

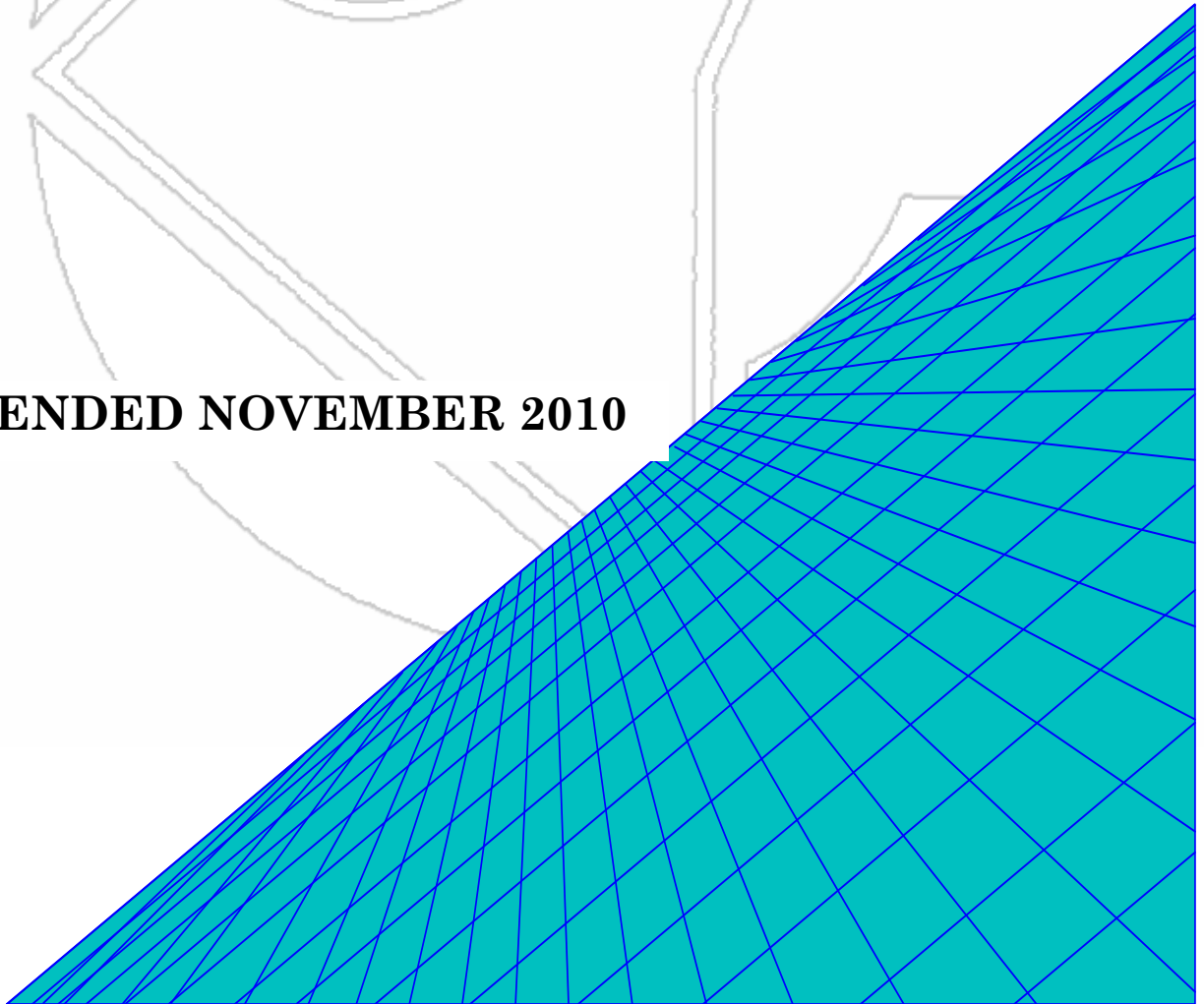


City of Canning

Engineering and Technical Services

STANDARD SPECIFICATIONS
For Subdivisional Development

AMENDED NOVEMBER 2010



Design Criteria For Subdivisions

AMENDED – NOVEMBER 2010

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3. ROADS - DESIGN CRITERIA
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1. GENERAL

Where the subdivision of land includes the construction of roads the roads shall be designed to the satisfaction of the City Engineer in accordance with the following guidelines.

