greenarrow
Engineering Consultants - Hydraulics - Fire - Civil

WATER MANAGEMENT REPORT

Project:

16-20 Carrington Road
Castle Hill NSW 2154

Prepared For:

Arada Development Management Pty Ltd

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Document History

Project: 16- 20 Carrington Rd, Castle Hill NSW 2154

Project Number: 224-2065

Revision	Author	File Name	Date	Issue	Approved
A	MG	SSDA Water Management Plan Rpt. 001	06.05.2026	Final	MG

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CONTENTS

1.0 EXECUTIVE SUMMARY

This Water Management Report has been prepared by Greenarrow Hydraulics Pty Ltd to accompany a detailed State Significant Development Application (SSDA) for the residential development containing 445 apartments at 16-20 Carrington Road, 2-12 Middleton Avenue ,4-6 Fishburn Crescent and 25-31 Sexton Avenue Castle Hill 2154.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (**SEARs**) issued for the project (SSD-90701958).

This report concludes that the proposed development is suitable and warrants approval subject to the implementation of the following mitigation measures.

- Compliance with Council's DCP 2012 – *Part B Section 2.12 Stormwater Management*
- Compliance with Councils DCP 2012 Appendix B- *Water Sensitive Urban Design*
- Compliance with the requirements of Basix
- Compliance with the requirements of the Water Quality Management report

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

2.0 INTRODUCTION

The proposed SSDA generally seeks approval for the redevelopment of 16- 20 Carrington Road, 2-12 Middleton Avenue 4-6 Fishburn Crescent and 25-31 Sexton Avenue Castle Hill.

The proposed development seeks approval for a multi-building, multi -story residential development comprising 445 residential apartments, with a minimum of 10% dedicated as affordable housing for a period of 10 years. The development also includes 2 levels below ground car park, a common podium, and dedicated to residential amenities. The site is located immediately adjacent to the new Metro Station, offering convenient access to public transport and nearby local services.

Purpose of this Report

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 25/10/2024 and issued for the SSDA (SSD-90701958).

3.0 THE SITE

The site is located at 16-20 Carrington Road within the Hills Shire LGA

The site is legally described as:

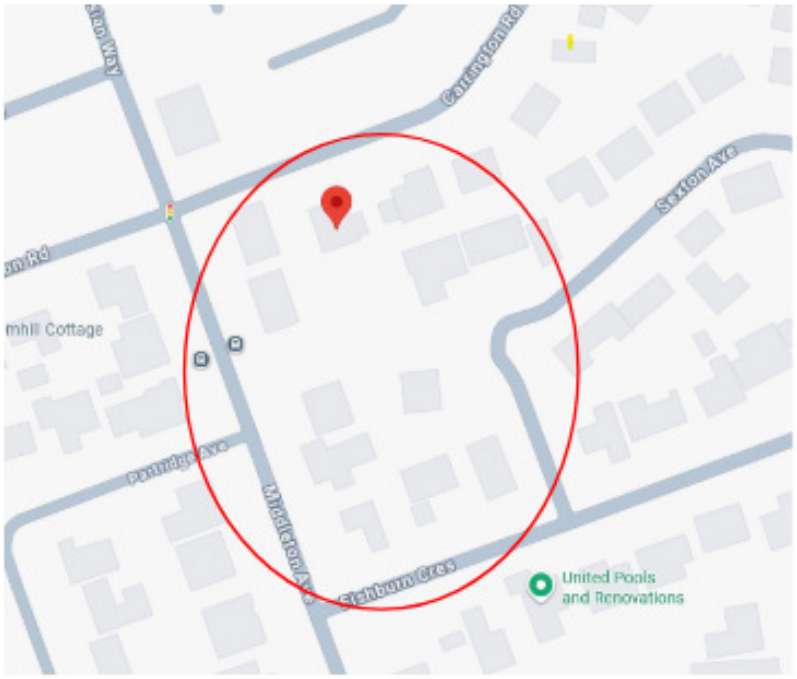
Lot 1 DP 253774, 16 Carrington Road; Lot 27 DP 247890, 18 Carrington Road; Lot 26 DP 247890, 20 Carrington Road; Lot 2 DP 1257535, 2 Middleton Avenue; Lot 24 DP 247890, 4 Middleton Avenue; Lot 23 DP 247890, 6 Middleton Avenue; Lot 22 DP247890, 8 Middleton Avenue; Lot 21 DP 247890, 10 Middleton Avenue; Lot 20 DP 247890, 12 Middleton Avenue; Lot 32 DP 247890, 4 Fishburn Crescent; Lot 31 DP 247890, 6 Fishburn Crescent; Lot 30 DP 247890, 31 Sexton Avenue; Lot 29 DP 247890, 29 Sexton Avenue; Lot 28 DP247890, 27 Sexton Avenue; Lot 2 DP253774, 25 Sexton Avenue within The Hills Shire.

