SITE BASED STORMWATER MANAGEMENT PLAN

FOR THE PROPOSED
CARSELDINE VILLAGE HEART LOTS 5001 & 9001

LOCATED AT
520 BEAMS ROAD, CARSELDINE QLD 4034

PREPARED FOR
DELUCA CORPORATION PTY LTD

BORNHORST
+WARD

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Bornhorst and Ward Project No: **23019**

If you have any queries regarding this proposal, then please contact: **Michael Kendall**

Revision	Date	Description	Author	Rev.	App.
A	10/Nov/2023	DRAFT REPORT	MK	RG	
B	13/Dec/2023	For Approval	MK	RG	RG
C	14/Dec/2023	For Approval	MK	RG	RG
D	8/Mar/2024	Further Issues Response	MK	RG	RG

RPEQ: 07048 Robert Gray

File Name: J:\2023\23019\07_REPORTS\DESIGNREPORTS\SWMP\RPT_SWMP.docx

BORNHORST +WARD

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1. INTRODUCTION

Bornhorst and Ward has been commissioned to develop a stormwater management plan for the proposed retail development located within 520 Beams Road, Carseldine, QLD 4034 (Lot 7003 on plan SP331690). In particular, it is on lots 5001 and 9001 of the Stage V subdivision of the Carseldine Village. The proposal consists of constructing retail, carpark and pedestrian plaza components. Plans of the proposed development layout can be seen in Appendix A.

This document reports on the existing and proposed civil works and infrastructure required as part of the proposed development. The engineering requirements for this proposal shall be in accordance with Engineering Best Management Practices and the State Planning Policy (2017). This development falls under the Carseldine Village PDA within the Brisbane City Council area.

This report outlines the preliminary design methodology in support of a Development Application and should be read in conjunction with other documents issued by the consultant team.

2. SITE CHARACTERISTICS

2.1 LOCATION AND EXISTING FEATURES

The development site, located at 520 Beams Road, Carseldine is currently undergoing a subdivision. The following site characteristics we expect upon the completion of the subdivision are:

- The site is bound by Beams Road to the north, Plaza Place to the east and Meander Street to the west, and a private lot to the south;
- The development site is comprised of scattered grassland;
- The total area of the site is approximately 1.342 ha consisting of 1.224 ha for lot 5001 and 0.118 ha for lot 9001;
- The site is only accessible from Meander Street.
- All easements through the site are expected to be removed as part of the subdivision works.
- There is also an Energex easement just outside the northwest corner of lot 5001 which is not shown on Queensland Globe. The development area of lot 5001 was reduced as a result.
- Cabbage Tree Creek is about 400m south of the site.

Figure 1: Site Locality Plan

2.2 PROPOSED DEVELOPMENT

The following points outline the extent of works for the proposed development:

- A retail development comprising of single and two storey shops, a carpark and a pedestrian plaza.
- The site will only be accessible to vehicles from Meander Street. Pedestrians will be able to access the site from Plaza Place.

Refer to the development drawings in Appendix A for further details of the proposed development.

2.3 TOPOGRAPHY AND CATCHMENT CHARACTERISTICS

The expected topography and catchment characteristics at the conclusion of the subdivision works are as follows:

- The high point of the existing site is RL 18.5m AHD located on the western edge of the site;
- The development falls from the high point at an approximate grade of 2.5% to a low point of RL 15.0m AHD in the eastern edge of the site;

- During minor events and major storm events, runoff from the site discharges as overland flow over the northern edge of the development site to Beams Road;
- The site is not expected to have any external catchments after completion of external roadworks.

See the survey plan in Appendix C for more information.

2.4 EXISTING FLOODING CONDITIONS AND FREEBOARD REQUIREMENTS

Information obtained from the Brisbane City Councils Floodwise Property Report for the site indicates that the current site is subject to flooding from Cabbage Tree Creek. Characteristics of the flooding are as follows:

- Likely flooding during 1% and 2% AEP events
- The flooding occurs on the eastern portion of the site.
- The 1% AEP flood level is 14.7m.
- The centre of lot 5001 has a risk of overland flow due to an existing depression in the land.
- The site has low risk of coastal storm tide.

Please refer to the Brisbane City Council's Floodwise Property Report in Appendix C and the Flood Overlay Map in Figure 2 below for more details.

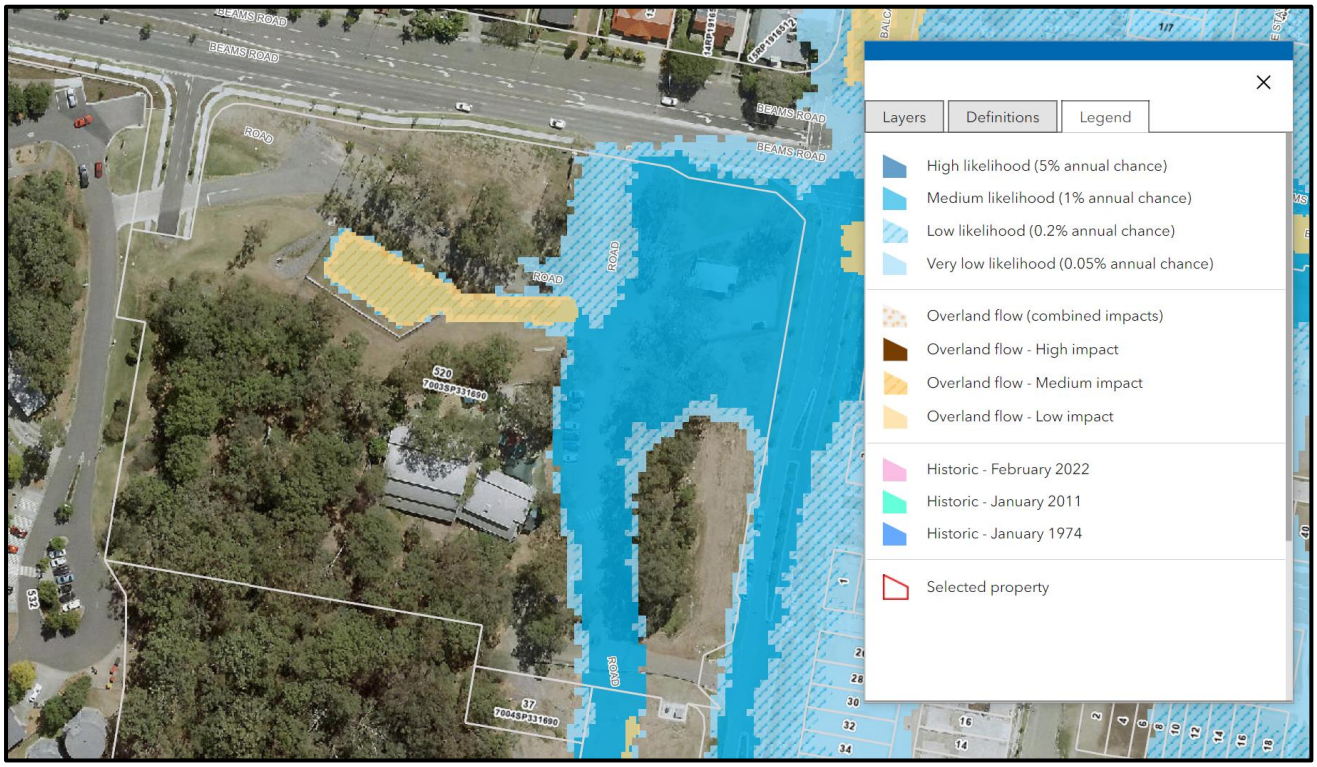


Figure 2: Brisbane City Council Interactive Flood Map

Design levels for the building must comply with the flood immunity standards specified by Brisbane City Council's City Plan (2014). The development will be assessed against the flood levels determined from our investigations. In accordance with the Brisbane City Council City Plan (2014), the minimum flood freeboard requirements would therefore be in order of:

Table 1: Flood Freeboard Requirements

Development Area	Council Flood Freeboard Requirements (AHD)	Council Required Development Level (AHD)	Development Level (m AHD)
Building Floor level (Shopping Centre)	Category C	1% AEP flood level	14.7
Building Floor level (Medical Care Facilities)	Category C	1% AEP flood level	14.7

Table 8.2.11.3.C, Table 8.2.11.3.D and Table 8.2.11.3.L of the Brisbane City Council's Flood Overlay Code were used to determine recommended development levels. The flood immunity levels have been based on a BCA building classification of "1-4" and "5, 6 or 8" within Table 8.2.11.3D. Flood planning level categories associated with this building classification have been deemed as A & C.

Table 1 above states the relevant flood immunity levels for the site. The site can reduce the likelihood of flooding by filling the site to at least the recommended development level. It should be noted that the site we receive after the subdivision is expected to have the lowest elevation of 15.0m AHD. As part of the works for the site we receive, the overland flow will be intercepted by the new Meander Street and directed down the roadway to Plaza Place. As a consequence, we expect a low risk of inundation.

3. EXISTING AND PROPOSED CIVIL WORKS AND INFRASTRUCTURE

3.1 STORMWATER

3.1.1 Expected Infrastructure

The expected stormwater infrastructure based on the civil design drawings from KN group for the subdivision indicate the following infrastructure:

- A stormwater manhole and a field inlet is near the eastern boundary of lot 5001 of the development pit.
- An existing 900mm stormwater pipe connects the manhole to the field inlet which subsequently discharges to the stormwater main in Plaza Place.
- The legal point of discharge for lot 5001 is the existing manhole.
- A 1200mm stormwater pipe enlarging to 1350mm is located under Meander Street.
- A field inlet on the western boundary of lot 9001 is connected to the stormwater main under Meander Street. This is legal point of discharge for lot 9001.
- The stormwater infrastructure has been built for a fully developed catchment.
- Existing overland flow is to be intercepted by the new Meander Street and directed down the roadway to Plaza Place.

KN group infrastructure can be found in Appendix C of this report.

3.1.2 Proposed Infrastructure

The following points outline the proposed stormwater infrastructure for the development site:

- For minor events, the runoff will be collected by gullies within the carpark. The gullies are connected via an internal stormwater network that discharges to the legal point of discharge along the eastern boundary.
- Roofwater from 5001 will be collected a discharged to the internal stormwater piped network in the carpark
- Surface runoff for 9001 will be directed towards Meander Street. For minor events, the runoff will be collected by gullies within the plaza.
- Major events for 5001 will be discharge as overland flow onto Beams Road;
- Major events for lot 9001 will discharge as overland flow onto Meander Street.
- As the site is part of Carseldine Village which is directing adjacent to Cabbage Tree Creek, no stormwater detention is expected to be required as its located within the lower third of the catchment.
- Considering the development works area is greater than 2500m^2 for 5001 and 9001, stormwater quality treatment measures would generally be required for the site. However, as lot 5001 is part of Carseldine Village Heart masterplan, a GPT is the only on-site treatment required.

Refer to the Engineering drawings located in Appendix B.

4. STORMWATER QUANTITY ANALYSIS

The masterplan for Carseldine Village Heart was designed so that Stage 5 would contain commercial/residential lots comprising of 90% impervious area including surrounding verges. The proposed development of Lot 5001 and 9001 contains

just enough landscaping to have 90.7% impervious area. This does not consider the adjacent verge which is counted as part of the 90%. Consequently, if the adjacent verge and road to the development site is included, the impervious area falls below 90%.

As such the development falls meets the design criteria of the masterplan. Consequently, this development does not increase the run-off compared to the expected run-off, and thus no stormwater detention is expected to be required.

Refer Appendix C for the stormwater management plan relating to the entire Carseldine Village Heart precinct.

5. STORMWATER QUALITY

5.1 CONSTRUCTION PHASE

The development works are considered medium risk with respect to the contaminants generated during the construction phase. A comprehensive Erosion and Sediment control plan including the construction process will be prepared during the detailed design. This is to be kept on site during the construction phase and will be in accordance with the State Planning Policy (2017) and Brisbane City Plan (2014).

Refer to the Erosion Hazard Assessment form in Appendix F for further information.

