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Karratha Apartments

Lot 14 Ridely Street Bulgarra

Stormwater Management Report

Issue Date: Thursday, May 15, 2025
Revision: Shire Submission

1 PREAMBLE.

PJ Wright and Associates Pty Ltd (**PJWAA**) have been engaged by Developed Pty Ltd (**Project Managers**) to prepare a stormwater management plan for three proposed residential development sites in Bulgarra.

This Stormwater Management Plan outlines the requirements for Lot 17 Ridely Street Bulgarra.

2 SITES AND CONDITIONS.

The proposed site is Lot 17 Ridley Street, Bulgarra (**The Site**). Refer to Figure 1.

The proposed development consists of:

- 5,100 square metres site;
- 32 residential units.
- Zoning: R40

Figure 1: Location Plan

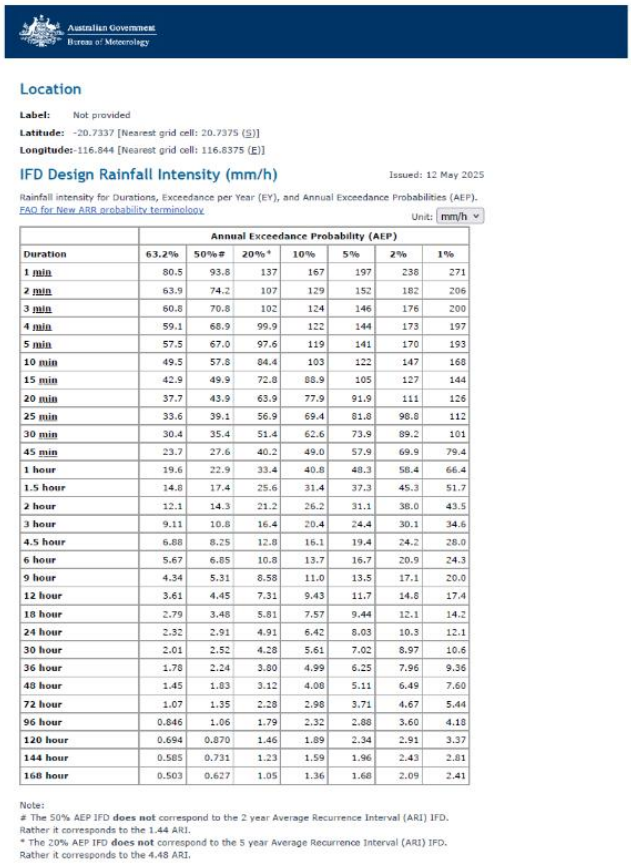
3 FLOOD DATA.

PJWAA have reviewed the City of Karratha *500 year Storm Surge Risk Policy* and confirm the proposed development is located between Ridley Street and Millstream Road.

The site located approximately 300m south of the Storm Surge Zone, which is located near Hunt Way of Sheet 6 of 6 of the Storm Surge Risk Policy.

3.1 RAINFALL DATA.

PJWAA have the 1%AEP storm events based upon current Bureau of Meteorology (**BOM**) rainfall data for Karratha (refer to Figure 2 below).



Australian Government
Bureau of Meteorology

Location

Label: Not provided
Latitude: -20.7337 [Nearest grid cell: 20.7375 (S)]
Longitude: 116.844 [Nearest grid cell: 116.8375 (E)]

IFD Design Rainfall Intensity (mm/h) Issued: 12 May 2025

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology
Unit: mm/h

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	80.5	93.8	137	167	197	238	271
2 min	63.9	74.2	107	129	152	182	206
3 min	60.8	70.8	102	124	146	176	200
4 min	59.1	68.9	99.9	122	144	173	197
5 min	57.5	67.0	97.6	119	141	170	193
10 min	49.5	57.8	84.4	103	122	147	168
15 min	42.9	49.9	72.8	88.9	105	127	144
20 min	37.7	43.9	63.9	77.9	91.9	111	126
25 min	33.6	39.1	56.9	69.4	81.8	98.8	112
30 min	30.4	35.4	51.4	62.6	73.9	89.2	101
45 min	23.7	27.6	40.2	49.0	57.9	69.9	79.4
1 hour	19.6	22.9	33.4	40.8	48.3	58.4	66.4
1.5 hour	14.8	17.4	25.6	31.4	37.3	45.3	51.7
2 hour	12.1	14.3	21.2	26.2	31.1	38.0	43.5
3 hour	9.11	10.8	16.4	20.4	24.4	30.1	34.6
4.5 hour	6.88	8.25	12.8	16.1	19.4	24.2	28.0
6 hour	5.67	6.85	10.8	13.7	16.7	20.9	24.3
9 hour	4.34	5.31	8.58	11.0	13.5	17.1	20.0
12 hour	3.61	4.45	7.31	9.43	11.7	14.8	17.4
18 hour	2.79	3.48	5.81	7.57	9.44	12.1	14.2
24 hour	2.32	2.91	4.91	6.42	8.03	10.3	12.1
30 hour	2.01	2.52	4.28	5.61	7.02	8.97	10.6
36 hour	1.78	2.24	3.80	4.99	6.25	7.96	9.36
48 hour	1.45	1.83	3.12	4.08	5.11	6.49	7.60
72 hour	1.07	1.35	2.28	2.98	3.71	4.67	5.44
96 hour	0.846	1.06	1.79	2.32	2.88	3.60	4.18
120 hour	0.694	0.870	1.46	1.89	2.34	2.91	3.37
144 hour	0.585	0.731	1.23	1.59	1.96	2.43	2.81
168 hour	0.503	0.627	1.05	1.36	1.68	2.09	2.41