The land size is 13 344m2 with a southern frontage to Carrington Road, Middleton Avenue, Fishburn Crescent and Sexton Avenue

The immediate urban context surrounding the site is characterised by a mix of commercial, retail and residential with Showground Metro train station opposite to the northwest.

The site is currently occupied with single dwelling housing typical of the Hills Shire LGA.
The site is approximately fifty percent impervious (50%) with the existing stormwater draining to a series of outlets along the site the kerb and gutters of the relevant street frontages.

Figure 1 – Local Context



Source: Google Maps

Figure 2 – The Site

Source: Google Maps

4.0 ASSESSMENT AND FINDINGS

4.1 Stormwater Drainage

Council instructed that the site shall be divided into two separate catchments, with each catchment area draining to sperate stormwater systems. One system draining to the Carrington Road trunk drainage system via the existing pit within the kerb at the corner of Middleton Avenue & Carrington Road and the other, to drain to the existing trunk drainage system within Partridge Avenue via an extension to a new pit on western side of Middelton Road.

Total site Catchment area = 13 334m3
Catchment Area A to Carrington Rd system = 7733m3 (58%)
Catchment Area B to Patridge Ave system = 5611 (42%)

Calculated Site Run-off

Site runoff is calculated using the Ration Method formula in accordance with Australian Rainfall and Runoff 2019, Council's policy and rainfall intensity data from the Bureau of Meteorology. Run-off is calculated for the 100yr Annual Exceedance Probability (AEP) for the existing site characteristics.

Rational Method Formula:

Existing Site Discharge (Current Conditions)

Q= A x C x I /3600
Where
Q = l/s
A = Site Area in M2
C = Coefficient (impervious area)
I = Rainfall Intensity mm/hr 100yr (tc5)
3600= Conversion to l/s

Total Site
Q = 13334 x 0.85 x 240 / 3600
Q= 755 L/S (existing site conditions)

Catchment Area A Catchment Area B
755 x 0.58 = 438 l/s 755 x 0.42 = 317l/s

Therefore, it is estimated that in a 100yr storm event rainfall run-off discharge from the site is approximately 755l/s This run-off is unabated and discharges directly to existing street gutter system.

On-Site Detention System Requirements

Council's DCP 2012 Part B requires all developments to be provided Onsite Detention (OSD).

OSD temporarily stores stormwater runoff on site and controls the rate of discharge to minimise impacts on the downstream drainage system.

The required Site Storage Requirement (SSR) must be calculated using the Upper Parramatta River Catchment

Trust Calculation sheet (Hawksbury River Catchment) . The Permissible Site Discharge (PSD) must be limited to the 5-year ARI storm event for the pre-developed (natural site conditions). This PSD limit applies to all storm events up to and including the 100-year ARI storm.

We have provided 3 OSD system across the site OSD1, OSD1a and OSD2

OSD Calculation Summaries.

Figure 3. OSD 1a Summary

HAWKESBURY RIVER CATCHMENT

COUNCIL O.S.D. CHECK SHEET

Site Address	= 16-20 Carrington Road, Castle Hill							
File No.	= OSD 1a						Drowned Condition	
Site Area	.....	=	0.3060	Ha	[A]		0.3060	Ha
Site Slope	.....	=	7	%	[A1]		7	%
Site Storage Volume	= See Chart	=	362	m3/Ha	[A2]		362	m3/Ha
Permissable Discharge	= See Chart	=	104	l/s/Ha	[A3]		104	l/s/Ha
Basic Storage Volume	= [A2] x [A]	=	110.8	m3	[B]		110.8	m3
Basic Discharge	= [A3] x [A]	=	31.8	l/s	[C]		31.8	l/s
Area of Site Drained to Storage	.....	=	0.3150	Ha	[D]		0.3150	Ha
% of Total Site	= [D] / [A] x 100	=	103	%	[E]		103	%
Storage Per Ha.	= [B] / [D]	=	351.7	m3/Ha	[F]		351.7	m3/Ha
Permissable Discharge	= {([F] / 69.21)^ (-1.368)} x 1000	=	108.2	l/s/Ha	[G]		108.2	l/s/Ha
P.S.D.	= [G] x [D]	=	34.1	l/s	[H]		34.1	l/s
Maximum Head to Orifice Centre	.....	=	0.880	m	[K]		1.610	m
Selected Orifice Dia.	= {(0.464x[H]/1000)^0.5/[K]^0.5}x1000	=	130	mm	[J]		130	mm
Maximum Discharge	= [H]	=	34.1	l/s	[L]		46.1	l/s
Head for High Early Discharge	.....	=	0.740	m	[M]		1.610	m
High Early Discharge	= {[L] x ([M]/[K])^0.5}	=	31.3	l/s	[N]		46.1	l/s
Approx. Ave. Discharge	= {([L] + [N]) / 2}	=	32.7	l/s	[P]		46.1	l/s
Ave. Discharge per Ha.	= [P] / [D]	=	103.8	l/s/Ha	[Q]		146.5	l/s/Ha
Storage Volume	= 69.21 x ([Q] / 1000)^-0.731	=	362.5	m3/Ha	[R]		281.8	m3/Ha
Site Storage Volume	= [R] x [D]	=	**114.2**	m3	[S]		**88.8**	m3