5.2 OPERATIONAL PHASE

The following extract from the document describes when a development is considered high risk, under Table 9.4.9.3.A of the Brisbane City Plan (2014):

a) A material change of use for an urban purpose which involves greater than 2500m^2 of land that:
  i. Will result in an impervious area greater than 25% of the net developable area, or
  ii. Will result in 6 or more dwellings.
b) Reconfiguring a lot for urban purposes that involves greater than 2500m^2 of land and will result in 6 or more lots;
c) Operational works for an urban purpose which involves disturbing greater than 2500m^2 of land.

On this basis, lot 5001 requires a stormwater quality treatment.

5.2.1 Pollutants of Concern

The key pollutants to be targeted and the minimum reductions in mean annual loads described in the State Planning Policy for the South-East Queensland Region area outlined in Table 2.

Table 2: South-East Queensland Water Quality Objectives

Pollutant	Reduction in Mean Annual Load
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

5.2.2 Modelling/Assessment Approach

A quantitative assessment of stormwater runoff quality was considered for the catchments ultimate developed scenario.

The predicted reductions in mean annual loads of key pollutants have been identified using the "Model for Urban Stormwater Improvement Conceptualisation" (MUSIC), Version 6 (6.3.0). MUSIC is a stormwater quality modelling program that provides estimates of stormwater pollution generation and the performance of stormwater management measures used in series or parallel to form a 'treatment train'.

However, it should be noted that a Stormwater Management Plan was included as part of the masterplan works for the whole Carseldine Village Precinct. As part of the 'Carseldine Urban Village – Updated Stormwater Management Plan' Version 04, the Bioretention B2 treats the stormwater from the Stage V precinct. As a consequence, the removal rates of target pollutants is already satisfies for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). The only remaining target pollutant removal rate to be satisfied is Gross Pollutants (GP).

5.2.3 Meteorological Data

The first step in creating the MUSIC model was to select the appropriate meteorological data set (period and time step) to be used as the basis for the runoff algorithms. Section 3.1 – Meteorological Data and Section 3.2 – Modelling Period and time-step, of the MUSIC Modelling Guidelines details the Rainfall Data and Time Step process requirements of the model, respectively.

The time step used for the MUSIC modelling process was: Brisbane Aero 6 Minutes.

5.2.4 Source Nodes

The second step taken in creating the MUSIC models was to define 'Source Nodes' or Sub-Catchments. Source nodes for modelling these catchments were based on the Water by Design reference material: Music Modelling Guidelines. The MUSIC model uses the split catchment approach and consists of residential source nodes. Catchment areas are outlined below with catchment extents illustrated in Appendix B.

Table 3: Source Node Information

Node type	Catchment	Area (ha)	Fraction Impervious
Commercial Ground	C1	0.195	88%
	C2	0.021	68%
Commercial Roof	C1	0.120	100%

5.2.5 Treatment Methodology

As part of the Carseldine Village masterplan, a bioretention basin was allocated to treat the stormwater from this precinct. As such only the gross pollutant reduction target needs to be met prior to the stormwater discharging off site.

The treatment of catchment C1 is via piped flow to a GPT. Catchment C2 will be treated via a GPT.

5.2.6 Treatment Nodes

The MUSIC model consisted of one treatment node for catchment C1 and one for catchment C2 as detailed in Table 4. Treatment node input parameters were based on the MUSIC modelling guidelines from WaterByDesign and MUSIC nodes sourced from Atlan (formerly SPEL).

Table 4: Selected Stormwater Quality Treatment Devices

Treatment Device	Discussion
Gross Pollutant Traps **Ecoceptor** **Atlan**	A gross pollutant trap is a treatment device designed to capture coarse sediment, trash and vegetation matter in stormwater runoff. This is to treat the runoff from catchment C1. The Ecoceptor is to be located in the carpark so it is accessible for maintenance. The discharge from Ecoceptor will discharge to the legal point of discharge.
Gross Pollutant Traps **Stormsack** **Atlan**	A gross pollutant trap is a treatment device designed to capture coarse sediment, trash and vegetation matter in stormwater runoff. The Stormsack is located before the Legal Point of Discharge for Lot 9001.

5.2.7 Proposed Treatment Train

A 'Treatment Train' was developed to target each of the pollutants of concern to be incorporated into the development site layout. This treatment train is illustrated in Figure 3.

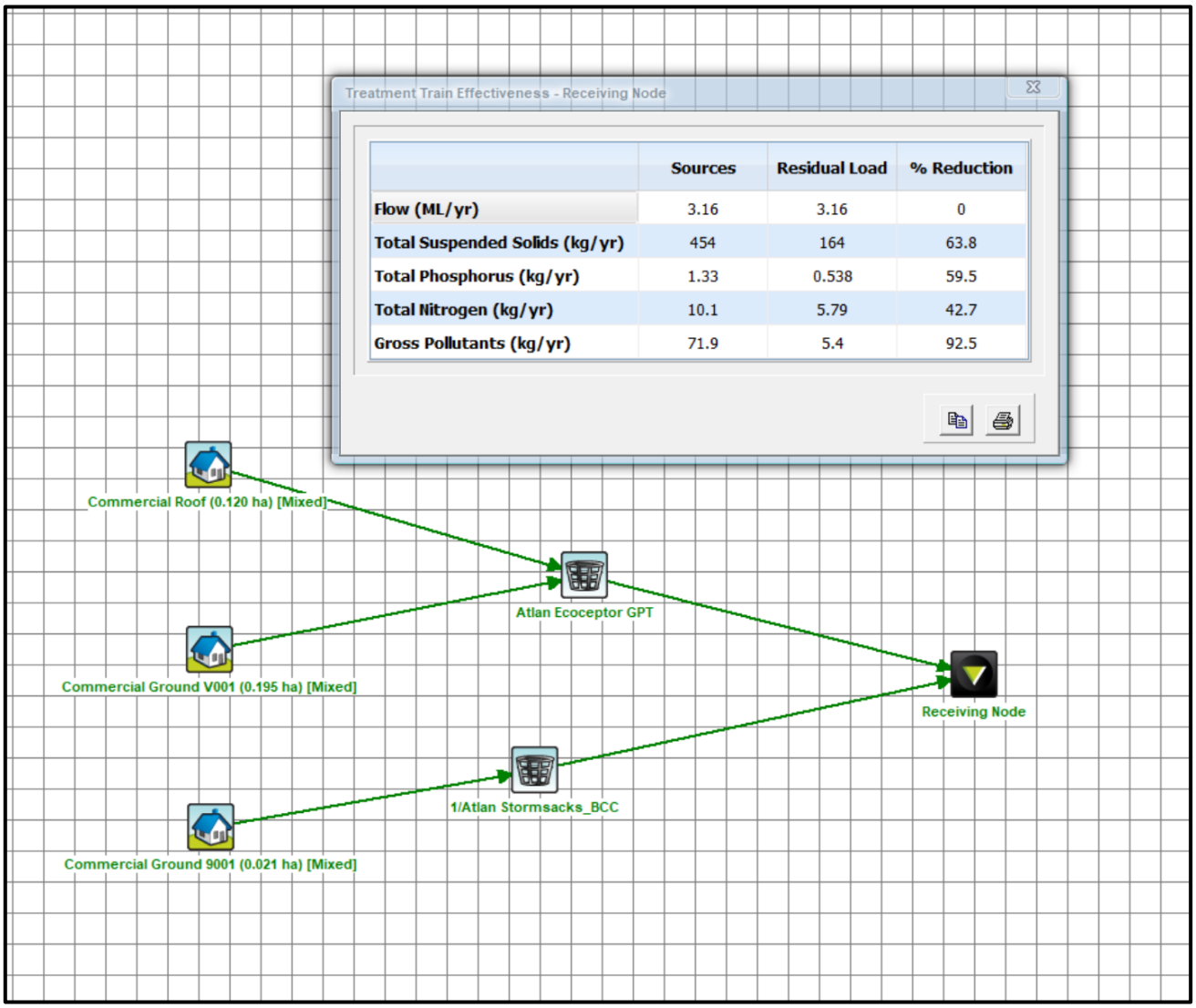


Figure 3: Proposed Treatment Train

5.2.8 RESULTS

The pollutant reductions for the ultimate developed phase of the site, with the inclusion of the detailed treatment train, as obtained from the MUSIC model and analysis are summarised in Table 5.

Table 5: Pollutant Removal Rates Discharge

Pollutant	TSS (%)	TP (%)	TN (%)	GP (%)
Treatment Train Effectiveness	N/A	N/A	N/A	92.5
WQOs	80.0	60.0	45.0	90.0

As indicated in the table above, the removal rates for the gross pollutants (GP) is above the water quality objectives stipulated in the *Urban stormwater – Queensland best practice environmental management guidelines 2009*. The other removal rates for total suspended solids, total phosphorus and total nitrogen were already satisfied by the masterplan Carseldine Village stormwater management plan. Therefore, the proposed treatment train for these areas will yield satisfactory pollutant removal.

6. BRISBANE CITY COUNCIL CODES

The relevant Brisbane City Council Codes with respect to engineering aspects for assessment of the Development Application have been addressed. The codes will assist in assessing operational works requirements. The codes addressed in this report include:

- Flood overlay code
- Stormwater code

The completed codes can be found attached in Appendix D of this Report.

7. SUMMARY

This Engineering Report has demonstrated that the proposed development located at 520 Beams Road, can be developed in accordance with Engineering Best Management Practice, Brisbane City Council guidelines, QUDM (2017) and the State Planning Policy (2017). The following points summarise the findings and recommendations:

- The site is contained within the Carseldine Village PDA masterplan and the development is generally in accordance with the masterplan. As a result, no major upgrades or amendments are required to service the project.
- Minor stormwater flows are directed via a piped network to the legal point of discharge. Major stormwater flow from 5001 and 9001 discharges to Beams Road and Meander Street respectively.
- There will be an increase in peak stormwater runoff because of the development, however the development is located within the lower third of the cabbage tree creek catchment. Detention is unlikely due to potential adverse effects.
- Stormwater runoff from lots 5001 and 9001 is to be treated via a GPT to meet the gross pollutant reduction target. The remaining reduction targets are met via the bioretention basin B2 that services the entire precinct.

