access arrangements		
on/off-site loading facilities		
Service vehicles (residential)		
rubbish collection and emergency vehicle access		
Hours of operation (non-residential only)		

Traffic volumes		
daily or peak traffic volumes		
type of vehicles (eg cars, trucks)		
Traffic management on frontage streets		
Public transport access		
nearest bus/train routes		
nearest bus stops/train stations		
pedestrian/cycle links to bus stops/train station		
Pedestrian access/facilities		
existing pedestrian facilities within the development (if any)		
proposed pedestrian facilities within development		
existing pedestrian facilities on surrounding roads		
proposals to improve pedestrian access		
Cycle access/facilities		
existing cycle facilities within the development (if any)		
proposed cycle facilities within development		
existing cycle facilities on surrounding roads		
proposals to improve cycle access		
Site specific issues		
Safety issues		
identify issues		
remedial measures		

Proponent's name

Company

Signature

Date

Transport assessor's name

Company

Signature

Date

Western Australian Planning Commission
Transport Assessment Guidelines for Developments

C2 - Checklist for a transport assessment of a development

- Tick the status column for items for which information is provided.
- Enter N/A in the status column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues
- Provide brief description of any proposed transport improvements, eg. new bus routes or signalisation of an existing intersection.

Item	Status	Comments/Proposals
Summary		
Introduction/Background		
name of applicant and consultant		
development location and context		
brief description of development proposal		
key issues		
Background information		
Development proposal		
regional context		
proposed land uses		
table of land uses and quantities		
access arrangements		
parking provision		

end of trip facilities		
any specific issues		
Existing situation		
existing site uses (if any)		
existing parking and demand (if appropriate)		
existing access arrangements		
existing site traffic		
surrounding land uses		
surrounding road network		
traffic management on frontage roads		
traffic flows on surrounding roads (usually AM and PM peak hours)		
traffic flows at major intersections (usually AM and PM peak hours)		
operation of surrounding intersections		
existing pedestrian / cycle networks		
existing public transport services surrounding the development		
crash data		
Changes to surrounding transport networks		
road network		
intersection layouts and controls		
pedestrian/cycle networks and crossing facilities		
public transport services		
Integration with surrounding area		
surrounding major attractors/generators		
proposed changes to land uses within		

1200 metres		
travel desire lines from development to these attractors/generators		
adequacy of existing transport networks		
deficiencies in existing transport networks		
remedial measures to address deficiencies		
Analysis of transport networks		
assessment years		
time periods		
development generated traffic		
distribution of generated traffic		
parking supply & demand		
committed developments and transport proposals		
base and "with development" traffic flows		
analysis of development accesses		
impact on surrounding roads		
impact on intersections		
impact on neighbouring areas		
traffic noise and vibration		
road safety		
public transport access		
pedestrian access / amenity		
cycle access / amenity		
analysis of pedestrian / cycle networks		
safe walk/cycle to school (for residential and school site developments only)		

Appendix B

Data sources

The following table provides a summary of the main sources of data required for a transport assessment.

Data	Source
Existing traffic flows	<p>MRWA Asset and Network Information Branch Ph 08 9323 4111</p> <p>Daily data available in <i>Average Weekday Traffic Flow</i> document (also available on MRWA website – www.mainroads.wa.gov.au)</p> <p>Local councils may have some data</p>
Public transport services	<p>Public Transit Authority (PTA) Ph 08 9326 2600 Website www.pta.wa.gov.au Email enquire@pta.wa.gov.au</p>
Cycle routes/facilities	<p>Local councils</p> <p>Department for Planning and Infrastructure (DPI) Ph 08 9216 8000 Website www.dpi.wa.gov.au/cycling Email cycling@dpi.wa.gov.au</p>
Crash data	<p>MRWA Asset and Network Information Branch Ph 08 9323 4111</p> <p>Some data available on the MRWA website under safety/research (www.mainroads.wa.gov.au)</p>
Other proposed developments	<p>Local council</p> <p>DPI – Statutory Planning Ph 08 9264 7777</p>
Other transport proposals	<p>MRWA - ph 08 9323 4111</p> <p>Local councils</p> <p>PTA (for public transport proposals – see above)</p>

Transport Assessment Guidelines For Developments

Volume 5 – Technical Appendix

Version for Trial & Evaluation

August 2006

Prepared by the Department for Planning and Infrastructure

on behalf of the Western Australian Planning Commission



VOLUME 5 – TECHNICAL APPENDIX

Contents	Page
Part A – Further Technical Guidance	1
Introduction	1
1.0 Traffic data	2
2.0 Time periods for analysis	5
3.0 Trip generation rates	6
4.0 Mode choice	8
5.0 Trip types	9
6.0 Trip distribution	10
7.0 Parking	12
8.0 Analysis of intersections	14
9.0 Remedial measures	15
Part B – Derivation of Technical Data	16
1.0 Trip generation rates	16
2.0 Assessment of pedestrian / cycle networks	19

Part A – Further technical guidance

Introduction

The guidance notes in this appendix expand on those in the main text. They are intended to provide further advice on the information required and how it should be presented. They are also intended as a discussion on the general traffic engineering and transport planning principles relevant to a transport assessment and expand on the suggested methodology.

To that end, they are not all encompassing and reference to other relevant traffic engineering and transport planning documents is recommended for those less familiar with the preparation of transport assessments.

1.0 Traffic data

Sufficient up-to-date traffic flow information is required to provide a picture of the current situation in the study area. It is important that the traffic flow data is appropriate for the level of assessment being undertaken and the type of land use development being assessed. For development applications, detailed peak period intersection turning movement data is likely to be required, while peak period link flow data may be sufficient for long-term structure plan and subdivision assessments.

The required data can be obtained either from existing traffic flow databases or from traffic surveys. The two main sources of existing data are Main Roads Western Australia (MRWA) and local councils.

MRWA produces a document called *Average Weekday Traffic Flow* that provides daily flows on main roads in the Perth metropolitan area. This data is also available on the MRWA website at www.mainroads.wa.gov.au under Traffic. MRWA also has data on rural roads and for regional towns.

These flows are usually measured by automatic traffic counters that are installed for a few days at regular intervals at a number of sites, as part of a rolling traffic count program. However, it should be noted that not all sites are counted on a regular or annual basis. Historic growth rates may be obtained by interpretation of the available data.

There are also a limited number of permanent count stations where flows are attempted to be counted on a continuous basis to provide information on daily and seasonal variations in flows.

The daily flow data is usually quoted as one of the following:

- AADT - Annual average daily traffic (includes weekends)
ie. average daily traffic adjusted for seasonal variations
- AAWT - Annual average weekday traffic (excludes weekends)
ie. average weekday daily traffic adjusted for seasonal variations
- AWT - Average weekday traffic
ie. average weekday daily traffic for the days surveyed.

MRWA also has the ability to produce turning movement data for signalised intersections from its SCATS traffic signal control system. This can be reasonably accurate when all lanes have a single movement, eg. ahead only or left turn only. It has limitations when there are lanes allowing more than one movement, eg. ahead plus left turn, as SCATS only records how many use the lane not which way they turn. Free (give way) left turns at signals are also not counted. Caution should therefore be applied when using SCATS turning movement data at face value and without expertise.

MRWA and councils may also have manually counted turning movement data for specific intersections. This data is usually fairly limited and if available, may be dated. The validity of the data with respect to current conditions should therefore be established prior to its use.

If no appropriate, up-to-date data is available, traffic surveys should be conducted. The four main types are outlined below. The type and scale of surveys required vary from site to site and should be discussed and agreed with the approving authority prior to commencement.

ATC counts

Automatic traffic counts, eg detectors placed across the road. These should preferably be put down for a minimum of one week and count hourly flows by direction. However, counts of just a few days may be acceptable, particularly if they coincide with the peak days of the proposed development.

Some counters can classify vehicles by type, eg cars, light goods and heavy goods. Others can also record speeds. ATCs are usually used to count mid-block flows, ie. remote from intersections.

Intersection turning movement counts

These are manual turning movement counts at intersections, normally counted for 2 hours, in 15 minute intervals, for the highway peak periods (usually the AM and PM weekday peaks). For developments with a peak outside the highway peaks, a count should be undertaken for the development peak period.

Where the development would generate more than minimal levels of traffic in the highway peaks, this count should be in addition to the highway peak counts. Where the development would generate only minimal levels of traffic during the highway peaks, the highway peak counts may not be required.

The counts should also be classified by vehicle type. Usually two classifications, car/light goods and heavy goods/buses, should be sufficient. Pedestrians and/or cyclists may also need to be counted.

Video surveillance is becoming more popular for data collection. While it requires extensive post processing and can be very time consuming, it does allow all vehicles to be tracked and results can be checked/verified.

O/D surveys

A third, less common, survey type is an origin/destination (O/D) survey to determine where vehicles have come from and/or are going to. This is usually done by recording and then matching number plates at a number of locations. Often only a sample is taken, eg. white vehicles only or number plates ending in a particular number(s). The sample results are then factored up by the ratio of total vehicles to recorded vehicles.

Alternatively, video surveys can be carried out at each station and vehicles tracked later on screen. Again, this is a very time consuming method but does allow all vehicles to be tracked and results to be checked/verified.

Interview surveys

Sometimes interview surveys can be undertaken where it is possible to interview customers at an existing development. This can be particularly useful to establish existing origin and destination suburbs (ie. the existing catchment), the routes taken and the mode split (car, public transport, cycle and walk).

More subjective information on travel behaviour can also be obtained by this method, such as why that particular destination was chosen and why a particular mode was used, (or why another mode wasn't used, eg. public transport).

2.0 Time periods for analysis

The analysis in a transport assessment may focus on one or more peak hours depending on the type of land use proposed and the specific issues to be addressed.

The peak hours should be identified on the basis of the 'worst case' combination of site-generated trips plus background trips. To determine this, two peak scenarios should be considered:

- peak period(s) for the surrounding roads
- peak period(s) for the development.

For residential or employment-based land uses such as offices the surrounding road and development peaks usually coincide, both normally the AM and PM weekday peaks. (The AM peak hour usually occurs within the 7am to 9am period and the PM peak hour within the 4pm to 6pm period).

For retail uses the peak development periods are typically the Thursday evening peak hour (Friday evening peak in the City of Perth) and a late morning or early afternoon Saturday peak hour. Both peaks will initially need to be considered. Traffic flows may show that one or the other is clearly the 'worst case' and the assessment can then concentrate on that one peak.

However, care must be taken in this approach as specific intersections or movements may be critical in the other peak. For example, for a retail development the total flow through an intersection providing access may be much higher in the weekday PM peak than the Saturday peak but the right turn at that intersection into the development may be much higher on the Saturday. Only analysing the PM peak may therefore not identify, say, a potential shortfall in the length of the right turn lane, resulting in blocking of the through traffic.

This should be discussed with the approving authority and, if there is any doubt, both peak periods should be assessed in full.

Other peak periods may be required to be assessed for specialised uses such as places of worship, entertainment uses, sporting facilities and eating establishments (particularly fast food outlets). In some cases the surrounding road peaks may not be the normal AM and PM weekday peaks, for example on roads close to the coast where flows may be highest on summer weekends.

For developments close to schools, or where the development traffic would pass close to a school, it may also be appropriate to undertake an assessment during the end-of-school-day period, eg. 2.30pm to 3.30pm to determine whether there is likely to be any adverse operational or safety issues for the school.

It is therefore important that the appropriate times for assessment are discussed and agreed with the approving authority in advance of the assessment.

3.0 Trip generation rates

Ideally, trip generation should be calculated based on generation rates encompassing all person trips regardless of the transport mode chosen. Person-trip generation rates for residential land uses may be derived from household travel surveys such as the 1986 Perth Travel Surveys, the more recent TravelSmart surveys in particular suburbs and the current Perth and regions travel survey (PARTS).

However, such person-trip generation data is often unavailable, particularly for other than residential land uses. In these cases it is usually sufficient to use vehicle-trip generation rates with adjustments as appropriate to reflect anticipated higher or lower non-car mode share for the particular development.

The person and/or vehicle trip generation of a development can be estimated by:

- surveying a comparable development in a similar location;
- using existing traffic data for a comparable development(s); and
- using typical rates for similar developments.

The first option is the most expensive but potentially will give the most accurate data, especially if a very similar development in a similar location can be found. For example, an existing residential subdivision could be surveyed to assess the likely traffic generation of an adjacent proposed residential subdivision.

The second option can also provide reasonably accurate data but this type of data is fairly scarce in WA as no traffic generation database for developments is available for general use. (The DPI is currently investigating an opportunity to develop such a database for Western Australia.) Local councils may be able to provide some data and are a good first step before organising a traffic survey.

The most common method, and potentially the least accurate, is to use typical rates for the type of development in question extracted from published land use traffic generating databases including:

- *Land Use Traffic Generation Guidelines*, March 1987 - Director General of Transport, South Australia;
- *Guide to Traffic Generating Developments*, Version 2.2, October 2002 - Roads and Traffic Authority, New South Wales; and
- *Trip Generation*, 7th edition, 2003 - Institute of Transportation Engineers, Washington, USA.

These databases provide general rates for a range of land uses expressed in terms of daily and/or peak hour trips per floorspace or number of dwellings.

These rates should be used with caution as they are based on surveys in NSW, SA and the USA. Much of the data is old and may not be particularly relevant to WA. The rates also tend to be averages implying that, even if they are appropriate, 50% of that type of development is likely to generate at a higher rate.

Sensitivity tests using higher rates (eg 85th percentile) may need to be carried out to ensure that if the development does generate at a higher rate than the average, the additional traffic can be accommodated.

Trip rates, and whether sensitivity tests using higher rates are required, should be agreed with the approving authority prior to carrying out the assessment.

The individual trip generation rates for each land use component and each time period should be shown in a table and sources used should be fully documented in the assessment report. The resultant number of trips generated by each land use component in each time period should also be presented in table form. It should be clearly indicated whether these are person trips or vehicle trips.

For mixed use developments, or those with a range of retail outlets, there is likely to be a degree of cross-visitation, ie. two or more of the individual land uses, or retail outlets, being visited on a single trip. There may therefore be some justification in reducing the individual land use trip rates to account for this.

For those mixed use developments with a residential component there is a greater potential for more trips to be made on foot or by bicycle, eg. walking to work or shops. This should also be taken into consideration when determining appropriate car trip rates.

The objective is to ensure that the car generation is not overestimated and that no more road infrastructure is provided than will be required. This should be assessed on a case by case basis and any reduction in rates agreed in advance with the approving authority.

It should be noted that this cross-visitation may reduce the number of vehicle trips but generally does not reduce the parking demand as average parking duration increases accordingly.

4.0 Mode choice

When trip generation is determined on a person-trips basis the next step is to determine what proportion of trips would be made by each available transport mode (ie. car driver, car passenger, bus, train, cycle, walk).

It should be noted that the mode choice may vary in different parts of the study area depending on factors such as proximity (eg. some of the catchment may be within walking or cycling distance of the site) and public transport provision (eg. some of the catchment may be along a bus route that runs close to the site).

There is also the potential for developers to influence the mode choice by, for example, the provision of bus stops adjacent to the site or the rerouting of buses closer to the site (in consultation with Transperth). For larger subdivisions the provision of new bus services may be appropriate. Proposals such as this would be viewed favourably by the approving authority and may allow a reduction in the vehicle trip generation rates to be used in the assessment.

When vehicle trip generation rates are used it is usually appropriate to omit the mode choice step. However, it may still be appropriate, in some cases, to analyse the potential for some of these car trips to be made by other transport modes. This would be important, for example, where a significantly improved public transport service to an area is proposed as part of the land use proposal.

The basis for the mode choice analysis should be clearly documented in the report or technical appendices, including any survey data or published sources, and any assumptions incorporated in the analysis. If the approval authority is concerned about the mode choice analysis then sensitivity testing may be appropriate to determine how critical this factor is in the overall assessment.

5.0 Trip types

Not all trips attracted to the development will be new to the surrounding road network. Depending upon the type of development, a proportion will already be on the network passing directly in front of or nearby the development and will simply divert in. An example of this is PM peak period shopping trips where customers may shop on the way home from work.

Some developments will generate relatively few totally new trips, eg. petrol stations and some fast food outlets. Most of their customers are drawn from cars directly passing, or passing very close to, the development. The traffic impact of these types of developments is therefore usually very localised, often just at the access to the development itself.

There are therefore three types of trips to consider:

- pass-by - directly passing the development and simply turning in before continuing their trip;
- diverted - passing close to the development and diverting to the development before continuing their trip; and
- new trips - totally new to the surrounding road network and made only because of the development.

The proportion of each trip type will depend upon the type and location of the development. This should be assessed on a case by case basis and agreed with the approving authority.

Where such an argument is put forward it should be clearly justified with reference to available research on this subject, analysis of appropriate marketing studies or retail modelling, or analysis of specially designed surveys.

6.0 Trip distribution

The traffic generated by the development should be distributed to the surrounding road network based on current patterns or using recognised traffic modelling techniques.

For pass-by and diverted trips this is very simple. Trips are diverted from their normal route to the development and back again, generally in proportion to existing flows. For example, if the frontage road has 60% northbound and 40% southbound, pass-by traffic to the development would be split 60% from the south (ie. northbound) and 40% from the north (southbound).

New trips can be distributed by:

- splitting the new trips in the same proportions as existing traffic on the surrounding roads;
- surveying a comparable development adjacent to the proposed site; and
- assessing the likely catchment of the development.

The most common and potentially least accurate method is to simply split the development traffic in the same proportions as the existing traffic passing the site, ie. per the pass-by and diverted trips. This method is generally less appropriate for the new trip component and its use would need to be justified by the proponent and agreed in advance with the approving authority.

The second and third methods above are more appropriate for the new trip component. The second method involves surveying a comparable development adjacent or close to the proposed site (if one is available), to determine the directional distribution of its traffic. This distribution can then be used as a basis for the proposed site's distribution.

Alternatively, interview surveys of its customers could also be undertaken to identify origins and destinations and approach routes and this data applied to the new development. This would be particularly relevant for expansion of an existing development, where the future travel patterns would likely be similar to existing.

In the third option, the trip distribution is based on an assessment of the likely catchment of the development. It is mainly applied to retail developments, but can be applied to employment and other developments.

It should be noted that the catchment of land uses such as retail is strongly influenced by the location of competing shopping centres and this should be taken into consideration in defining the likely catchment. Information on the likely catchment should be extracted from a retail impact assessment if one has been undertaken. The vehicle and retail catchments should be consistent.

The potential trip distribution can then be estimated using a simple gravity model, as follows. The total catchment area is divided into smaller sections. The area of each section is roughly measured and the time to travel from the section to the development estimated. For each section an $\text{Area}/(\text{Travel time})^n$ value is obtained. The power n is

a measure of the reluctance to travel longer distances, the higher the power the greater the reluctance. It is also a measure of the discretionary nature of different trip types.

Work related trips generally have a low n value, reflecting the lower flexibility in choosing the workplace; however, many can and do choose where they live based on their place of work and vice versa. Shopping trips have a higher n value as there is a greater choice in shopping locations.

Typical values of the power n are:

Shopping 1.5 – 2.5

Employment 1.2 - 1.5

Note that these values are rough guidelines only and can vary significantly from one location to another. Care should be taken in using them and supporting information, wherever possible, should be provided to justify the n values adopted, eg. calibration against known journey to work data.

An example of the gravity model (A/T^n) method is shown in table A1 for a shopping centre surrounded by four residential areas with similar densities and assuming $n = 2$.

Table A1 - Example of A/T^n trip distribution method

Residential Area	Size (Hectares)	Travel Time (minutes)	A/T^2	% of Trips
1	5	5	0.2	14%
2	10	4	0.625	44%
3	2	2	0.5	35%
4	10	10	0.1	7%
Total			1.425	100%

The proportion of trips coming from each area is equal to the ratio of it's A/T^n value to the sum of the A/T^n values. Thus, two residential areas of the same size (2 and 4) provide 44% and 7% of the trips respectively based on their travel times to the development.

Whichever method is used, the basis for the distribution of trip origins and destinations should be clearly explained in the report. If this becomes very involved it may be appropriate to include it in a technical appendix with just a brief overview in the body of the report.

7.0 Parking

This section provides advice on assessing the parking demand of a development. A parking assessment is only likely to be required at development application stage and then only for uses likely to generate significant levels of public parking. The need for the assessment is to be confirmed with the approving authority.

There are two main methods of projecting parking demand.

- Survey a comparable development.
- Extract typical rates from appropriate land use databases.

The first approach is potentially the more accurate. For the expansion of existing developments, such as shopping centres, the existing parking demand should be surveyed and used as a basis for projecting the parking demand for the expanded centre.

For new developments the demand should be projected based on surveys of comparable land uses in the locality of the subject site or in a locality similar in characteristics to the subject locality, such as surrounding land uses, residential density and public transport accessibility.

It should be noted that the peak parking demand often occurs outside the development's peak periods for traffic generation and the times adopted for the parking survey need to take this into consideration. For example, the busiest hour for traffic to an office development may be 7.30am to 8.30am but employees may continue to arrive for work until 9.30am or 10am. The peak parking demand may therefore occur at around 10am.

There are two main forms of parking surveys.

- A count of the number of cars in the parking areas.
- A count of all vehicles entering and leaving the development.

Method 1 involves counting the number of cars in the car park, (or number of vacant spaces if the car park is busy), at regular intervals, usually _ hr or _ hr during the high demand periods.

For larger sites such as major shopping centres, the car park should be divided into sections and each counted separately. This gives an indication of the popularity of the various car park areas and allows a parking management plan to be developed, if required.

If the car park is approaching or above capacity, any off-site parking, (and illegal parking within the car park), should be recorded to ensure the true parking demand is measured.

Method 2 involves counting the vehicles entering and leaving at all access points during the survey period, usually subdivided into _ hr intervals. The number of vehicles in the car park should be counted at the start and end of the survey period.