Figure 4. OSD 1B Summary

HAWKESBURY RIVER CATCHMENT

COUNCIL O.S.D. CHECK SHEET

Site Address	= 16-20 Carrington Road, Castle Hill							
File No.	= OSD 1b						Drowned Condition	
Site Area	.....	=	0.4583	Ha	[A]		0.4583	Ha
Site Slope	.....	=	7	%	[A1]		7	%
Site Storage Volume	= See Chart	=	362	m3/Ha	[A2]		362	m3/Ha
Permissable Discharge	= See Chart	=	104	l/s/Ha	[A3]		104	l/s/Ha
Basic Storage Volume	= [A2] x [A]	=	165.9	m3	[B]		165.9	m3
Basic Discharge	= [A3] x [A]	=	47.7	l/s	[C]		47.7	l/s
Area of Site Drained to Storage	.....	=	0.4583	Ha	[D]		0.4583	Ha
% of Total Site	= [D] / [A] x 100	=	100	%	[E]		100	%
Storage Per Ha.	= [B] / [D]	=	362.0	m3/Ha	[F]		362.0	m3/Ha
Permissable Discharge	= {([F] / 69.21)^ (-1.368)} x 1000	=	104.0	l/s/Ha	[G]		104.0	l/s/Ha
P.S.D.	= [G] x [D]	=	47.7	l/s	[H]		47.7	l/s
Maximum Head to Orifice Centre	.....	=	1.550	m	[K]		1.610	m
Selected Orifice Dia.	= {(0.464x[H]/1000)^0.5/[K]^0.5}x1000	=	133	mm	[J]		133	mm
Maximum Discharge	= [H]	=	47.7	l/s	[L]		48.6	l/s
Head for High Early Discharge	.....	=	1.450	m	[M]		1.510	m
High Early Discharge	= {[L] x ([M]/[K])^0.5}	=	46.1	l/s	[N]		47.1	l/s
Approx. Ave. Discharge	= {([L] + [N]) / 2}	=	46.9	l/s	[P]		47.8	l/s
Ave. Discharge per Ha.	= [P] / [D]	=	102.4	l/s/Ha	[Q]		104.4	l/s/Ha
Storage Volume	= 69.21 x ([Q] / 1000)^-0.731	=	366.2	m3/Ha	[R]		361.0	m3/Ha
Site Storage Volume	= [R] x [D]	=	**167.8**	m3	[S]		**165.4**	m3

Figure 5. OSD 2 Summary

HAWKESBURY RIVER CATCHMENT

COUNCIL O.S.D. CHECK SHEET

						Drowned Condition	
Site Address	= 16-20 Carrington Road, Castle Hill						
File No.	= OSD 2						
Site Area	.....	=	0.5611	Ha	[A]	0.5611	Ha
Site Slope	.....	=	7	%	[A1]	7	%
Site Storage Volume	= See Chart	=	362	m3/Ha	[A2]	362	m3/Ha
Permissable Discharge	= See Chart	=	104	l/s/Ha	[A3]	104	l/s/Ha
Basic Storage Volume	= [A2] x [A]	=	203.1	m3	[B]	203.1	m3
Basic Discharge	= [A3] x [A]	=	58.4	l/s	[C]	58.4	l/s
Area of Site Drained to Storage	.....	=	0.5611	Ha	[D]	0.5611	Ha
% of Total Site	= [D] / [A] x 100	=	100	%	[E]	100	%
Storage Per Ha.	= [B] / [D]	=	362.0	m3/Ha	[F]	362.0	m3/Ha
Permissable Discharge	= {([F] / 69.21)^ (-1.368)} x 1000	=	104.0	l/s/Ha	[G]	104.0	l/s/Ha
P.S.D.	= [G] x [D]	=	58.4	l/s	[H]	58.4	l/s
Maximum Head to Orifice Centre	.....	=	1.990	m	[K]	2.040	m
Selected Orifice Dia.	= {(0.464x[H]/1000)^0.5/[K]^0.5}x1000	=	139	mm	[J]	139	mm
Maximum Discharge	= [H]	=	58.4	l/s	[L]	59.1	l/s
Head for High Early Discharge	.....	=	1.890	m	[M]	1.940	m
High Early Discharge	= {[L] x ([M]/[K])^0.5}	=	56.9	l/s	[N]	57.7	l/s
Approx. Ave. Discharge	= {([L] + [N]) / 2}	=	57.7	l/s	[P]	58.4	l/s
Ave. Discharge per Ha.	= [P] / [D]	=	102.8	l/s/Ha	[Q]	104.1	l/s/Ha
Storage Volume	= 69.21 x ([Q] / 1000)^-0.731	=	365.2	m3/Ha	[R]	361.8	m3/Ha
Site Storage Volume	= [R] x [D]	=	**204.9**	m3	[S]	**203.0**	m3

Based on the calculations above the overall SSR and PSD are:

PSD = 140 l/s

SSR = 486 m3

Therefore, our calculations indicate there will be a reduction in site run-off of approximately 615 l/s for the 100year for the overall site.