APPENDIX A

DEVELOPMENT DRAWINGS

BEAMS ROAD

MEANDER STREET

PLAZA PLACE

DRIVEWAY MOVED NORTH >

204 CARPARKS

EV

EV

EV

EV

SUB STATION

SCREENING TO SUBSTATION

6000

5000

4090

6955

6200

TICKET BAY

TICKET BAY

AMBULANCE BAY
LOADING
LIMITED HOURS

TICKET BAY

4 DA 200

3 DA 200

FFL 17875

FFL 18750

1:14

1:14

FFL 17000
PLAZA

FFL 16850

FFL 17000

1:34 RAMP

FFL 16000

LINE OF ROOF ABOVE

SHARED LOADING
182.6 m²

LINE OF ROOF OVER

SUPERMARKET
804.3 m²
FFL 16000

IGA BIN STORAGE

4 PALLET HOIST

RETAIL/
COMMERCIAL 01A
61.8 m²

INTER-TENANCY WALLS INDICATIVE ONLY

RETAIL/
COMMERCIAL 01B
52.4 m²

INTERACTIVE ART INSTALLATION

FFL 17000

1:22

LINE OF AWNING OVER

FFL 17000

FFL 16850

FFL 17000

1:34

COMMUNITY DISPLAY BOXES

COMMUNITY DISPLAY BOXES

FFL 16000

2 DA 200

1 DA 200

MEANDER STREET

FFL 16000

LANE / ARCADE

RETAIL 02A
74.7 m²
FFL 16000

RETAIL 02B
80.6 m²
FFL 16000

RETAIL 02C
74.8 m²
FFL 16000

INTER-TENANCY WALLS INDICATIVE ONLY

FFL 16000
RETAIL 02D
74.5 m²

FFL 16000
RETAIL 02E
80.4 m²

FFL 16000
RETAIL 02F
74.6 m²

STAIR OVER

1 DA 201

5400

3 DA 201

FFL 13850

FFL 16000

GP CLINIC & PATHOLOGY
474.9 m²
FFL 16000

LINE OF PLANTER BELOW

PHARMACY
Not Enclosed

PWD

NSW COMMS

CLEANER

MSB

WASTE

M

F

EOT

ARTWORK ON WALL

RETAIL 03
137.8 m²
FFL 16000

FFL 16000

2 DA 201

FFL 15200

AHD 15050

FFL 16000

LINE OF AWNING OVER

LINE OF BASEMENT UNDER

VILLAGE
FFL 16000

1:21 RAMP

DA 220
1

RETAIL 05A
91.8 m²

RETAIL 05B
95.6 m²

INTER-TENANCY WALLS INDICATIVE ONLY

LOBBY
89.9 m²

RETAIL 05C
69.8 m²

INTERNAL COMMUNAL SPACE
92.5 m²

4 DA 220

2 DA 220

3 DA 220

PLAZA PLACE

PRELIMINARY

COURTYARD 55.5 m²
TOWNHOUSE 73.5 m²

COURTYARD 48.3 m²
TOWNHOUSE 63.9 m²

COURTYARD 48.3 m²
TOWNHOUSE 63.9 m²

COURTYARD 55.5 m²
TOWNHOUSE 73.5 m²

COURTYARD 55.5 m²
TOWNHOUSE 73.5 m²

COURTYARD 52.6 m²
TOWNHOUSE 73 m²

SERVICES
42.2 m²

DELUCA - CARSELDINE

CV Arch Consultanty Brief - Issue 12 December 2023

Preferred Uses	Target m2	Minimum Carparks	1 per m2	Carpark Sum	Carpark Total (Rounded Up)	Definition Source
Supermarket	800		20	40	40	Fitzgibbon PDA - Retail
Retail 5001	706		20	35	35	Fitzgibbon PDA - Retail
Retail 5003	257		20	13	13	Fitzgibbon PDA - Retail
Retail/ Allied Health	673		20	34	34	Fitzgibbon PDA - Retail
Lifestyle/ Sport & Recreation (L1)	458		10	46	46	BCC SC6.31 - TAP
Medical/ Allied Health/ Lifestyle (L1)	1277		50	26	26	Fitzgibbon PDA - Commercial
Swim School	680	15	100	7	22	BCC SC6.31 - TAP
PWD Carparks					5	
Required	**4851**				**220**	
Total Supplied					**204**	
Difference					**-16**	

architectus™ Conrad Gargett

We acknowledge the Traditional Custodians of the land on which this project is sited, and pay respects to their Elders past, present and emerging.

Revision

REV	DESCRIPTION	DATE	APP.
S	EDQ Issue	21/11/2023	KL
T	Issued For Information	30/11/2023	KL
U	Issued For Information	05/12/2023	KL
V	Issued For Information	07/12/2023	KL
W	DA Issue	12/12/2023	KL
X	DA Issue	18/12/2023	KL
Y	Issued For Information	05/03/2024	NJA

Client
DELUCA

Project
CARSELDINE VILLAGE - STAGE V - LOTS 5001, 9001 & 5003

Drawing
KEY PLAN - GROUND FLOOR

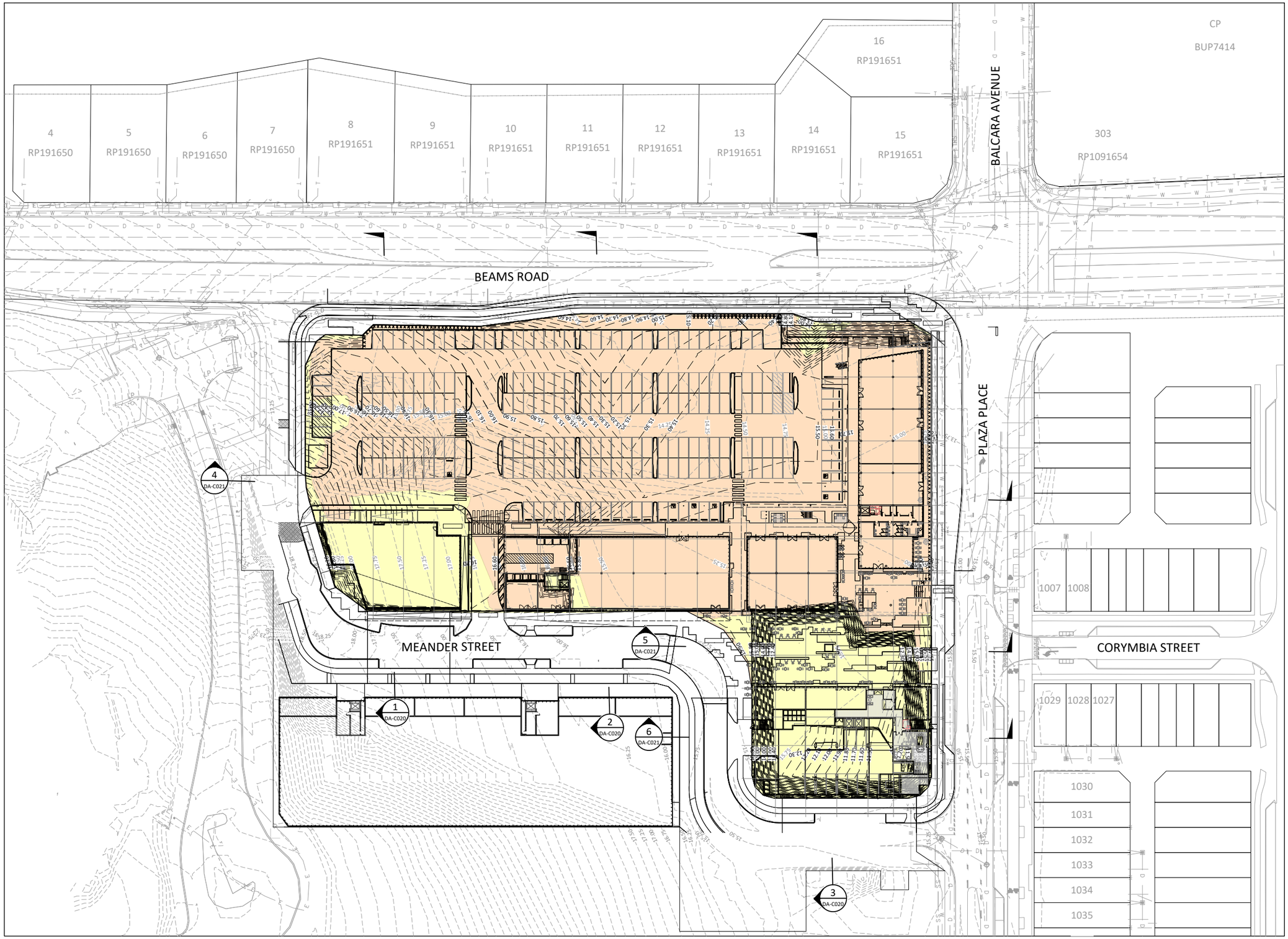
A1 Scale 1 : 250
Project No. 23.0159
Revision Y

Number SK - AR - DR - DA 100

Details

APPENDIX B

ENGINEERING DRAWINGS



PLAN
SCALE 1:500

EARTHWORKS

PROPOSED

CUT

FILL

VOLUMES

BULK EARTHWORKS VOLUMES
CUT: 7000.020m^3
Fill: 7413.105m^3
BALANCE: 413.086m^3

THIS DRAWING IS BEST VIEWED IN COLOUR AND ON AN ELECTRONIC DEVICE

PROJECT NORTH

DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES

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A3 REDUCED

SCALES

UNREDUCED / REDUCED

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STATUS

DEVELOPMENT APPLICATION

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B	07.03.24	FOR INFORMATION	ETA	ETA		
A	06.03.24	FOR INFORMATION	ETA	ETA		

ASSOCIATED CONSULTANTS

APPROVED
RPEQ
DATE

CHECKED
DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
EARTHWORKS LAYOUT

PROJECT No. 23019
DRAWING No. DA-C010
REVISION B

ORIGINAL SIZE A1

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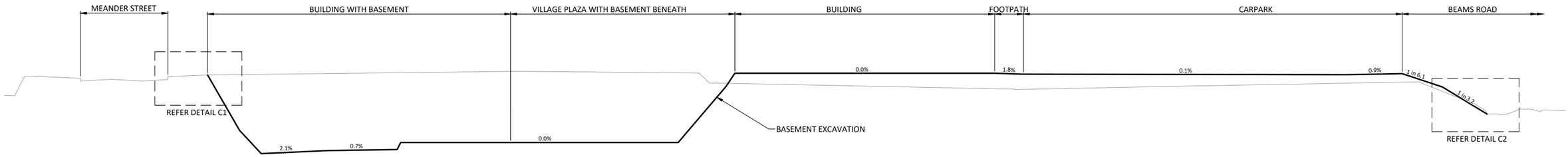

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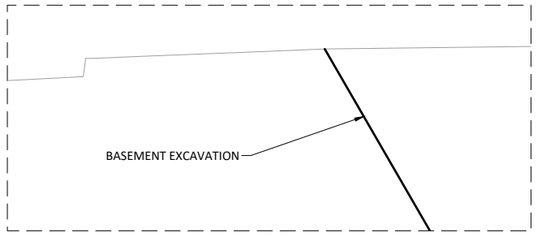

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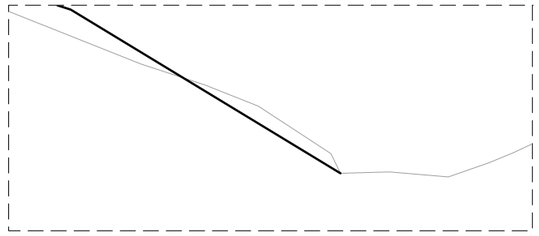

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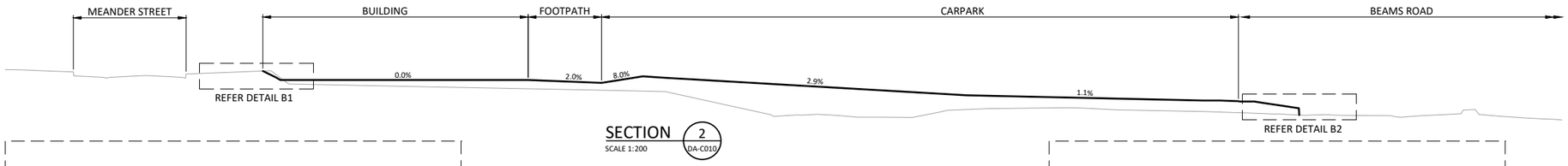

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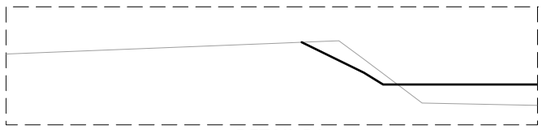

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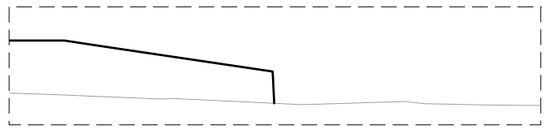

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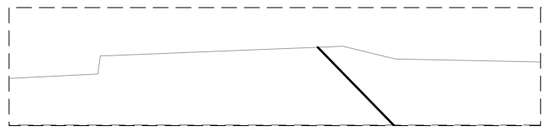

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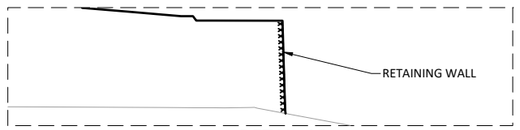

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DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES

A1 UNREDUCED
A3 REDUCED

SCALES — UNREDUCED / REDUCED

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STATUS

DEVELOPMENT APPLICATION

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DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
EARTHWORKS SECTIONS SHEET 1

PROJECT No.
23019

DRAWING No. DA-C020
REVISION B

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ORIGINAL SIZE A1

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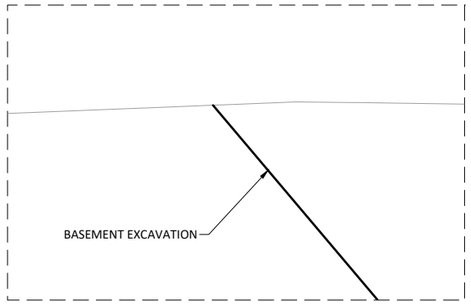