From this the number of vehicles in the car park throughout the survey period can be determined. Again, if the car park is approaching or above capacity, any off-site (overflow) parking should be recorded to ensure the true parking demand is measured.

A less accurate method of determining the parking demand is to extract parking rates for comparable developments from appropriate land use traffic generating databases including:

- *Land Use Traffic Generation Guidelines*, March 1987 - Director General of Transport, South Australia;
- *Guide to Traffic Generating Developments Version 2.2*, October 2002 - Roads and Traffic Authority, New South Wales; and
- *Trip Generation* 7th edition, 2003 - Institute of Transportation Engineers, Washington, USA.

Note that these are the same databases used to obtain development trip generation rates.

The parking rates extracted from these sources should be used with caution and with due consideration of the site's accessibility by public transport and potential walk-in or cycle catchment. These can have a significant impact on the parking demand.

In estimating the potential parking demand for mixed use developments, due regard should be given for the peak parking demands for the various components occurring at different times. For example, at a shopping centre with a multiplex cinema, the peak for the centre is likely to be Thursday evening or mid-afternoon Saturday while the peak for the cinema would probably be Saturday evening.

Combining the two individual peaks would probably result in a significant oversupply of parking. Some reduction in the parking supply should be made to account for the two peaks not occurring at the same time, thereby allowing some spaces to be shared.

This sharing of parking will depend on the mix of land uses and each development would need to be assessed on an individual basis. The combined peak may in fact not occur at the same time as either individual peak. For the example above, this may be 4pm on a Saturday when the shops are starting to close but the cinemas are getting busier.

8.0 Analysis of intersections

The operation of all site-access locations and all relevant intersections in the study area should be analysed for each time period in the assessment years with and without the proposed land use.

This is invariably a requirement for development applications and usually appropriate for subdivisions. However, this level of analysis is unlikely to be required for structure plans except for major intersections that may require grade separation or where the land requirements of major intersections need to be accurately defined (eg an intersection of two regional roads where the land requirements will need to be identified on the region or town planning scheme map).

The operational analysis for signalised intersections should generally be conducted using an approved intersection analysis program, (such as aaSIDRA). For unsignalised intersections other methods such as detailed in the Austroads *Guide to Traffic Engineering Practice* series or the US *Highway Capacity Manual* may be appropriate.

All assumptions concerning lane configuration, geometry and use, pedestrian and cyclist activity, signal cycle length and phasing should be documented in a technical appendix. The sources of all information and assumptions should also be documented in the same part of the report as the information or assumption.

For each intersection, the overall volume/capacity ratios (V/C) or degree of saturation, and level of service, should be documented in a table in the body of the report. More detailed results (and full calculations for manual analyses) for each intersection should be documented in the technical appendices. V/C (or degree of saturation), level of service, average delay and queue lengths should be documented for each traffic movement at each intersection.

The information should be presented in tabular format allowing a ready comparison between the without and with development scenarios. A discussion of the results should be provided, including an assessment of the scale of impact on the intersection's operation and whether the development traffic can be accommodated under the existing layout or whether remedial measures should be considered.

Where appropriate, electronic copies of the data and output files used in the analysis should be provided.

9.0 Remedial Measures

For priority intersections, lower average delay thresholds have been adopted compared to signalised intersections. This is to counter the uncertainty for drivers on the side road (ie giving way) in finding a suitable gap in the priority stream and how long they will have to wait.

When priority flows are high, side road delay can be significant and there can be a high degree of uncertainty as to when a gap will become available. This can have safety implications, as drivers may accept smaller gaps in the main traffic stream than normally considered safe.

The impact on main stream traffic, ie. increased delay, needs to be considered in any proposal to change the existing form of control. The ability of pedestrians and cyclists to negotiate the intersection under increased traffic flows due to the development also needs to be considered.

All proposed new traffic signals should be evaluated in terms of Austroads / Main Roads WA signal warrants, distance from other signals, impacts on existing signal coordination and likely timing of implementation.

All proposed adjustments to signal cycle lengths, traffic signal phasing and timing should be evaluated in terms of pedestrian crossing times, impacts on queue lengths and adequacy of existing storage, impacts on downstream access points, modifications required to existing traffic signals and controllers (hardware-related) and impacts on offsets and traffic signal coordination. The developer should liaise with Main Roads WA on all issues concerning traffic signals.

Part B – Derivation of Technical Data

1.0 Trip Generation Rates

Trip generation rates are used in Table 1 of Volume 1 to determine the land use thresholds for the various levels of assessment for subdivisions and individual developments and are provided in Table 1 of Volume 2 to estimate the trip generating potential of structure plan land uses.

Data on the trip generating potential of the various land uses is fairly limited in Western Australia with the exception of the home end, (from the Perth and Regions Travel Surveys (PARTS) and TravelSmart).

As surveys are undertaken, over time, more data will become available and the above tables can be reviewed and revised.

Where more information is known on the likely trip generation of the development in question, site specific trip rates should be used in lieu of the rates in these guidelines.

The trip rates suggested in these guidelines have been derived mainly from the PARTS and TravelSmart surveys and the *RTA Guide to Traffic Generating Developments*, as outlined below.

Residential

The rates are based on the Perth and Regions Travel Surveys (PARTS) data averaged over the range of dwelling types. The rates for structure planning (Table 1 Volume 2) are:

0.8 vehicle trips per dwelling for the AM and PM peak hours

split as follows:

AM peak 25% IN / 75% OUT

PM peak 67% IN / 33% OUT

For the threshold calculations (Table 1 Volume 1) the rate has been rounded up to 1 vehicle trip per dwelling.

Schools

The rates are based on data from the PARTS surveys that indicate that around 65% - 70% of children are driven to primary school, with an average occupancy of around 1.4 - 1.5 children per car. This equates to:

0.5 trips per child to school and 0.5 trips per child from school in each of the AM and PM peak hours.

For secondary schools the PARTS data indicate that the proportion driven to school is generally a little lower but, to simplify the process of determining the level of assessment required and for the broad assessment of structure plans, it is suggested that the above primary school rates be used for all schools.

Entertainment venues / Restaurants

The *RTA Guide* indicates that rates can vary significantly for this land use type and gives an average peak hour rate of:

5 trips per 100m² GFA or 10 trips per 100 seats (based on 2 m² GFA per person)

For most developments of this type, the peak hour(s) are likely to be outside the normal AM and PM peak hours. Professional judgement should therefore be used when selecting the hours for assessment, appropriate trip rates and IN/OUT splits.

Fast Food Restaurants

The available data is fairly limited. The RTA surveys suggest that the rate is not directly related to floorspace. This could possibly be due to fast food restaurants generally being of a similar size, with location being a greater determinant – a significant proportion of trade being drawn from passing traffic (RTA suggests at least 50%).

The rates adopted in these guidelines assume 20 trips per 100m², ie. four times that of a sit down restaurant above. Due to the dearth of good survey data, this is somewhat intuitive and will be reviewed and revised when better data become available. Where the proponent has more reliable trip rate information for their specific development, this should be used in lieu of the guideline figures.

Retail / shopping centres (with significant food retail component)

Trip rates can vary significantly for this land use. The RTA surveys indicate peak hour vehicle trip rates of around 12 trips per 100 m². These surveys were carried out in the 1970's and updated in the early 90's.

With the trend towards longer shopping hours since these surveys were carried out, a lower rate of 10 trips per 100m² GFA has been adopted for the PM peak hour, (and 2.5 trips per 100m² for the AM peak hour). A 50/50 IN/OUT split has been adopted for the PM peak and an 80/20 split for the AM peak hour.

Non-food Retail

Trip rates also vary significantly for this land use as it covers a wide range of retail developments. The RTA surveys indicate a range from 0.1 to 6.4 trips per 100 m² GFA for the weekday PM peak hour, with an average rate of 2.5 trips per 100 m².

These guidelines have adopted a PM peak hour rate of 4 trips per 100 m² GFA, in the upper middle of the range, (with AM rates around a quarter of this), but these rates should be used with caution in view of the large potential range in trip rates.

Where-ever possible, rates more appropriate to the specific development should be used in lieu of the guideline figures.

Offices

Trip rates are based on the RTA guide rate of 2 trips per 100 m² in the PM peak hour. The same rate is assumed for the AM peak. An 80% / 20% IN/OUT split has been assumed for the AM peak and the reverse for the PM peak.

Industrial

Trip rates are again based on the RTA guide rate of 1 trips per 100 m² in the PM peak hour. The same rate is assumed for the AM peak. An 80% / 20% IN/OUT split has been assumed for the AM peak and the reverse for the PM peak.

2.0 Assessment of pedestrian / cycle networks

2.1 Rationale

The assessment of pedestrian / cycle networks within these guidelines concentrates on the ability to cross major roads

While pedestrian crossing facilities are usually provided at major intersections (except at multi-lane roundabouts), these intersections are usually fairly widely spaced (often 1 kilometre or more apart), to provide for efficient vehicle movement.

This spacing is too wide to provide an efficient pedestrian network and a significant proportion on crossing manoeuvres are likely to be made, or would want to be made, remote from these intersections. This includes access to/from bus stops.

At these “mid-block” locations, pedestrians require gaps in the traffic of sufficient length to allow them to cross, and sufficient frequency to keep delays to acceptable levels.

The ability to cross a road safely is a function of:

- the width and type of road to cross (eg. 2 lane undivided or 4 lane divided);
- the volume of traffic on the road;
- the speed of the traffic; and
- the walk speed of person crossing (often lower for school children and the elderly).

The key factor in determining whether pedestrians can cross is the traffic volume. At low traffic volumes there are regular gaps of sufficient length for pedestrians to be able to cross safely, with minimal delay. As traffic volumes increase the number of gaps large enough for pedestrians to cross decreases, making it more difficult to cross and increasing delays to pedestrians.

As volumes increase further, a point is reached at which there are few, if any, gaps of sufficient length for pedestrians to cross safely and delays become significant. This has two potential impacts.

- Pedestrians take risks by crossing in less than desirable gaps – with major safety implications.
- Pedestrians do not try to cross, or give up after waiting for some time – i.e. the road becomes an impassable barrier.

Table 3 of Volume 3 gives a maximum desirable average delay for any individual movement at an intersection as 65 seconds (equating to middle of level of service E). It is reasonable to adopt this delay for pedestrians crossing mid-block.

Indeed, it could be argued that a lower delay threshold should be adopted due to the uncertainty of receiving a sufficient gap. (At signals pedestrians know that they will

be able to cross in due course, at mid-block there is no guarantee that there will be a suitable gap).

2.2 Threshold volumes

The volumes at which pedestrians are likely to experience this level of delay, ie. the threshold volumes used in these guidelines, have been determined using the priority intersection delay formula in the *Austrroads Guide to Traffic Engineering Practice Volume 5 – Intersections at Grade* as follows.

Two lane undivided roads

- Crossing width = 8 metres
- Walking speed = 1.2 m/s
- Crossing time = 10 seconds
($8 / 1.2 + 3$ secs clearance / safety margin)

Volume to give 65 secs delay ~ 1100 vehicles per hour (two way)

Two lane divided roads

- Crossing width per carriageway = 5 metres
- Walking speed = 1.2 m/s
- Crossing time per carriageway = 7 seconds
($5 / 1.2 + 3$ secs clearance / safety margin)

Volume to give 65 secs delay ~ 2800 vehicles per hour (two way)

Four lane undivided roads

- Crossing width = 14 metres (4 lanes @ 3.5m per lane)
- Walking speed = 1.2 m/s
- Crossing time = 15 seconds
($14 / 1.2 + 3$ secs clearance / safety margin)

Volume to give 65 secs delay ~ 700 vehicles per hour (two way)

Four lane divided roads

Total delay is the combined delay to cross both carriageways

- Crossing width per carriageway = 8 metres
- Walking speed = 1.2 m/s
- Crossing time per carriageway = 10 seconds
- A 60 / 40 directional split in traffic is assumed

Volume to give 65 secs delay ~ 1600 vehicles per hour (two way)

2.3 Spacing of crossings

The spacing of safe crossings is a compromise between improved pedestrian efficiency and safety (close spacing) and the installation/maintenance costs and disruptions to vehicles (wider spacing).

It is generally recognised that pedestrians will walk up to 400 metres to local facilities and bus stops and up to 800 metres to town centres or train stations. The spacing of safe crossings can obviously have a major impact on walk catchments and the level of walking.

For example, safe crossing facilities 800 metres apart would cause a maximum detour of 800 metres, ie. if someone midway between the two crossings simply wanted to cross the road to a bus stop immediately opposite there would be an 800 metre detour to a safe crossing point. This is twice the distance most people would be prepared to walk to local facilities. The road therefore becomes a barrier to pedestrian movement and a major deterrent to walking.

These guidelines have adopted the following spacings based on the road's vehicle function and the extent pedestrians would have / be prepared to detour.

For arterials with minimal frontage activity, (eg. Network City transport corridors) a 400 metres spacing is proposed, equating to a maximum detour of 400 metres or 5-6 minutes. The average detour would be 200 metres or 50 percent of the average maximum walk distance.

For arterials with significant frontage activity but outside town centres, (eg. Network City activity corridors) a 200 metres spacing is proposed, equating to a maximum detour of 200 metres or 2-3 minutes.

For arterials with significant frontage activity within town centres, (eg. Network City activity centres) a 100 metres spacing is proposed, equating to a maximum detour of 100 metres or 1-1 1/2 minutes.

ITEM NO: 9.3

DEVELOPMENT APPLICATION FOR INTEGRATED RESPITE CARE AND TRANSITIONAL ACCOMMODATION FACILITY - LOT 13 RESERVE RD, SPEARWOOD

WAPC OR COMMITTEE:	Statutory Planning Committee
REPORTING AGENCY:	Department of Planning
REPORTING OFFICER:	Planning Manager, Metropolitan South West
AUTHORISING OFFICER:	A/Director, Metropolitan South West
AGENDA PART:	C
FILE NO:	23-50401-1
DATE:	23 July 2012
ATTACHMENT(S):	Attachment 1: Proposed Development Plans Attachment 2: Locality Plan Attachment 3: Site and Surrounds Photographs Attachment 4: Vehicle Manoeuvring Plan
REGION SCHEME ZONING:	Urban
LOCAL GOVERNMENT:	City of Cockburn
LOCAL SCHEME ZONING:	Residential R30/40
LGA RECOMMENDATION(S):	Refusal
RECEIPT DATE:	30 May 2012
PROCESS DAYS:	51
APPLICATION TYPE:	Integrated Respite Care and Transitional Accommodation Facility
CADASTRAL REFERENCE:	Lot 13 (#10) Reserve Road, Spearwood

RECOMMENDATION:

That the Western Australian Planning Commission resolves to approve the development application in accordance with the plans submitted thereto subject to the following condition(s) and advice:

Condition(s):

- 1. This approval relates to the following drawings received by the Department of Planning on behalf of the Western Australian Planning Commission date stamped 5 June 2012 Nos.: A1.01 & A1.03 (copies attached).***
- 2. All stormwater being contained and disposed of on-site.***

3. Compliance with the City of Cockburn Town Planning Scheme No. 3 in respect of developer contributions towards community infrastructure the subject of Development Contribution Area 13.

This decision is issued pursuant to the provisions of the Metropolitan Region Scheme, and has been made by the Commission after due consideration of the regional planning implications of the proposal.

Should the applicant be aggrieved by this decision there is a right to apply for a review pursuant to the provisions of Clause 33 of the Metropolitan Region Scheme. Such an application for review must be submitted to the State Administrative Tribunal, 12 St George's Terrace, Perth in accordance with Part 14 of the *Planning and Development Act 2005*. It is recommended that you contact the State Administrative Tribunal for further details (telephone 9219 3111) or go to its website: <http://www.sat.justice.wa.gov.au>.

Advice:

- 1. The applicant is advised that no construction or related activities causing noise and/or inconvenience to neighbours should occur after 7.00pm or before 7.00am Monday to Saturday, and not at all on Sundays or Public Holidays.**

SUMMARY:

- The application seeks approval to construct residential buildings comprising an integrated respite care facility and transitional accommodation units at Lot 13 Reserve Road, Spearwood.
- The City of Cockburn Planning Department under delegated authority of the Council recommends refusal as it has classified the proposal as "grouped dwellings" and for which the proposal does not comply with the requirements of the City's *Local Planning Policy APD58 – Residential Design Guidelines* (LPP APD58).
- The applicant's planning consultant contends that the development proposal constitutes "residential buildings" and that it complies with the provisions of the City's *Town Planning Scheme No. 3 (TPS 3)* and the Residential Design Codes (R-Codes).
- The planning consultant's views are supported. Approval is accordingly recommended.

LEGISLATION / STRATEGIC PLAN / POLICY:

Legislation *Planning and Development Act 2005*
Section: Part 10

Strategic Plan
Strategic Goal: Planning
Outcomes: Planned Local Communities developing a sense of place
Strategies: Implement State and Regional Planning priorities
Encourage innovation in the design of our communities
Develop connected and accessible communities

Policy

Number and / or Name: Proposal complies with WAPC policies unless discussed in the Comments section.

INTRODUCTION:

The application seeks approval to construct an integrated respite care facility and transitional accommodation units at Lot 13 Reserve Road, Spearwood, at an estimated cost of \$750,000. The application has been submitted by planning consultant Greg Rowe and Associates on behalf of the Department of Housing (DoH).

The buildings are to be constructed in battle-axe configuration; with 3 single bedroom units designed to provide transitional accommodation at the front and a dedicated respite care facility providing temporary accommodation for up to 5 residents at any one time at the rear (**Attachment 1: Proposed Development Plans**). The existing dwelling on the site is proposed to be demolished upon approval of the development plans.

The proposed dedicated respite care facility at the rear is to be occupied and managed by Mosaic Community Care (a not-for-profit organisation that provides care for people with an intellectual and/or physical disability). It will cater for the needs of dependent persons, inclusive of an on-site carer to look after the occupants on a full-time basis. The units at the front will provide accommodation for people with varying disabilities and are designed for independent living.

The subject land is zoned 'Urban' in the Metropolitan Region Scheme (MRS) and 'Residential R30/40' in the City's TPS 3. (**Attachment 2: Locality Plan**)

Pursuant to the provisions of the *Planning and Development Act 2005*, public works by public authorities are exempt from requiring approval from the local government under the local planning scheme however require approval of the WAPC under the MRS. The application has accordingly been forwarded to the WAPC for its determination.

CONSULTATION:

Under delegated authority from the Council, the City's Planning Department recommends refusal for the following reasons:

- “1. *The development does not comply with the requirements, or the objectives of Section 11 of the City of Cockburn Local Planning Policy APD58 – Residential Design Guidelines, and does not comply with the requirements pertaining to the R30 density code applicable to the land. The resultant lot sizes are therefore below both the accepted minimum and average requirement.*
2. *The proposed development does not comply with the minimum and average lot size requirements of State Planning Policy 3.1 'Residential Design Codes' for lots zoned Residential with an associated density coding of R30, taking into*

consideration the requirements variations provided for in accordance with Clause 6.1.3 of the Codes.

3. *The lots proposed are smaller than the prevailing lot sizes in the locality and approval of the development would set an undesirable precedent for the further development of surrounding lots."*

The basis for this is the Planning Department's assessment of the proposal as a "grouped dwelling" development. The applicant's planning consultant states that the City's Planning Department has erred as the development proposal constitutes a "residential building" on the basis that the buildings are intended to provide accommodation for residents on a temporary basis.

The City has provided a list of draft conditions in the event that the WAPC sees fit to approve the proposal.

COMMENTS:

Clause 30 (1) of the MRS requires the WAPC to have regard to the following factors when determining a development application:

- (i) the purpose for which the land is zoned or reserved under the MRS;
- (ii) the orderly and proper planning of the locality; and
- (iii) the preservation of the amenities of the locality.

Having regard to the above, the following is relevant:

Zoning/Dwelling Density

The subject land is afforded a dual density code of 'Residential R30/40' in the City's TPS 3. The applicant's planning consultant has requested that the development be considered in accordance with the higher R40 density code and associated development standards. Clause 5.4.4(c) of TPS 3 – addressing medium density residential development – states:

"in considering applications for the development of land within any of the R30/40 split coded areas depicted in the Scheme Map, the Council may support development up to the maximum density of R40 subject to the application being consistent with the provisions and objectives of Local Planning Policy No.APD58 (Residential Design Guidelines)".

Local Planning Policy APD58 – Residential Design Guidelines

The City argues that the proposal fails to comply with the provisions of its LPP APD58, in particular Section 11 which provides the basis upon which the R40 density code may be applied. It should be noted that the City's LPP APD58 articulates the City's expectations to meet the relevant acceptable development provisions and performance criteria listed in the R-Codes as they relate to grouped dwellings and single houses on lots less than 350 square metres.

The applicant's planning consultant describes both the proposed respite care facility and transitional accommodation units as "residential buildings" on the basis that they

are intended to provide accommodation for residents on a temporary basis. The definition of a residential building provided for in the R-Codes (and reflected in TPS 3) is:

“A building or portion of a building, together with rooms and outbuildings separate from such building but incidental thereto; such building being used or intended, adapted or designed to be used for the purpose of human habitation:

- *temporarily by two or more persons; or*
- *permanently by seven or more persons who do not comprise a single family, but does not include a hospital or sanatorium, a prison, a hotel, a motel or a residential school.”*

Based on the above, the proposal accords with the definition for residential buildings. It is considered that LPP APD58 does not apply as the proposal seeks to construct residential buildings on a single lot 1,201 square metres in area, each of which would operate independent of the others. The grounds of the City's refusal recommendation are therefore not sustained.

The City's TPS 3 is silent on provisions for residential buildings, other than that they are a discretionary use in the City's TPS 3 for land zoned “Residential”.