4.2 Rainwater Harvesting and Water Conservation

Rainwater harvesting and water conservation is determined by the Building Sustainability Index (Basix) which is a mandatory NSW Government sustainability assessment tool (and associated certificate) for residential developments, including new homes, renovations, and apartments. It evaluates and sets minimum standards for energy efficiency, water conservation, and thermal comfort as part of the development application process.

The current Basix report Certificate No. 1812711M_04 prepared by Renyi Pty Ltd Dated April 28 2026, demonstrates a 41% reduction in water usage which exceeds the minimum requirement of 40%.

Figure 6. Basix Extract A

Project summary		
Project name	16-20 Carrington Road, Castle Hill_04	
Street address	16-20 CARRINGTON ROAD CASTLE HILL 2154	
Local Government Area	THE HILLS SHIRE	
Plan type and plan number	Deposited Plan 247890	
Lot no.	26	
Section no.	-	
No. of residential flat buildings	3	
Residential flat buildings: no. of dwellings	445	
Multi-dwelling housing: no. of dwellings	0	
No. of single dwelling houses	0	
Project score		
Water	✔ 41	Target 40
Thermal Performance	✔ Pass	Target Pass
Energy	✔ 65	Target 63
Materials	✔ -100	Target n/a

Water conservation is achieved by utilising rainwater catchment and harvesting, water efficient tapware and fixtures, and where possible, capture and reuse of fire systems test water.

Rainwater Catchment, Harvesting and Re-use
The current Basix report nominates 2500 m2 of roof area to be collected in a 2000Litre minimum rainwater tank with the harvested water servicing the following:

- 5458 M2 of Landscaping area
- 1 Car washing bay

Figure 7. Basix Extract B

Central systems	Size	Configuration	Connection (to allow for...)
Swimming pool (No. 1)	Volume: 110 kLs	Location: Other Pool shaded: no	-
Central water tank - rainwater or stormwater (No. 1)	20000	To collect run-off from at least: - 2500 square metres of roof area of buildings in the development - 0 square metres of impervious area in the development - 0 square metres of garden/lawn area in the development - 0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 5458 square metres of common landscaped area on the site - car washing in 1 car washing bays on the site
Fire sprinkler system (No. 4)	-	So that fire sprinkler test water is contained within the fire sprinkler system for re-use, rather than disposed.	-

Tapware and Fixtures

The current Basix report nominates the following tapware and fixtures for the project.

Figure 8. Basix Extract C

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	4 star (> 6 but <= 7.5 L/min)	4 star	5 star	6 star	-	not specified	4 star	-	-	-	-	-	-	-

Fire Test Water Reclamation and Re-use

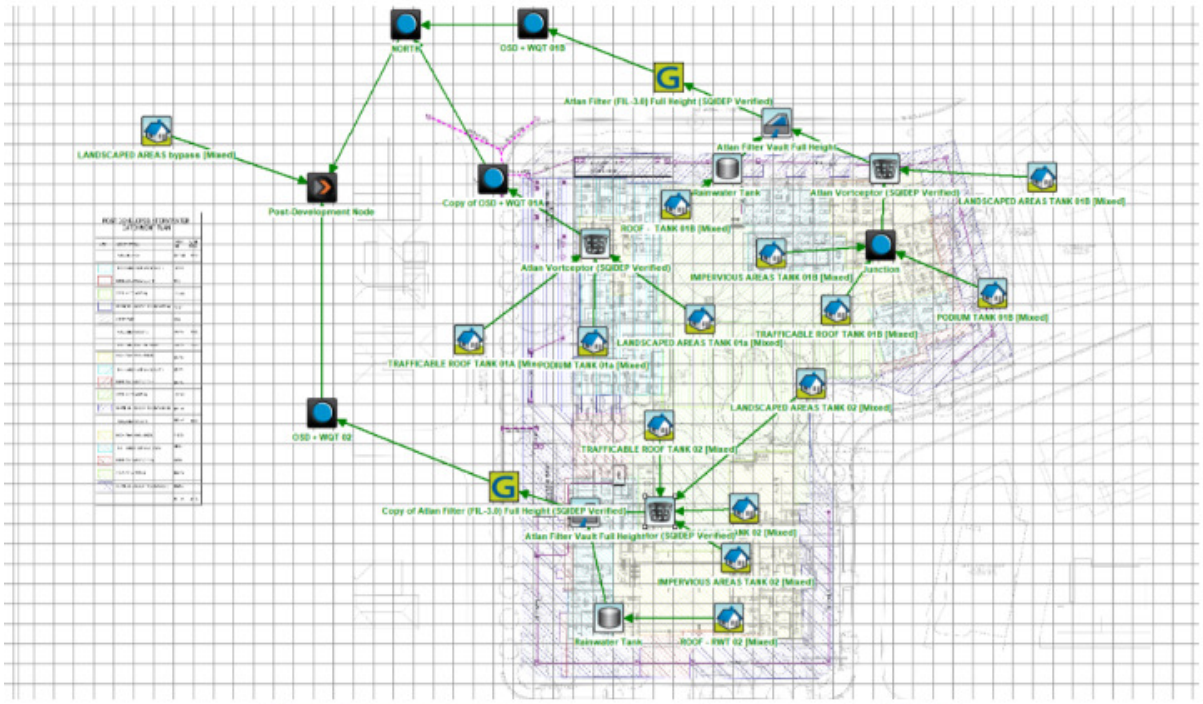
The building is protected by a combined fire sprinkler and hydrant system. The primary water supply will be provided via a 140m3 onsite fire tank with secondary supply being from the existing 150mm CICL water main located in Middleton Avenue. The Fire water supply arrangement is in accordance with current and relevant Australian Standards and NCC 2022. Fire test water will be supplied from the fire tank and circulated back to the tank in a close-looped system in accordance with the Basix certificate and industry best practice. (refer to Figure 4)