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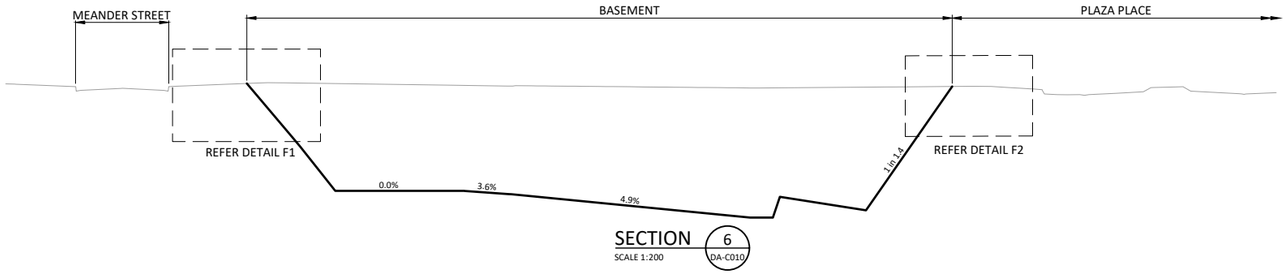

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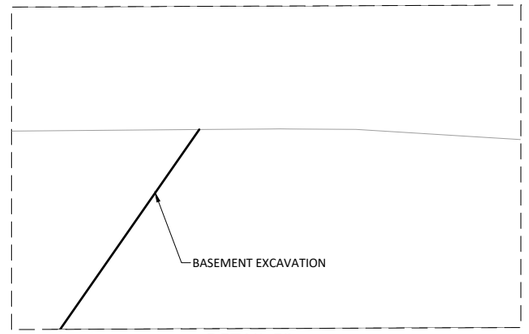

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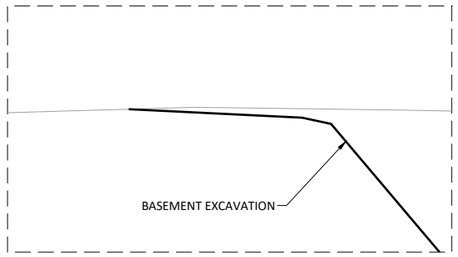

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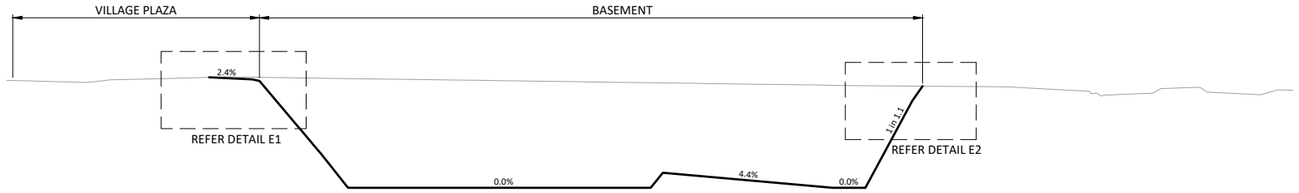
SCALE 1:50



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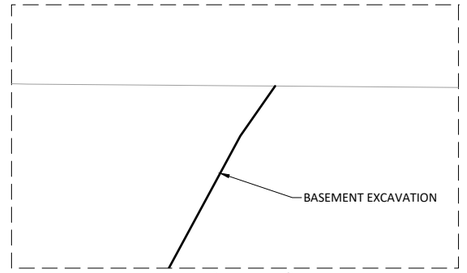

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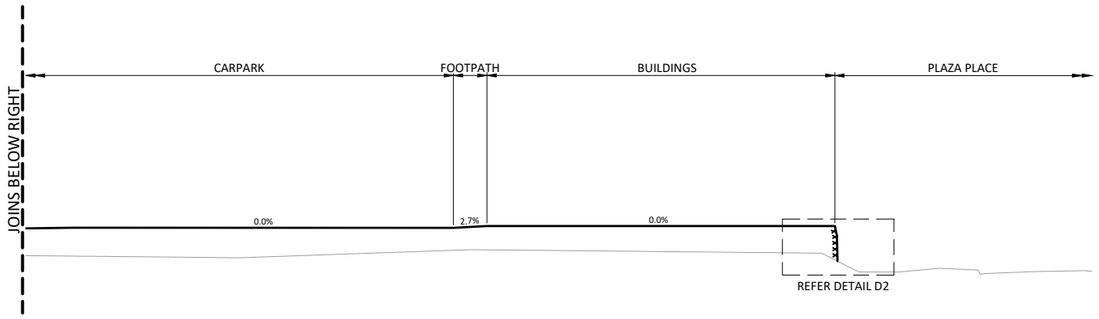

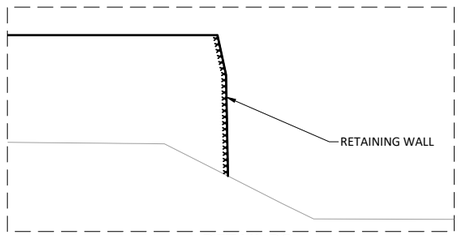

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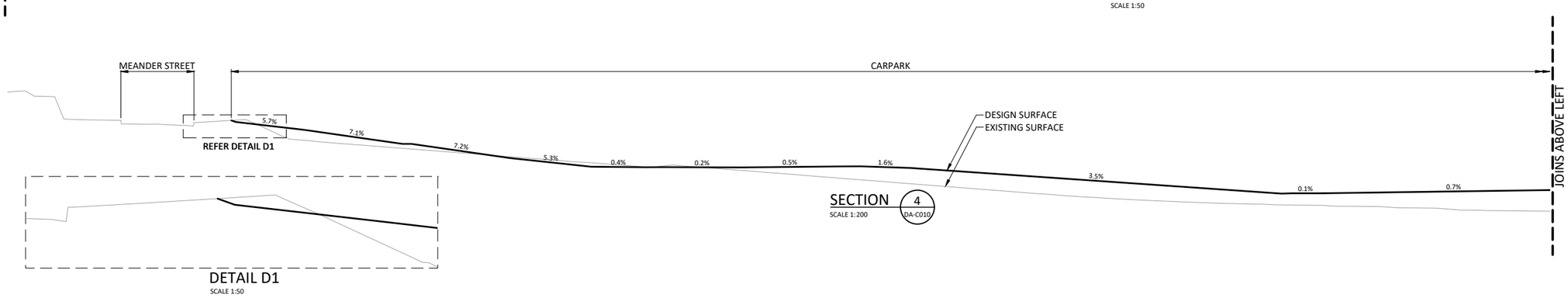

SECTION 4
SCALE 1:200 DA-C010

DETAIL D1
SCALE 1:50

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DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES

A1 UNREDUCED
A3 REDUCED

SCALES UNREDUCED / REDUCED

0 0.5 1 1.5 2 2.5 m 1: 50 / 1: 100

0 2 4 6 8 10 m 1: 200 / 1: 400

STATUS

DEVELOPMENT APPLICATION

SCAN QR CODE TO CONFIRM CURRENT DRAWING REVISION
http://docs.bornhorstward.com.au/revision/

REV	DATE	DESCRIPTION	DWN	DES	CHK	APP
B	07.03.24	FOR INFORMATION	ETA	ETA		
A	06.03.24	FOR INFORMATION	ETA	ETA		

ASSOCIATED CONSULTANTS

APPROVED
RPEQ
DATE

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DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
EARTHWORKS SECTIONS SHEET 2

PROJECT No. 23019

DRAWING No. DA-C021

REVISION B

8/03/2024 11:06:57 AM

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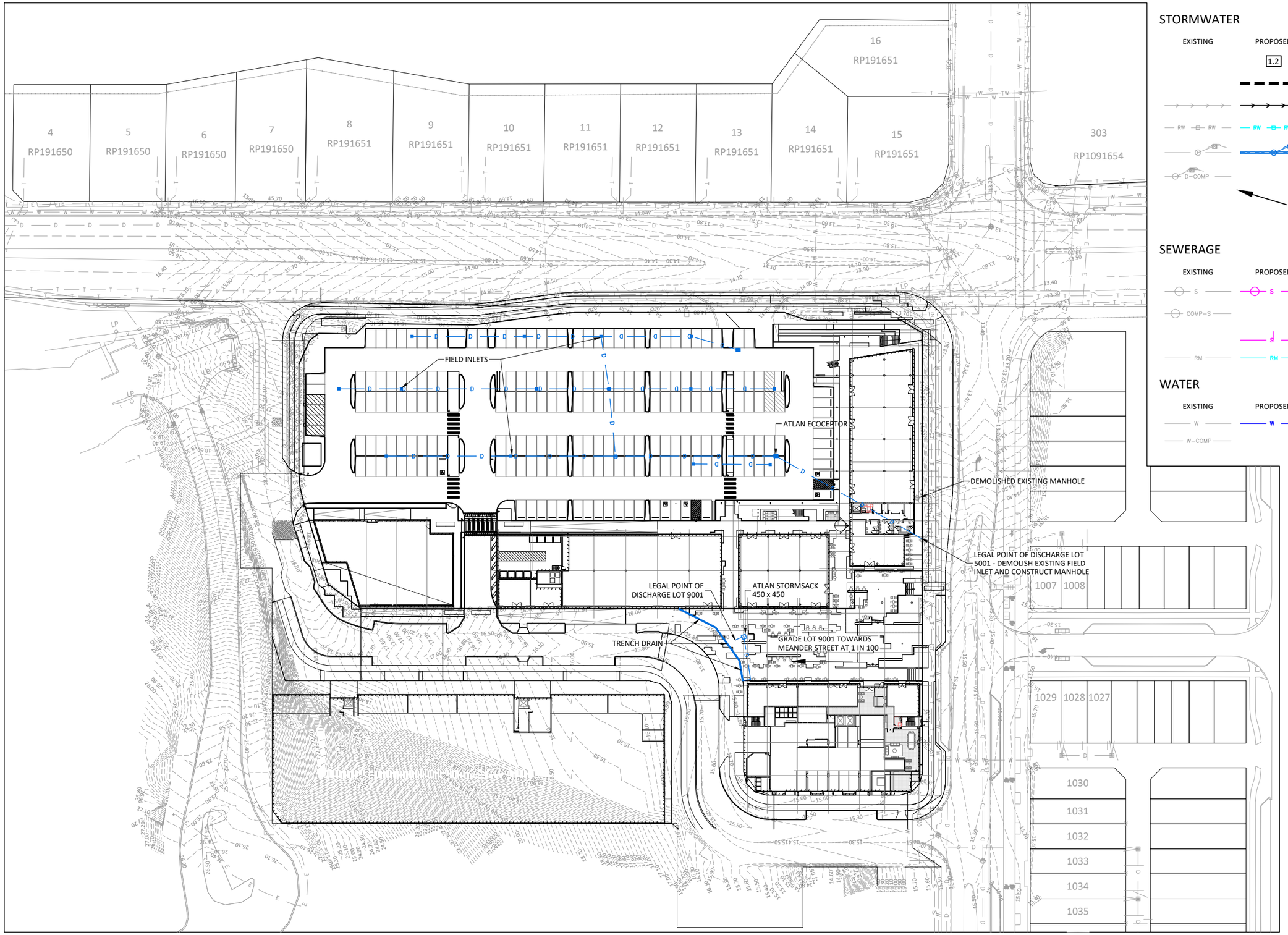

PLAN
SCALE 1:500

STORMWATER

EXISTING	PROPOSED	
	1.2	CATCHMENT NUMBER
		CATCHMENT BOUNDARY
		OPEN CHANNEL
RW RW	RW RW	ROOFWATER DRAINAGE
		STORMWATER DRAINAGE
D–COMP		STORMWATER DRAINAGE (FROM RECORDS)
		DIRECTION OF FLOW

SEWERAGE

EXISTING	PROPOSED	
S	S	SEWERAGE
COMP–S		SEWERAGE (FROM RECORDS)
	S	SEWERAGE PROPERTY CONNECTION
RM	RM	SEWERAGE RISING MAIN

WATER

EXISTING	PROPOSED	
W	W	WATER
W–COMP		WATER (FROM RECORDS)

NOTE

ROOFWATER DRAINAGE FROM LOT 5001 IS TO CONNECT TO INTERNAL STORMWATER DRAINAGE PRIOR TO ATLAN ECOCEPTOR

THIS DRAWING IS BEST VIEWED IN COLOUR AND ON AN ELECTRONIC DEVICE

PROJECT NORTH

DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES — A1 UNREDUCED, A3 REDUCED