The proposed buildings (dwellings) are of a residential design and character (single storey) compatible with the local streetscape, and will front Reserve Road as well as Watson Reserve which is located across from Reserve Road (**Attachment 3: Photographs of Existing Site, Local Streetscape and Surrounds**). The proposed development layout complies with the relevant building setbacks, building height, privacy and climate design requirements of the R-Codes for residential development at the R40 density coding, as well as providing a suitable open space amenity for future residents.

The proposed single bedroom units and associated parking at the front comprise an area of approximately 420 square metres, with the respite care facility at the rear (inclusive of parking and driveway) comprising approximately 781.4 square metres.

Outdoor Living Area

The respite care facility building at the rear is provided with 2 separate outdoor living areas – one positioned at the rear and one positioned near the entry. Both outdoor living areas measure in excess of 30 square metres each. The City has requested that the outdoor living areas be consolidated to achieve a larger, useable area which is suitable for use by 5 unrelated adults, to be located on the northern side of the building.

The applicant's planning consultant has responded that many of the future occupants of the facility will be restricted in their movement. The location and size of the outdoor living areas has been designed to accommodate the specific needs and requirements of its future occupants and accordingly the applicant's planning consultant considers the proposed outdoor living areas appropriate.

The outdoor living areas comply with the R-Codes requirements for the provision of that space. Given that the facility (including access to outdoor living areas) has been

designed in strict accordance with the DoH's "Generic Mobility" Accommodation brief, the outdoor living areas are supported as proposed.

Vehicle Manoeuvring and Parking

Vehicle Manoeuvring

At the request of the City, the applicant has provided a site plan showing vehicle manoeuvring on the subject site (**Attachment 4:** Vehicle Manoeuvring Plan for Site). The City has requested that the applicant should ensure that there is adequate vertical clearance beneath the eaves line (of the proposed single bedroom units at the front) and the vehicle manoeuvring path.

The applicant's planning consultant advises that the minimum height of the eaves above ground level for the front buildings is 2.198 metres and increases to approximately 2.4 metres. Australian Standard AS 1428.1 "Design for Access and Mobility" requires an unobstructed vertical clearance of not less than 2 metres to provide an appropriate 'circulation space' to enable movement into and within the buildings. There is accordingly adequate vertical clearance for vehicle movement to the residential building at the rear.

Parking

Table 2 of TPS 3 sets out the minimum car parking requirements for different use classes, of which "residential building" is not included. The table notes that where parking provisions are not prescribed for a particular use, the City will determine the requirement. The City has not specified whether it believes there is a shortfall in the number of bays provided, other than requesting the applicant provide justification for any car parking variation.

The applicant advises that proposed Units 1, 2 and 3 will be occupied by individuals on a transitional basis. Although able to live independently, the occupants of these dwellings may require assistance for transport and on this basis 2 shared bays are provided and considered adequate to meet the needs of future residents.

The rear building is designed for assisted living, with occupants requiring full time care. These residents do not drive, however 2 spaces are proposed to be used by the carer and potential visitors (as required) who may be dropping off or picking up family members.

The proposed parking bays for the development are appropriate for the intended use. Further, there is adequate on-street parking capacity in the event that additional parking bays are required.

Orderly and Proper Planning of the Locality

The WAPC's strategic planning document *Directions 2031* promotes efficient and effective use of residential land through appropriate infill development. This form of infill development for transitional accommodation and respite care facility meets a growing demand for provision of these forms of development, as well as constituting

compatible housing for the location. In this context the proposed development is consistent with orderly and proper planning.

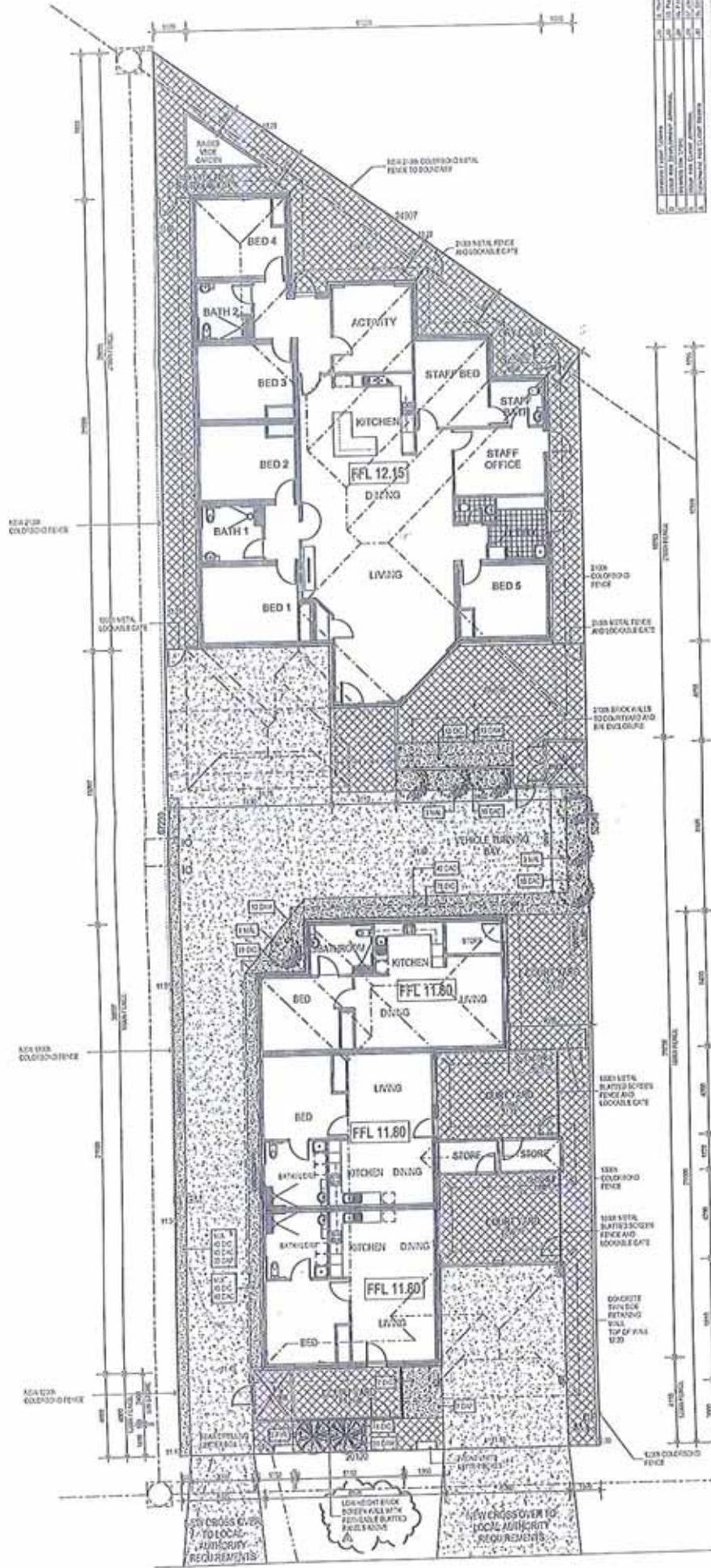
Preservation of the Amenities of the Locality

The surrounding development is predominantly residential with the exception of the local park on the opposite side of Reserve Road which contains playing fields (Watson Reserve). The proposed buildings will be compatible in density and form, and will be consistent with the surrounding streetscape. The minimal traffic generated by the proposal will not adversely impact local vehicular traffic and pedestrian movement.

CONCLUSION:

The proposal provides an important community housing project to support people with disadvantages. The use and form of development is compatible with the local character and amenity.

Approval is recommended.



NO.	REVISION	DATE	BY	CHKD.
1	ISSUED FOR PERMIT	10/11/11	...	...
2	REVISED PER LOCAL AUTHORITY COMMENTS	11/11/11	...	...
3	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
4	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
5	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
6	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
7	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
8	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
9	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...
10	REVISED PER LOCAL AUTHORITY COMMENTS	12/11/11	...	...

Government of Western Australia
Department of Housing

MOSAIC COMMUNITY CARE
ROAD SPANWOOD
SITE PLAN

DATE	11/11/11
BY	...
CHKD.	...
SCALE	A1.01

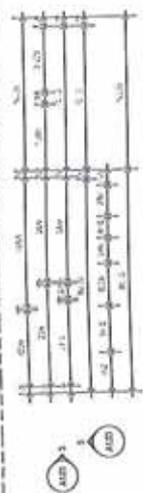
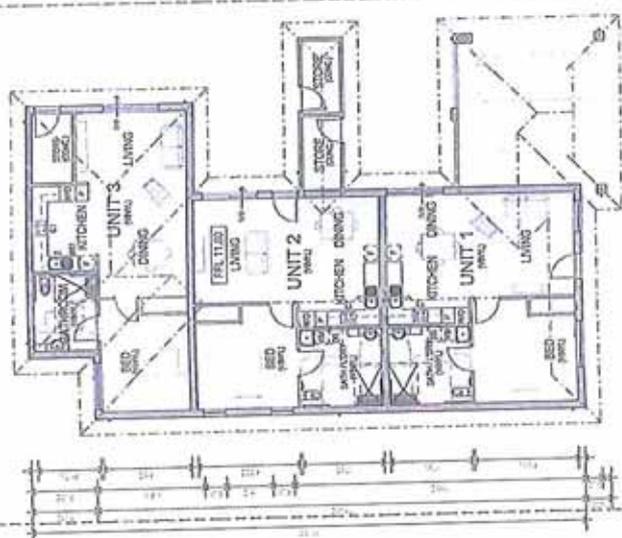
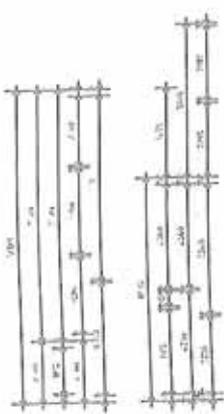
PLANNING LEGEND

LOT AREA = 1205 m²
TOTAL BUILDING AREA = 512m²
6 BED RESPITE = 310m²
3 INDEPENDENT UNITS = 202m²

DEPARTMENT OF PLANNING
5 JUN 2012
FILE 123-50401-1

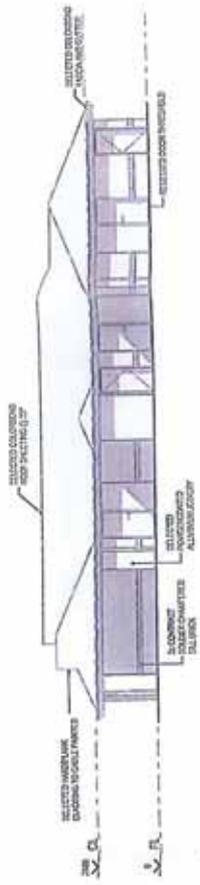
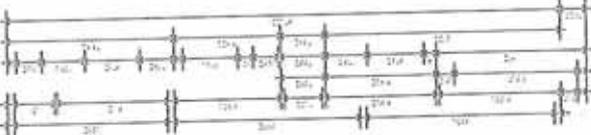
SITE PLAN
1:100

RESERVE ROAD



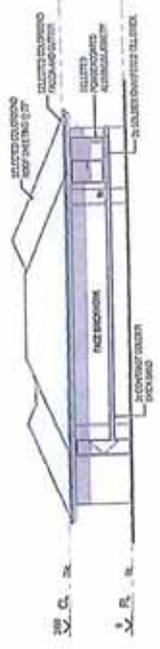
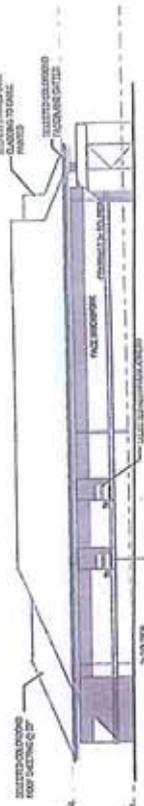
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A1.03 1:100

2 EAST ELEVATION
A1.03 1:100



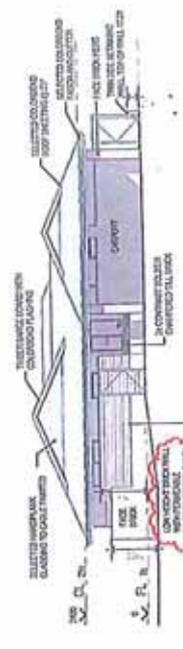
2 EAST ELEVATION
A1.03 1:100

3 WEST ELEVATION
A1.03 1:100



4 NORTH ELEVATION
A1.03 1:100

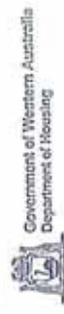
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A1.03 1:100



NO.	DATE	DESCRIPTION	BY	CHKD.
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2	01/11/12
3	02/11/12
4	03/11/12
5	04/11/12



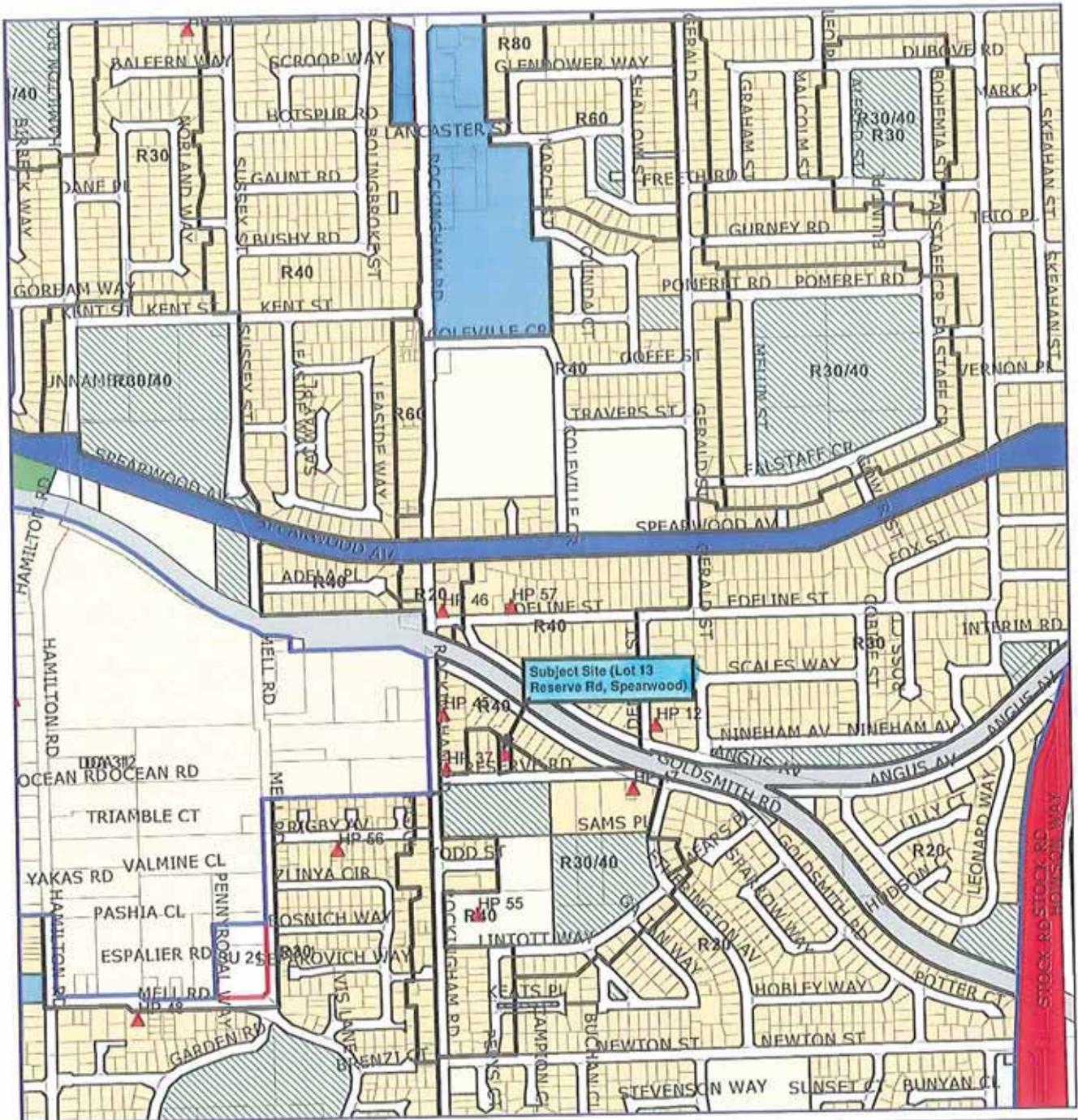
CONSULTANT O
PLANNING AND DESIGN
ARCHITECTS



GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF HOUSING
MOSAIC COMMUNITY CARE
1150 HIGHWAY 11
MIDLAND WA 6450

NO.	DATE	DESCRIPTION	BY	CHKD.
1	12/11/11	ISSUED FOR PERMIT	...	...
2	01/11/12	...	...	...
3	02/11/12	...	...	...
4	03/11/12	...	...	...
5	04/11/12	...	...	...

DEPARTMENT OF PLANNING
5 JUN 2012
FILE 23-50401-1



Cadastre with Lot Numbers	TPS - Scheme Boundaries	DISTRICT CENTRE	PARKS & RECREATION
TPS Special Points	TPS - R Code Boundaries	INDUSTRY	PUBLIC PURPOSES
SPECIAL 10	PRIMARY REGIONAL ROADS	LAKES & DRAINAGE	RESIDENTIAL
DEVELOPMENT CONTRIBUTION AREA	OTHER REGIONAL ROADS	LOCAL CENTRE	SPECIAL USE
DEVELOPMENT AREA	PARKS & RECREATION	LOCAL ROAD	
SPECIAL USE AREA	RAILWAYS	MIXED BUSINESS	
	DEVELOPMENT	NO ZONE	

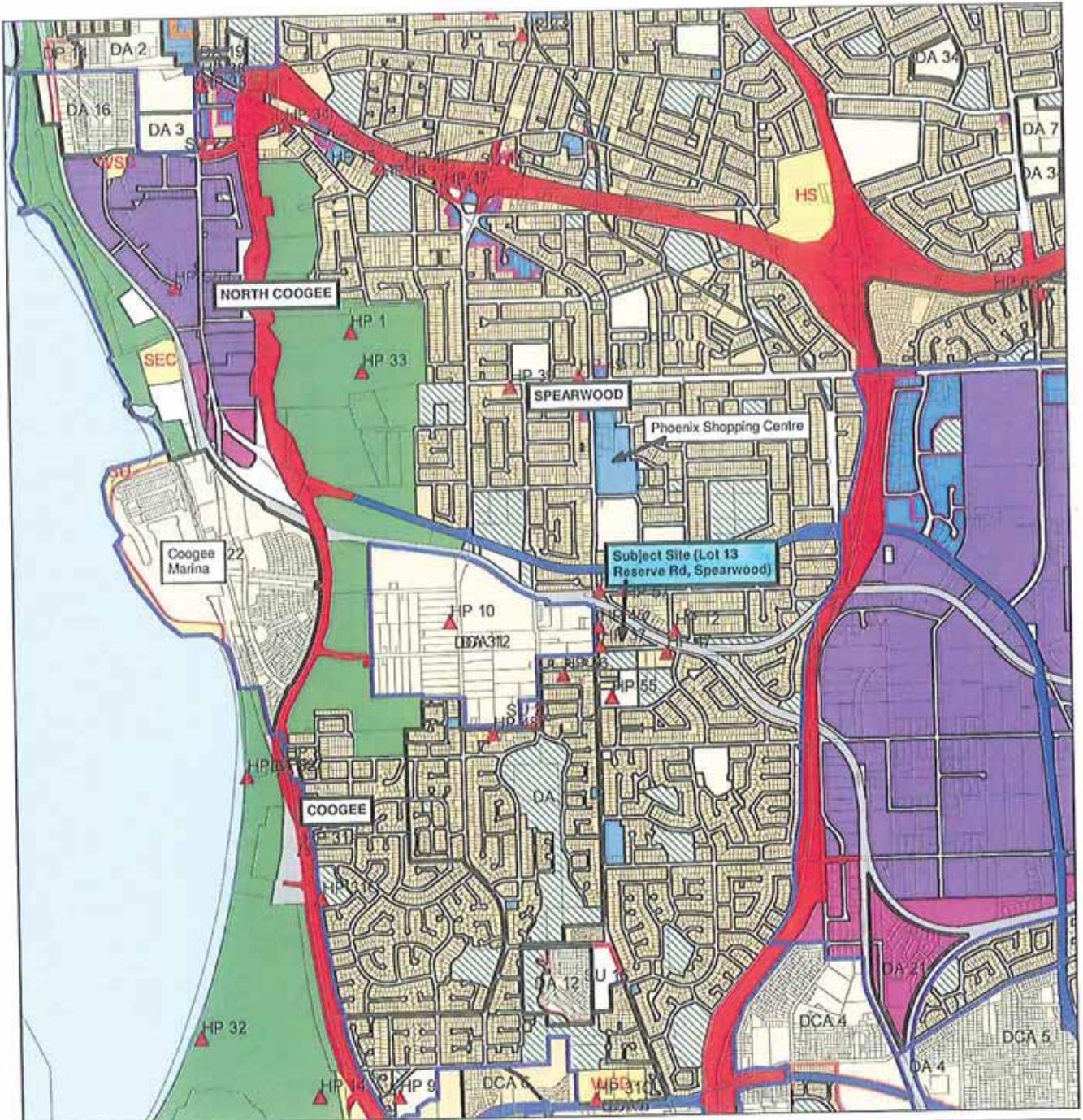
Scale 1:10,835
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Prepared by: achhabra
 Prepared for:
 Date: Monday, July 23, 2012 13:29
 Plot Identifier: P20120723_1328

DP INTERNAL USE ONLY



Locality Plan (TPS)