4.3 Water Quality Treatment

A water quality treatment model (MUSIC) was prepared in order to determine the reduction in flow, total suspended solids, total phosphorus, total nitrogen and gross pollutants as a result of the proposed treatment train provided for the project.

The results of the model are highlighted in the figure below.

Figure 9 MUSIC Model Summary



Treatment Train Effectiveness - Post-Development Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.81	6.35	6.8
Total Suspended Solids (kg/yr)	812	87.4	89.2
Total Phosphorus (kg/yr)	1.63	0.304	81.3
Total Nitrogen (kg/yr)	14.4	6.13	57.6
Gross Pollutants (kg/yr)	172	0.796	99.5

5.0 CONCLUSION

The proposed development complies with the requirements set forth by the relevant authorities having jurisdiction over the project including the Basix Certificate and Water Quality Modelling Results.

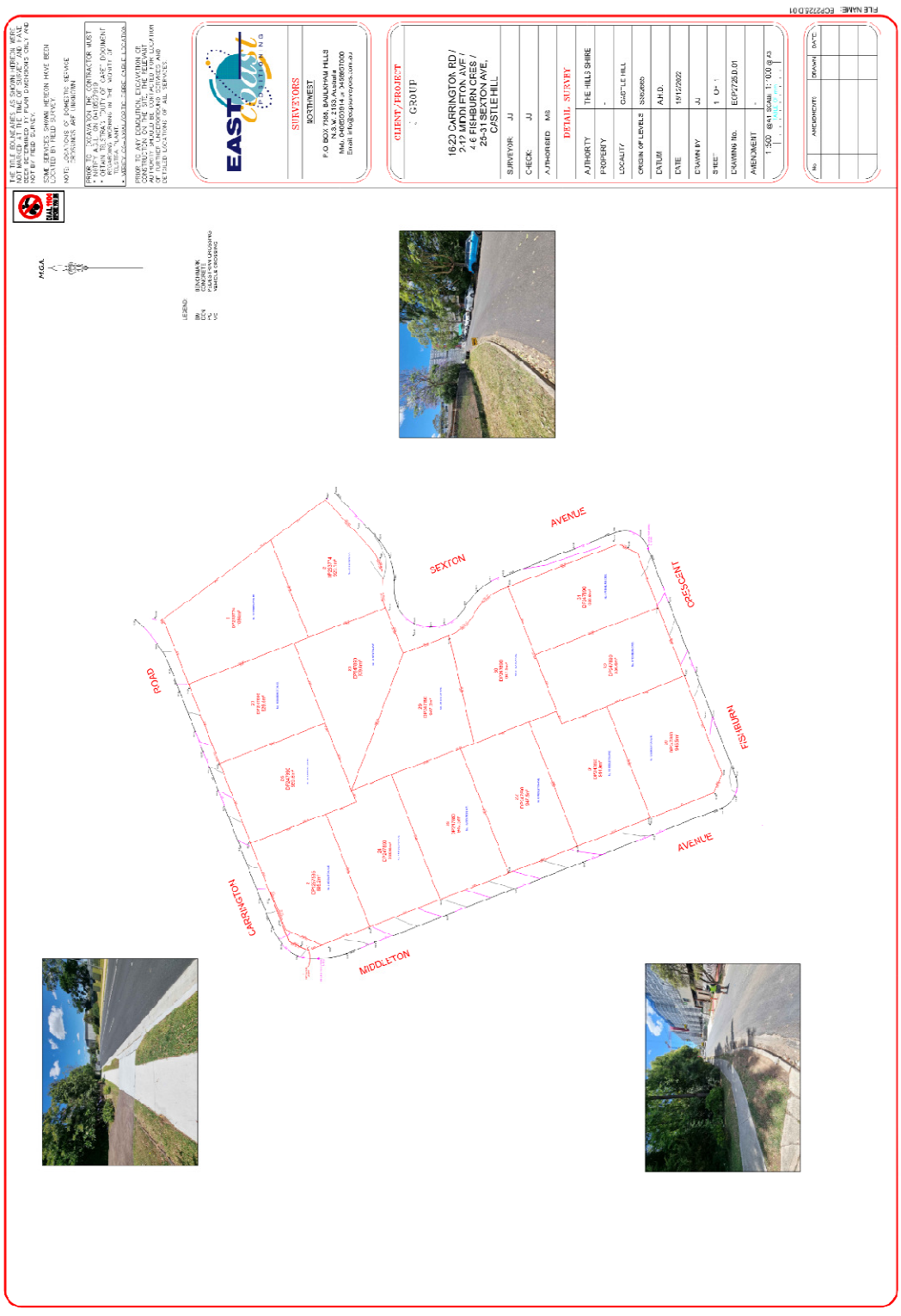
Complying with Council DCP reduce the site's stormwater discharge rate, thereby lessening the load on Council's existing stormwater infrastructure.