SCALES — UNREDUCED / REDUCED

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1: 500 / 1: 1000

STATUS

DEVELOPMENT APPLICATION

SCAN QR CODE TO CONFIRM CURRENT DRAWING REVISION
http://docs.bornhorstward.com.au/revision/

REV	DATE	DESCRIPTION	DWN	DES	CHK	APP

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DATE

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DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
SITEWORKS AND DRAINAGE LAYOUT

PROJECT No. 23019
DRAWING No. DA-C030
REVISION

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ORIGINAL SIZE A1

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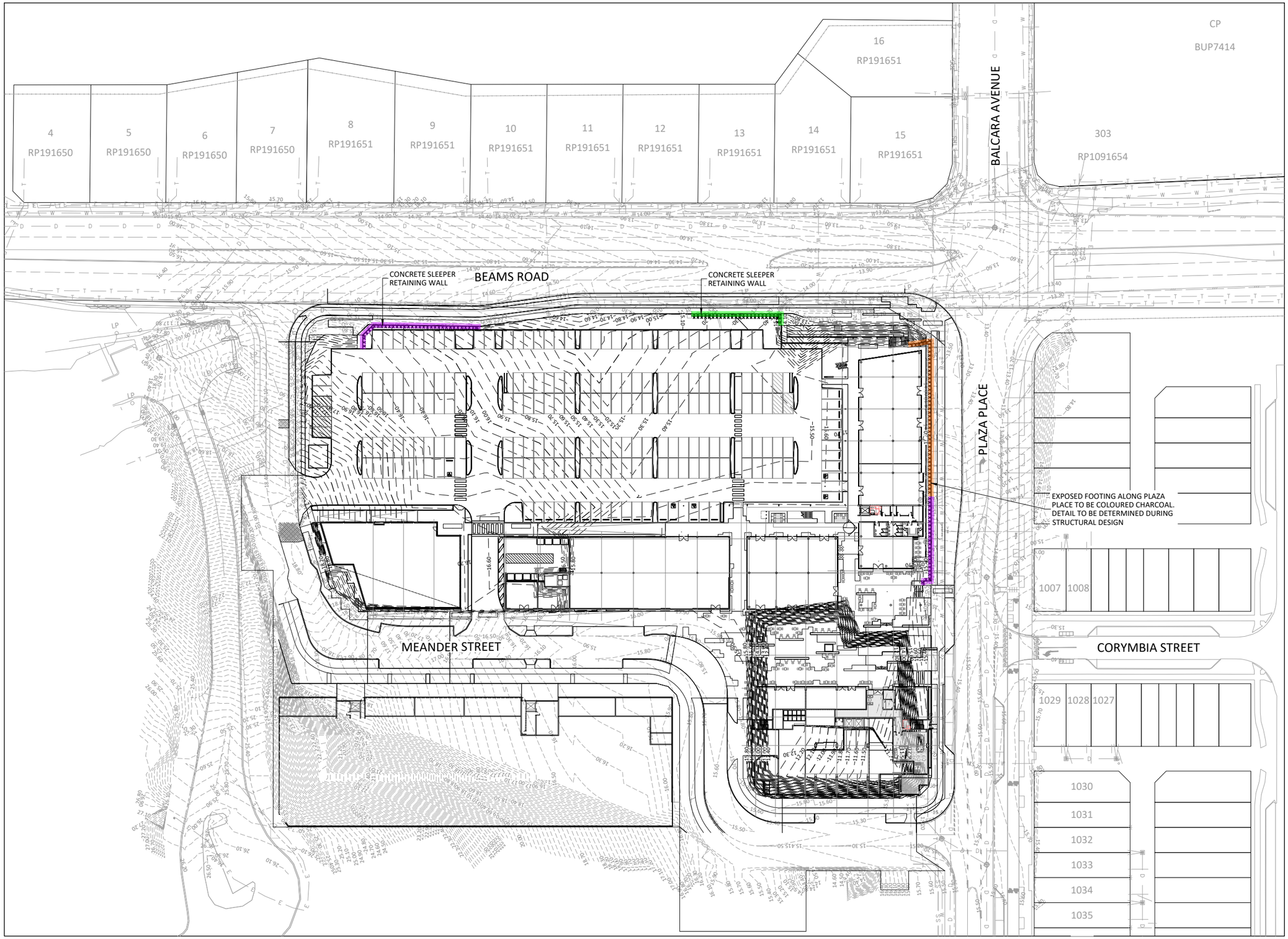

PLAN
SCALE 1:500

RETAINING WALL LEGEND

1 TIER WALL
LESS THAN 1.0m

1 TIER WALL
BETWEEN 1.0m TO 2.0m

2 TIER WALL
BETWEEN 1.0m TO 2.0m

NOTE

CONCRETE SLEEPER RETAINING WALLS, ARE TO BE TEXTURED (WOODGRAIN) AND COLOURED CHARCOAL.

THIS DRAWING IS BEST VIEWED IN COLOUR AND ON AN ELECTRONIC DEVICE

PROJECT NORTH

DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES

A1 UNREDUCED
A3 REDUCED

SCALES

UNREDUCED / REDUCED

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1: 500 / 1: 1000

STATUS

DEVELOPMENT APPLICATION

SCAN QR CODE TO CONFIRM CURRENT DRAWING REVISION
http://docs.bornhorstward.com.au/revision/

REV	DATE	DESCRIPTION	DWN	DES	CHK	APP
A	07.03.24	FOR INFORMATION	ETA	ETA		

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DATE

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DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
RETAINING WALL LAYOUT

PROJECT No.
23019

DRAWING No.
DA-C070

REVISION
A

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ORIGINAL SIZE A1

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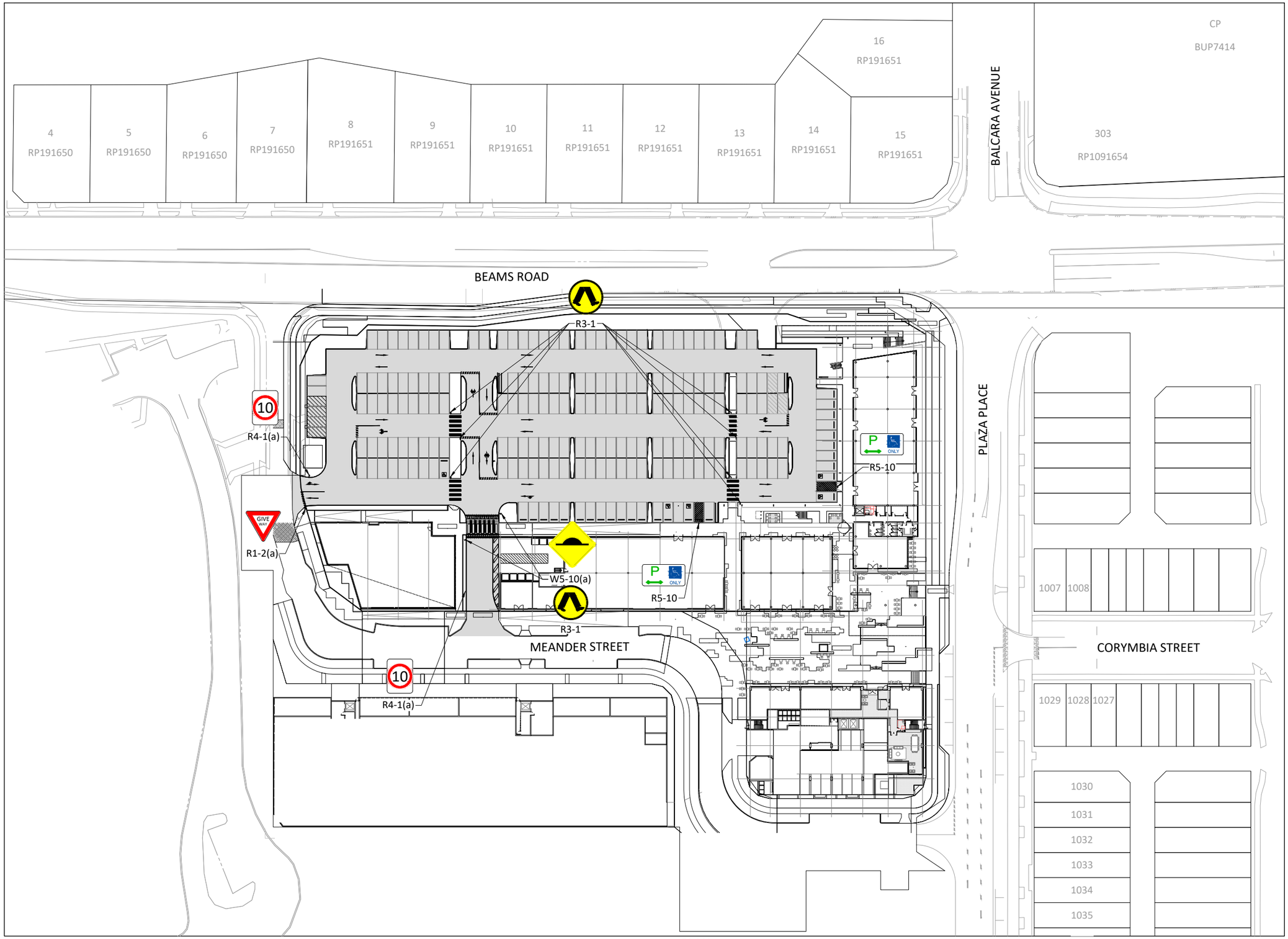

PLAN
SCALE 1:500

THIS DRAWING IS BEST VIEWED IN COLOUR AND ON AN ELECTRONIC DEVICE

PROJECT NORTH

DIMENSIONS IN METRES EXCEPT WHERE SHOWN OTHERWISE. CULVERT AND PIPE SIZES IN MILLIMETRES

A1 UNREDUCED
A3 REDUCED

SCALES

UNREDUCED / REDUCED

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1: 500 / 1: 1000

STATUS

DEVELOPMENT APPLICATION

SCAN QR CODE TO CONFIRM CURRENT DRAWING REVISION
http://docs.bornhorstward.com.au/revision/

REV	DATE	DESCRIPTION	DWN	DES	CHK	APP
A	06.03.24	PRELIMINARY ISSUE	ETA	ETA		

ASSOCIATED CONSULTANTS

APPROVED
7729 RPEQ
DATE

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DATE

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CLIENT
DE LUCA CORPORATION PTY LTD