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

Figure 2:BOM Annual Exceedance Period (AEP) data.

3.2 COEFFICIENT OF RUNOFF.

The off site catchments are based upon *Coefficient of Runoff* (**CoR**) of 0.65 as the land is un-developed.

All internal site catchments are based upon CoR of 0.8.

3.3 TIME OF CONCENTRATION.

PJWAA have undertaken the *Time of Concentration* (**TOC**) calculation based upon travel distance for each off site catchment area.

The TOC was calculated using an *Empirical version of the Rational Method* as appropriate to the scale of the development being a single property based upon Table 9.6.3 Book 9 of the ARR.

4 FLOOD CALCULATIONS.

PJWAA have utilised the survey and architectural drawings to calculate the catchment areas for each stormwater travel path.

Refer to Drawings P.01 and P.02 which form part of proposed the stormwater management plan for the development

4.1 OFF SITE INFLOWS.

An un-development area of land is located to the south of the site which bound Millstream Street.

This land is elevated and has a natural slope towards the southern boundary of the site.

The land has been broken into two areas based upon existing topographic information provided on the site survey. Refer to Figure 3.

Figure 3 : Offsite Inflow Catchments

PJWAA have taken into account the predevelopment flows from this land and provided drainage channel to collect and diver the 1 % AEP flows around the development.

4.1.1 West Offsite Catchment

a) Catchment: 1,120 square meters.
b) Time of concentration: 8.66 mins.

The catchment has an estimated predevelopment 1% AEP design flow of 0.0342m^3/sec.

The existing flow path will require redirection to divert flow towards the west boundary.

The new flow path will be directed through a new 450 x 225 concrete culvert installed along the western boundary.

The culvert will discharge onto the amended footpath onto Ridely Street

The culvert will also receive the Catchment C discharge which has been calculated at 0. 030m3/sec, providing a total design flow of 0.04m^3/sec

This discharge characteristic will be as follows:

450 x 225 box culvert

i. Volume: 0.064 m3/sec
ii. Slope : 2.0%
iii. Depth of 1% AEP flow: 85.5mm (38%).
iv. Velocity: 1.704m/sec
v. Maximum flow: 0.257 m3/sec @ 2.537m/sec.

4.1.2 East Offsite Catchment

a) Catchment: 1,644 square meters.
b) Time of concentration: 9.46 mins.

The catchment has an estimated predevelopment 1% AEP design flow of 0.0502m3/sec.

The current flow path currently flows through a shallow gully on the eastern side of lot 14 and will remain in this configuration.

The flow will be directed through a new 450 x 225 concrete culvert installed along the eastern boundary.

The culvert will discharge onto the amended footpath onto Ridely Street.

This discharge characteristics will be as follows:

450 x 225 box culvert

i. Volume:0.0502 m3/sec
ii. Slope : 1.353%
iii. Depth of 1% AEP flow: 83.25mm (37%)
iv. Velocity:1.38m/sec
v. Maximum flow: 0.221 m3/sec @ 2.087m/sec.

4.2 SITE FLOWS.

Lot 14 has a high point located at the rear boundary with natural falls towards Ridely Street.
The site has been broken into 4 main catchment areas. Refer to Figure 4.

a) Catchment A : Western side of the site.
b) Catchment B : Eastern side of the site.
c) Catchment C : Central common area.
d) Catchment D : Ridely street frontage.