Cadastral with Lot Numbers	SCA LOCAL PLANNING AREAS (SCHEDULE 12 SCHEME TEXT)	PP - STATE ENERGY COMMISSION	LOCAL ROAD
Townsites	SPECIAL USE AREA	PP - SPECIAL USES	MIXED BUSINESS
TPS Special Points	TPS - Scheme Boundaries	PP - WATER AUTHORITY OF W A	MIXED USE
SPECIAL 10	PRIMARY REGIONAL ROADS	DEVELOPMENT	NO ZONE
DEVELOPMENT CONTRIBUTION AREA	OTHER REGIONAL ROADS	DISTRICT CENTRE	OPEN SPACE
DEVELOPMENT CONTRIBUTION AREA	WATERWAYS	INDUSTRY	PARKS & RECREATION
SCA DEVELOPMENT AREAS (SCHEDULE 11)	PARKS & RECREATION	LAKES & DRAINAGE	PUBLIC PURPOSES
DEVELOPMENT AREA	RAILWAYS	LIGHT AND SERVICE INDUSTRY	RESIDENTIAL
DEVELOPMENT PLANS (SCHEDULE 14)	PP - HIGH SCHOOL	LOCAL CENTRE	SPECIAL USE

Scale 1:30,957 0 0.5 km

Prepared by: achhabra
 Prepared for:
 Date: Wednesday, July 25, 2012 11:24
 Plot Identifier: P20120725_1052

DP INTERNAL USE ONLY

Government of Western Australia
Department of Planning

Locality Plan (Overall)



Figure 1: Current dwelling on subject site



Figure 2a: Local Streetscape (to the east of the subject site)



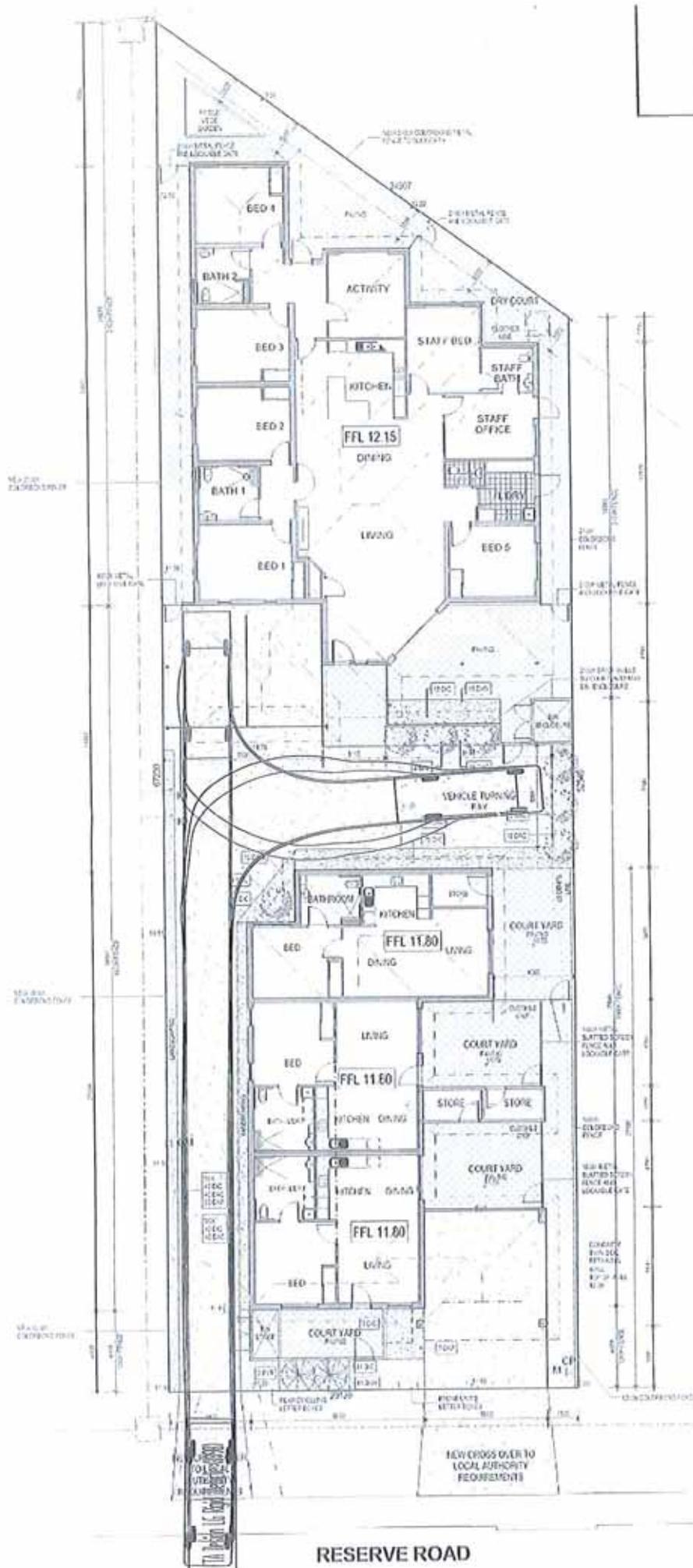
Figure 2b: Local Streetscape (to the west of the subject site)



Figure 3: Watson Reserve (photo taken from front of subject site)

MOSAIC COMMUNITY CARE
 10 RESERVE RD SPEARWOOD
 COASTER VAN MANOEUVRING
 1.5.12

CSK01



PLAN
 1:200 (A3)

BG & E

PERTH
 401 S. GOSWAMI
 401 S. GOSWAMI
 PERTH
 WA 6150
 www.bge.com.au

21 MAY 2012

DEPARTMENT OF PLANNING
 30 MAY 2012
 23-50401-1
 FILE

ITEM NO: 9.4

APPLICATION FOR RETROSPECTIVE APPROVAL OF EXPANSION OF EXISTING POULTRY FARM (BIRD NUMBERS) AND ASSOCIATED BUILDINGS AND STRUCTURES. APPLICATION FOR APPROVAL TO CONSTRUCT VENTILATION STACKS, ABLUTION FACILITY AND OTHER ASSOCIATED IMPROVEMENTS TO POULTRY FARM. LOT 600 CHELTENHAM ROAD, WEST SWAN.

WAPC OR COMMITTEE:	Statutory Planning Committee
REPORTING AGENCY:	Department of Planning
REPORTING OFFICER:	Planning Manager, Metropolitan Planning North East
AUTHORISING OFFICER:	Director, Metropolitan Planning North East
AGENDA PART:	G
FILE NO:	21-125050-2
DATE:	28 May 2012
ATTACHMENT(S):	1 - Development Plans 2 - MRS zoning plan 3 - Excerpt from development application report 4 - Excerpts from additional supporting information dated 29 March 2012 5 - Excerpts from GRA report
REGION SCHEME ZONING:	MRS: URBAN DEFERRED
LOCAL GOVERNMENT:	City of Swan
LOCAL SCHEME ZONING:	General Rural
LGA RECOMMENDATION(S):	Refusal to approve increase in bird numbers. Conditional approval (retrospective) to existing built development
REGION DESCRIPTOR:	Perth Metro North East
RECEIPT DATE:	21 March 2011
PROCESS DAYS:	436
APPLICATION TYPE:	Development
CADASTRAL REFERENCE:	Lot 600 Cheltenham Road, West Swan

RECOMMENDATION:

That the Western Australian Planning Commission resolves to refuse the development application for retrospective approval to an expansion of the poultry farm at Lot 600 Cheltenham Street, West Swan for the following reasons (LETTER E):

- 1. The proposed development is inconsistent with the requirements of State Planning Policy No. 4.3 Poultry Farms Policy as it proposes the expansion of a poultry farm in an area identified for urban development in the short or medium term.*
- 2. The proposed development is inconsistent with the requirements of State Planning Policy No. 4.3 and the Environmental Protection Authority Guidance Statement No. 3 Separation Distances Between Industrial and Sensitive Land Uses as it proposes the expansion of a poultry farm in the vicinity of existing and proposed residential development, and has not demonstrated that current or future residents will not be adversely affected by the operations of the poultry farm.*
- 3. The subject land is zoned 'Urban Deferred' within the Metropolitan Region Scheme and identified for residential purposes within the Swan Urban Growth Corridor Sub-Regional Structure Plan. Approval of the proposed development would prejudice and restrict the urbanisation of this area inconsistent with the planning objectives of the Swan Urban Growth Corridor Sub-Regional Structure Plan, and would be inconsistent with the orderly and proper planning of the area.*
- 4. The subject land is zoned 'General Rural' within the City of Swan Local Planning Scheme No. 17. The proposal is inconsistent with the objectives of the 'General Rural' zone within the scheme as the proposal has not demonstrated that approval will not impact on the amenity and rural character of the area.*

ADVICE:

- 1. In relation to the development on site that has occurred without approval to which retrospective approval was sought, the applicant is advised to remove this development and restore the land as nearly as practicable to its condition immediately before the development started.*

Section 214 of the Planning and Development Act 2005 provides for the WAPC to give notice in writing directing the owner to alter the development and restore the land as nearly as practicable to its condition immediately before the development started. Should the unapproved development not be removed and the land restored to its previous condition, the WAPC will need to consider whether action should be taken in relation to the unapproved development in accordance with the provisions of the Planning and Development Act.

SUMMARY:

- The application seeks retrospective approval to the expansion of an existing poultry farm (egg laying) at Lot 600 Cheltenham Street, West Swan (refer **Attachment 1** - Development plans, **Attachment 3** - Excerpt from Development application report).
- The proposal requires Western Australian Planning Commission (WAPC) determination in accordance with Clause 32 of the Metropolitan Region Scheme (MRS) as the proposal involves an extension to an existing poultry farm in excess of 100m² on land in the urban deferred zone under the MRS.
- The subject land and surrounds are zoned urban deferred under the MRS (**Attachment 2** - MRS zoning plan).
- The main issues for consideration in this report are:
 1. whether, given the urban deferred zoning of the land under the MRS, the proposal is consistent with proper and orderly planning and State Planning Policy 4.3 'Poultry Farms Policy' (SPP 4.3); and
 2. whether the proposed odour mitigation measures (odour stacks) are adequate in light of the number of complaints received by the City of Swan from nearby residents, and whether these measures supported by the Department of Environment and Conservation (DEC).
- The DEC notes that the findings of the odour assessment are not definitive and cannot be used to support a reduction in the current 500 metre buffer.
- The proposed expansion is not consistent with SPP 4.3 as the subject land and surrounding 'cell' has been zoned urban development since 1994 and residential development is well advanced in the surrounding urban areas that are not affected by the poultry farm buffer.
- The proposal, if supported, would prejudice and restrict the urbanisation of an area that is identified for residential development within the Swan Urban Growth Corridor Sub-Regional structure plan (SUGCSP), inconsistent with the MRS zoning, the principles of proper and orderly land use planning and SPP 4.3.
- It is recommended that the proposal be refused.

LEGISLATION / STRATEGIC PLAN / POLICY:

Legislation Subdivision / Development Approval - Part 10 of the P&D Act 2005

Section:

Strategic Plan

Strategic Goal: Planning

Outcomes: State-wide integrated Policy frameworks

Strategies: Implement State and Regional Priorities

Policy

Number and / or Name: State Planning Policy 4.3. Poultry Farms Policy (SPP 4.3).

Environmental Protection Authority. 'Separation Distances between Industrial and Sensitive Land Uses'. Guidance Statement No. 3.

BACKGROUND:

On 29 February 2012 the City of Swan Council resolved to:

1. Refuse to grant retrospective approval to the increase in bird numbers from 24,000 to 80,000 for the following reasons:
 - The expansion is inconsistent with objective (c) of the General Rural zone which is to *"Ensure the use and development of land does not prejudice rural amenities, and to promote the enhancement of rural character"* . The City has received 25 complaints regarding odour from the expanded poultry farm.
 - The proposal appears to be inconsistent with the intent of SPP 4.3 where it is inferred that expansion of existing poultry farms in areas identified for urban use in the medium to short term should not be permitted.
 - The proposal is not consistent with proper and orderly planning.
2. Grant retrospective approval to associated buildings, subject to a number of conditions relating to the provision of a revised operational management plan, confirmation of the structural integrity and BCA compliance of buildings, investigation of possible site contamination, and provision of 'as constructed' drawings.

It is noted that the City's determination did not include a resolution relating to the proposed new odour stacks, the proposed sealed car parking area and the proposed ablution facility.

The applicant has subsequently lodged an appeal to the State Administrative Tribunal (SAT). It is understood that the SAT appeal has not been significantly progressed as the applicant is awaiting the WAPC's decision on the application.

With regard to the unapproved increase in bird numbers, the applicant advises that prior to 2005 poultry farms had to be licenced for the numbers of birds kept on site. After 2005 the poultry industry was deregulated, and bird numbers no longer regulated. Under the Code of Practice for egg laying poultry farms, cages that met a standard introduced in 1995 could be in place for 20 years from the date of manufacture. Cages that did not comply with the 1995 standard (as was the case with the cages on the subject poultry farm) were required to be decommissioned by 1

January 2008 or modified to meet the 1995 standard. The Code of Practice introduced a new system of layered cages which meant that greater numbers of birds could be kept without increasing the size of the sheds. Changes also included the requirement for mechanical ventilation and an increase in cage size for birds. The applicant advises that in order to remain competitive in the industry the number of birds kept on site was also increased. It is understood that the multi-layered cages were installed in 2006.

The SPC considered the application at its meeting on 12 June 2012, and resolved to defer the proposal to allow additional time for the applicant to liaise with staff of the DoP. Further discussions have occurred, with the applicant raising the possibility of modifying the proposal to reduce the number of birds for which approval was sought. The reporting officer has requested this information from the applicant, however the applicant has advised that the modified proposal involving reduced bird numbers will be presented to the SPC when it considers the proposal.

The site currently has planning approval for 24,000 birds. A modified proposal which reduces the proposed bird numbers would not alleviate the planning objections raised relating to the proposal as outlined in this report. In addition, there is an active SAT matter in relation to the City's determination under the local planning scheme. The SAT mediation process has been deferred pending the WAPC's decision.

INTRODUCTION

In summary, the application seeks retrospective approval of:

- An increase bird numbers from the currently approved 24,000 to 80,000 within sheds 1, 2, 3 and 4.
- Internal modifications to sheds 1, 2, 3 and 4 to enable accommodation of the birds (multi layered cages).
- The coolroom and packing shed, ramps and retaining walls and use of that building for grading and packing of eggs and storage of eggs.
- Incidental feed silos constructed at the western ends of sheds 1-4.
- The covered area currently used for selling manure, and approval for the bagging and selling of a compost product based upon processed manure.
- The conveyor system and associated structures that are used to collect eggs, which extends between sheds, 2, 3 and 4 and the packing shed.
- The shop/office/store, and approval of the incidental shop and office uses.
- Various minor structures and 5 sea containers used for the storage of egg cartons.
- The hen sales area, and for the Alpaca pen (between Shed 3 and Cheltenham St).

The application seeks approval of a proposed:

- 6m high odour stacks for sheds 2, 3 and 4. The birds housed in Shed 1 are free to range in an adjoining large fenced yard. The birds are moved back into the shed overnight. The proposed odour stacks for sheds 2, 3 and 4 are an integral component of the application and will ventilate odour vertically rather than horizontally, which is the current method of ventilation
- New customer and staff parking area, and a proposed new toilet facility.
- Car parking and loading area between the shop/office building, poultry sheds and Cheltenham Street.

Local and Regional Context

The subject land is within a broader area that is zoned urban deferred under the MRS, which is generally bounded to the east by the existing Perth-Darwin National Highway Primary Regional Roads reservation (PDNH), and to the south by the Reid Highway. Whiteman Park forms the boundaries of the urban deferred area to the north and west. To the south-west of the Reid Highway is Bennett Springs, an existing residential area. To the east of the PDNH reservation the land is zoned urban and is within the Swan Urban Growth Corridor as depicted under the Swan Urban Growth Corridor Sub-Regional Structure Plan (Feb 2009) (SUGCSP). This area is approximately 500 metres from the subject land at its closest point. The SUGC includes the subject land and is projected to provide housing for approximately 33,000 residents in 12,500 dwellings. Within the SUGC are the developing suburbs of Caversham, Dayton and Albion. Structure planning has been approved in these areas and residential development has been occurring over the last few years.

The area immediately surrounding the poultry farm is characterised by low density rural residential style development and is currently zoned General Rural within LPS 17. A number of residences on semi rural properties are located between 75m and 370m from the subject land. The closest adjacent urban area (Dayton LSP 1) is approximately 500m to the east of the subject land. Residential densities in the urban areas are generally between R20 to R60.

Under SPP 4.3, where the odour source is within 300 metres of existing/proposed rural residential development and 500 metres of existing/proposed residential development, an assessment of the likely environmental impacts is required. Further, the EPA GS 3, recommends a buffer distance to a poultry farm of between 300m to 1000m, depending on the size of the farm.

In this instance there is existing rural residential and residential development within these buffer distances to the poultry farm. The proponent's odour modelling seeks to establish that a buffer distance of 500 metres is appropriate, however, a buffer distance 500 metres will prevent further intensification of the existing rural-residential development and urbanisation throughout the majority of the local area zoned urban

deferred, which would be inconsistent with the current zoning of the land under the MRS.

The City of Swan granted development approval for a poultry farm (egg laying) on 22 September 1993, subject to a number of conditions, including that the capacity of the poultry farm did not exceed current bird numbers, which at that time was 24,000.

The poultry farm land use is considered under the 'Animal Husbandry - Intensive' land use class under LPS 17, and is a discretionary use in the General Rural zone under LPS 17. The other uses for which approval is sought are considered ancillary to the primary use.

The application includes a comprehensive development application report (dated July 2011) which can be tabled if requested, including an:

- Odour Impact Assessment & Dispersion Modelling Study dated February 2011 conducted by consultants 'The Odour Unit' (TOU);
- odour modelling projections plan; and a
- environmental management plan, which incorporates plans addressing odour, noise, dust, waste, manure and traffic management.

The applicant has also submitted additional information dated 29 March 2012 which provides further justification in support of the increased bird numbers (**Attachment 4** - Excerpt from additional supporting information dated 29 March 2012)

CONSULTATION

The City of Swan Council resolved to not approve the increase in bird numbers from 24,000 to 80,000, but to approve a number of the associated buildings.

The application was publicly advertised by the City of Swan for 30 days via a sign on site, the City of Swan web site, and in the local newspaper. Written notification was sent to surrounding neighbours. A total of 65 submissions were received, including 62 objections and 3 letters of non-objection. One objection included a petition containing 83 landholder signatures (one being an organisation with 133 members).

The main objections raised in submissions relate to:

- Odour
- Inappropriate development in the urban deferred zone.
- Inappropriate to consider development retrospectively.
- Health
- Amenity
- Traffic

These issues are discussed below in the comments section of this report.

In addition, GRA has prepared a report on behalf of landowners and residents objecting to the proposal. This report considers the proposal against the relevant local government, environmental and WAPC policies and legislation. The GRA report includes a critique of the odour assessment and dispersion modelling undertaken by TOU. A copy of the GRA report can be provided to the SPC upon request. (**Attachment 5** - Excerpts from GRA report). The matters raised in the GRA report are discussed in the comments section of this report.

The DEC has reviewed the TOU report and has raised a number of concerns regarding the assessment and the assumptions made in the modelling. In summary the DEC advise that ... *"the input data used in the model have large uncertainty and therefore so do the odour contours... In conclusion, the findings of the odour assessment are not definitive and cannot be used to support a reduction in the buffer."*

The DEC also recommend that the WAPC assess the number of complaints since the increase from 24,000 to 80,000 birds, whether the number of complaints has risen and where the complainants are located. *"Any recent complaints or an increase in the level of complaints post expansion will indicate that there are impacts to be further considered by the WAPC."*

The DEC referral response concludes that the modelling input data have large uncertainty and therefore so do the odour contours. With all of these uncertainties taken together, DEC suggests maintaining a minimum distance of 500 metres as recommended in the previous EPA report in relation to the 1994 MRS amendment.

The additional information provided by the applicant dated 29 March 2012 was referred to the DEC, however no written response has been received. The reporting officer has spoken with an officer of the DEC air quality branch. These comments are discussed below.

The Department of Water (DoW) did not raise any objections to the proposal.

COMMENTS

Swan Urban Growth Corridor Sub-Regional Structure Plan (Feb 2009) (SUGCSP)

An objective of the SUGCSP is to provide for the coordination of development within areas of the SUGC identified for urbanisation. The subject locality is identified as 'West Swan West' within the SUGCSP as suitable for residential development. The SUGCSP acknowledges that the operational poultry farm on Cheltenham Street currently poses a constraint to residential development in the area.

Metropolitan Region Scheme - Major Amendment (950/33)

The subject land is part of a broader area which was rezoned from MRS rural to urban deferred in December 1994. The MRS amendment included the majority of

land that is known as the Swan Urban Growth Corridor (SUGC), and also recognised that the two main constraints to urbanisation of the area were the lack of connection to essential services and the odour buffer to the poultry farm/mushroom farm in the locality.

In 2011 the servicing constraints relating to reticulated water, electricity and sewerage were resolved due to the residential development of urban land to the east that is within the SUGC.

State Planning Policy 4.3 - Poultry Farms Policy

The objectives of SPP 4.3 are:

- * "To ensure that new poultry farms are established in locations suitable to their operational requirements;*
- * To minimise the impact of poultry farms on residential, rural residential and other potentially incompatible uses;*
- * To protect the interests of existing poultry farms in the face of encroaching development; and*
- * To encourage the relocation of poultry farms on land required for residential or rural-residential development."*

The SPP 4.3 (background) acknowledges the conflicts associated with accommodating future urban growth located on or near existing poultry farms, and identifies the need to provide guidelines on managing these impacts. The SPP states:

"The vast majority of poultry farms in future urban development areas will relocate on their own as urban development approaches and the farm land is used for urban uses. There are exceptional circumstances where it is impractical or impossible for affected farms to relocate within the timeframe for development. In the (sic) case the Commission could support the rezoning of the poultry farm and adjacent land affected by farm operations for urban or urban deferred development."