2. ROADS - RESERVE AND CARRIAGEWAY WIDTHS

The minimum road reserve and carriageway widths for various classifications of roads shall be in accordance with Table 1.

Table 1.0 - Subdivision Road Reserves

ROAD CLASSIFICATION	RESERVE WIDTH	PAVEMENT WIDTH	VERGE WIDTH
Residential Roads	As Per Appendix A "Standards for Residential Subdivision Roads"		
Rural Roads	Min 20m	Unkerbed 7.4m	Nom 6.3m
Industrial Roads	Min 20m	Min 9m	Nom 5.5m

3. ROADS - DESIGN CRITERIA

- 3.1. All roads shall be designed in accordance with the current relevant NAASRA or AUSTRROADS standards, unless otherwise specified. Of particular importance is the geometric design of horizontal and vertical alignment to provide adequate sight distances for the design speed of the road.
- 3.2. Roads shall be designed to give the best possible grade to suit the natural ground conditions.
- 3.3. The maximum longitudinal grade shall be 8% or 1 in 12.5 unless the resultant earthworks and access to adjacent lots are impracticable, in which case approval may be given by the City Engineer for a steeper grade.
- 3.4. Minimum longitudinal grade shall be 0.5% or 1 in 200.
- 3.5. All changes of grade of more than 1% shall be connected by a vertical curve.
- 3.6. In general, verges shall be graded at a slope of 2% upwards to the property boundary from the top of the kerb.
- 3.7. Intersecting roads shall be designed centre to centre except where superelevation exists.
- 3.8. Intersections at main roads shall be designed in accordance with NAASRA publication "Guide To Traffic Engineering Practise Part 5 NAARSA 1988 - Intersections at Grade" .
- 3.9. All intersection sweeps shall be 9.0m minimum radius in residential areas and 15.0m in industrial areas.
- 3.10. Cul-de-sac bulbs in residential areas shall be min 8.0m radius with 15.0m radius sweeps and in industrial areas shall be 12.0m radius with 15m radius sweeps. Any variation to these figures shall require approval of the City Engineer.

3.11. All corner truncations shall be 6.0m by 6.0m minimum in residential areas and 10.0m by 10.0m in industrial areas. Any variation to these figures shall require approval of the City Engineer.

3.12. Traffic control devices, sign posts, guide posts and street name plates and guide signs shall be provided to the satisfaction of the City Engineer.

3.13. The following kerb sections shall be used unless otherwise directed by the City Engineer.

Mountable: - Single carriageway residential streets providing access to properties except on intersection sweeps.

Semi Mountable: - Intersection sweeps.
- Medians or channelisation island.

Barrier: - Roads providing access to industrial or commercial properties.
- Roads adjacent to Public Open Space areas.

4. ROADS - PAVEMENT DESIGN

Due to the variability of soil and groundwater conditions in the Municipality, pavement thickness design may be required.

Where required pavement thickness shall be designed in accordance with Austroads publication "Pavement Design: A Guide to the structural Design of Road Pavements - Austroads 1992" and based on evaluation of the subgrade CBR values. Copies of calculations shall be provided.

In normal well drained Bassendean Sand conditions the minimum design pavements as shown in Table 2 may be used.

Alternative pavement designs or alternative pavement material may be considered where detailed investigations support the use of such material.

Table 2.0 - Subdivision Road Pavement

ROAD CLASSIFICATION	MINIMUM PAVEMENT
Local Distributor (Bus Routes)	200 Limestone 100 Rockbase Prime 25 Asphalt
Access Ways (<100,000ESA)	150 Limestone OR 200 75 Rockbase Limestone Prime 50 Asphalt 25 Asphalt
Industrial Roads	200 Limestone 100 Rockbase Prime 30 Asphalt

5. ROADS - SELECTION OF ASPHALT MIX

Table 3.0 - Asphalt Mix

Road Classification	Base	Min Asphalt Thickness (mm)	Mix Type
Local Distributor	Rockbase	25	10G 50 blow
Access Ways	Rockbase	25	10G 50 blow
	Limestone	50	14G 50 blow
Industrial Roads	Rockbase	30	10G 75 blow

6. STORMWATER DRAINAGE - GENERAL

- 6.1 Land owners subdividing land for urban, residential or industrial developments are required to provide a stormwater drainage system to the satisfaction of the City Engineer in accordance with the following guidelines.
- 6.2 All commercial, industrial and multi-residential (triplex or larger) developments are required to provide a stormwater-disposal system to the satisfaction of the City Engineer. Further information on the means of disposal whether it be "on-site" or connection to an existing drainage scheme may be obtained from the City's Engineering Department.