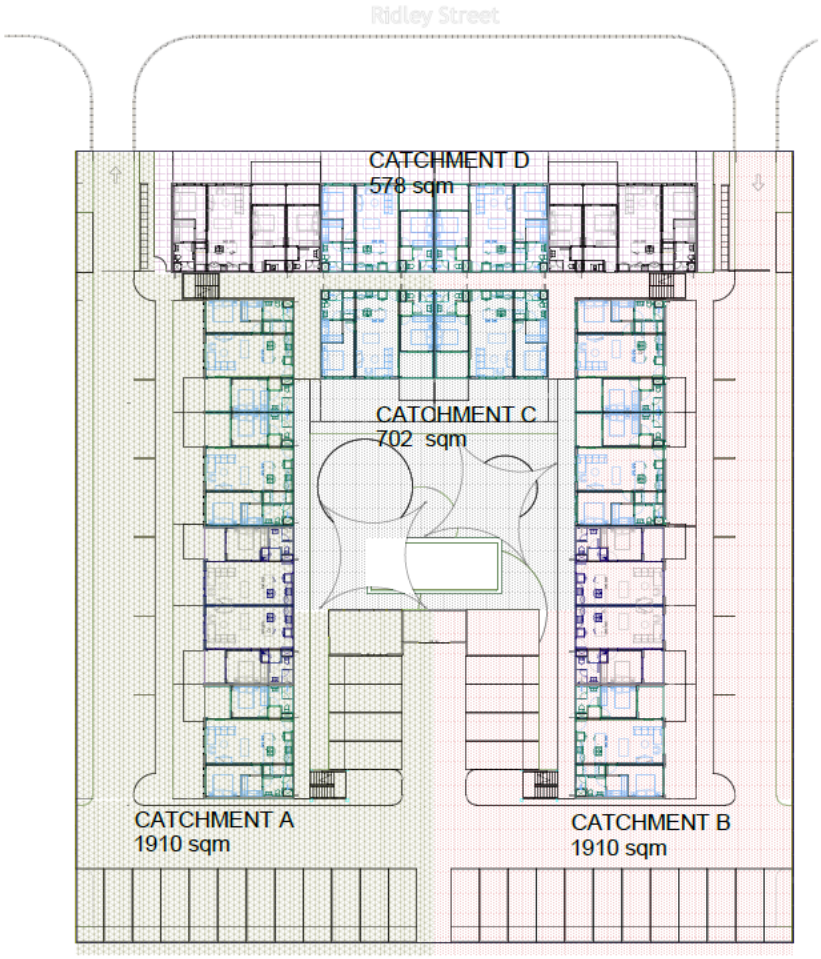


Figure 4: Site Catchment Areas.

The flows from Catchment A and B have been directed to flow down the centre of the roadways to discharge via crossovers onto Ridley Street.

Catchment C will be piped to the Western box culvert.

Catchment D will discharge via overland from towards Ridely Street.

4.3 CATCHMENT A

Catchment A is 1910 square meters in area. The storm flow path will run down the centre of the driveway.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to Ridely Street.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 47.23L/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100 year ARI) design stormwater flow has been calculated at 102.96 l/second and has been designed to the driveway width.

The flow characteristics at the crossover has been calculated as follows:

a) 5% AEP
    i. Volume:0.047 m3/sec
    ii. Slope : 6.668% (1:15)
    iii. Depth of 5% AEP flow: 13.5 mm across driveway
    iv. Velocity: 1.121 m/sec

b) 1% AEP
    i. Volume:0.103 m3/sec
    ii. Slope : 6.668% (1:15)
    iii. Depth of 5% AEP flow: 20.25 mm across driveway
    iv. Velocity: 2.557m/sec

4.4 CATCHMENT B

Catchment B is 1910 square meters in area. The storm flow path will run down the centre of the driveway.

The parking bays will be graded towards the driveway and the driveway will fall to allow discharge to Ridely Street.

The 20% AEP (5year ARI) design stormwater flow has been calculated at 9.50 L/second and the anticipated flow path has been indicated on drawing P.01.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 102.96 l/second and has been designed to the driveway width of 3.9m.

The flow characteristics at the crossover has been calculated as follows:

c) 5% AEP
    i. Volume:0.047 m3/sec
    ii. Slope : 6.668% (1:15)
    iii. Depth of 5% AEP flow: 13.5 mm across driveway
    iv. Velocity: 1.121 m/sec

d) 1% AEP
    i. Volume:0.103 m3/sec
    ii. Slope : 6.668% (1:15)
    iii. Depth of 5% AEP flow: 20.25 mm across driveway
    iv. Velocity: 2.557m/sec

4.5 CATCHMENT C

Catchment C is the central common area and is 702 square meters in area. The storm water will be overland flow collected by a 1500 wide rock swale located north of the main access path.

The swale will discharge to a grated manhole with a pipe 150mm pvc drain run below the building and connecting into the western box culvert

The 20% AEP (5year ARI) design stormwater flow has been calculated at 14.25 L/second.

The 1% AEP (100year ARI) design stormwater flow has been calculated at 30.26 l/second.

The depth of flow in the swale has been calculated as follows:

a) 5% AEP.
    i. Volume:0.014 m3/sec
    ii. Slope : 1.0%
    iii. Depth of 5% AEP flow: 39.6 mm (33 %)
    iv. Velocity: 0.805 m/sec

b) 1% AEP.
    i. Volume:0.030 m3/sec
    ii. Slope : 1.0%
    iii. Depth of 5% AEP flow: 98.4 (82 %)
    iv. Velocity: 1.068m/sec

4.6 CATCHMENT D

Catchment C are the north apartments facing Ridley street.