The SPP suggests that "the vast majority" of poultry farms in future urban development areas will relocate as urban development encroaches, and that there may be exceptional circumstances where it is impractical or impossible for affected farms to relocate within the timeframe for development, in which case the Commission could support the rezoning of the poultry farm and adjacent land affected by farm operations for urban or urban deferred development.

In this instance the subject land is no longer zoned MRS rural, and has been zoned urban deferred since 1994. Subject to the extension of essential services, the subject poultry farm is now the only remaining impediment to urbanisation of the entire urban deferred cell.

Section 5.2.1 states: *"Applications to expand existing poultry farms located in a rural zone which is not identified for short or medium-term urban or rural-residential development may be permitted. This applies particularly to egg production farms where there is no increase in bird-stock numbers."*

Section 5.2.1 establishes that poultry farms on rural zoned land may only be considered for expansion if they are in areas that are not identified for short or medium term urban or rural-residential development. The land to the south and east of the subject locality is already zoned for residential development and within these areas, district and local structure plans have been approved, along with related subdivision applications. Residential development in these areas is well advanced. Therefore, by virtue of the existing urban deferred zoning, the subject land and surrounds have been identified as being suitable for residential development since 1994 and urbanisation of the surrounding area not impacted by the poultry farm is well advanced. Accordingly it is considered that the proposal is inconsistent with section 5.2.1 of SPP 4.3.

With regard to the objectives of SPP 4.3, the applicant maintains that an important objective of the policy is to protect the interests of existing poultry farms in the face of encroaching development, and that the proposed odour mitigation measures will result in odour impact being limited to those properties within 450m of the poultry farm.

In respect to the policy objective to protect poultry farms in the face of encroaching development, section 5.6.3 of SPP 4.3 notes that it is not appropriate to permit poultry farming 'as of right' in the rural zone, and that new farms should be a discretionary use in the rural zone and should generally be a prohibited use in other zones. Therefore, it is considered that this objective only contemplates protection of poultry farms on land zoned rural under the MRS. From a strategic land use planning perspective, it is contended that the poultry farm became an 'inappropriate' land use once the area was rezoned to urban deferred in 1994. In this instance, the land use planning process for this area has progressed over the last 17 years to the extent that the remainder of the Swan Urban Growth Corridor has been urbanised, and the subject land and surrounds rezoned to facilitate future urbanisation. Therefore it is considered that the objective to protect existing poultry farms is no longer relevant in this instance as the SPP only contemplates poultry farms as being an appropriate land use within the rural zone, or under a separate Special Use zone.

Another objective of SPP 4.3 is to encourage the relocation of poultry farms on land required for residential or rural-residential development. With regard to this objective, section 5.5 of SPP 4.3 notes that as an incentive, and where it is in accordance with proper and orderly planning, the local government and the WAPC may support rezoning of poultry farms and adjacent affected land, for residential or rural-residential purposes. In this instance, such a rezoning occurred in 1994, and thus the landowner has, for the last 17 years, been duly incentivised as provided for under the SPP.

Environmental Protection Authority – Separation Distances between Industrial and Sensitive Land Uses. Guidance Statement 3.

The EPA's Guidance Statement 3 (GS 3) adopts a range of generic separation distances between industrial and sensitive land uses. Under GS 3, the generic buffer

from an intensive poultry farming operation is between 300m – 1000m, depending upon the size of the poultry farm.

Odour Impact Assessment and Dispersion Modelling Study

The applicant has commissioned TOU to undertake three odour studies in relation to the proposal. The first study, dated February 2011, is a odour impact assessment and dispersion modelling study. The second study, dated December 15, 2011, is a site specific modelling assessment of Shed 1 (free range shed). The third study, dated February 2012, compares a scenario of the currently approved 24,000 birds (with existing horizontal air exhaustion from Sheds 2, 3 and 4, and naturally ventilated Shed 1) to the current operating arrangement of 84,000 birds but with the vertical air stacks installed to Sheds 2, 3 and 4.

The February 2011 TOU study was commissioned by the applicant to determine if a 500m odour buffer should be placed on the farm to account for the increased capacity of egg layers. The study modelled the odour impact based on Sheds 2, 3 and 4 being fitted with vertical mechanical ventilation stacks (minimum 6m high), and Shed 1 being naturally ventilated and assuming best management practice and 'housekeeping'. At the time the study was conducted Shed 1 was empty, so a comparable shed on a poultry farm in Hazelmere was used to model a naturally ventilated scenario.

The study finds that based on the odour concentrations vertically exhausted to the air, ground level malodour impacts may only arise from the naturally ventilated free-range shed (Shed 1). The report states that once the vertical stacks are installed on Sheds 2, 3 and 4, this will reduce the odour footprint to *"nominally 100 metres from the nearest odour source at the farm."* The Study concludes that: *"Once the tunnel ventilated sheds are reconfigured such that their emissions are ejected vertically at a height of no less than 6 metres above ground, and the naturally ventilated shed is operated to best practice, along with diligent housekeeping, the odour footprint is expected to be less than 450 metres from the nearest odour source at the Swan Valley Eggs farm. Based on the modelling these odour emissions would be attributed (if any) to the naturally ventilated shed."*

The submission prepared by GRA disputes the findings of the Study, and engaged Coterra Environment consultants to critique TOU study. In summary the GRA review of TOU Study, incorporating the findings of the Coterra critique concludes:

- The applicant's odour study does not model the odours from Sheds 2-4 without installation of odour stacks, i.e. their current configuration is not modelled;
- A comparable odour study of the farm with only 24,000 birds has not been undertaken;
- The odour study predicts an off-site odour impact beyond 500 metres even if the vertical stacks are installed to Sheds 2, 3 and 4;

-
- The Study concedes sensitive receptors within 450 metres would be subject to odour nuisance, from Shed 1 as well as from Sheds 2, 3 and 4 with vertical stacks installed;
 - Coterra suggests a buffer of closer to 1,000 metres to limit odours from a poultry farm with approximately 90,000 birds;
 - Stephenson recommends a minimum buffer of 900 metres, even with odour stacks, to account for unforeseen events, abnormal operating conditions, or adverse weather conditions; and
 - Stephenson suggests a maximum capacity of 14,600 birds to limit the impacts of odour on sensitive receptors.

In relation to the GRA conclusions the following comments are made:

- In respect of the first dot point, TOU Study has modelled the existing poultry farm arrangements by stating (page 21) *"The dispersion modelling of a naturally ventilated (volume source) egg layer shed and three tunnel ventilated, multi tier egg layer sheds (stack sources) projected an off site odour impact beyond 500 metres."* It is noted that the actual extent of the odour impact under this scenario is not stated.
- With regard to dot point 3, the conclusion of TOU Study is noted above which indicates that once the mitigation measures are in place *"the odour footprint is expected to be less than 450 metres from the nearest odour source at the Swan Valley Eggs farm. Based on the modelling these odour emissions would be attributed (if any) to the naturally ventilated shed."*

Notably however, one of the conclusions of the Coterra report states: *"The odour dispersion modelling has determined that there is an impact under ideal conditions within 450 metres of the sheds with a 90,000 chicken capacity. Further, under any unfavourable meteorological conditions this plume will not disperse efficiently in any direction, including vertically. Therefore the separation or buffer distance for plant upsets or non-normal operations or unfavourable meteorology may be at least double this predicted distance of 450 metres; that is, 900 metres."*

The second TOU Study dated December 2011 was conducted to confirm the results of the first study in respect of the impact of Shed 1. The results of the second study concluded that the cumulative impacts from Shed 1 (naturally ventilated) and three tunnel sheds have a projected off site impact radius of 500 metres.

With regard to the third TOU study, the information provided by the applicant has been referred to the DEC, however no formal response has been received. The reporting officer has spoken with an officer of the DEC air quality branch who has indicated that the DEC position has not altered, and the DEC maintains its advice that the buffer distance should not be less than 500 metres, and that WAPC should investigate complaints relating to the poultry farm.

The applicant has undertaken extensive odour studies and dispersion modelling, and has responded to queries raised. DEC advises that due to complexities associated with modelling of odour impact there remains uncertainty in making predictions

relating to odour impact and specific buffer distances, particularly when seeking to reduce buffers below those recommended in GS 3. In this instance it is relevant to note that the applicant has not sought to determine a specific buffer distance, and their modelling concludes that the odour from the upgraded facility will impact residents within 450 metres of the farm, with Shed 1 being the principle odour source. The submission by GRA suggests that if adverse weather conditions are taken into account a buffer closer to 900m-1000m is appropriate.

Although these studies seek to establish that a 450 metre buffer is appropriate to the expanded operation, a buffer of this distance will still impact on existing dwellings in the vicinity that are closer than 450 metres from the poultry farm, and will prevent intensification of development and urbanisation of virtually the entire area zoned urban deferred, which would not be consistent with the zoning under the MRS, or proper and orderly planning.

City of Swan - Local Planning Scheme 17 - General Rural zone.

The objectives of the General Rural Zone are to –

- (a) facilitate the use and development of land for a range of productive rural activities, which will contribute towards the economic base of the region;
- (b) provide for a limited range of compatible support services to meet the needs of the rural community, but which will not prejudice the development of land elsewhere which is specifically zoned for such development;
- (c) ensure the use and development of land does not prejudice rural amenities, and to promote the enhancement of rural character;
- (d) ensure that development and land management are sustainable with reference to the capability of land and the natural resource values.

Objective (c) is particularly relevant in this instance, given the number of complaints made to the City of Swan relating to odour from the poultry farm. The report to the City of Swan Council notes that between 2002 and 2006 no complaints were received regarding the poultry farm. Since 2006 the City of Swan has received:

- 2006 - 13 complaints;
- 2007 - 6 complaints;
- 2008 - 0 complaints;
- 2009 - 5 complaints;
- 2010 - 14 complaints;
- 2011 - 14 complaints.

The numbers of complaints coincide with the expansion in bird numbers from 24,000 to 80,000.

During 2007 a number of residents on Rugby Street lodged an Application for Mediation with the Registrar of the Agricultural Practices Board in an attempt to resolve issues relating to 'excessive and overpowering poultry manure odours' and 'excessive fly numbers throughout the year'. The reduction in complaints in 2008 may be due to operational improvements undertaken by the farm operator. However, in 2010 and 2011, 14 complaints were received in each year by the City of Swan.

The DEC recommended that the WAPC investigate the complaints against the poultry farm, and that if there has been an increase in complaints post expansion, then there are impacts that require further consideration by the WAPC. It is notable that the proponent has not reported on the current odour impact of the poultry farm on local residents. Having regard to the above comments from the DEC regarding the difficulties associated with assessing odour buffer reductions, it is considered that the complaints received could be an effective indication of the extent of the amenity impact from the poultry farm.

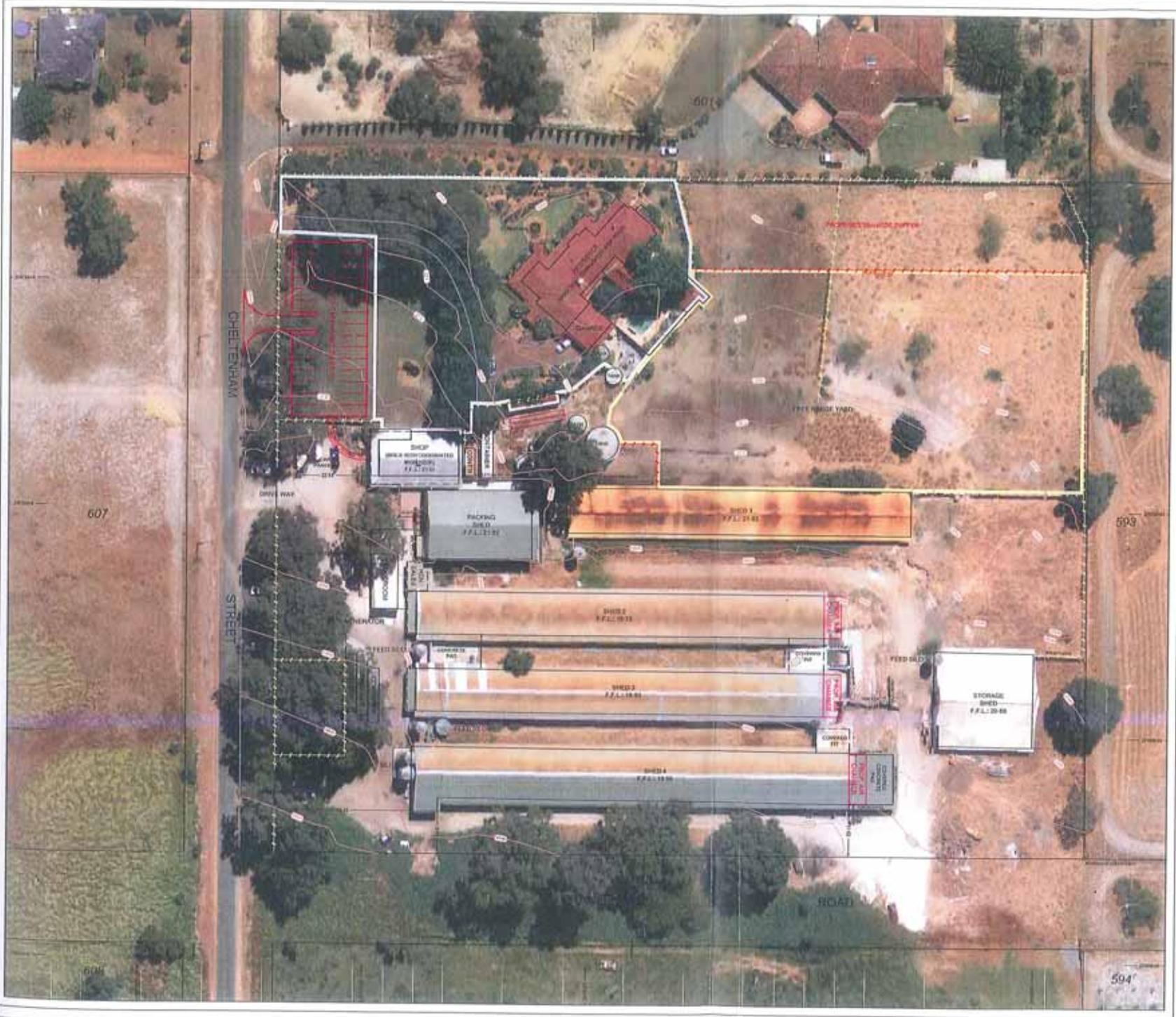
Based on the above information a significant number of residents are being adversely impacted by the operation of the poultry farm. Accordingly, the existing (expanded) operation is prejudicing rural amenity and is detrimental to the rural character of the area.

CONCLUSION

Having regard to the number of complaints received by the City of Swan, the current expanded operating arrangements are having a detrimental impact on the rural amenity and rural character of the area, inconsistent with the General Rural zoning under LPS 17. The proponent's odour modelling indicates that with the proposed vertical air stacks to be installed on Sheds 2, 3 and 4, and Shed 1 being operated to 'best practice' the resultant odour impact will not be greater than the impact from the currently approved 24,000 birds without the upgrades. The DEC states that the Study findings are not definitive and cannot be used to support a reduction in the buffer, and that a 500 metre buffer distance should remain. It is acknowledged that the proposed operational improvements may reduce the odour impact on nearby residents from current levels.

However the subject land and immediate surrounding locality is zoned urban deferred and is intended for urban development in the short to medium term, with the only remaining constraint being the poultry farm. SPP 4.3 encourages the relocation of poultry farms in the face of encroaching urban development and includes incentivising such relocation by rezoning of affected areas for residential development. The land has been zoned urban development since 1994, and the poultry farm has not relocated in that time. It is contended that the SPP objective to protect poultry farms does not apply in this instance as the SPP only contemplates poultry farms as being an appropriate land use within the rural zone, or under a separate Special Use zone. The proposal is inconsistent with SPP 4.3.

The proposal, if considered for support, would prejudice and restrict the urbanisation of the area as identified by the SUGCSP and the MRS zoning, inconsistent with the principles of proper and orderly land use planning and SPP 4.3. Accordingly, for the reasons outlined above it is recommended that the proposal be refused.



General Notes: **ATTACHMENT 1**

COORDINATE: GDA 94
 DATUM: PERTH COASTAL GRID 94
 HORIZONTAL: A.S.D.
 BASED ON SELF COVERING 30

AIRIAL PHOTOGRAPH SUPPLIED BY LANDGATE SITE 2016
 CAPTURE START DATE: 22 FEB 2016
 CAPTURE FINISH DATE: 24 FEB 2016
 GROUND MEASUREMENT: N/A

THIS PLAN WAS PREPARED FOR SNOWDALE HOLDINGS PTY LTD FOR THE PURPOSE OF LOCATING EXISTING STRUCTURES CONSTRUCTED ON THE SITE AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

USABLE SERVICES (SUCH AS WATER) HAVE BEEN PLOTTED FROM FIELD MEASUREMENTS. UNDERGROUND SERVICES HAVE NOT BEEN PLOTTED.

BEFORE ANY EXCAVATION, ERECTION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY MUST BE CONTACTED FOR A DETAILED LOCATION OF ALL SERVICES.

THIS NOTE FORMS AN INTEGRAL PART OF THIS PLAN.



0	07 11 16	ISSUED TO CLIENT	V.L.P.S
1	21 12 16	P.P.L OF SHEETS ADDED	V.L.P.S
2	12 08 11	PROPOSED CARPARKING, ABUTMENT BLOCK & AIR CHANGERS ADDED, RESECTORIAL, PRE-DICTA DEFEND	V.L.P.S

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In the absence of "Approved By" signature this plan is invalid and BMS&P Pty Ltd is not responsible for its contents.

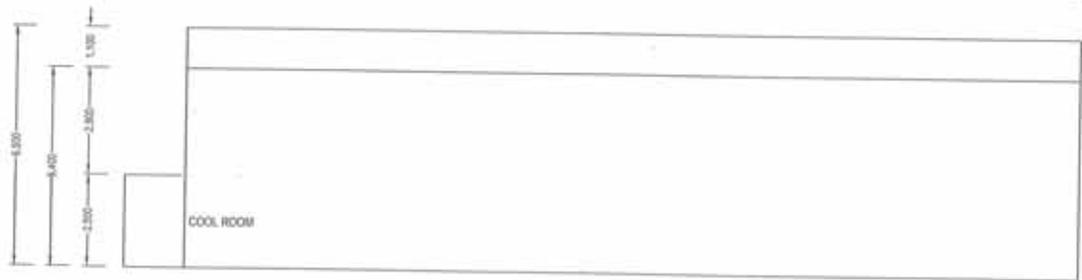
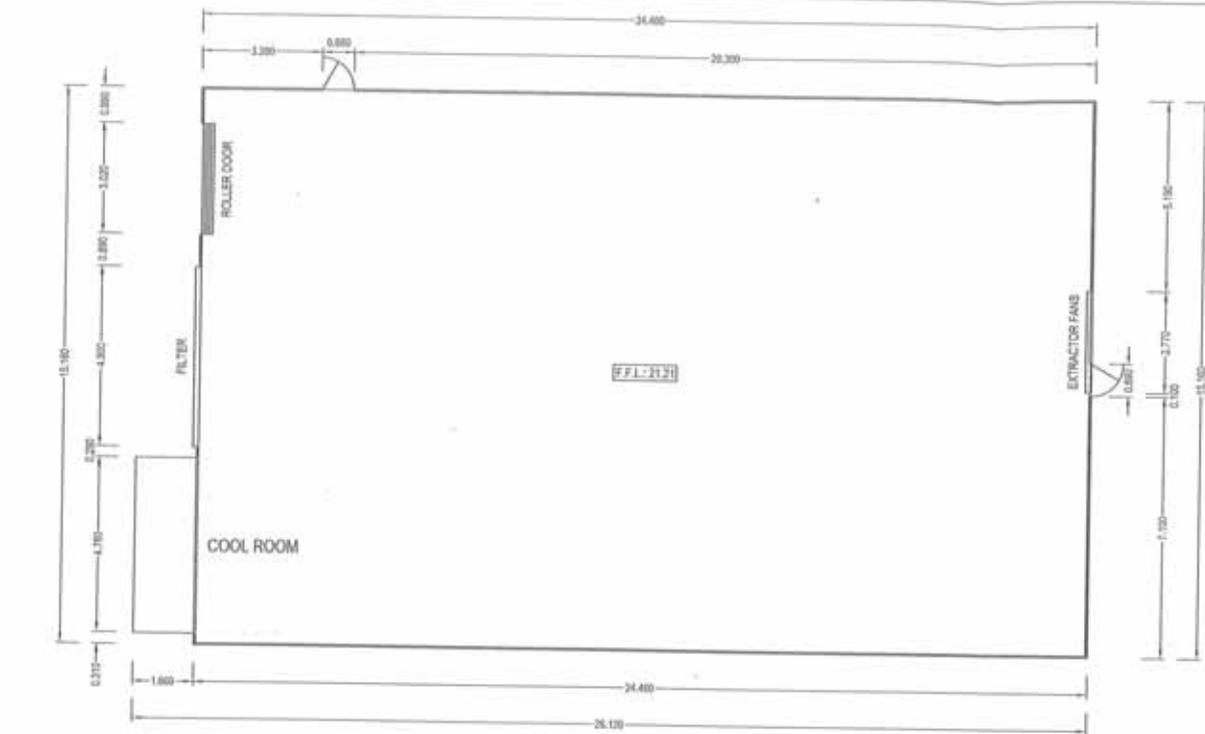
DATE	ISSUED TO	BY
07 Nov 2016	S.T. GROGAN	V.L.P.S
05 Nov 2016	S.T. GROGAN	V.L.P.S
31 Dec 2016	S.T. GROGAN	V.L.P.S
12 Jun 2011	S.T. GROGAN	V.L.P.S
12 Jun 2011	S.T. GROGAN	V.L.P.S

JOB No: SVEF DRAWING No: SVEF01 SHEET No: 2
 SCALE: 1:400 FILE NAME: Swan Valley Egg Farm PC004 A1