The measures outlined in the BASIX Certificate aim to reduce water consumption by specifying low-water-usage tapware and fixtures, harvesting rainwater for reuse in irrigation, and recirculating fire test water from the fire tank.

Additionally, following the requirements outlined within Water Quality Modelling report will reduce contaminants in the receiving water ways.

With the implementation of the proposed mitigation measures, the remaining impacts associated with the development are appropriate and acceptable.

APPENDIX I – EXISTING SITE SURVEY



APPENDIX II – BEURAU OF METROLOGY IFD TABLE

Australian Government
Bureau of Meteorology

Location

Label: Not provided

Latitude: -33.7282 [Nearest grid cell: 33.7375 (S)]

Longitude: 150.989 [Nearest grid cell: 150.9875 (E)]

IFD Design Rainfall Intensity (mm/h)

Issued: 23 July 2024

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

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	130	146	197	233	269	317	355
2 min	105	117	155	182	210	249	282
3 min	97.9	109	145	171	197	234	264
4 min	92.7	104	139	163	188	223	251
5 min	88.2	98.7	133	157	181	214	240
10 min	70.3	79.2	108	127	147	173	193
15 min	58.5	65.9	89.6	106	122	144	160
20 min	50.2	56.6	76.8	90.8	105	123	137
25 min	44.2	49.7	67.3	79.6	91.7	108	121
30 min	39.5	44.4	60.1	71.0	81.8	96.4	108
45 min	30.5	34.2	46.0	54.3	62.7	74.0	83.0
1 hour	25.2	28.2	37.9	44.7	51.5	61.0	68.6
1.5 hour	19.2	21.4	28.7	33.9	39.2	46.6	52.5
2 hour	15.9	17.7	23.7	28.0	32.4	38.6	43.7
3 hour	12.2	13.6	18.3	21.7	25.2	30.1	34.2
4.5 hour	9.51	10.6	14.3	17.1	19.9	24.0	27.3
6 hour	8.01	8.97	12.2	14.6	17.1	20.6	23.5
9 hour	6.34	7.14	9.83	11.8	14.0	16.9	19.3
12 hour	5.39	6.10	8.49	10.3	12.2	14.7	16.8
18 hour	4.28	4.88	6.91	8.44	10.1	12.2	13.9
24 hour	3.62	4.15	5.95	7.31	8.75	10.6	12.0
30 hour	3.17	3.65	5.27	6.50	7.80	9.42	10.7
36 hour	2.83	3.26	4.75	5.87	7.07	8.52	9.67
48 hour	2.34	2.72	3.99	4.95	5.97	7.18	8.12
72 hour	1.76	2.05	3.03	3.77	4.55	5.44	6.12
96 hour	1.42	1.65	2.43	3.03	3.65	4.34	4.87
120 hour	1.19	1.38	2.03	2.51	3.03	3.59	4.00

APPENDIX III - BASIX CERTIFICATE (Pages 1 & 2 only)

BASIX™ Certificate

Building Sustainability Index
www.planningportal.nsw.gov.au/development-and-assessment/basix

Multi Dwelling

Certificate number: 1812711M_04

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 10/09/2020 published by the Department. This document is available at www.planningportal.nsw.gov.au/definitions

Secretary
Date of issue: Tuesday, 28 April 2026
To be valid, this certificate must be submitted with a development application or lodged with a complying development certificate application within 3 months of the date of issue.

When submitting this BASIX certificate with a development application or complying development certificate application, it must be accompanied by NatHERS certificate 0012935220.