The total area of the catchment is 578 square meters.

The storm water will be overland flow collected into four 1000 wide gravel lined channels which will discharge towards Ridely Street as shown on drawing P.02

5 BUILDING FINISHED FLOOR LEVELS

The stormwater Management Plan drawing are based upon the current survey levels and indicate the minimum gradients and levels to achieve discharge to Ridely Street.

Final design verifications will be undertaken during the working drawing phase to allow for transitions between the three apartment blocks.

At this stage, the ground floor levels will be no less than 200mm above the adjacent kerbing levels.

Floor levels will also need to be adjusted to ensure gravity connection to sewer.

If you require further information or clarification, please do not hesitate to contact this office.

Anthony R Serek
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6 APPENDIX A

References

1 Stormwater Management Manual of Western Australia, Department of Water; Chapter 9 Structural Controls. 2007.

2 Policy DP 19Karratha 500 year Storm Surge Risk Policy 2012, City of Karratha

3 Australian Rainfall and Runoff Book 9 – A Guide to Flood Estimation, Commonwealth of Australia (Geoscience Australia), 2016 ; Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M , Testoni I.

7 APPENDIX B. SHEETS AND CHARTS.

DRAINAGE CALCULATIONS

Address	17 Ridley Street Bulgarra Eastern Offsite	Date	08.05.25

PRE DEVELOPMENT

Site Area	1120	m^2
Pervious Area	1120	m^2
Impervious Area	0	m^2
$^1I_{10}$	70.6	mm/hr
F_i	0	
F_y	1	
C_{10}	0.5	
$C_y = F_y C_{10}$	0.65	

Time of concentration

$t = (107nL^{0.333})/s^{0.2}$

t = 9.46 mins

$^{10}I_{10}$ = 104 mm/hr

where		
t =	time (mins)	
n = (bare soil)		0.0275
L = (m)		52
s = (%)		2.1
F = (m)		1.09

Flow

$Q_o = CIA/3600$

Q_o = 34.18 L/s

0.0342 m^3/s

where		
Q_o =	?	
C =		0.65
I =		169
A =		1120.0

AEP	Fy	C10	Cy
100%	0.8	0.65	0.52
50%	0.85	0.65	0.5525
20%	0.95	0.65	0.6175
10%	1	0.65	0.65
5%	1.05	0.65	0.6825
2%	1.15	0.65	0.7475
1%	1.2	0.65	0.78

PRE DEVELOPMENT FLOWS			
AEP	Cy	Iy	Qy
63.20%	0.52	49.90	8.07 L/s
50%	0.5525	58.20	10.00 L/s
20%	0.6175	84.9	16.31 L/s
10%	0.65	**104**	**21.03** L/s
5%	0.6825	123	26.12 L/s
2%	0.7475	148	34.42 L/s
1%	0.78	169	41.01 L/s

Spreadsheet based upon RAMWADE flow calculator.

Sheet 1 Predevelopment West Off Site inflow.

DRAINAGE CALCULATIONS

Address	17 Ridley Street Bulgarra Western Offsite	Date	08.05.25

PRE DEVELOPMENT

Site Area	1120	m^2
Pervious Area	1120	m^2
Impervious Area	0	m^2
$^1I_{10}$	27.5	mm/hr
F_i	0	
F_y	1	
C_{10}	0.5	
$C_y = F_y C_{10}$	0.5	

Time of concentration

$t = (107nL^{0.333})/s^{0.2}$

t = 8.66 mins

$^{15}I_{10}$ = 104 mm/hr

where		
t =	time (mins)	
n = (bare soil)		0.0275
L = (m)		51.2
s = (%)		3.2
F = (m)		1.63

Flow

$Q_o = CIA/3600$

Q_o = 26.29 L/s

0.0263 m^3/s

where		
Q_o =	?	
C =		0.5
I =		169
A =		1120.0

AEP	Fy	C10	Cy
100%	0.8	0.5	0.4
50%	0.85	0.5	0.425
20%	0.95	0.5	0.475
10%	1	0.5	0.5
5%	1.05	0.5	0.525
2%	1.15	0.5	0.575
1%	1.2	0.5	0.6

PRE DEVELOPMENT FLOWS			
AEP	Cy	Iy	Qy
63.20%	0.4	49.90	6.21 L/s
50%	0.425	58.20	7.70 L/s
20%	0.475	84.9	12.55 L/s
10%	0.5	**104**	**16.18** L/s
5%	0.525	123	20.09 L/s
2%	0.575	148	26.48 L/s
1%	0.6	169	31.55 L/s

Spreadsheet based upon RAMWADE flow calculator.