FEATURE SURVEY OF LOT 600 ON PLAN 3698 60 CHELTENHAM STREET WEST SWAN
 CLIENT: SNOWDALE HOLDINGS PTY LTD

BENETTI GROGAN & ASSOCIATES
 CONSULTING ENGINEERS & SURVEYORS
 (INCORPORATED IN AUSTRALIA)

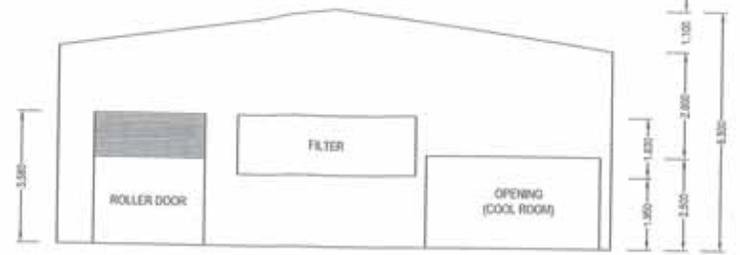
181 WALTEERS DRIVE, OSBORNE PARK
 PO BOX 184 MOUNT HARTSHORN WA 6015
 TELEPHONE: (08) 9443 6245 FACSIMILE: (08) 9443 2987
 Email: benetti@benettigrogan.com.au



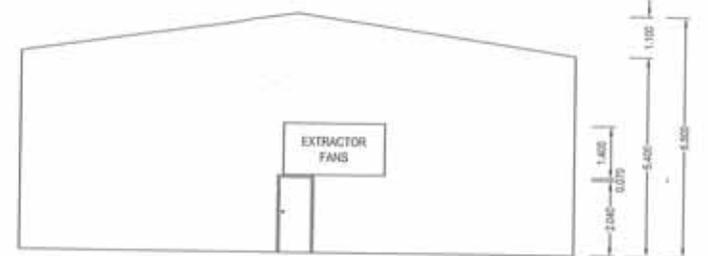
SIDE (NORTH)



SIDE (NORTH)



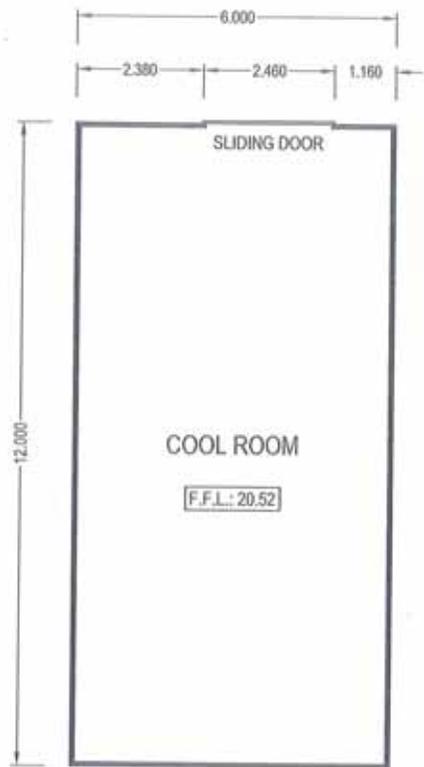
FRONT



REAR



SWAN VALLEY EGG FARM
GRADING ROOM
FLOOR PLAN & ELEVATIONS
Scale 1:100



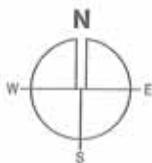
FRONT



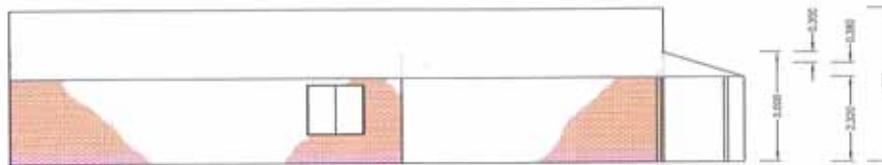
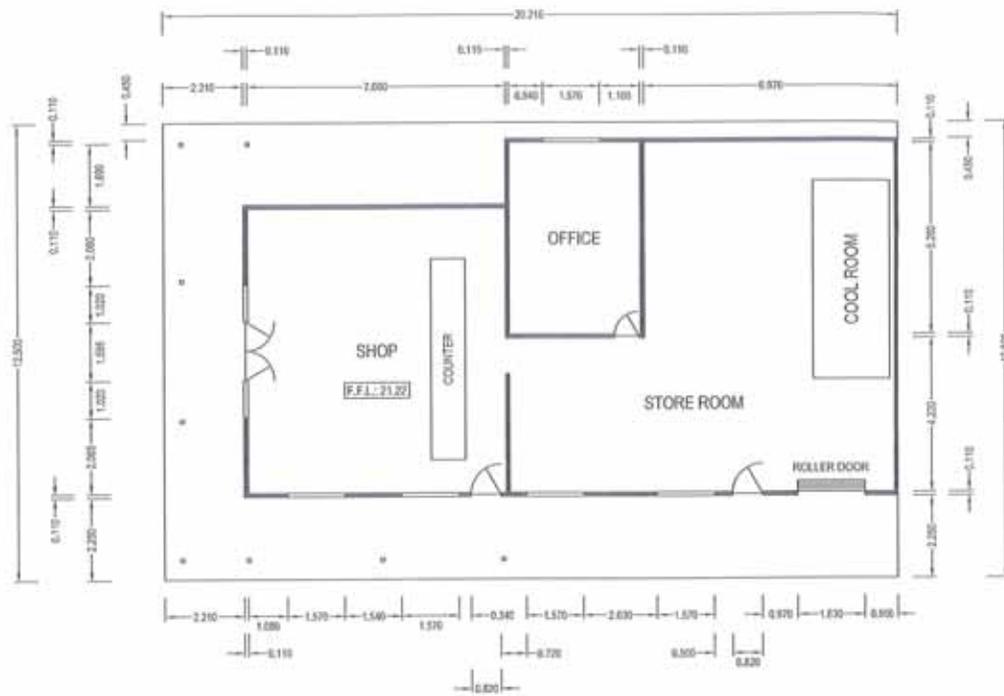
REAR



SIDE (EAST)



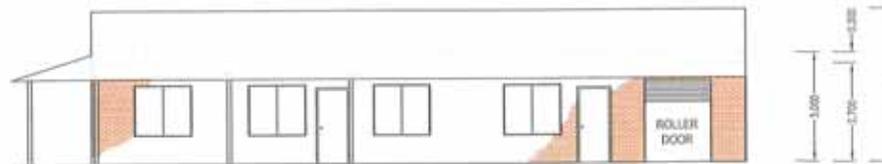
SWAN VALLEY EGG FARM
 COOL ROOM
 FLOOR PLAN & ELEVATIONS
 Scale @ A3 1:100



SIDE (NORTH)



FRONT

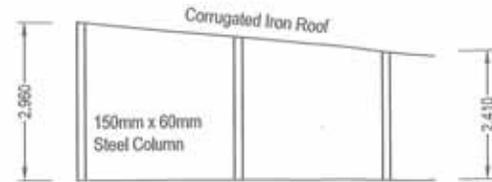
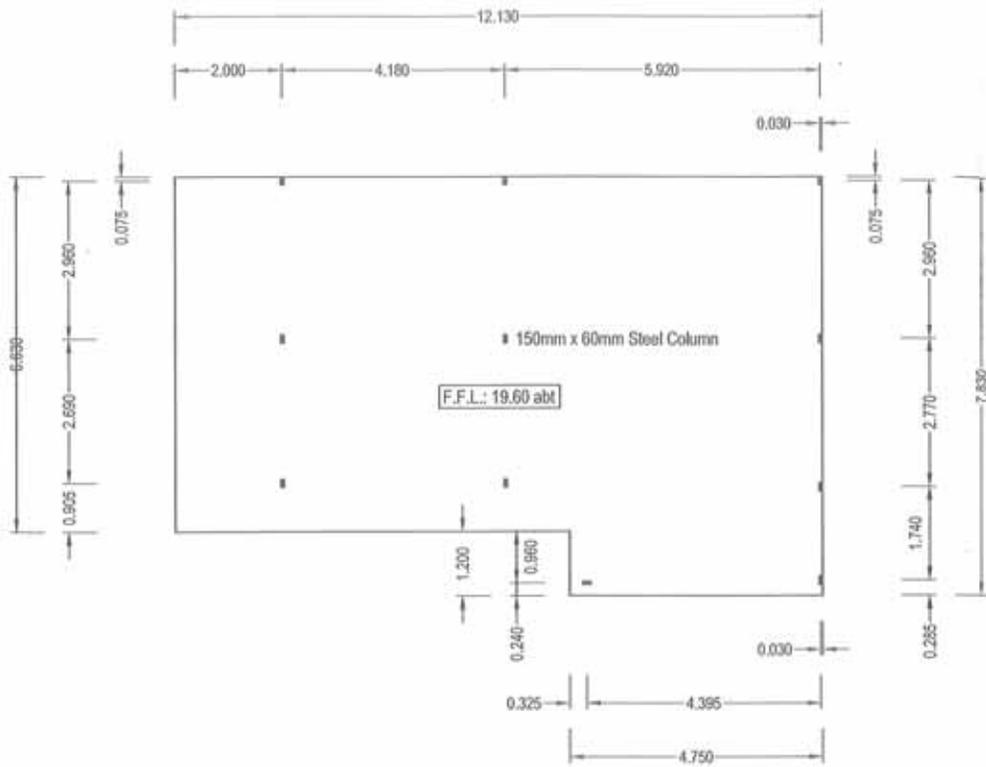


SIDE (SOUTH)

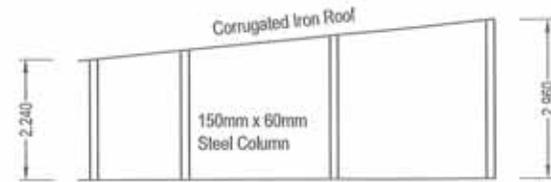


REAR

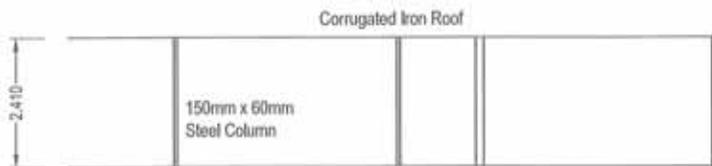
SWAN VALLEY EGG FARM
 ADMINISTRATION & RETAIL
 FLOOR PLAN & ELEVATIONS



SIDE (WEST)



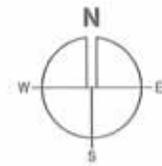
SIDE (EAST)



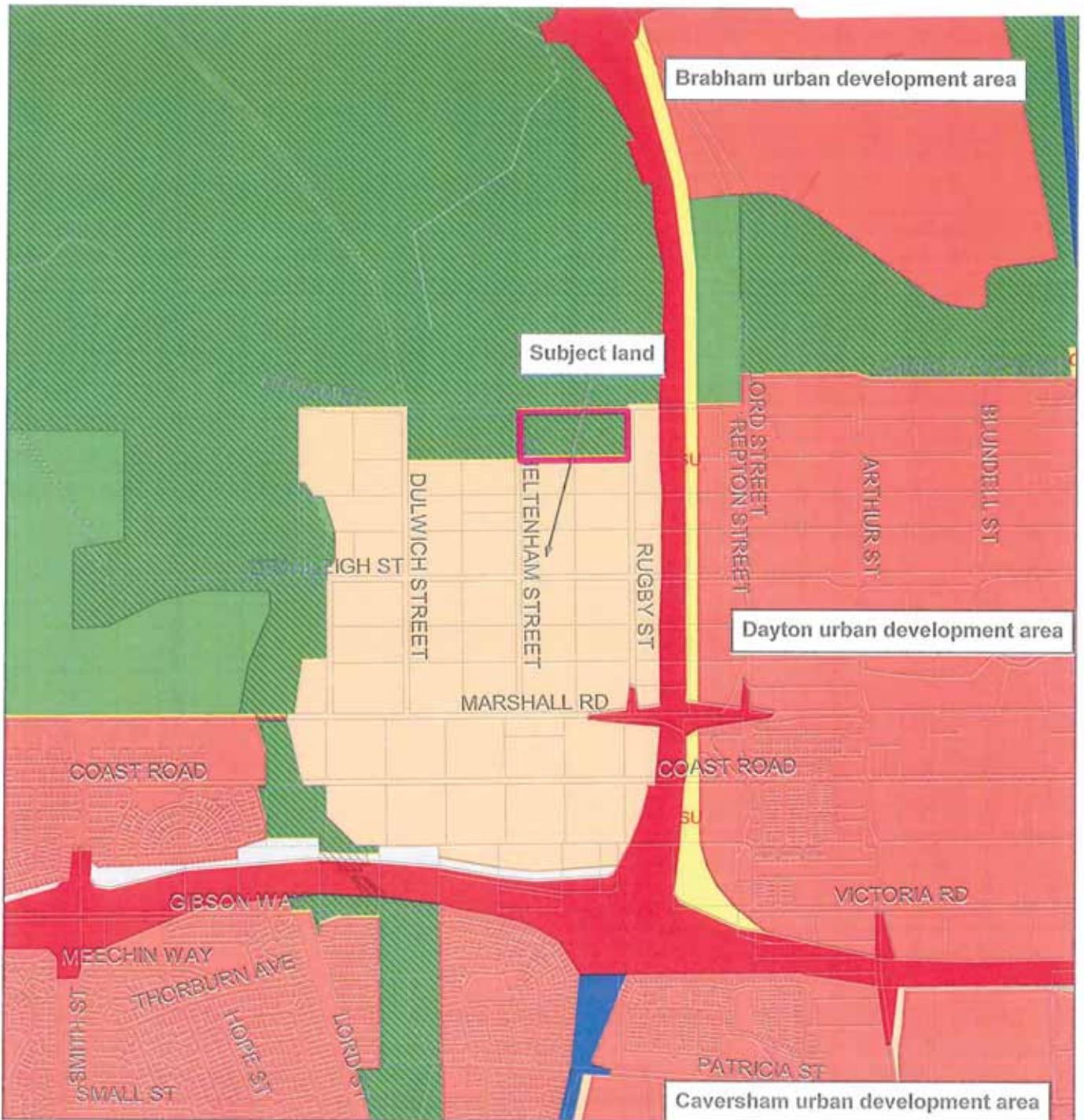
REAR



FRONT



SWAN VALLEY EGG FARM
 COMPOST SALES SHED
 FLOOR PLAN & ELEVATIONS
 Scale @ A3 1:100
 Agenda Page 465



	Cadastre with Lot Numbers		OTHER REGIONAL ROADS
	Bushforever Area		PARKS & RECREATION
	URBAN		RAILWAYS
	URBAN DEFERRED		PP - COMMONWEALTH GOVERNMENT
	RURAL		PP - SPECIAL USES
	PRIMARY REGIONAL ROADS		

Scale 1:20,000
 0 500 m

Prepared by: rcull
 Prepared for:
 Date: Wednesday, May 30, 2012 13:26
 Plot identifier: P20120530_1326

DP INTERNAL USE ONLY



7.0 JUSTIFICATION FOR THE DEVELOPMENT

7.1 Consideration of the Uses Proposed

7.1.1 Poultry Farm Use

With respect to the poultry farm use, this use has not changed since the original grant of approval by the City. The Applicant therefore does not require Council's further approval to the poultry farm use.

In any event, for completeness, such a use is consistent with the General Rural zoning under the Scheme and the objectives of that zone as follows:

The first objective is to *"facilitate the use and development of land for a range of productive rural activities, which will contribute towards the economic base of the region."* The poultry farm clearly and significantly contributes towards the economic base of the region through local employment and through the generation of income for the region and through the incidental sale of eggs to the local community.

The second objective is to *"provide for a limited range of compatible support services to meet the needs of the rural community, but which will not prejudice the development of land elsewhere which is specifically zoned for such development."* In this regard the generation of manure is used as a by-product for use in other rural activities in the locality. The incidental sale of eggs on site to the general public also assists in providing a range of compatible support services to the local community.

In regard to objective c), the Application, although providing a greater number of birds does not prejudice the rural amenity. This is discussed under the relevant sections included in the development section of the Application.

The poultry farm is reasonably described as animal husbandry – intensive. Under the Zoning table of LPS17, an 'animal husbandry – intensive' land use is a discretionary use in a General Rural zone.

However, given the use has not changed since the original grant of approval by the City, this aspect, we contend, does not require the further consideration of Council.

It is however recognised that the additional number of birds, the development listed in Council's Notices and the other incidental development as listed in this report require the further approval of Council. These aspects are discussed in further detail below.

7.1.2 Shop and Office Uses

The shop and office uses are incidental to the primary poultry farm operations and could reasonably be considered under the primary use as a poultry farm.

It is worthwhile noting that a case was considered by the State Administrative Tribunal being *Joondalup Gate Pty Ltd v City of Joondalup* [2008] WASAT 47, whereby the Tribunal considered whether the different components of a land use should be separated and assessed independently or whether the use should be considered in more general terms.

In the Tribunal case, they considered “pet grooming” as part of a “showroom” use and based their decision to include this use as part of the showroom on the following grounds:

It is also necessary to have regard to the ‘big picture’ to ensure that the purposes of planning and the objectives that the planning scheme seeks to achieve are not frustrated by unduly restrictive interpretations of land use terms.

Accordingly it is considered reasonable, given the small scale of the office and shop land use and that they are part of the poultry farm operations that they can be considered under that more general land use of poultry farm or animal husbandry – intensive.

7.2 Consideration of the Developments Proposed

7.2.1 Poultry Sheds & Number of Chickens

Whilst the number of chickens that approval is sought is a substantial increase upon that approved in 1993, the management practices on site have improved significantly to adopt best management practices, such that it is considered that the odour created by the current number of chickens is potentially less than the odour from the farm in 1993.

The reason for the change in the number of birds is partly due to the Environmental Code of Practice for the Poultry Industry which required by 2008 a change in the requirements for housing chickens. The changes include the requirement of mechanical ventilation and a change in the cage size for birds as discussed earlier in this report.

Further with the introduction of the layering system for keeping chickens under the Code of Practice, the new layering caging system was introduced on the property and then in order to remain competitive in the industry the number of birds kept on the property was also increased.

The landowner was unaware that planning approval was required to increase the number of chickens housed on the property.

In order to accommodate the new cage system and increase the number of birds, minor internal alterations to the sheds were also undertaken. These modifications involved putting in a new concrete floor, new walls and other minor internal changes. These have not affected the height of the sheds above natural ground level.

Management Practices

When the approval was granted in 1993, the chickens were kept in cages on the ground level and the manure was collected and removed on an annual to 18 monthly basis. This management practice, resulted in a significant potential for odour problems to arise in the immediate locality.

In increasing the number of chickens, the management practices for the caged chicken sheds have improved significantly in order to minimise the potential for odour issues. The poultry farm now adopts best management practices and will continue to adopt best management practices.

As detailed in an earlier section of this report, the current arrangement in the sheds is that the caged birds are arranged in a layering system and the cages are connected to a conveyor belt system. The conveyor belt system arranges for immediate transfer of:

- a) The eggs on a daily basis
- b) Collection of manure on a regular basis.

Management Plans are included in Annexure 12 which demonstrate the practices and procedures adopted by the poultry farm in order to minimise the potential for offsite impact.

Manure

The conveyor system for sheds 2, 3 and 4 collects the manure at least once a week the conveyor system is run and the manure collected in the tray of an awaiting trailer and the manure transported off site via trucks.

In regard to the free range shed, the chickens are kept on a raised plastic slat floor, suspended above a concrete floor base. The manure collects and is removed when the chickens are rotated, usually once every 18 months.

The waste management plan contained in Annexure 12 further addresses this matter.

Noise

Since 1993 the caged poultry sheds have been upgraded from permeable canvas walls, to solid and insulated walls. This change has resulted in the potential for noise nuisance to be significantly reduced.

There are no night time deliveries to or from the site, thus the potential for noise nuisance is minimised.

The introduction of odour stacks will also assist to redirect noise away from the eastern boundary.

In regard to the free range shed, as discussed in the management plan, the hatches providing chickens with access to the free range yard are closed by 7pm each night and not opened until 6.00am.

The noise management plan contained in Annexure 12 further addresses this matter.

Dust

In comparison to the poultry sheds as approved in 1984 and 1993, those sheds had permeable canvas walls to the poultry farm sheds and unsealed flooring created the potential for dust nuisance on the property.

With the use of solid insulated walls, the potential for dust nuisance from the poultry sheds is minimised.

The majority of vehicle movements on site are at the front of the property and the track to the rear of the site is only used for limited internal vehicle movements and twice weekly pick up of manure. As the use of the track to the rear of the site is minimal, it is considered that a sealed accessway would not be in keeping with the rural character of the area and that the existing surface does not create a dust nuisance and is therefore satisfactory.

A dust management plan has been prepared and is included in Annexure 12 as part of the environmental management strategy.

The dust management plan contained in Annexure 12 further addresses this matter.

7.2.2 Assessment of Odour impacts associated with additional keeping of birds

An odour impact assessment and dispersion modelling study was conducted. A copy of the report is included at **Annexure 9**. The modelling was based on the Queensland Environmental Protection Agency (QEPA) 'Ecoaccess' odour performance criterion (OPC). The QEPA OPC is currently accepted by the WA Department of Environment and Conservation (DEC) as an 'interim' guidance whilst the WA DEC prepares a formal OPC.

This odour impact study has been assessed in response to SPP 4.3 by the Odour Unit.

That study has assessed odour based on the operational 3 tunnel (caged bird) sheds and one free range shed (shed 1). The odour footprint is based on orientating the odour emissions from the fans upwards via a stack. The modelling projections plan included in that assessment is shown on the following page.