PROJECT
CARSELDINE VILLAGE

SUBJECT
SIGNS AND LINEMARKING LAYOUT

PROJECT No.
23019

DRAWING No.
DA-C080

REVISION
A

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ORIGINAL SIZE A1

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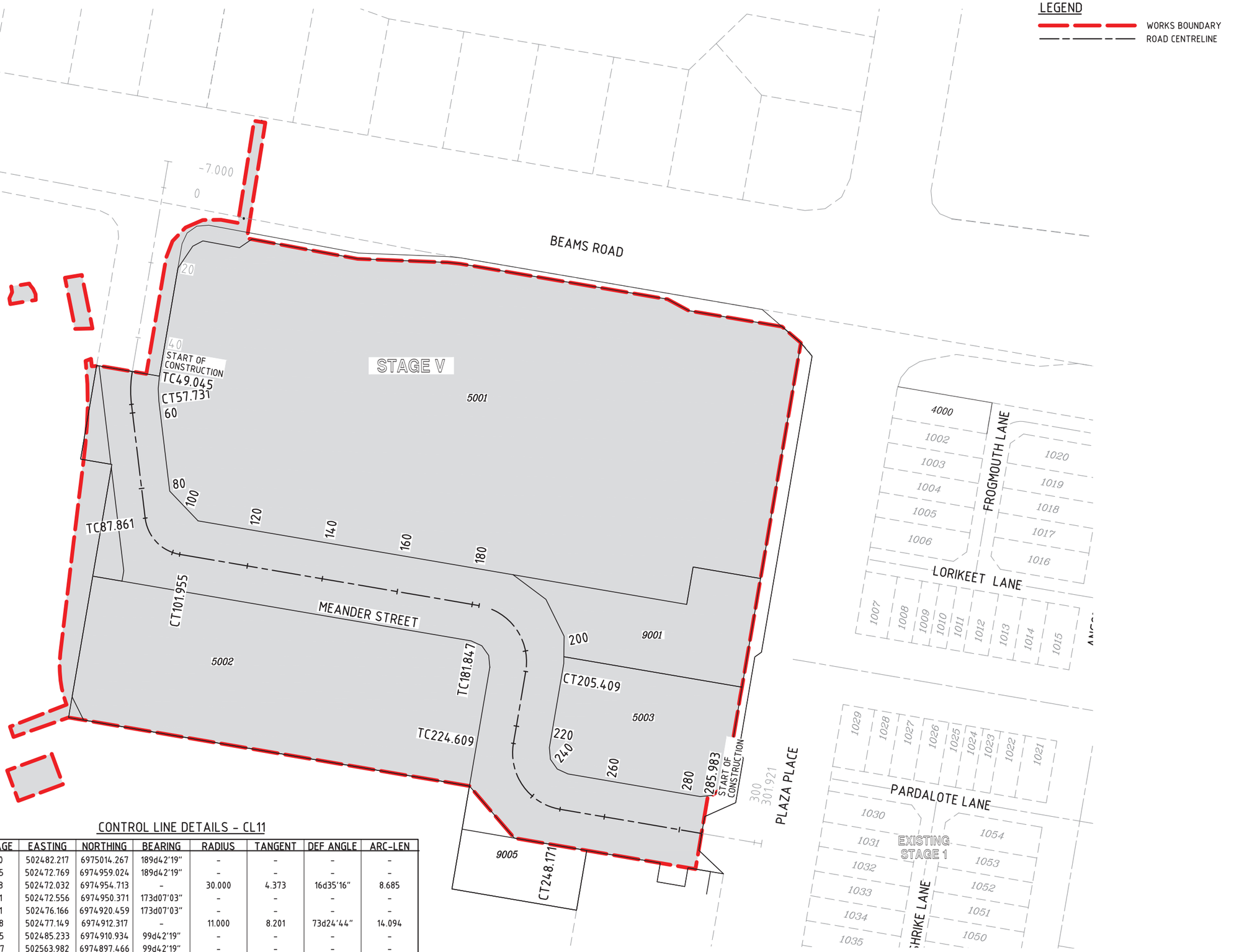
APPENDIX C

EXISTING SITE INFORMATION



CONTROL LINE DETAILS - CL11

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IP1	-7.000	502482.217	6975014.267	189d42'19"	-	-	-	-
TC	49.045	502472.769	6974959.024	189d42'19"	-	-	-	-
IP2	53.388	502472.032	6974954.713	-	30.000	4.373	16d35'16"	8.685
CT	57.731	502472.556	6974950.371	173d07'03"	-	-	-	-
TC	87.861	502476.166	6974920.459	173d07'03"	-	-	-	-
IP3	94.908	502477.149	6974912.317	-	11.000	8.201	73d24'44"	14.094
CT	101.955	502485.233	6974910.934	99d42'19"	-	-	-	-
TC	181.847	502563.982	6974897.466	99d42'19"	-	-	-	-
IP4	193.628	502578.767	6974894.937	-	15.000	15.000	90d00'00"	23.562
CT	205.409	502576.238	6974880.152	189d42'19"	-	-	-	-
TC	224.609	502573.002	6974861.227	189d42'19"	-	-	-	-
IP5	236.390	502570.473	6974846.441	-	15.000	15.000	89d59'60"	23.562
CT	248.171	502585.258	6974843.912	99d42'19"	-	-	-	-
IP6	301.921	502638.239	6974834.851	99d42'19"	-	-	-	-

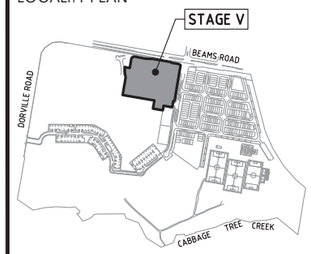
SETOUT PLAN
SCALE 1:500

SCALE
10 5 0 10 20 30 40 50m
1 : 500 (A1 UNREDUCED)

DO NOT SCALE THIS DRAWING
IF IN DOUBT - ASK!

NORTH

LOCALITY PLAN



REVISIONS

No	Description	Date	By
A	FOR APPROVAL	30.10.2023	AA

Client
ECONOMIC DEVELOPMENT QUEENSLAND (EDQ)

Project
CARSELDINE VILLAGE STAGE V

kn group
ABN 35 112 53 611
L1, 62 Astor Tce
Spring Hill Q 4000
07 3017 1900
www.kngroup.com.au

Approved
M. Shaw
Digitally signed by Mark Shaw RPEQ 17544
Date: 2023.11.02 07:36:35+10'00'

Drawing Title
GENERAL SETOUT PLAN

Drawn	Designed	Checked	Date
RW	JB	MS	OCT '23

Scale	Sheet
AS SHOWN	02 of 20

	Drawing No	Revision
A1	21-121-02	A

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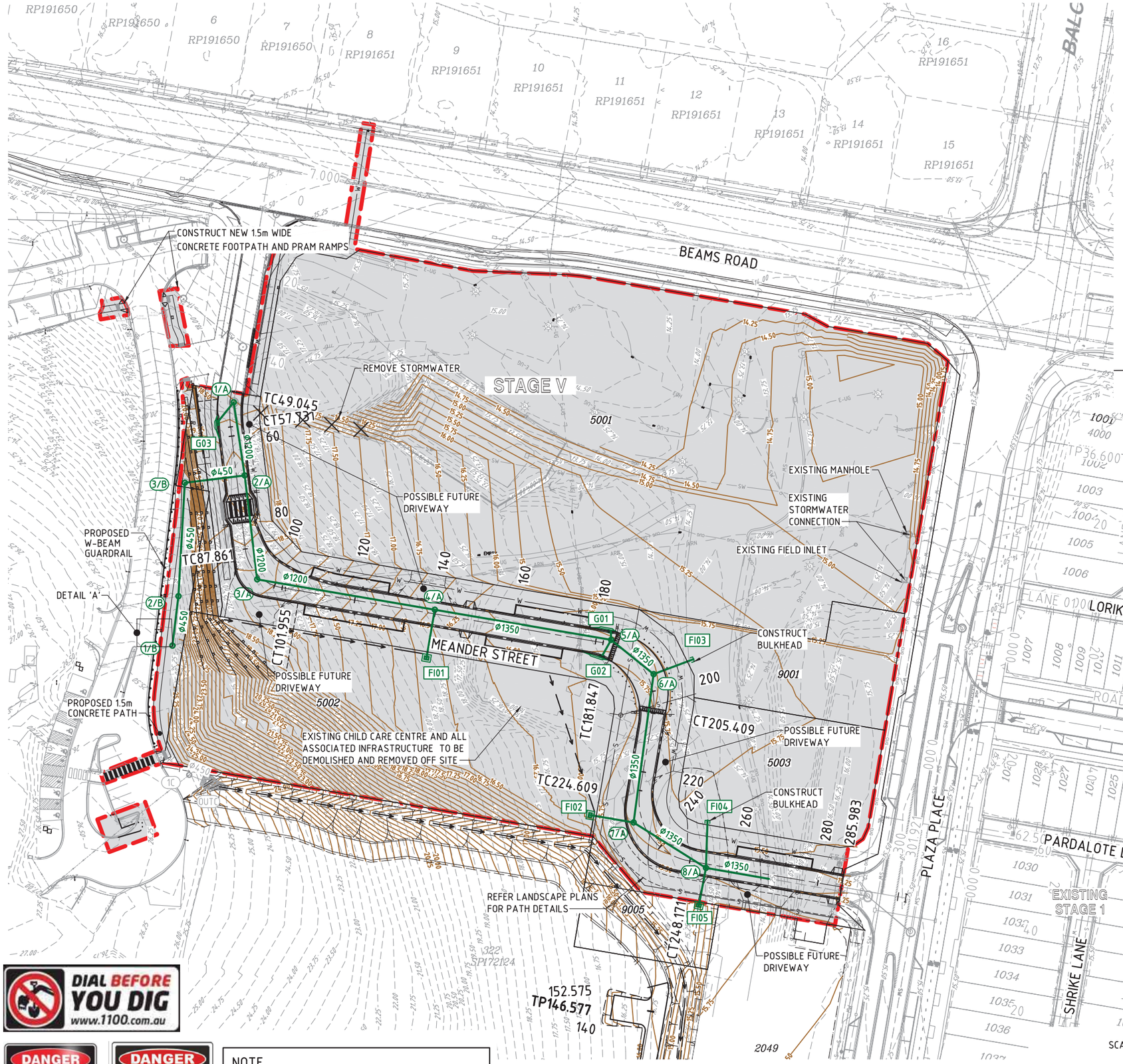
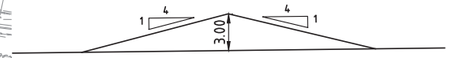
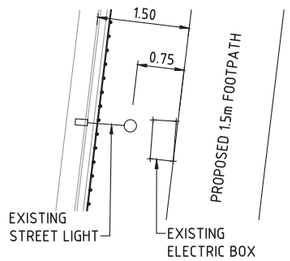


LEGEND

- WORKS BOUNDARY
- ROAD CENTRELINE
- KERB AND CHANNEL - TYPE E
- KERB ONLY - TYPE E
- INVERT CHANNEL
- MOUNTABLE KERB WITH BACKING STRIP
- PROPOSED RETAINING WALL
- PROPOSED W-BEAM GUARDRAIL
- STORMWATER DRAINAGE
- SEWER MAIN
- WATER MAIN
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER MAIN
- EXISTING WATER MAIN
- FINISHED SURFACE CONTOURS
- EXISTING SURFACE CONTOURS
- BATTER LINE
- TURF BUND 300mm HIGHT
- 17N STORMWATER MANHOLE/NUMBER
- G706 STORMWATER GULLY PIT/NUMBER
- R703 ROOFWATER FIELD INLET/NUMBER



BUND DETAIL
NTS.



DETAIL 'A'
SCALE 1:50

LAYOUT PLAN
SCALE 1:500

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1 : 50 (A1 UNREDUCED)

SCALE 10 5 0 10 20 30 40 50m
1 : 500 (A1 UNREDUCED)

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DANGER UNDERGROUND CABLES

DANGER LIVE WIRES AND COMMUNICATION SERVICES

NOTE
PROPOSED WORKS ARE NEAR EXISTING SERVICES. CONTRACTOR TO COMPLETE DBYD AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCING CONSTRUCTION.

DO NOT SCALE THIS DRAWING
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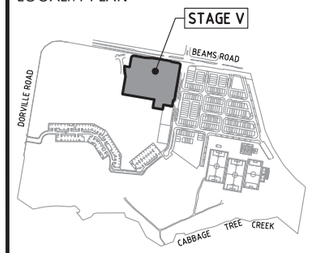
NORTH

LOCALITY PLAN



REVISIONS

No	Description	Date	By
A	FOR APPROVAL	30.10.2023	AA

Client
ECONOMIC DEVELOPMENT QUEENSLAND (EDQ)

Project
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kn group
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07 3017 1900
www.kngroup.com.au

Approved
M. Shaw
Digitally signed by Mark Shaw RPEQ 17544
Date: 2023.11.02 07:36:35+10'00'

Drawing Title
GENERAL LAYOUT PLAN

Drawn	Designed	Checked	Date
RW	JB	MS	OCT '23

Scale	Sheet
AS SHOWN	03 of 20

	Drawing No	Revision
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LEGEND

- WORKS BOUNDARY
- ROAD CENTRELINE
- KERB AND CHANNEL - TYPE E
- KERB ONLY - TYPE E
- INVERT CHANNEL
- MOUNTABLE KERB WITH BACKING STRIP
- FINISHED SURFACE CONTOURS (36.0)
- EXISTING SURFACE CONTOURS (36.0)
- BATTER LINE
- EXTENT OF CUT
- EXTENT OF FILL

EARTHWORKS SPOT LEVELS PLAN

SCALE 1:500

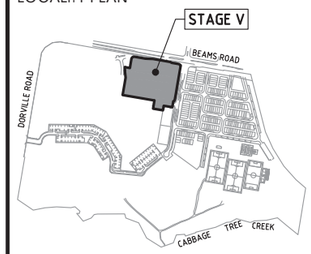
SCALE 5 0 5 10 15 20 25m
1 : 250 (A1 UNREDUCED)

SCALE 10 5 0 10 20 30 40 50m
1 : 500 (A1 UNREDUCED)

DO NOT SCALE THIS DRAWING
IF IN DOUBT - ASK!