Sheet 2 Predevelopment East Off Site inflow

Flow Volume: 65.708L/s

Flow Velocity: 1.704m/s

Flow Depth: 85.5mm

Flow Depth: 38%

Maximum Flow Volume: 257.446L/s

Maximum Flow Velocity: 2.537m/s

Input

Invert Width (mm)

451

Width at top (mm)

451

Depth of Channel (mm)

225

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

2

Design Flow Rate (L/s)

64.00

Submit

Chart 1: Western Culvert Predevelopment flow

Flow Volume: 51.946L/s

Flow Velocity: 1.384m/s

Flow Depth: 83.25mm

Flow Depth: 37%

Maximum Flow Volume: 211.749L/s

Maximum Flow Velocity: 2.087m/s

Input

Invert Width (mm)

451

Width at top (mm)

451

Depth of Channel (mm)

225

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

1.353

Design Flow Rate (L/s)

50.2

Submit

Chart 2 : Eastern Culvert Predevelopment flow

Flow Volume: 48.381L/s

Flow Velocity: 1.127m/s

Flow Depth: 115.9mm

Flow Depth: 61%

Maximum Flow Volume: 105.237L/s

Maximum Flow Velocity: 1.495m/s

Input

Invert Width (mm)

0.01

Width at top (mm)

3900

Depth of Channel (mm)

190

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

1.018

Design Flow Rate (L/s)

47.23

Submit

Chart 3: Catchment A 5% flow

Flow Volume: 103.633L/s

Flow Velocity: 1.487m/s

Flow Depth: 188.1mm

Flow Depth: 99%

Maximum Flow Volume: 105.237L/s

Maximum Flow Velocity: 1.495m/s

Input

Invert Width (mm)

.01

Width at top (mm)

3900

Depth of Channel (mm)

190

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

1.018

Design Flow Rate (L/s)

103

Submit

Chart 4 : Catchment A 1% flow

Flow Volume: 59.022L/s

Flow Velocity: 1.121m/s

Flow Depth: 13.5mm

Flow Depth: 6%

Maximum Flow Volume: 5995.243L/s

Maximum Flow Velocity: 6.832m/s

Input

Invert Width (mm)

3900

Width at top (mm)

3900

Depth of Channel (mm)

225

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

6.668

Design Flow Rate (L/s)

47.23

Submit

Chart 5 : Driveway 5% AEP flow depth.

Flow Volume: 115.745L/s

Flow Velocity: 1.466m/s

Flow Depth: 20.25mm

Flow Depth: 9%

Maximum Flow Volume: 5995.243L/s

Maximum Flow Velocity: 6.832m/s

Input

Invert Width (mm)

3900

Width at top (mm)

3900

Depth of Channel (mm)

225

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

6.668

Design Flow Rate (L/s)

103

Submit

Chart 6 : Driveway 1% AEP depth

Flow Volume: 48.051L/s

Flow Velocity: 1.138m/s

Flow Depth: 114mm

Flow Depth: 60%

Maximum Flow Volume: 107.336L/s

Maximum Flow Velocity: 1.525m/s

Input

Invert Width (mm)

0.01

Width at top (mm)

3900

Depth of Channel (mm)

190

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

1.059

Design Flow Rate (L/s)

47.23

Submit

Chart 7 : Catchment B 5% flow

Flow Volume: 104.069L/s

Flow Velocity: 1.508m/s

Flow Depth: 186.2mm

Flow Depth: 98%

Maximum Flow Volume: 107.336L/s

Maximum Flow Velocity: 1.525m/s

Input

Invert Width (mm)

.01

Width at top (mm)

3900

Depth of Channel (mm)

190

Surface Type (Manning's n)

Concrete, trowel finished

Roughness (n)

0.013

Slope of Invert (%)