The Odour Unit (WA) Pty Limited

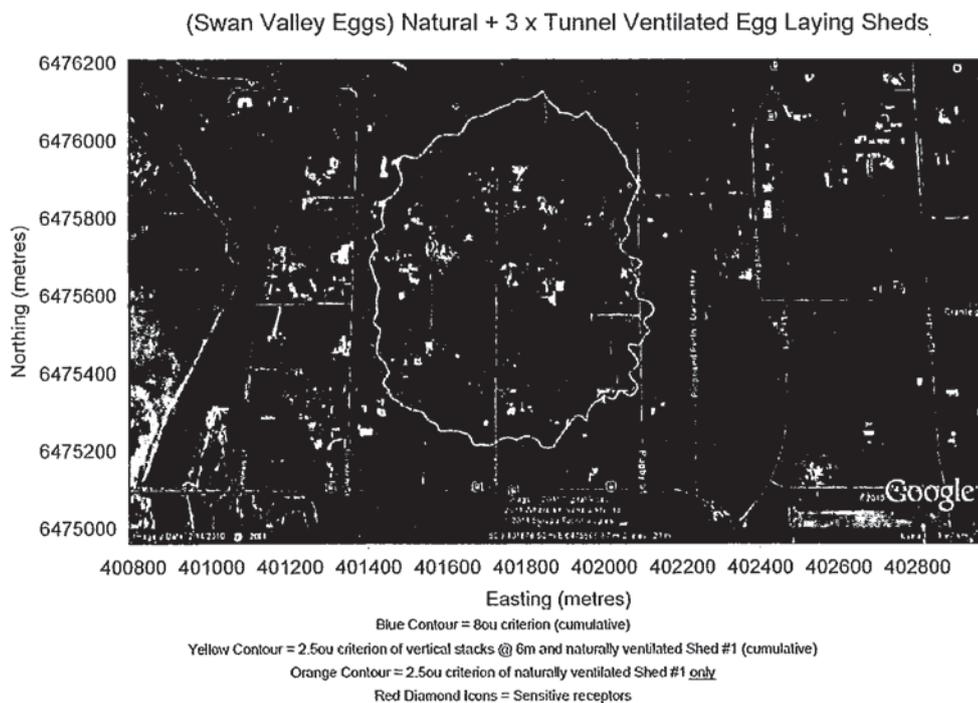


Figure 6.1: Ausplume modelling projections for case scenarios of 2.5ou; 1-hour averaging times at the 99.5th percentile (worst 44 hours annually), and 8ou; 1-hour averaging times at the 99.9th percentile (worst 9 hours annually).

The report and assessment is included as **Annexure 9** and in relation to odour it states that:

"The model projections have shown that the risk assessment odour footprint based on the cumulative impacts from the naturally ventilated 'free-range' shed and the orientating of the stack emissions vertically produces an odour separation distance of 450 metres north, 380 metres west, 250 metres east and 380 metres south of the nearest odour source (such as the edge or corner of a laying shed). This projection is based on the 2.5^{ou}, 99.5th percentile and 1 hour averaging time criterion."

Further, in the conclusion it states:

"Once the tunnel ventilated sheds are reconfigured, and the naturally ventilated shed is operated to best management practice, along with diligent site housekeeping, the odour footprint is expected to be less than 450 metres from the nearest odour source at the Swan Valley Eggs farm."

As a consequence of that assessment it is apparent that the management measures adopted and proposed have resulted the odour emissions being controlled such that the increase in the number of birds has not resulted in an increase in the odour buffer.

7.2.3 Packing Shed/Grading Room

Prior to the 1990s a poultry farm was not permitted to package eggs on the property. However during the 1990s deregulation of the egg industry resulted in an ability for a poultry farmer to grade and pack eggs on their property. At this time the packing shed was constructed. The packing shed location was chosen as it meant that the majority of delivery vehicles would only need to remain at the front of the property and minimise the potential for dust nuisance and the need for any other vehicles to have to drive through the site. A floor plan of the packing shed/grading room is included in **Annexure 3**.

The packing shed/grading room is an integral part of the operations on site and is predominantly screened from view from neighbours due to the existing mature vegetation on site and on the verge.

7.2.4 Coolroom

The building referred to as the shop/office has a cool room, however, in accordance with best management practice, cracked eggs must be stored in a separate coolroom. The cracked eggs are presently stored in the coolroom in the administration and retail building. Refer **Annexure 3** for a floor plan and elevations of the cool room.

Whilst eggs are also stored in the packing shed/grading room, the egg market is subject to fluctuations and as a result of the national egg surplus a number of years ago, a coolroom was brought on site to cater for the sudden unexpected need to store eggs on site for a longer period of time if required.

The cool room now allows for greater efficiency in transport of eggs prior to delivery and maximises the freshness of eggs prior to pick up by delivery trucks for retail sales off site. Given the fragile nature of eggs and to minimise any potential impact, the cool room needs to be located in close proximity to the packing shed.

7.2.5 Office and shop (administration and retail)

A floor plan and elevations of the office and shop or administration and retail building are provided in **Annexure 3**. The office and shop building was granted planning approval as a machinery and storage shed in 1997. At the time of construction, there was a need to accommodate an office on site, so windows were introduced to then use a portion of the building as an office.

The office component is required for the administration of the poultry farm and provides a reception area for any visitors to the property. The building also provides for an incidental shop for the sale of goods produced on the property to the local community.

The shop and office component should be considered under the objectives of the General Rural zone as per clause 4.2.23 of the City of Swan Local Planning Scheme No. 17. Objective (b) reads:

Provide for a limited range of compatible support services to meet the needs of the rural community, but which will be prejudice the development of land elsewhere which is specifically zoned for such development.

In this context the shop does sell eggs produced on site which is considered to be a compatible support service and given that the goods sold predominantly relate to those goods produced on site (eggs and manure), it is considered that it will not prejudice the development of land elsewhere which is specifically zoned for such development.

7.2.6 Covered Area or Compost Sales Shed

A floor plan and elevations of the compost sales area are provided in **Annexure 3**. The covered area is located to the front of the lot as it is used to display bagged manure for public sale. The selling of raw manure will cease and it is proposed to sell compost (composted at an approved facility) that is based on the manure from the poultry sheds. By locating the area to the front it means that customer vehicles will remain at the front of the property.

The structure is low key and gives the appearance of a carport structure. The property to the west does not contain a residence and the structure is screened by existing mature vegetation and therefore does not adversely affect the visual amenity of the area.

The amount of on site sales of manure is reasonably small, the majority is carted off site. The amount of product offered for the sale of compost is considered to be minor and incidental to the primary use as a poultry farm. However the sale of compost (generated from the poultry manure) on site is beneficial to the local community.

7.2.7 Storage Shed - Lean to Structures (Compost bagging shed)

The storage shed (south eastern end of the property) has had two lean to structures added onto the shed that was granted planning approval in 1993. A floor plan and elevations of the storage shed or compost bagging shed are provided in **Annexure 3**. The shed was originally used as a poultry shed, then storage however, as the business expanded, the shed became too small so lean to structures were then added to the existing building.

Its use is presently limited to storage and bagging of manure and general storage use. However, given concerns raised by the Shire, it is proposed to cease the use of the shed for storage and bagging of manure and to only store and bag compost on site. The compost will not present an issue in term of odour, notwithstanding, the odour management plan will be updated once the compost storage and bagging commences in order to ensure that management practices are adopted in order to minimise the potential for external impacts.

In terms of visual impact the closest residence is approximately 180m from the storage shed and it is considered that the lean to structures and an outbuilding of that size and scale is reasonable in a General Rural zone.

7.2.8 Other incidental Development

The lean to structure located at the eastern end of shed 4 is used to temporarily store and dry manure prior to bagging and sale on site. A floor plan and elevations of the drying shed is provided in **Annexure 3**. However as the storage of manure on site will cease, this area will no longer be used for this purpose. Much of the manure drying area structure will be used to accommodate the odour stacks or air chamber.

The conveyor system used to transport the eggs to the packing shed runs along the western end of the sheds and the conveyor system used to transport manure extends beyond the eastern end of sheds 2 & 3.

The property also contains a number of feed silos for storage of grain for the chickens. The feed silos are located at the western ends of sheds 1, 2, 3 and 4.

7.2.9 Traffic movement/parking

Historically, many of the delivery and pick up vehicle movements were to the storage shed at the rear of the property. The access to the storage shed had been via a compacted limestone track located between poultry shed 1 and poultry shed 2.

With the deregulation of the egg industry and construction of the packing shed, office and coolroom, the deliveries and pick ups are predominantly to the front of the property. The only delivery vehicles to the rear of the property are to collect manure twice a week. The manure pick up vehicles travel to the conveyor belt system located at the eastern end of poultry shed 3.

Therefore with the exception of on site vehicles and the twice weekly manure pick up, all regular traffic movements are to the front of the property. Loose gravel has been placed on the trafficked area to the front of the property in order to reduce any potential for dust nuisance.

As detailed in the sections above, it is proposed to construct a new customer and staff carpark that is to be sealed.

In addition, the traffic management report addresses issues regarding traffic movement and parking

7.2.10 Proposed odour stack or air chamber

The Odour Impact Assessment and Dispersion Modelling Study states:

The farm currently operates to best practice with respect to the automated egg layer sheds. To further improve on this best practice the air stream exhausted from the tunnel sheds should be directed upward to provide vertical momentum. ...

[The Odour Unit] TOU modelled the odour footprint based on orientating the odour emissions from the fans upward. That is, the exhaust fans per shed were assessed as single 'fat' stacks at the combined odour emission rates measured. The height at which the air was discharged to atmosphere was set at 6m above ground. At this height the exit point of the air stream (per shed) would be approximately 1m above each sheds' roof apex. As part of this assessment scenario the naturally ventilated shed (Shed #1) was also included and the four sheds modelled as one cumulative impact.

The precise odour footprint from the current operations which includes only the tunnel ventilated sheds with horizontal exhaust fans is not readily definable since the modelling assumes the fans have zero vertical momentum. Site observations and that of historical complaints data would provide a clearer understanding of the current impacts; however, TOU did not observe any significant malodours beyond approximately 200 metres off site during the sampling program.

Nevertheless, Swan Valley Eggs have indicated their preference to optimising their operations such that best practices are undertaken and malodours are mitigated. The layer sheds themselves already operate at best practice with respect to the internal control and automation of the egg laying process. The extraction fans however would provide a level of nuisance under the right ambient conditions (under poor dispersive conditions). As such the vertical re-orientation of the ejected air stream is needed. This can be achieved by reconfiguring the fans to have banks of vertical stack outlets, or to construct an angled 'bund' at the rear of the sheds to direct the airstream upward. These and other technologies are widely used to affect vertical dispersion from horizontal exhaust streams.

It is the opinion of TOU that the installation of vertical stacks on the tunnel ventilated sheds or the erection of a wind barrier earth bund that 'launches' the air vertically will provide a level of odour mitigation that will reduce the odour footprint from the tunnel ventilated sheds to nominally 100metres from the nearest odour source at the farm. At a distance of 100m from the nearest tunnel ventilated odour source an odour impact on sensitive receptors is not expected. This assumption is based on the vertical airstream exiting the site at approximately 6metres above the ground.

As part of this application, it is proposed to construct the stacks. Plans and elevations of the proposed stacks are included in **Annexure 10**.

7.2.11 Visual Impact

The property contains substantial mature vegetation along the Cheltenham Road frontage, especially near to the location of the shop/office, packing shed, cool room and covered structure near to Cheltenham Street. This vegetation provides a visual screen to the buildings that approval is sought as part of this application.

Photos from the north and south of the site are provided to show the extent of landscaping to assist in screening the site from neighbours.



View from the south looking towards the property from Cheltenham Street.

7.3 Objectives

The following table identifies the objectives of the General Rural zone and our comment in relation to those matters which approval is sought as part of this application.

	Objective	Comment
(a)	Facilitate the use and development of land for a range of productive rural activities, which will contribute towards the economic base of the region	The poultry farm is an approved productive rural activity that contributes to the economic base of the region. The shop which sells goods produced on site contributes to the economic base.
(b)	Provide for a limited range of compatible support services to meet the needs of the rural community ...	The shop which sells goods produced on site is a compatible support service which provides ready access to goods produced on site
(c)	Ensure the use and development of land does not prejudice rural amenity is and promote the enhancement of rural character	The components of the application for which approval is sought do not prejudice the rural amenity of the locality and the existing vegetation to Cheltenham Street assists to screen the development from view.
(d)	Ensure the development and land management are sustainable	The poultry farm operations adopt best management practices.

As can be seen from the above table, the application meets the objectives of the General Rural zone.

7.4 State Planning Policy – Poultry farms

This State Planning Policy (SPP4.3) provides guidance in determining development applications for poultry farms. SPP4.3 has four objectives and objective 3 reads:

To protect the interests of existing poultry farms in the fact of encroaching development

In this case the application is not for additional sheds but rather an operation whereby management practices have been improved and approval is sought to increase the bird numbers.

This poultry farm has been in operation for a significant time frame and the planning framework and zoning reflects the generic 500m poultry farm odour buffer. Land to the west and south within 500m of the poultry farm is zoned General Rural. Land to the north, within the 500m buffer is zoned general Rural or reserved for parks and recreation (Whiteman park). Land to the east is zoned General Rural, with the exception of land, at the edge of the 500m buffer which is zoned Special Use. This Special Use zone requires preparation of a Structure Plan and for this special use zone, the scheme requires an odour impact study to be undertaken to ensure development design avoids any adverse impacts. Further, the structure plan for West Swan East, endorsed by the City of Swan identifies service commercial land uses for that portion of the structure plan area within the 500m buffer from the poultry farm.

Therefore the land within the 500m buffer is zoned General Rural and there is no Rural-Residential Zoned land within the 500m buffer of the poultry farm sheds.

This report demonstrates that the environmental impacts of the development are minimised.

A site specific odour study was undertaken as part of this application and this supports that the odour buffer is contained within the generic 500 metre buffer, even with the increased number of birds for which approval is sought. Further the site specific buffer demonstrates that the odour buffer does not extend to the land zoned urban.

7.5 Status of Urban Deferred zone

The property is zoned under the MRS as Urban Deferred and as yet the Commission has not formed the view that the land has overcome the constraints to rezone this immediate locality from Urban Deferred to Urban.

The subregional Structure Plan for the Swan Urban Growth Corridor states, in regard to Public utilities and more specifically water supply:

The Water Corporation has confirmed that a water supply can be provided to the Caversham and West Swan cells through a series of staged construction.

In order to supply with West Swan West cell with water supply, a further 3,100 metres of pre-funded water distribution main will be required from the intersection of Silver Swan Road and Bennett Springs Drive in Beechboro. This is a minimum requirement prior to the development of this cell.

The existing wastewater scheme can only accommodate for the development of 500 lots in the locality and this is likely to be within Caversham and West Swan Eat. Any further residential subdivision will not be able to proceed until a regional pump station is constructed to provide wastewater supply to the entire Caversham, West Swan West and West Swan East cells, This will require pre-funding as the site is remote from existing sewerage infrastructure.

8.0 CONCLUSION

In conclusion, the subject site is located within a General Rural zone and the property has Council approval to be used as a poultry farm or animal husbandry – intensive land use.

The use of the property as a poultry farm is consistent with the objectives of the General Rural zone.

Objective (a) of the General Rural zone is to

'Facilitate the use and development of land for a range of productive rural activities, which will contribute towards the economic base of the region'.

The developments for which approval is sought are important aspects of the poultry farm operations. The structures that have been built are integral parts of the poultry farm operations. Much of the development (office/shop, packing shed, cool room and covered area) are screened by the existing mature vegetation on site.

The poultry farm has significantly improved its management practices over the last 15 years such that the current operations, as compared to the operations from 15 years ago, have not resulted in a significant increase in the potential impact from the operations. Further the application proposes further improvements to the poultry farm operations in the form of odour stacks that will address Council's concerns in relation to odour, noise and dust from the egg laying sheds.

The State Planning Policy on Poultry Farms includes an objective to protect the interests of existing poultry farms in the face of encroaching development. This poultry farm has in place a buffer of General Rural zoned land under the City of Swan Scheme and Urban Deferred under the Metropolitan Region Scheme which means that the land is unlikely to be further subdivided.

The odour impact assessment and dispersion modelling study provides an ausplice modelling projection as shown in figure 2 of this report and figure 6.1 of the Odour report. The odour modelling projections have been transposed on a plan showing:

1. the aerial with concentric circles to show the extent of the odour buffer; and
2. The modelling projections on a Metropolitan Region Scheme (MRS) zoning map identifying that the odour projections do not extend into the land zoned Urban under the MRS.

These plans have been included in **Annexure 11**. These plans demonstrate that the odour buffer is contained within the Urban Deferred MRS zoning and the LPS General Rural zoning and general rural land uses.

This report demonstrates that the poultry farm operations have changed to adopt best management practices in order to minimise any impacts. Whilst the application does seek approval for an increase in the number of birds from that originally approved, the report explains the management practices put in place to ensure that the potential impacts are not increased as a result of the increase in the number of birds.

Accordingly, approval is sought for the application as lodged and as described under section 2 of this report.



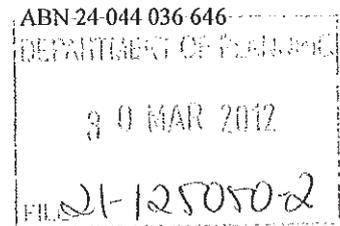
Town Planners, Advocates
& Subdivision Designers

29 March 2012

Our Ref: SNW SWN AP

The Secretary
Western Australian Planning Commission
140 William Street
PERTH WA 6000

ATTENTION: ROBERT CULL



Dear Robert

**RE: WAPC REF: 21-125050-2 DEVELOPMENT APPLICATION FOR POULTRY FARM:
LOT 600 CHELTENHAM ROAD, WEST SWAN/BENNETT SPRINGS**

I refer to the abovementioned application that has been referred to the Western Australian Planning Commission for determination on the basis that it is located on land zoned Urban Deferred under the Metropolitan Region Scheme.

The City of Swan has made a determination under its Local Planning Scheme No. 17 in regard to this application. The application is now to be determined under the Metropolitan Region Scheme in accordance with Clause 32 of the Metropolitan Region Scheme.

More specifically, State Planning Policy 4.3: Poultry Farm Policy outlines that all applications for extensions or additions to improvements of existing poultry farms in the Urban, Urban Deferred and Rural zones should be referred to the Commission for determination as provided in the Commissions resolution under clause 32 of the Metropolitan Region Scheme.

The application itself is for development as described in section 2 of the July 2011 report. I advise that four copies of the report dated July 2011 were provided and received by the Department of Planning in July 2011. I advise that the application was originally for the keeping of 84,000 birds, however, the figure of 80,000 birds was referred to in the odour management plan contained with the suite of management plans included in Annexure 12 of the July 2011 report. The City questioned whether the application was for 84,000 birds or 80,000 birds and we advised the City via a letter dated 19 August 2011 that we are willing to revise the application to be for a total of 80,000 birds. A copy of that letter is contained in **Attachment 1** to this letter.

I also advise that the plans included for the air chamber in the July 2011 report are superceded. **Attachment 2** to this letter contains the updated version of the plans for the air chamber/stack and photos of other air chambers/stacks are also provided to show the visual appearance of an operational air chamber. The City of Swan considered and approved the air chamber/stacks of 6m in height. By clarification, the updated air stack plans attached to this letter provide for an air stack of 6 metres in height in accordance with the odour report. The original odour stacks as illustrated in the July 2011 report were incorrectly drawn at 4.3m in height.

The City of Swan has assessed the application and issued a two part decision. The first part of the decision deals with the number of chickens only. The second part of the decision deals with all other development as proposed in the application and as detailed in the July 2011 report. I advise that we accept the recommendation of approval for all development other than the increase in bird numbers.

This letter seeks to provide justification as to why we consider that the increase in bird numbers should be approved by the Western Australian Planning Commission.

Bird Numbers – Water Licence

The poultry farm owner presently has a licence to take water from the Department of Water that is presently valid until November 2019. That licence provides for an annual water entitlement of 38,000 kL and is subject to a number of conditions. Specifically, in regard to bird numbers, condition 4 reads:

4. That the maximum number of birds kept shall not exceed 90,000.

Refer to **Attachment 3** for a copy of the current Water Licence. Therefore a water licence exists such that approval of this application would be in accordance with the licence to take water.

Bird Numbers: Justification

The planning approval issued by the City of Swan on 22 September 1993 (copy provided in Annexure 2 of the July 2011 report) included conditions 3 & 4 which read as follows:

3. *The capacity of the poultry farm not exceeding current bird numbers*
4. *Detailed records of bird numbers being registered by the owners and provided upon the request of Council.*

In response to that approval, the owner wrote to the City of Swan (refer Annexure 2 of the July 2011 report – letter dated 21 October 1993) advising that the bird numbers on site in 1993 were as follows:

3 laying sheds of 6,000 birds

1 rearing shed of 6,000 birds

TOTAL BIRDS 24,000

Therefore, the landowner has had approval to operate at 24,000 birds since 1993. This application seeks to increase bird numbers from 24,000 birds to 80,000 birds.

Prior to 2005, the egg industry used to be licenced and poultry farms had to be licenced for the number of chickens kept on a property. With the deregulation of the egg industry in 2005, licencing for the number of chickens kept on the property was no longer required.

The justification and reasoning for the increase in bird numbers is detailed in the July 2011 report. This is in extract of section 5.1 of the July 2011 report:

The Code of Practice for laying hens identified that cages that met a standard introduced in 1995 could be in place for 20 years from the date of manufacture. Cages that did not comply with the 1995 standard (as was the case with the cages on this site) were required to be decommissioned by 1 January 2008 or modified to meet the 1995 standard. This referred to multi deck cages and the requirements for minimum heights and design of the cages.

As detailed in section 7.2.1 of the July 2011 report:

The reason for the change in the number of birds is partly due to the Environmental Code of Practice for the Poultry Industry which required by 2008 a change in the requirements for housing chickens. The changes include the requirement of mechanical ventilation and a change in the cage size for birds as discussed earlier in this report.