7. STORMWATER DRAINAGE - DESIGN CRITERIA

- 7.1 Stormwater drainage system shall be designed using methods in accordance with "Australian Rainfall and Runoff - A Guide to Flood Estimation Vol. 1 1987 (AR & R - 1987) and "Stormwater Drainage in Small Urban Catchments: ARRB special Report No 34".

Attention is drawn to the major / minor concepts of drainage design as per section 14.5.1 AR & R 1987.

- 7.2 Drainage systems in residential areas are to be designed for a 1 in 5 year storm and in industrial areas for a 1 in 10 year storm. Drainage systems are to be designed as a manhole to manhole system with contributing inflows from "trapped" interceptors.
- 7.3 The rainfall intensity for a calculated time of concentration and recurrence interval shall be determined from the Rainfall Intensity Diagram for the City of Canning (Figure 1).
- 7.4 The total area contributing should be analysed and runoff coefficients assigned to each common sub-area. Runoff coefficients to be used are as follows:

Industrial & Commercial Areas

0.9 of total area unless otherwise advised by the City Engineer

Residential

0.3 of total area (where connected to drainage system)

Multi-Residential

0.7 of total area (where connected to a drainage system)

Road Reserve

Weighted coefficient based on **0.9 for road pavement** and **0.5 for verge area**.

- 7.5 Due to the high groundwater conditions within much of the Municipality subsoil drainage may be required as a condition of subdivision.
- 7.6 The minimum time of concentration to the first gully shall be 6 mins.

7.7 Interceptors

Interceptors shall be of side entry type and positioned so that the width of gutter flow is limited to 1.5m in local roads, collector and arterial roads. Consideration should always be given to keeping intersections as free of runoff as possible. At low points double length entry pits may be required. In low points each pit should be individually connected to a common manhole.

Interceptors must be "trapped" and fitted with a fibreglass baffle prior to connection to a stormwater manhole.

7.8 Flow In Pipes

1. Pipes to be designed to operate under pressure "or surcharge" as per section 14.5.7 of Australian Rainfall and Runoff. The Hydraulic Grade Line analysis shall take into account head losses through gully pits and manholes. The pipe system shall have the capacity to handle the design flow with the surcharge maximum water level in gullies 150mm below the surface and in manholes 300mm below the surface.
2. In general pipes should not decrease in size downstream irrespective of steeper grades. Special circumstances requiring the decrease of downstream pipe sizes must be approved by the City Engineer.
3. The velocity in pipes shall be limited to the range 0.7 m/s - 6.0 m/s. The possibility of scour at outfalls shall be considered and steps taken to eliminate it where it may occur.
4. Where pipe selections are determined from flow charts care should be taken to use the appropriate chart that will reflect conditions well into the service life of the pipe.

Where flow charts are based on the Colebrook-White Equation the 'K' value for concrete pipes shall be 0.30mm.

7.9 Design Calculations

A copy of all design calculations shall be submitted with the design plans for approval. Reference should be made to the flow chart used in determining pipe selection.

In industrial and multi-residential subdivisions design flow and proposed connection points for each lot shall be clearly indicated on the design plans. The lot connection pit shall conform to the City's requirements for manhole construction and be fitted with a baffle on the outlet pipe to the main line.

7.10 Pipe Types And Cover

Drainage lines shall be rubber ring jointed Concrete Pipes, Aluminium Pipes or PVC Stormwater Class for subsoil drainage (maximum size 300mm) unless approved by the City Engineer.

Slotted drainage lines shall be a minimum size of 150mm diameter and shall be laid as deep as possible such as to have the maximum effect on lowering the water table. The minimum depth to the invert shall be 1.3 metres. The maximum size of slotted drainage lines shall be 300mm diameter; where drainage lines exceed 300mm and subsoil drainage is required a 150mm diameter slotted drain is to be run alongside main line.