Project summary		
Project name	16-20 Carrington Road, Castle Hill_04	
Street address	16-20 CARRINGTON ROAD CASTLE HILL 2154	
Local Government Area	THE HILLS SHIRE	
Plan type and plan number	Deposited Plan 247890	
Lot no.	26	
Section no.	-	
No. of residential flat buildings	3	
Residential flat buildings: no. of dwellings	445	
Multi-dwelling housing: no. of dwellings	0	
No. of single dwelling houses	0	
Project score		
Water	✔ 41	Target 40
Thermal Performance	✔ Pass	Target Pass
Energy	✔ 65	Target 63
Materials	✔ -100	Target n/a

Certificate Prepared by
Name / Company Name: RENYI PTY LTD
ABN (if applicable): 81603204299

Description of project

Project address	
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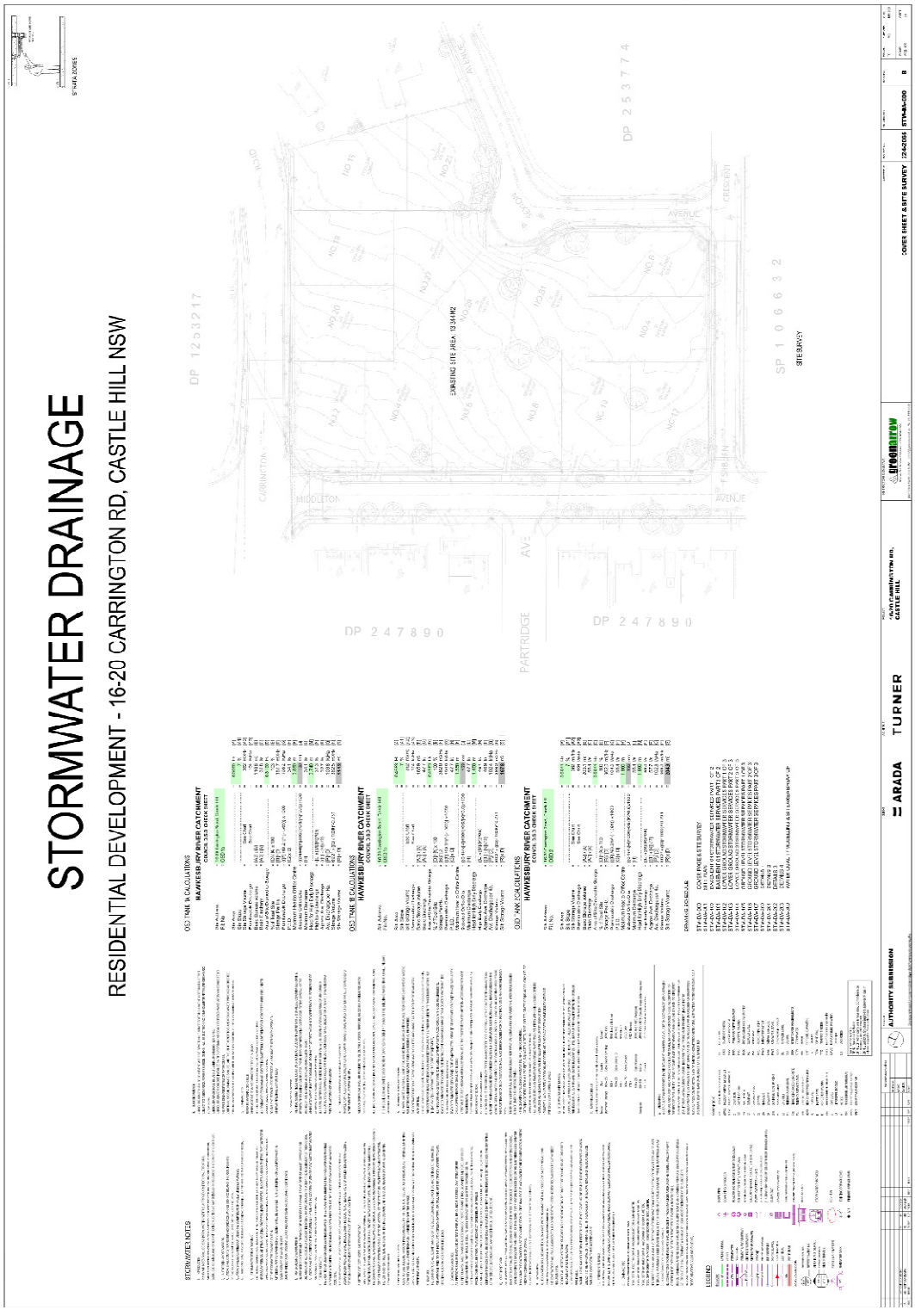
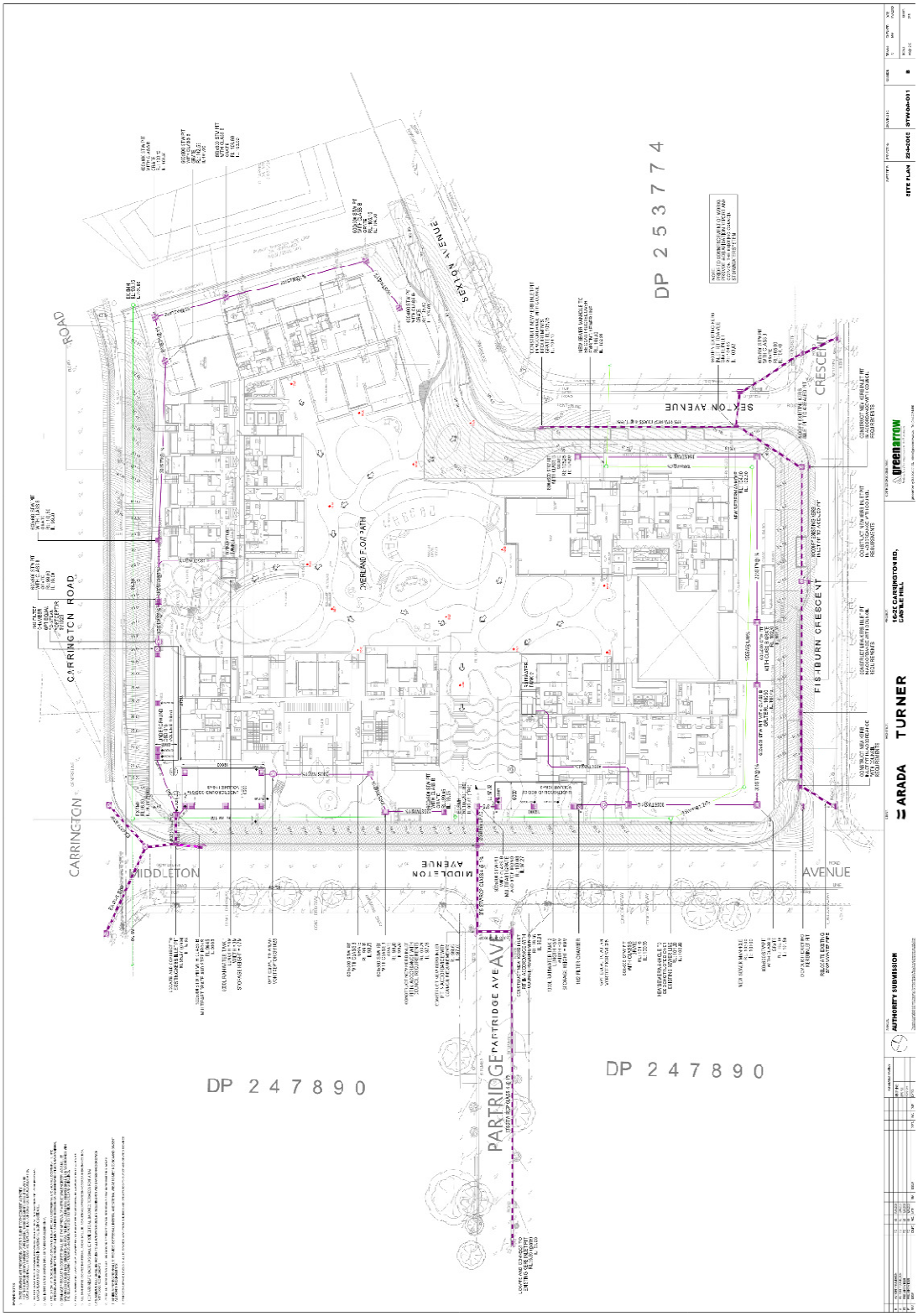
Project type	
No. of residential flat buildings	3
Residential flat buildings: no. of dwellings	445
Multi-dwelling housing: no. of dwellings	0
No. of single dwelling houses	0
Site details	
Site area (m²)	13344.26
Roof area (m²)	5820.64
Non-residential floor area (m²)	-
Residential car spaces	674
Non-residential car spaces	-

Common area landscape	
Common area lawn (m²)	1637
Common area garden (m²)	3821
Area of indigenous or low water use species (m²)	0
Assessor details and thermal loads	
Assessor number	DMN/18/1837
Certificate number	0012935220
Climate zone	56

Project score		
Water	✔ 41	Target 40
Thermal Performance	✔ Pass	Target Pass
Energy	✔ 65	Target 63
Materials	✔ -100	Target n/a

APPENDIX IV - STORMWATER DRAWINGS




DP 253774
DP 247890
DP 247890
CARRINGTON ROAD
CARRINGTON ROAD
SEKYON AVENUE
SEKYON AVENUE
FISHBURN CRESCENT
FISHBURN CRESCENT
MIDDLETON AVENUE
MIDDLETON AVENUE
PARTRIDGE AVE
OVERLAND FLOW PATH
ARADA
TURNER
SITE PLAN
AUTHORITY SUBMISSION