Further with the introduction of the layering system for keeping chickens under the Code of Practice, the new layering caging system was introduced on the property and then in order to remain competitive in the industry the number of birds kept on the property was also increased.

In increasing the bird numbers, the owner proposes to construct odour stacks at the eastern ends of Sheds 2, 3 and 4. It should be noted that Shed 1 is a free range shed and operates under different conditions which are not conducive to utilise an odour stack. In the event that the bird numbers are increased to the 80,000 birds as proposed, the applicant will install the odour stacks on the 3 sheds currently used for caged chickens. The City of Swan has granted planning consent for the construction of the odour stacks as proposed. In the event that the increase in bird numbers to 80,000 is not supported, the odour stacks will simply not be constructed.

The size of the sheds do not change as a result of the increase in bird numbers. The increase in bird numbers is brought about as a result of introduction of a layered cage system in Sheds 2, 3 and 4.

Odour modelling for this poultry farm was conducted and the findings presented in an Odour Impact Assessment report dated February 2011 which was included as Annexure 9 of the March 2011 report and Annexure 9 of the July 2011 report. This Odour Impact Assessment was undertaken for 84,000 birds and not 80,000 birds. Whilst all modelling has been done at 84,000 birds, the application has been revised to be for 80,000 birds.

For the free range shed only, the Odour Impact Assessment report from February 2011 used odour sampling data based upon a different poultry farm. The reason for this was because at the time of undertaking the odour sampling, the free range shed did not contain any chickens. The odour sampling for the tunnel sheds (Sheds 2, 3 and 4) was based upon on site sampling.

Subsequently after the free range shed on the subject property had chickens kept in it for approximately a year, site specific odour sampling for the free range shed was undertaken. A copy of that is provided in **Attachment 4** to this letter (Titled: Site Specific Modelling Assessment of Shed 1). This contains a plan which shows the odour contour for the 3 tunnel sheds (Sheds 2, 3 and 4) and shed 1 (free range shed) all based upon on site odour sampling.

In response to the City's resolution that the application for the increase in bird numbers be refused, we instructed our odour consultants to undertake further odour modellings based upon those scenarios being:

1. Odour generated as a result 24 000 birds with no odour stacks on any sheds; and
2. Odour generated from 80,000 birds with odour stacks on Sheds 2, 3 and 4.

A report was subsequently prepared by The Odour Unit using odour modelling to provide odour contours for the odour generated as a result 24 000 birds with no odour stacks compared to the odour generated from 80,000 birds with odour stacks on Sheds 2, 3 and 4. **Attachment 5** to this letter contains a summary of the results of that modelling (dated 8 February 2012).

I specifically refer to Figure 3 included in Attachment 5 which shows the dispersion modelling comparison of 84,000 birds (white contour), compared to 24,000 birds (red contour) and the free range shed only (yellow contour). As detailed in page 2 of the report:

The clear result was that when reverting back to the licence condition of 24,000 birds and with horizontally tunnel ventilated sheds, the predicted odour footprint increased beyond the predicted 500 metre separation distance for 84,000 birds. (emphasis added)

...

Furthermore an increase in the stocking density overall of 84,000 birds, from the current licence conditions of 24,000 birds, operating with vertical exhaust stacks, is not predicted to adversely affect ground level odour impacts beyond 500 metres. Retaining the current licence [of 24,000 birds] with horizontal tunnel ventilated sheds will have adverse impacts on surrounding receptors beyond 500 metres.

The report concludes on page 9 stating that:

The findings of this assessment have shown that vertical discharge stacks at 6 metres above ground (or more) are recommended for Sheds 2, 3 and 4m and that the stocking density of 84,000 birds for the farm is not predicted to increase the ground level odour impacts beyond the currently placed 500 metre odour buffer. (emphases added)

City of Swan reasons for refusal

It is noted that the City of Swan identifies in its first reason for refusal for the increase in bird numbers that "odour from the expended facility has been noted as offensive to 25 residents within 500m of the immediate locality." Firstly I advise that the poultry farm has been operating at between 80,000 – 84,000 for at least the last 5 years. A review of the City's complaints received also identified that no complaints were received by the city for 25 months (more than 2 years) after 80,000 birds was reached.

Therefore approval of the 80,000 birds will not in fact increase odour beyond that which is presently experienced by those nearby residents as the farm has been operating at 80,000 birds for the last 5 years. We consider that approval of the 80,000 birds will in fact reduce odour as a result of:

1. Construction of odour stacks for sheds 2, 3 and 4
2. Improved management practices in regard to storage of manure on site.

I refer to Attachment 6 to this letter which includes a summary of all the management practices that the owner is willing to implement in the event that the application for 80,000 birds is approved. These are mostly a summary of what is contained in the management plans (Annexure 12 of the July 2011 report).

It should be noted that it is proposed to improve the current management practices in regard to the chicken manure from Sheds 2, 3 and 4. Presently the majority of the manure from Sheds 2, 3 and 4 is transported off site twice a week via the conveyor system which loads direct into a commercial vehicle with trailer. However, at present, portion of the manure from Sheds 2, 3 and 4 is stored in the "storage shed" (shed to the east of Sheds 2 & 3). This manure is then mixed on site, bagged on site and sold on site. The storing, mixing and bagging of the manure on site does generate an odour. It is proposed to change this practice such that all manure will be taken off site where it will be converted to compost. Once sealed in bags, the bagged compost will be returned to site for sale.

We have not been made aware exactly what odour the nearby residents consider to be offensive. If it is manure, then the changes to management practices in regard to manure storage will address that odour. If the odour is as a result of the poultry sheds, that odour will be lessened by the use of odour stacks on Sheds 2, 3 and 4. Presently the odour is extracted from sheds 2, 3 and 4 and vented horizontally. The odour stacks will contain a ramp that will push the ventilated air in a vertical stream (therefore resulting in the odour being dispersed above ground level).

The odour modelling for 84,000 birds with no odour stacks (present situation) has not been conducted. However, the modelling clearly demonstrates that approval of 80,000 birds with odour stacks results in a reduced odour buffer as compared to the odour buffer for 24,000 birds with no odour stacks (as approved by the City of Swan).

State Planning Policy 4.3: Poultry Farm Policy

In regard to the second reason for refusal, the relevant clause of SPP 4.3 states:

Applications to expand existing poultry farms located in a rural zone which is not identified for short or medium-term urban or rural-residential development may be permitted. This applies particularly to egg production farms where there is no increase in bird-stock numbers.

Firstly it is considered relevant that SPP4.3 was gazetted in 2003, at a time when egg production farms were regulated by licencing of bird numbers and this may be part of the reason why there was specific reference to bird numbers in egg production farms. The egg industry was deregulated in 2005 and now there is no specific licensing requirement for bird stock numbers in egg production farms.

The application does not seek to expand the existing poultry farm. The footprint of the poultry sheds will not change. The application seeks to increase bird numbers on the basis of introducing improved management practices for the existing development and that birds will be in a layered cage system (which is what has existed on site for at least 5 years). The increased bird numbers with improved management practices results in the odour buffer being less than that of the approved number of birds with existing management practices.

The clause within SPP4.3 does not expressly state that approval cannot be granted for an increase in the bird numbers for egg production farm, it merely refers to a situation where an application is sought to expand the farm. This application proposes to retain the existing sheds and does not seek to expand the poultry farm sheds beyond the existing building footprint of what has been approved by the City of Swan historically.

SPP 4.3 also has an objective "To protect the interests of existing poultry farms in the face of encroaching development." This objective also needs to be taken into consideration in determining this application.

SPP 4.3 identifies in the background section of the policy that

The approach recommended is to examine the specific impacts of poultry farming and the implications of adjacent development having regard to the type of poultry production, management of the farms and prevailing conditions. This will lead to a range of measures, which can be taken to address the particular impacts in a given location and manage development in the vicinity of existing or proposed farms

We confirm that the odour stacks will only be constructed if the increase in bird numbers to 80,000 birds is approved. We consider that this is a unique situation whereby increasing the number of birds will enable introduction of improved management practices which will in turn reduce odour and this is a better outcome for all parties.

Proper and Orderly planning

We note that many poultry farms in Western Australia do not have a specific limit on the number of chickens they can accommodate in the sheds. We are aware of other poultry farms which are only restricted in terms of the buildings they can use for rearing of poultry and not restricted by a condition on the maximum number of birds able to be accommodated in the sheds. In the interest of proper and orderly planning, if other poultry farms are able to operate without any restriction on bird numbers, we question why the bird numbers in this specific application are being restricted.

In regard to proper and orderly planning, we are of the view that the poultry farm is not being expanded as the building footprint of the poultry sheds is remaining unchanged. We consider that approval of the application is in accordance with the objectives of SPP 4.3. The option that results in a reduced odour buffer is the option with 80,000 birds and odour stacks on Sheds 2, 3 and 4.

Approval of 80,000 birds and improved management practices as provided in the management plans and attached management practices will significantly improve odour from the site and less odour than approval for 24,000 birds in which case the odour stacks will not be constructed.

Given the building footprint is not proposed to change, we consider that it would be proper and orderly to approve the application that results in the reduced odour buffer and that is the application with 80,00 birds with odour stacks on sheds 2, 3 and 4.

Site inspection

We would like to give the assessing officer the opportunity to view the poultry farm operations prior to determining the application in order to provide a greater understanding of how this use is conducted on this site. Please contact me on 9382 3000 in order to discuss a suitable time to undertake an inspection.

Summary

It is hoped that this further justification and information assists the Western Australian Planning Commission and officers of the Department of Planning (DoP) to make an informed decision.

We note that the odour report and additional information will be referred to the Department of Environment and Conservation (DEC) for comment. We would be happy to meet with the DEC and DoP officers in order to further discuss the application.

I will also be seeking to give a deputation to the Statutory Planning Committee of the Western Australian Planning Commission, when they consider the application.

I can be contacted on 9382 3000 should you have any further queries in regard to this application.

ALLERDING AND ASSOCIATES



AMANDA BUTTERWORTH
ASSOCIATE

Attachments

1. Letter to City of Swan dated 19 August 2011
2. Updated plan for Air Chambers or odour stacks (to replace plan from Annexure 10 of July 2011 report) and photos of a typical air chamber/stack
3. Current Licence to take water
4. Site Specific Odour Modelling Assessment of Shed 1
5. The Odour Unit Technical Memorandum dated 8 February 2012 providing a summary of odour comparison of 24,000 chickens with no odour stack and 80,000 chickens with odour stack
6. Management Practices to be implemented if approved at 80,000 birds

6.0 Conclusion

The key grounds of this submission can be summarised as follows.

History of the Poultry Farm

- » Since 1970, the poultry farm has expanded from a small operation to a substantial commercial business;
- » In 1993, approval as granted for a maximum of 24,000 chickens;
- » In 2006 to 2007, the operator installed new multi-layered cage systems in Sheds 2 to 4;
- » The City has been receiving complaints from residents since 2006, coinciding with the installation of the multi-layered cages which have intensified operations to a level significantly greater than permitted;
- » Since 2007, the City has been aware a significantly greater number of chickens are being kept at the premises (estimates range from 100,000 to 150,000): a four to six-fold increase over that permitted;
- » The City is aware the poultry farm is the cause of odour, flies and dust, and has had a severe and significant detrimental impact on the amenity of residents;
- » Since at least 2006, the poultry farm has been operating in breach of its 1993 approval, and throughout this time (perhaps longer), the City has been aware of this breach of planning approval;
- » In mid 2007, the City noted the need for an application for retrospective approval to be made, and noted there would likely be significant issues due to the zoning of the land;
- » Since the City started to receive complaints six years ago, the poultry farm has been allowed to continue to operate in breach of its 1993 approval, to the detriment of the amenity of the locality.
- » Review of the Application and Odour Study
- » Application has been made for retrospective approval to increase the capacity of the poultry farm to 80,000 – 90,000 chickens, together with various other additions and improvements;
- » The increase in capacity is opposed by surrounding residents, who are also opposed to the various additional activities proposed at the site, including all retail sales (i.e. chickens, manure etc);
- » The Applicant's odour study seeks to determine if a 500 metre buffer should be placed on the farm. The odour study predicts an off-site odour impact beyond 500 metres if vertical stacks are installed;
- » The six metre high emission stacks will not be effective, as they will only be one metre above the roof ridge and be subject to building downwash. Such an emission plume will tend to not disperse readily at ground level and its vertical dispersion will be limited, particularly under stable meteorological conditions;
- » The Applicant's odour study concedes sensitive receptors within 450 metres would be subject to odour nuisance, and states the nearest 5 sensitive receptors are within 370 metres;
- » We calculate there are actually 17 sensitive receptors within 370 metres and another 6 within 450 metres, being a total of 23 within 450 metres;
- » The generic buffer distance applicable to poultry farms under EPA Guidance Statement No.3 is between 300 and 1,000 metres depending on the size of the poultry farm;

- » A buffer closer to 1,000 metres is required to limit odours from a poultry farm with 80,000 birds, with a minimum buffer of 900 metres to account for unforeseen events / adverse weather;
- » Within 900 metres, there are 58 sensitive receptors, and within 1,000 metres, 102 sensitive receptors, including vacant lots in St Leonards Estate, but does not include future urban lots in West Swan (east);
- » We recommend a maximum capacity of 14,600 chickens to limit the impacts of odour on the 17 sensitive receptors within a distance of 370 metres.
- » Impacts on Amenity
- » The poultry farm will have a significant detrimental impact on the amenity of the locality by virtue of odour, dust, and flies;
- » Residents have previously documented their concerns, and those living closest to the poultry farm have noted on some occasions in summer they are unable to enjoy the outdoors due to the intense smell. Other nearby residents have advised that they are considering moving out due to the poultry farm;
- » There are no site specific factors that would assist in buffering odour impacts to nearby residents, such as dense vegetation or significant changes in topography;
- » Dust is a nuisance to nearby residents, and without additional management measures it will remain an issue given the proximity of private landholdings;
- » No consideration has been given to the visual impact of the proposed odour stacks, which will have an adverse impact on the character and amenity of the area.
- » Orderly and Proper Planning
- » The Application is contrary to the strategic and statutory town planning framework, including the Metropolitan Region Scheme, State Planning Policy 4.3 – Poultry Farms Policy, State Planning Policy 4.1 – State Industrial Buffer Policy, Guidance Statement No.3 – Separation Distances between Industrial and Sensitive Land Uses, Directions 2031, and the Outer Metropolitan Perth and Peel Sub-Regional Strategy;
- » The zoning of the land under TPS17 is inconsistent with the zoning of the land under the MRS, and pursuant to the Planning and Development Act, the MRS zoning prevails over the TPS17 zoning. This means that, for all intents and purposes, the Application ought to be assessed on the basis that it is located on land zoned for urban development purposes;
- » The Urban Deferred zone in West Swan (west) has the potential to yield 1,800 dwellings and approval of the Application will severely limit the ability of the area to contribute to the expansion of Perth;
- » Approval of the Application would prevent land within a 900 metre buffer from being urbanised. The buffer area has the potential to yield 1,600 additional dwellings west of Perth-Darwin Highway;
- » Approval of the Application would be detrimental to the implementation of draft Local Structure Plans in West Swan (east), which propose approximately 450 dwellings inside the 900 metre buffer;
- » Even if the 450 metre buffer identified by the Applicant's odour study were to apply, such an area would have the potential to yield 675 residential dwellings;

- » Approval of the poultry farm would sterilise 145 hectares of Urban Deferred land from being developed;
- » There is a risk of contaminated runoff and groundwater impacting on the wetland located immediately south of the operations, which is inconsistent with the intent of the City's Environmental Planning Policy.

In conclusion, Clause 10.2 of TPS17 requires the City to have due regard to State Planning Policies, the orderly and proper planning of the locality, any relevant local and state policies and strategies, the impacts of a proposal on the amenity of the area, and submissions by the public. Having regard to all those factors, there are no valid grounds whatsoever for approval of the Application.

For a considerable time now, surrounding residents have suffered while the poultry farm has benefited commercially by operating contrary to the terms of its original approval, with little regard for the off-site impacts this has caused. A poultry farm of the scale proposed is not an appropriate land use in this locality, and even at the scale approved in 1993, it is considered the time has come for the facility to be dismantled or relocated to a remote area, to enable West Swan (west) to realise its urban potential, and more importantly, to allow residents to enjoy the amenity of their properties in a way they deserve.

The Council urged to refuse the Application.

susceptible to impacts from nutrients found in animal waste. Direct infiltration of rainfall into the groundwater may also carry nutrients and other pollutants if manure spillage, and/or bad housekeeping occur on the property. The City of Swan noted following an inspection of the facility in 2010 that accumulated poultry manure was observed on the ground adjacent to the manure loading point, the external conveyor systems and adjacent to the rear storage shed. This is of concern to the receiving environment, given the manure can be infiltrated into the shallow groundwater or be transported to the REW following rainfall.

The Code of Practice for Poultry Farms (DEC, 2004) recommends the following in respect to protecting the environment from poultry farms:

To protect aquatic environments, vegetated buffers of resilient local native species should be maintained between poultry sheds and significant wetlands, as well as waterways and floodways. Appropriately vegetated buffers decrease stormwater velocities allowing entrained material to be deposited and nutrients to be assimilated, thereby protecting the health of the wetland/waterway. Buffer width should be determined using biophysical criteria, see Foreshore Policy 1 - Identifying the foreshore area. As a guide, a buffer of no less than 50 metres (measured from each poultry shed to the outside edge of wetland/waterway fringing vegetation) is required provided there is adequate fringing nutrient filter vegetation, and suitable design and management measures are proposed. Where fringing vegetation has been cleared, revegetation with appropriate local native species is required. Larger buffers may be required where proposed management practices may be insufficient and where biophysical criteria indicate larger buffers are necessary. More information is available in the Department of Environment's Wetland Position Statement and Water Notes - Wetland Buffers and Identifying the Riparian Zone.

Apart from wetland setbacks and the application of a suitable vegetated buffer, potential pollutants can be controlled by ensuring a well maintained and clean operation.

Proposed Management and Adequacy

The Waste Management Plan (Allerding and Associates, 2011) provided with the planning application outlines management measures to control waste and ensure manure and waste is contained and treated/removed appropriately. The inspection by City of Swan Health Officers in August 2010 indicates that manure has accumulated in areas of the farm, which is in contravention to the Code of Practice.

Due to the proximity of the REW (which is less than the 50m setback recommendation outlined within the Code of Practice), and minimal vegetated buffer between the operations and the REW there remains a risk to the wetland environment from runoff and groundwater contamination.

SUMMARY AND CONCLUSIONS

Coterra Environment have reviewed all available information relevant to the retrospective planning application for the expansion of poultry operations at 60 Cheltenham Road, Bennett Springs. Based on this assessment of the planning application and associated technical reporting, it is the opinion of Coterra Environment that the current setbacks from the poultry farm operation to sensitive receptors (private dwellings) are not sufficient to warrant an expansion of the facility and an increase in the number of birds permitted under the existing planning approval. The reasons for this are outlined below:

- A site specific odour study completed in February 2011 on behalf of the Poultry Farm owner established that currently 17 and up to 23 residences within a 300m to 450m radius of the operations are impacted by odour in excess of the recommended odour levels accepted by the DEC. The area of impact is likely greater when the free-range shed is at capacity.
- 90,000 birds is considered a large-scale poultry operation, indicating that a buffer of greater than 300m and likely closer to 1,000m would be required to limit odour impacts in accordance with the EPA Guidance Statement (EPA, 2005). It should be noted that nuisance odour levels were recorded by City of Swan Health Officers during an inspection of a shed clean out at West Swan Road, located approximately 2.5km away.
- The odour dispersion modelling has determined that there is an impact under ideal conditions within 450 metres of the sheds with a 90,000 chicken capacity. Further under unfavourable meteorological conditions this plume will not disperse efficiently in any direction, including vertically. Therefore the separation or buffer distance for plant upsets or non-normal operations or unfavourable meteorology may be at least double this predicted distance of 450 metres; that is , 900 metres.
- Six metre high emission source will only be one metre above roof ridge of shed and will therefore be subject to building downwash. Such an emission plume will tend to not disperse readily at ground level and its vertical dispersion component will be limited, particularly under stable meteorological conditions.
- Using NSW EPA variable separation distances calculations, as referenced in QEPA *Odour Impact Assessment from Developments Guideline* which is currently adopted as an interim Guideline by WA DEC, the minimum separation distance between sheds and receptor would be of the order of 900 metres
- There are no site specific factors that would assist in buffering odour impacts to nearby residents, such as dense vegetation or significant changes in topography.
- Dust is a nuisance to nearby residents, and without additional management measures it will remain an issue given the proximity of private landholdings.
- There is a risk of contaminated runoff and groundwater impacting on the wetland located immediately south of the operations. At a minimum, additional buffer plantings within the property between the sheds and the wetland should be considered to reduce impacts from runoff.

CONCLUDING COMMENTS

Given the proximity of a number of sensitive receptors to the poultry farm located at Lot 60 Cheltenham Road, Bennett Springs, and the large scale of these operations, it is unlikely that nuisances such as odour and dust can be controlled to adequately prevent impacts to nearby residents to the levels required by regulatory authorities. The change in impacts from 24,000 birds, to 90,000 birds has resulted in a significant increase in odour nuisances, which is unlikely to be controlled to required standards, despite the implementation of best practice management.

We trust this information meets your current requirements. If you have any questions or need any further information please do not hesitate to contact the undersigned.

Yours Sincerely



Luke Rogers
Lead Scientist

Figures

- Figure 1: Site Location
- Figure 2: Proximity of nearest residences
- Figure 3: Generic buffers (EPA, 2005)
- Figure 4: Soil mapping, topography and wetlands

Attachments

- Attachment 1: Review and Commentary on the 'Odour Impact Assessment & Dispersion Modelling Study' (Stephenson Environmental, 2011)