Solid drainage lines shall be a minimum size of 225mm diameter and at least Class 2. All road pavement crossings shall be in minimum 225mm diameter solid pipe at a minimum grade of 1:200. In general the **minimum cover** for a Class 2 pipe shall be 600mm.

7.11 Manholes

Manholes shall be included on drainage lines at all connection points, all changes of horizontal alignment and all changes of grades. The maximum distance between manholes shall be 100m and the maximum distance between a manhole and a gully shall be 20m.

7.12 Outfalls

7.12.1 Where a drainage system is to discharge into a Water Authority of Western Australia (WAWA) drainage system prior approval from WAWA must be obtained.

7.12.2 Where a drainage system can not be connected to an outfall system, the method of discharge shall be approved by the City Engineer.

7.13 Compensating Basins

Where a subdivision is to include a compensating basin the basin shall be designed in accordance with section 14.6.6 AR&R 1987 and the requirements of the Water Authority of WA.

7.14 Drainage Alignment

Generally stormwater drainage pipes shall be laid on the alignment as specified in the Public Utilities Information Manual unless approved by the City Engineer. In general the standard drainage alignment shall be 3.6m from the property boundary. Within easements the standard alignment shall be 1.5m from the boundary.

7.15 Catchment Size

All subdividers with land in a common catchment area have a joint responsibility to ensure that the whole catchment area (including dedicated roads) will be served by an effective drainage system. When only a portion of a catchment is being developed at a particular time the drainage strategy for the whole area should be determined. Subdividers are responsible for arranging their own cost sharing arrangements.

7.16 Drainage In Dedicated Road Reserves

Any drainage to be constructed within a dedicated road reserve shall be undertaken by the City at the subdividers cost, unless otherwise approved.

8. **EARTHWORKS AND RECONTOURING**

8.1. The maximum grade across blocks and developed areas shall be 1 in 8, property boundary to property boundary.

- 8.2. Where overall recontouring is not required the maximum block grading from the design verge level at the property boundary shall be not greater than 1 in 6 extending 7.5 metres into the property. The City Engineer may approve a variation to this condition under special circumstances.
- 8.3. Earthworks for Public Access ways (PAW) and Battleaxe Entries (BE) shall have a level cross section boundary to boundary. The maximum longitudinal grade of PAW's and BE's shall be 1 in 6 unless otherwise approved by the City Engineer.
- 8.4. Recontouring of land adjacent to Dedicated Roads shall match the boundary levels for that Dedicated Road specified by the City Engineer.
- 8.5. Recontouring and earthworks on Public Open Space (POS) shall be to a maximum grade of 1 in 8. Under certain circumstances, the City Engineer may approve grades up to 1 in 6.
- 8.6. Roads, PAW's and BE's shall be cleared of rocks, trees, shrubs and vegetation and grubbed out to clear roots and stone. Clearing on POS and blocks shall be restricted to those areas which require recontouring. Topsoil shall be removed, stockpiled and respread on batters, embankments, POS and other earthworked areas to encourage vegetation regrowth. Cleared areas may also require soil stabilization.

Note: Where recontouring in either residential or industrial areas requires fill the fill material shall be clean sand. Material shall be placed in horizontal layers which can be compacted to the specified densities with the Contractor's equipment and methods. The fill shall be compacted to not less than the following maximum dry density when tested in accordance with the appropriate test methods of AS1289.

- | | | |
|----|---|-----|
| a) | Fill within road reserve and other locations subject to traffic | 95% |
| b) | All other areas | 90% |

9. DESIGN PLANS

9.1 SCALE OF PLANS

Where possible the scale of plans should conform to the following:

- | | | |
|------|--------------------|---|
| i) | LAYOUT PLAN | 1/500 or 1/1000 |
| ii) | LONGITUDINAL PLAN | 1/500 horizontally (H)
1/50 vertically (V) |
| iii) | CROSS SECTIONS | 1/200 horizontally (H)
1/20 vertically (V) |
| iv) | PARTICULAR DETAILS | (ie intersections, etc) 1/250 |
| v) | DRAINAGE | As for Longitudinal Section. |