NORTH

LOCALITY PLAN



REVISIONS

No	Description	Date	By
A	FOR APPROVAL	30.10.2023	AA

Client
ECONOMIC DEVELOPMENT QUEENSLAND (EDQ)

Project
CARSELDINE VILLAGE STAGE V

kn group
ABN 35 112 53 611
L1, 62 Astor Tce
Spring Hill Q 4000
07 3017 1900
www.kngroup.com.au

Approved
M. Shaw
Digitally signed by Mark Shaw RPEQ 17544
Date: 2023.11.02 07:36:36+10'00'

Drawing Title
EARTHWORKS SPOT LEVELS PLAN

Drawn	Designed	Checked	Date
RW	JB	MS	OCT '23

Scale	Sheet
AS SHOWN	04 of 20

	Drawing No	Revision
A1	21-121-04	A

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CARSELDINE URBAN VILLAGE

UPDATED STORMWATER MANAGEMENT PLAN

DesignFlow

Prepared for Economic Development Queensland

October 2019

Document Control Sheet

Report Title:	Carseldine Urban Village – Updated Stormwater Management Plan
Suggested Reference:	Carseldine Urban Village – Updated Stormwater Management Plan (DesignFlow, 2019)
Version:	04
Client:	Economic Development Queensland
Author(s):	Ralph Williams
Reviewed By:	Shaun Leinster
Approved By:	Shaun Leinster RPEQ15637 
Date:	10/10/2019
File Location:	S:\Projects\4306
Circulation:	Electronic Copies: Economic Development Queensland

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Qualifications & Limitations

In preparing this report, Designflow has relied upon and assumed accurate data provided by Brisbane City Council (BCC) and other sources. Unless otherwise stated in this report, Designflow has not attempted to verify the accuracy or completeness of any such information. The accuracy of this report is reliant upon the accuracy of this information.

This investigation is based upon BCC's established flood model of the Cabbage Tree Creek floodplain. While some refinements have been made to BCC's models to suit the current project, overall the modelling approach and assumptions have been applied consistently with that of the established models. Consequently, the model accuracy limitations of BCC's flood models also generally apply to this investigation.

Modelling for this investigation is based on a design event approach and assumptions that are consistent with current industry practice. It is important to be aware that real world flood events are random and highly variable. Consequently, observed and future flooding characteristics may not reflect those described in this report.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Designflow for use of any part of this report in any other context.

Study results should not be used for purposes other than those for which they were prepared.

Table of Contents

EXECUTIVE SUMMARY

Carseldine Urban Village (Lot 322 on SP172124) is a proposed development on a 45ha site, currently occupied by Queensland Government facilities and community sports fields. The development is currently being undertaken by Economic Development Queensland (EDQ) and involves the creation of lots for a mix of uses including commercial and retail, residential, retirement living and a sporting complex.

This report presents the details of an Updated Stormwater Management Plan for the development to meet the requirements under:

- *State Planning Policy* – SPP (DLGIP, 2017) for the operational stormwater quality objectives;
- *Queensland Urban Drainage Manual* (QUDM) for stormwater quantity management; and
- *Brisbane City Council Planning Scheme*

This report supersedes the previously issued stormwater management plan for the site (DesignFlow, April 2018). This updated stormwater management plan captures the following updates and information that has been made available since the issue of the April 2018 report:

- Updated and approved overall masterplan for the development (source: RPS, October 2019)
- Latest earthworks associated with the development (source: Calibre Consulting, June 2019)
- Existing site pipe drainage survey (completed June 2019 – source: Land Partners)

STORMWATER QUALITY MANAGEMENT

The updated stormwater treatment strategy includes two (2) bioretention basins that treat development runoff prior to discharge to Cabbage Tree Creek:

- Bioretention Basin B1 265m^2 filter area treating Stages 2, 3 (part of) and S
- Bioretention Basin B2 500m^2 filter area total treating the remainder of the development (Stages 1,3 (part of), 4 and 5)

These basins are located outside of the Cabbage Tree Creek riparian corridor and will have low impact on existing vegetation. The proposed locations also avoid conflicts with the future busway corridor.

Drainage swales along the eastern boundary of the site and at the southern boundary of the Stage S sports fields also provide additional treatment.

FLOOD MANAGEMENT

Flood impact assessment demonstrates no significant impacts occurring external to the site as a result of development. Some afflux (~50mm) is observed immediately south east of the development boundary, however this afflux occurs within a low-lying flood prone bushland area and is not considered an actionable nuisance.

Improved flood conditions are observed at Beams Road and the rail line at the north-east end of the site. This is because much of the site drainage will be directed to Cabbage Tree Creek. Furthermore, during larger magnitude events, the proposed development fill restricts Cabbage Tree Creek breakout flow from entering this area.

Required mitigation measures to manage flood impacts external to the site include:

- Providing flood storage over the sports field zone for events greater than the 5% AEP (20 year ARI).
- Incorporation of a 1200mm dia pipe with one-way flap valve along the new drainage swale draining the eastern half of the development. This minimizes the impacts of Cabbage Tree Creek flows into the site via this new connection to Cabbage Tree Creek.
- Inclusion of a flood barrier (~1m high) along the eastern boundary of the site. This avoids increases in flood levels along the rail line adjacent to the site.

This report is based on regional flood modelling based upon the Brisbane City Council (BCC) flood model for Cabbage Tree Creek. Updated regional modelling and detailed local modelling will occur as part of continuing design development for the site.

1 SITE CHARACTERISTICS

1.1 SITE LOCATION

The Carseldine Urban Village development is located approximately 14km north of Brisbane. The site is bounded by Beams road to the north, Cabbage Tree Creek to the south, Brisbane rail to the east and Dorville Road to the west.

Figure 1 shows the location of the site.

Figure 1: Locality plan

1.2 CLIMATE

Figure 2 provides a summary of the monthly rainfall based on climate statistics for Brisbane (station No 40223).

The annual average rainfall is 1,190 mm, whilst annual evaporation is approximately 1,950mm. The figure clearly indicates the seasonal nature of rainfall and evaporation with lower rainfall and evaporation periods during the winter months.

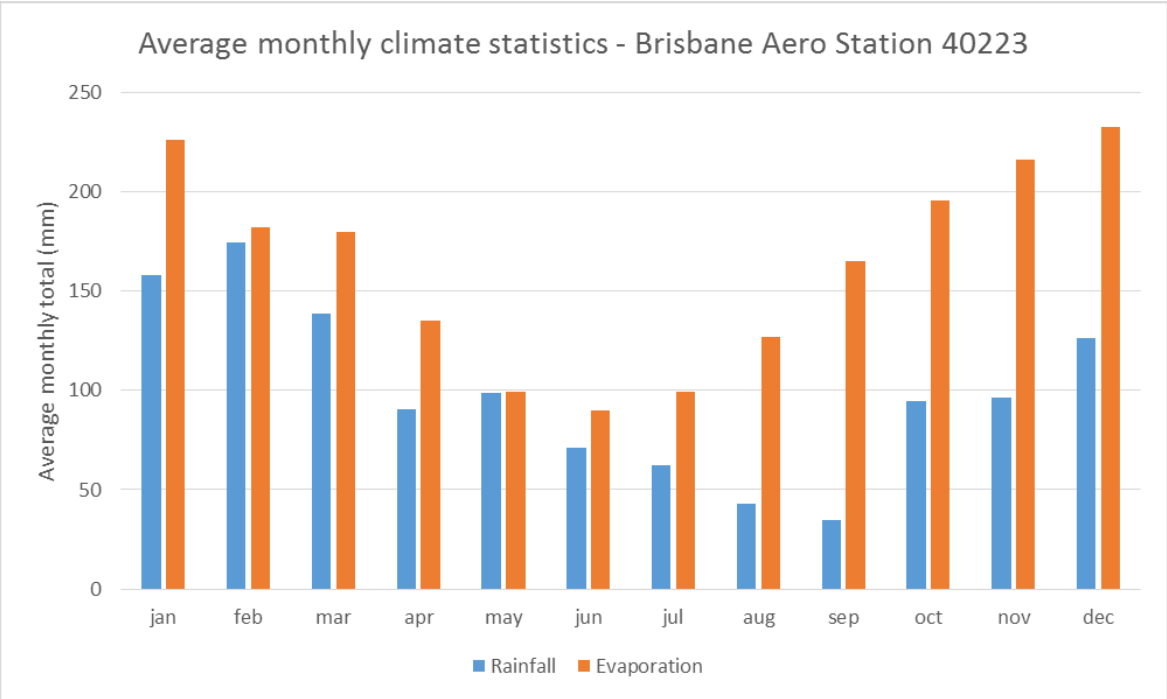


Figure 2 Average monthly climate statistics

1.3 TOPOGRAPHY, CATCHMENTS AND DRAINAGE

Ground levels across the site range from approximately RL28 at the high point located at the north western boundary of the development to approximately RL9.5 at the south eastern corner at Cabbage Tree Creek. Grades across the site are flat to moderate typically ranging from 0.5 to 10%.

The site is characterised by areas of low lying and poorly drained topography. Figure 3 shows the existing topography and general drainage of the current site. The majority of the site drainage is toward Cabbage Tree Creek to the south, whilst the north west section of the site drains northward. Poorly drained areas are also noted at the north east of the site.

Pipe drainage within the site discharges at two (2) outfalls to Cabbage Tree Creek. This drainage system minimises localised site flooding in the more frequent events, when regional flooding from Cabbage Tree Creek does not occur.

In general, the northern bank of Cabbage Tree Creek is higher than adjacent ground levels further north within the site. This means flood flows are initially contained within Cabbage Tree Creek but then break out of the banks of the creek over the high point on the northern bank and inundate low lying and poorly drained areas within the site.

At the north eastern end of the site, low lying areas occur adjacent to the rail line and at the northern boundary of the existing sports fields adjacent to Beams Road. This area appears to be providing an overland flow path for flood flows.

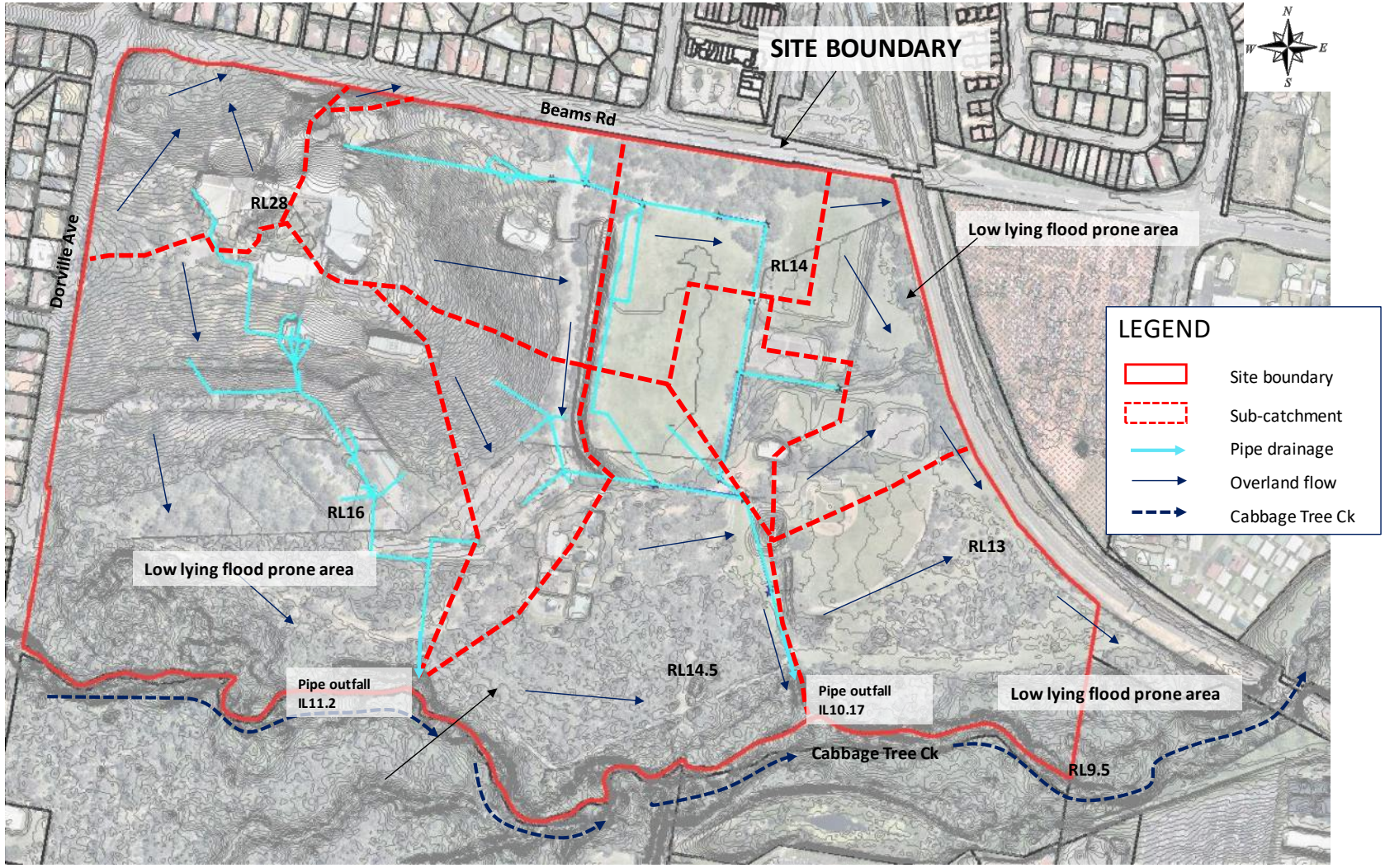


Figure 3: Topography and drainage

1.4 SOILS AND VEGETATION

Soils across the site are generally characterised by alluvial soils comprising surface clayey silt overlying medium to high plasticity silty clay and sandy clay, with interbedded layers of clayey sand, gravelly sand and gravel (SGS, 2017).