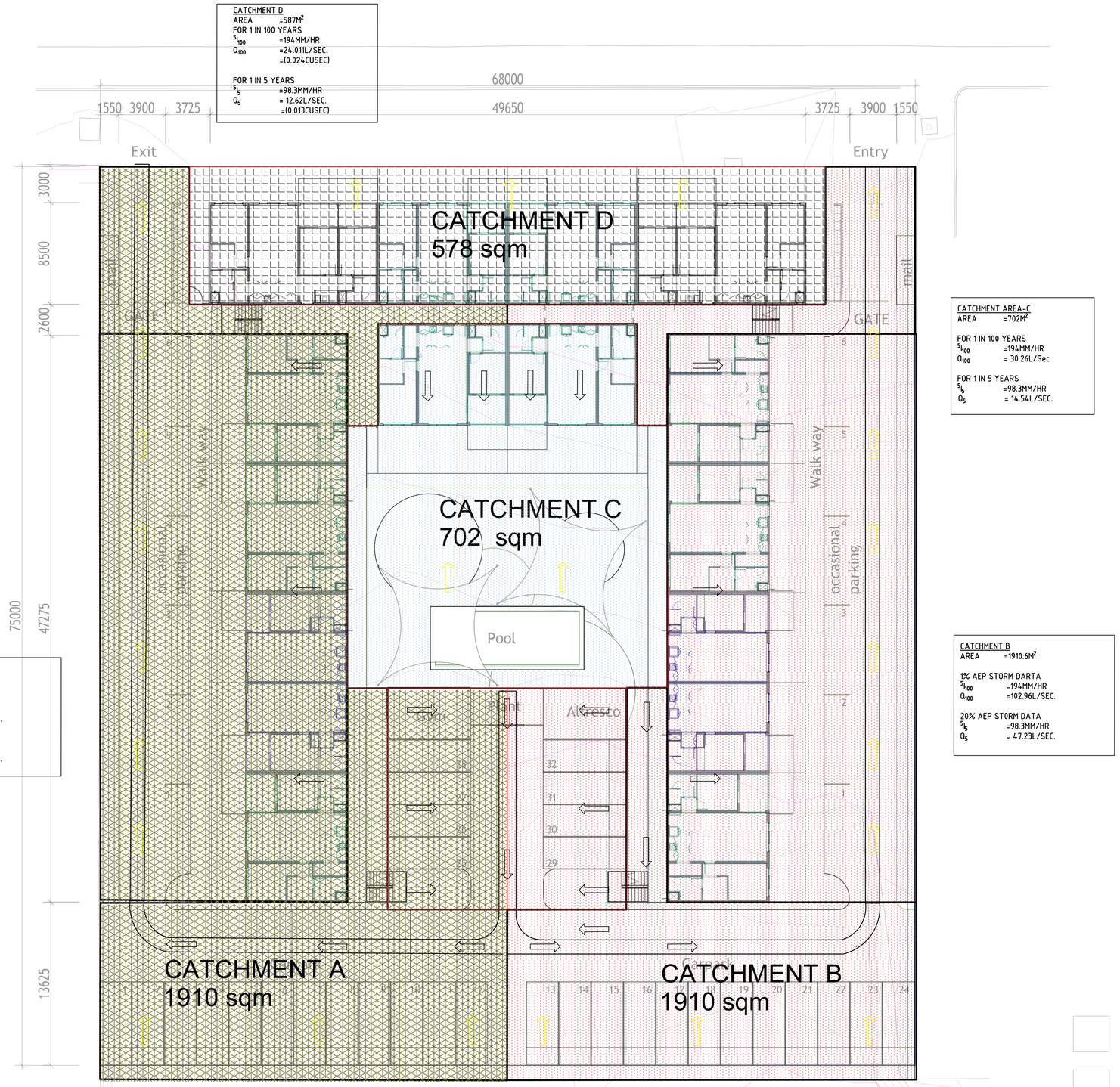
1.059

Design Flow Rate (L/s)

103

Submit

Chart 8 : Catchment B 1% flow



CATCHMENT AREA-C
AREA =702M²

FOR 1 IN 100 YEARS
$^5I_{100}$ =194MM/HR
Q_{100} = 30.26L/Sec

FOR 1 IN 5 YEARS
$^5I_5$ =98.3MM/HR
Q_5 = 14.54L/SEC.

CATCHMENT A
AREA =1910.6M²

1% AEP STORM DARTA
$^5I_{100}$ =194MM/HR
Q_{100} =102.96L/SEC.

20% AEP STORM DATA
$^5I_5$ =98.3MM/HR
Q_5 = 47.23L/SEC.

CATCHMENT B
AREA =1910.6M²

1% AEP STORM DARTA
$^5I_{100}$ =194MM/HR
Q_{100} =102.96L/SEC.

20% AEP STORM DATA
$^5I_5$ =98.3MM/HR
Q_5 = 47.23L/SEC.

WESTERN OFFSITE CATCHMENT
SITE AREA = 1,120m²
RUN-OFF CO-EFFICIENT = 0.65
1% AEP FOR 5 MINS =194mm/HR
PREDEVELOPMENT FLOW = 34.18L/SEC
=0.0342m³/sec

EASTERN OFFSITE CATCHMENT
SITE AREA = 1,644m²
RUN-OFF CO-EFFICIENT = 0.65
1% AEP FOR 5 MINS =194mm/HR
PREDEVELOPMENT FLOW = 50.2L/SEC
=0.0502m³/sec

1 P.01 SITE PLAN - CARCHMENT PLANS
SCALE 1:200

GENERAL NOTES:

THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STORMWATER MANAGEMENT REPORT RELATED TO THE SITE.

THE DESIGN INDICATED HAS BEEN PREPARED FOR PLANNING APPROVAL PURPOSES AND FURTHER DEVELOPMENT OF FINAL SITE LEVELS WILL BE REQUIRED PRIOR TO BUILDING PERMIT SUBMISSION.