9.2 ROADWORKS

In general design plans should show the following:

i) Layout Plan

North Point/Scale/Datum

Road Reserve Boundaries

Street Names

Lot Boundaries/Lot Numbers

Any Easements/Width

All existing and proposed street drainage sizes/offsets, etc

Existing and proposed contours

Bench Marks (All levels to be related to AHD)

Services - Alignment/Type/RL

Crossovers/Width and Type

Footpaths/Alignment and width

Horizontal Curve data/Tangent Points etc

Chainages on centre line of road

Width of Pavement/Verge/Medians

Legend explaining symbols used

Any required signing and/or linemarking

Typical cross section and pavement design

ii) Longitudinal Sections

Natural surface level along centreline and property lines

Design pavement levels at centre line and channels (Levels to be at 20m intervals on straight grades and alignments and every 10m on vertical and horizontal curves. Levels also required at all low points.)

Grade lines between VPI's with grades expressed as a percentage

VPI's chainage/Level/Length of Vertical Curve

Any transition and superelevation details

iii) Cross Section (When required)

Natural surface level at boundaries

Natural surface level at kerblines and centreline

Design cross section

Batter slopes

9.3 DRAINAGE

In general design, plans should show the following:

i) Layout Plan

All information specified under roadworks layout plan.

Systematic numbering of gullies and manholes

All proposed drainage lines are to be labelled as follows:

US	Upstream invert level (to 3 decimal places)
mm ϕ / 1 :	Pipe size / Pipe Grade
m	Length between manholes / gullies
DS	Downstream invert level (to 3 decimal places)

Any property connections

Any outlet structures

For industrial subdivisions or multi-residential areas, the connection point and design discharge for each lot.

ii) Longitudinal Section

Pipe sizes and grade

Type of pipe (ie Solid or Slotted)