DESIGN LEVELS HAVE BEEN BASED UPON EXISTING SITE CONTOURS AND LEVELS.

FLOWS AND DISCHARGE CHARACTERISTICS HAVE BEEN DEVELOPED BASED UPON CURRENT CITY OF KARRATHA DEVELOPMENT GUIDELINES AND CRITERIA.

DESIGN CERTIFICATION
ISSUED FOR APPROVAL PURPOSES

00	15.05.25	ISSUED FOR SUBMISSION TO SHIRE

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AHSCA THE ASSOCIATION OF HYDRAULIC SERVICES CONSULTANTS AUSTRALIA INCORPORATED

NORTH POINT

DESIGN CERTIFICATION
This drawing the referenced copy and issue as noted in the Technical Design Certification as issued in compliance with the Building Act 2011.
Refer to Design Certificate dated same for reference design standards
Subsequent revisions after the date of certification must be referenced by the installing contractor when submitting final certification.

Authorized Engineering Staff For PJ Wright& Assoc. Date

Project
KARRATHA APPARTMENTS
17 RIDLEY STREET
BULGARRA WA 6714

Drawing Title
HYDRAULIC SERVICES
STORMWTER CATCHMENT PLAN

Date MAY 2025
Scale 1:200 @ A1
Drawn TRS/JGT

Drawing Number P.01

Revision 00

400 X 225 RC BOX CULVERT EXTENDED CLEAR OF TRANSFORMER. TERMINATE BASE OF CHANNEL FLUSH WITH FOOTPATH. CUT AND SPLAY UPSTAND AND TRIM TO NEW GROUND LEVELS.

CATCHMENT A
AREA =1910.6M²

1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =102.96L/SEC.

20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} = 47.23L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS
WIDTH OF FLOW PATH =3.9M
DEPTH OF FLOW =190MM
SLOPE = 1.018%
VELOCITY = 1.495m/sec
Q MAXIMUM = 105.237L/SEC

CORE 150MM PVC STORM INLET TRHUGGH BOX CULVERT AND SEAL ON COMPLETION

1000 WIDE X 50MM DEEP GRAVEL LINED CHANNEL FROM FENCE TO FOOTPATH

1000 WIDE X 50MM DEEP GRAVEL LINED CHANNEL FROM FENCE TO FOOTPATH

1000 WIDE X 50MM DEEP GRAVEL LINED CHANNEL FROM FENCE TO FOOTPATH

400 X 225 RC BOX CULVERT EXTENDED CLEAR OF COMMUNICATIONS PIT. TERMINATE BASE OF CHANNEL FLUSH WITH FOOTPATH. CUT AND SPLAY UPSTAND AND TRIM TO NEW GROUND LEVELS.

CATCHMENT B
AREA =1910.6M²

1% AEP STORM DARTA
$^{5}I_{100}$ =194MM/HR
Q_{100} =102.96L/SEC.

20% AEP STORM DATA
$^{5}I_{5}$ =98.3MM/HR
Q_{5} = 47.23L/SEC.

Q_{100} DISCHARGE CHARACTIERSITICS
WIDTH OF FLOW PATH =3.9M
DEPTH OF FLOW =190MM
SLOPE = .059%
VELOCITY = 1.525m/sec
Q MAXIMUM = 107.4L/SEC

1200 WIDE X 120MM DEEP WITH 400 BPTTOM WITH GRAVEL LINED CHANNEL GRADED AT 1 %.

1500 WIDE X 1200MM DEEP MANHOLE WITH RAISED HD GALV'D GRATE. CONSTRUCT 500 WIDE X 100 MOTART BEDDED ROCK SPAL AROUND COVER

CATCHMENT AREA-C
AREA =702M²
1%AEP
$^{5}I_{100}$ =194MM/HR
Q_{100} = 30.26L/Sec
= 0.030m3/sec
20% AEP
$^{5}I_{5}$ =98.3MM/HR
Q_{5} = 14.54L/SEC.

SWALE DESIGN CHARACTERISTICS
INVERT WIDTH =400mm
TOP WIDTH = 200mm
DEPTH OF SWALE =120MM
SLOPE = .1%
VELOCITY = 0.69m/sec
Q MAXIMUM = 0.0404 m3/sec

WESTERN CULVERT:
SITE AREA = 1,120m²
RUN-OFF CO-EFFICIENT = 0.65
1% AEP FOR 5 MINS =194mm/HR
PREDEVELOPMENT FLOW = 34.18L/SEC
=0.0342m³/sec