Natural Surface Level

Invert Levels of Pipe

Running Chainages and distance between manhole/gullies, etc

Location and levels of all other services

iii) Special Details

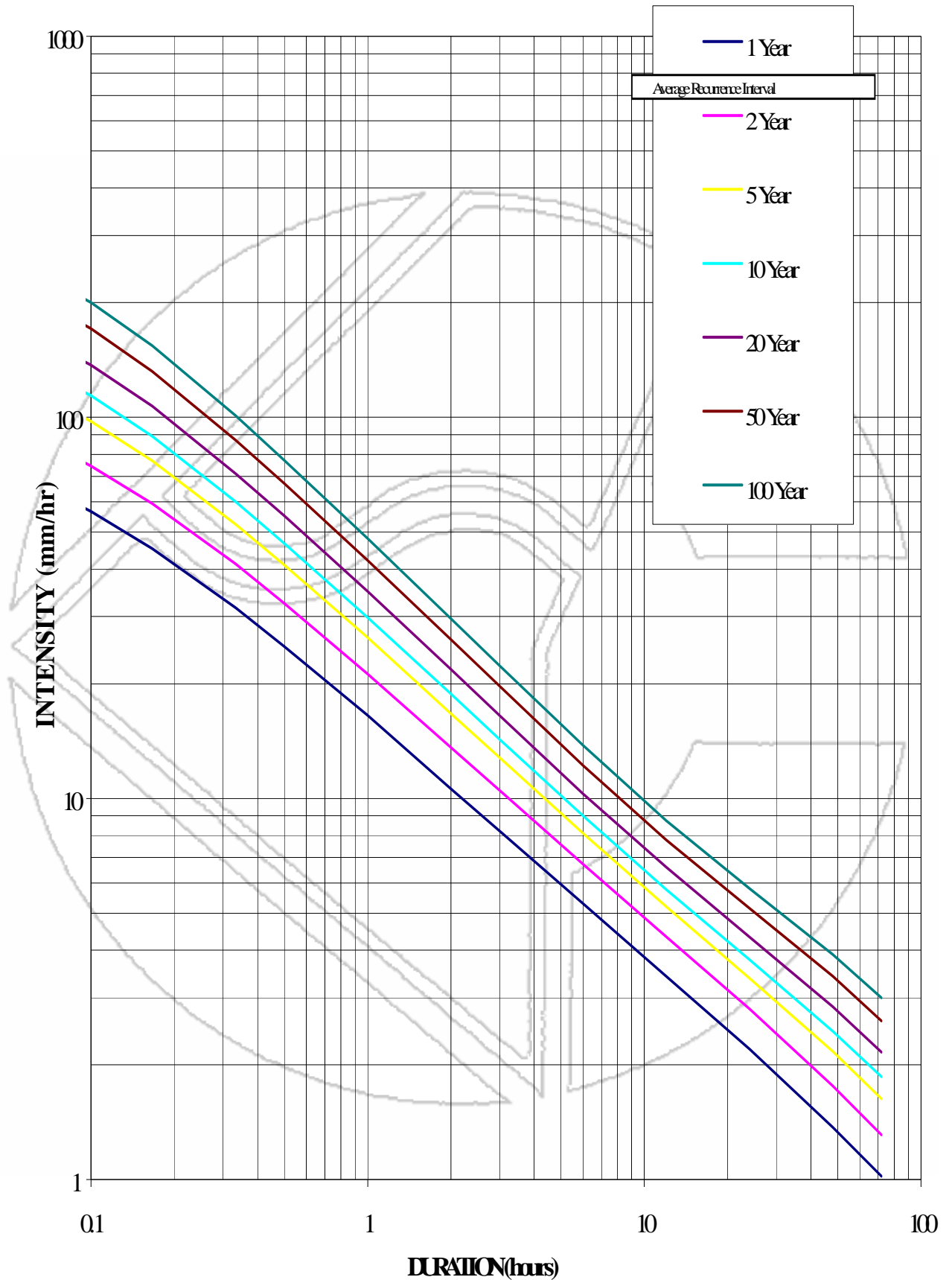
Any Outlet Structure

Any connection to WAWA main drain

Cross section of subsoil drainage



10.1 RAINFALL INTENSITY-DURATION CHART for CITY OF CANNING



10.2 RAINFALL INTENSITY DATA for CITY OF CANNING - LOCATION: 32.000 S 115.950 E
 (Data obtained from Hydrology Branch, Bureau of Meteorology , Melbourne)

LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$\ln(I) = a + b*(\ln(T)) + c*(\ln(T))^2 + d*(\ln(T))^3 + e*(\ln(T))^4 + f*(\ln(T))^5 + g*(\ln(T))^6$$

I = rainfall intensity in millimetres per hour
 T = time in hours

RETURN PERIOD (years)	RAINFALL INTENSITY COEFFICIENTS						
	a	b	c	d	e	f	g
1	2.8006	-0.6213	-0.0164	0.00732	-0.000801	-0.0000654	-0.0000062
2	3.0557	-0.6294	-0.0166	0.00664	-0.000553	0.0000541	-0.0000329
5	3.2720	-0.6493	-0.0150	0.00593	-0.000370	0.0002220	-0.0000636
10	3.3961	-0.6600	-0.0149	0.00502	-0.000039	0.0003743	-0.0000978
20	3.5519	-0.6706	-0.0142	0.00462	0.000065	0.0004703	-0.0001157
50	3.7401	-0.6823	-0.0140	0.00349	0.000435	0.0006579	-0.0001578
100	3.8738	-0.6914	-0.0137	0.00318	0.000557	0.0007322	-0.0001719

RAINFALL INTENSITY IN MM/HR FOR VARIOUS DURATIONS AND RETURN PERIODS

DURATION	RETURN PERIOD (years)						
	1	2	5	10	20	50	100
5 mins	60.60	80.00	105.00	122.00	147.00	184.00	215.00
6 mins	56.60	74.60	97.60	114.00	137.00	171.00	200.00
10 mins	45.20	59.40	76.90	89.20	107.00	132.00	154.00
20 mins	31.60	41.20	52.40	60.10	71.10	87.10	101.00
30 mins	25.00	32.50	41.00	46.70	55.10	67.00	77.10
1 hour	16.50	21.20	26.40	29.80	34.90	42.10	48.10
2 hours	10.60	13.60	16.70	18.80	21.80	26.10	29.60
3 hours	8.22	10.50	12.80	14.30	16.50	19.70	22.30
6 hours	5.30	6.73	8.11	9.01	10.30	12.20	13.80
12 hours	3.42	4.34	5.20	5.77	6.61	7.79	8.76
24 hours	2.20	2.80	3.37	3.77	4.33	5.14	5.80
48 hours	1.37	1.76	2.17	2.45	2.84	3.42	3.89
72 hours	1.02	1.31	1.63	1.86	2.16	2.61	3.00

ANNEX A - City of Canning - Standard Specifications for Subdivisional Development - Section 2

STANDARDS FOR RESIDENTIAL SUBDIVISIONAL ROADS

ROAD TYPE	"B" DISTRIBUTOR NO ACCESS					LOCAL DISTRIBUTOR RESIDENTIAL ACCESS					ACCESS WAY					ACCESS PLACE				
TRAFFIC VOLUMES	3000 - 6000 vpd					1500 - 3000 vpd					< 1500 vpd									
DESIGN SPEED	80 kph					70 kph					60 kph					60 kph				
DESIGN OPERATING SPEED (MAX)	60 kph					50 kph					40 kph					40 kph				
CARRIAGEWAY WIDTH (MIN)	9.0m					7.4m					6.0m					6.0m				
VERGE WIDTH	4.5m (MIN)					4.5m (MIN)					3.0 - 4.5m (MIN) *					3.0 - 4.5m (MIN) *				
RESERVE WIDTH	18m (MIN)					17m (MIN)					14 - 17m (MIN) *					14 - 17m (MIN) *				
TYPE OF KERB	BARRIER / MOUNTABLE					SEMI MOUNTABLE					MOUNTABLE					MOUNTABLE				
SPEED RESTRAINTS REQUIRED	NO					YES					YES					NOT NECESSARY				
PARKING REQUIREMENTS	BUS BAYS AT TERMINII					BUS BAYS AT TERMINII					EMBAYMENT AT SCHOOL AND					EMBAYMENT AT SCHOOL				
FOOTPATH REQUIREMENTS	2 SIDES					1 SIDE ONLY					1 SIDE ONLY									
OTHER REQUIREMENTS	REFUGE TREATMENT TO BE PROVIDED AT PATH CROSSINGS UNIFORM TYPE FENCING TO BE APPROVED BY COUNCIL					REFUGE TREATMENT TO BE PROVIDED AT PATH CROSSINGS					MAXIMUM NUMBER OF DWELLINGS SERVICED BY ACCESSWAY , ACCESS PLACE 150 UNITS					MAXIMUM NUMBER OF DWELLINGS 30 UNITS CUL DE SAC HEADS TO BE 8.0m RADIUS (MIN)				
INTERSECTS WITH																				
ACCEPTABLE INTERSECTION TYPE	A DISTRIBUTOR PRIMARY	B DISTRIBUTOR	LOCAL DISTRIBUTOR	ACCESS WAY	ACCESS PLACE	A DISTRIBUTOR PRIMARY	B DISTRIBUTOR	LOCAL DISTRIBUTOR	ACCESS WAY	ACCESS PLACE	A DISTRIBUTOR PRIMARY	B DISTRIBUTOR	LOCAL DISTRIBUTOR	ACCESS WAY	ACCESS PLACE	A DISTRIBUTOR PRIMARY	B DISTRIBUTOR	LOCAL DISTRIBUTOR	ACCESS WAY	ACCESS PLACE
TRAFFIC SIGNALS	D																			
ROUNDBABOUT	R	R	R			D	R	R						D						
CHANNELISED	M	M	M			R	M	M												
ENTRY STATEMENT			O	R	R		O	O	O	O	D	D	O			R	R	O		
STREET LIGHTING TO INCLUDE D.U.P. CONNECTIONS THROUGH P.O.S.																				
ACCEPTABLE TYPES OF SPEED RESTRAINTS INCLUDE ROUNDBABOUTS AND THRESHOLD TREATMENTS																R - RECOMMENDED				
																D - DESIRABLE				
*WHERE A DEVELOPER WISHES TO GO BELOW THE UPPER RANGE OF THE DIMENSIONS THEN IT IS ESSENTIAL THAT ALL SERVICES ARE DESIGNED PRIOR TO APPROVAL OF THE SUBDIVISIONAL LAYOUT.																O - OPTIONAL				
																M - MINIMUM				
FOR VERGE WIDTHS LESS THAN 4.5m UNDERGROUND POWER WILL BE REQUIRED.																				
PLANTING OF STREET TREES WILL BE SUBJECT TO SERVICES LOCATIONS.																				