PRECAST CONCRETE CULVERT
450mm x 250mm .
GRADIENT 2.0%
MAX CULVERT FLOW 0.248m³/sEC

EASTERN CULVERT
SITE AREA = 1,644m²
RUN-OFF CO-EFFICIENT = 0.65
1% AEP FOR 5 MINS =194mm/HR
PREDEVELOPMENT FLOW = 50.2L/SEC
=0.0502m³/sec

PRECAST CONCRETE CULVERT
450mm x 250mm .
GRADIENT 1.353%
MAX CULVERT FLOW 0.21m³/sec

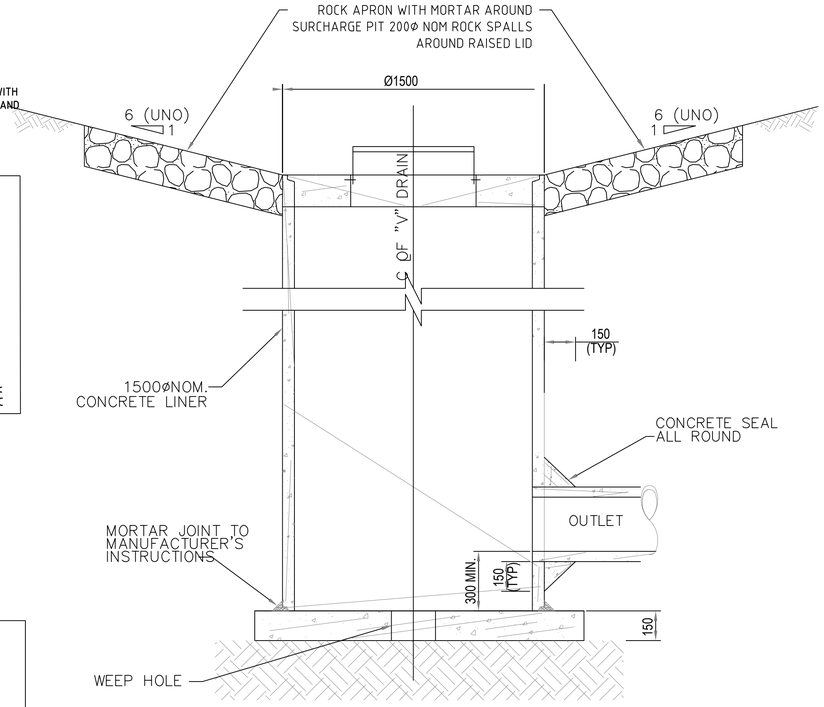
FORM SHALLOW BASIN OVER EXCAVATE AND INSTALL STONE PITCHING WITH OUTFALL TO 450 X 225 CULVERT.

1500 WIDE X 250MM DEEP GRAVEL LINED SWALE AT 2.778% QMAX 0.0343 VELOCITY 1.061m/sec

CUT EXISTING EMBANKMENT AND BATTER TO DAYLIGHT AT 1 IN 4

FORM SHALLOW BASIN OVER EXCAVATE AND INSTALL STONE PITCHING WITH OUTFALL TO 450 X 225 CULVERT.

1 P.02 SITE PLAN - 1% AEP FLOOD PLAN
SCALE 1:200



2 P.02 STORMWATER MANHOLE
NTS

GENERAL NOTES:

THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STORMWATER MANAGEMENT REPORT RELATED TO THE SITE.

THE DESIGN INDICATED HAS BEEN PREPARED FOR PLANNING APPROVAL PURPOSES AND FURTHER DEVELOPMENT OF FINAL SITE LEVELS WILL BE REQUIRED PRIOR TO BUILDING PERMIT SUBMISSION.

DESIGN LEVELS HAVE BEEN BASED UPON EXISTING SITE CONTOURS AND LEVELS.

FLOWS AND DISCHARGE CHARACTERISTICS HAVE BEEN DEVELOPED BASED UPON CURRENT CITY OF KARRATHA DEVELOPMENT GUIDELINES AND CRITERIA.

00	15.05.25	ISSUED FOR SUBMISSION TO SHIRE

DESIGN CERTIFICATION
ISSUED FOR APPROVAL PURPOSES

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AHSCA THE ASSOCIATION OF HYDRAULIC SERVICES CONSULTANTS AUSTRALIA INCORPORATED

NORTH POINT

DESIGN CERTIFICATION
This drawing the referenced copy and issue as noted in the Technical Design Certification as issued in compliance with the Building Act 2011.
Refer to Design Certificate dated same for reference design standards
Subsequent revisions after the date of certification must be referenced by the installing contractor when submitting final certification.

Authorized Engineering Staff For PJ Wright& Assoc. Date

Project
KARRATHA APPARTMENTS
17 RIDLEY STREET
BULGARRA WA 6714

Drawing Title
HYDRAULIC SERVICES
STORMWATER DRAINAGE PLAN

Date MAY 2025
Scale 1:200 @ A1
Drawn TRS/JGT

Drawing Number P.02

Revision 00