The site comprises of sports fields and government buildings in the northern half of the site. Extensive good value bushland occurs in the southern half of the site including the Cabbage Tree Creek riparian corridor (refer Figure 1).

1.5 PROPOSED DEVELOPMENT

The Carseldine Urban Village development is located within a 45ha site. The site includes existing government facilities at the north western end of the development that are to be retained. Existing sports fields at the north eastern corner of the site are to be redeveloped, whilst a new sporting precinct will be constructed at the south eastern corner of the site. A future busway is planned at the southern end of the site. The existing QUT research facility at the southern end of the site is planned to be decommissioned in 2020.

The overall development will include approximately 10.3ha of new commercial and residential development, and an approximated 5 ha of new sporting complex area.

The current development layout for Carseldine Urban Village is shown in Figure 4.

Figure 4 Proposed Carseldine Urban Village development (Source: RPS 2019)

2 STORMWATER DESIGN OBJECTIVES

Stormwater management objectives have been established based on the following:

- *State Planning Policy* (DLGIP, 2017)
- *Queensland Urban Drainage Manual* (2016)
- *Brisbane City Council (BCC) Planning Scheme*

2.1 STORMWATER QUALITY

The stormwater quality management objectives that apply to the operational phase of the development are defined in the State Planning Policy (DLGIP, 2017) which applies load based objectives presented in Table 1.

Table 1 – Stormwater quality objectives

Constituent	Discharge criteria
Total suspended solids (TSS)	80% reduction in post developed mean annual load
Total phosphorous (TP)	60% reduction in post developed mean annual load
Total nitrogen (TN)	45% reduction in post developed mean annual load
Gross pollutants	90% reduction in post developed mean annual load

Construction phase erosion and sediment control objectives are outlined in Table A Appendix 2 of SPP (DLGIP, 2017). Detailed erosion and sediment control plans will be provided with the Operational Works application.

2.2 FLOODING

The flood management objectives applicable to the site are presented in Table 2. Carseldine Urban Village development lies within Brisbane City Council (BCC) mapped City Wide Waterway corridor zone.

Table 2 Flood objectives

Criterion	Design Objective
No worsening hydraulic conditions	No worsening hydraulic impact to be demonstrated external to the site for the critical duration storm for the 39% AEP to 1% AEP events
BCC flood overlay code PO2 Development within a creek/waterway flood planning area	a) Maintains conveyance of flood waters to allow flow and debris to pass predominantly unimpeded through the site b) Does not concentrate, intensify or divert floodwater onto upstream, downstream or adjacent properties c) Will not result in a material increase in flood levels or flood hazard on upstream, downstream or adjacent properties
BCC Flood overlay code PO8 Development for filling or excavation in an area affected by creek/waterway flooding	Does not directly, indirectly or cumulatively cause any material increase in flooding or hydraulic hazard or involve significant redistribution of flood storage from high to lower areas in the floodplain

3 STORMWATER MANAGEMENT STRATEGY

The stormwater management strategy for the Carseldine Urban Village development has been developed based on discussions with EDQ, the design team and field inspections to identify opportunities and constraints.

When developing the strategy, several guiding principles were considered:

- achieve obligations under the *State Planning Policy*, *BCC planning scheme policy* and *Queensland Urban Drainage Manual*
- ensure stormwater management systems are functionally feasible within the constraints of the development and drainage levels
- avoid numerous stormwater management sites
- avoid works within the Cabbage Tree Creek riparian buffer zone
- minimize impacts on existing good value vegetation
- avoid works encroaching into the future busway corridor
- minimize the need for an on-site flood basin, where possible
- utilization of the 10m wide acoustic barrier at the eastern boundary of the site for drainage conveyance and treatment

Figure 5 shows the stormwater management strategy for the Carseldine Urban Village development. The strategy has been developed considering the proposed drainage for the development (source: Calibre Consulting). This includes pipe drainage for minor storm events and overland flows for flows exceeding pipe capacity.

Performance assessments of the proposed management strategy are presented in Section 4 (stormwater quality) and Section 5 (flooding).

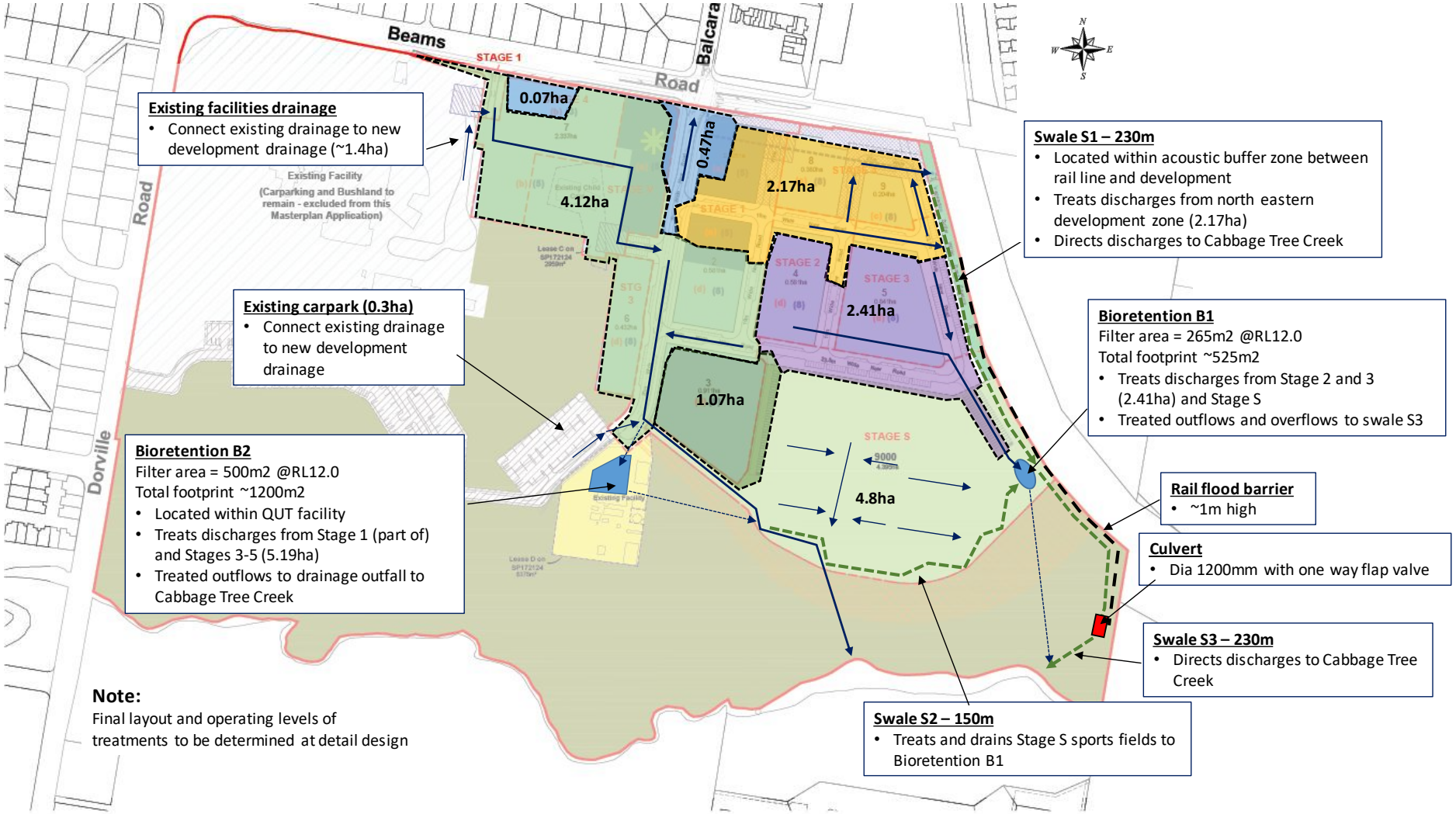


Figure 5 Stormwater Management Strategy Carseldine Urban Village

Table 3 Stormwater treatment elements

ID and Stages Treated	Treatment		Catchment	Comment
	Type	Area/length	ha	
B1 – Stages 2,3 (part of) and S	Bioretention	265m²	2.41	Located within Stage S. Treats discharges from Stage 2 and 3 (part of). Receives treated flows from Stage S sports fields. Treated flows and overflows to swale S3.
B2 – Stages 1 and 3 (part of) and 4-5	Bioretention	500m²	5.19	Located within the QUT facility. Treats Stages 1 and 3 (part of) and Stages 4 and 5. Receives low from diversion from main drainage pipe. Treated outflows to drainage outfall to Cabbage Tree Ck.
S1 – Stages 1, 2 and 3 (part of) and 4	Swale	230m	2.17	Treats north eastern development zone (Stage 1, 2 and 3 (part of) and Stage 4).
S2 – Stage S	Swale	150m	4.8	Treats and drains Stage S sports fields to Bioretention B1
S3 – Stages 1 and 3 (part of) and 2,4 and S	Swale	230m	B1+S1+S2	Conveys eastern development zone discharges to Cabbage Tree Ck. Provides additional treatment for upstream discharges prior to discharge to Cabbage Tree Creek
Stage 1 (part of) – Beams Rd	untreated		0.54	Development treatment upsized to offset this untreated portion of the development
TOTAL			15.11	

3.1 STORMWATER TREATMENT

The treatment strategy includes two (2) bioretention basins treating the development zones as shown in Figure 5. Swales along the southern boundary of the Stage S sports fields and at the eastern boundary of the site will also provide a treatment function prior to discharge to Cabbage Tree Creek.

Two small development areas (0.54ha total) adjacent to Beams Road at the northern end of the development do not report to the treatments proposed. The stormwater treatment proposed as part of this strategy have been sufficiently sized to compensate (i.e. over-treat) for the treatment of this area. Refer to Section 4 for performance assessments.

It should also be noted that the proposed drainage strategy will connect existing drainage from the existing facilities at the north west of the site to drainage that will report to Bioretention basin B2. This provides treatment of an area that previously was untreated.

Bioretention Basin B1

Bioretention Basin B1 (filter area 265m² at RL12.0) treats Stage 2 development and the eastern Stage 3 development and receives treated discharges from the swale (S2) draining Stage S sports fields. This basin is located at the eastern boundary of the site, just south of Stage S carpark. Pipe discharges enter the basin from the development zone via the Stage S carpark.

Treated outflows from the bioretention basin discharge to swale S3. Overflows from the bioretention connect directly to swale S3 via an overflow weir.

Detail designs for this bioretention basin have now been completed and construction is currently underway as part of Stage S works. A general arrangement of the bioretention basin is shown in Figure 6.

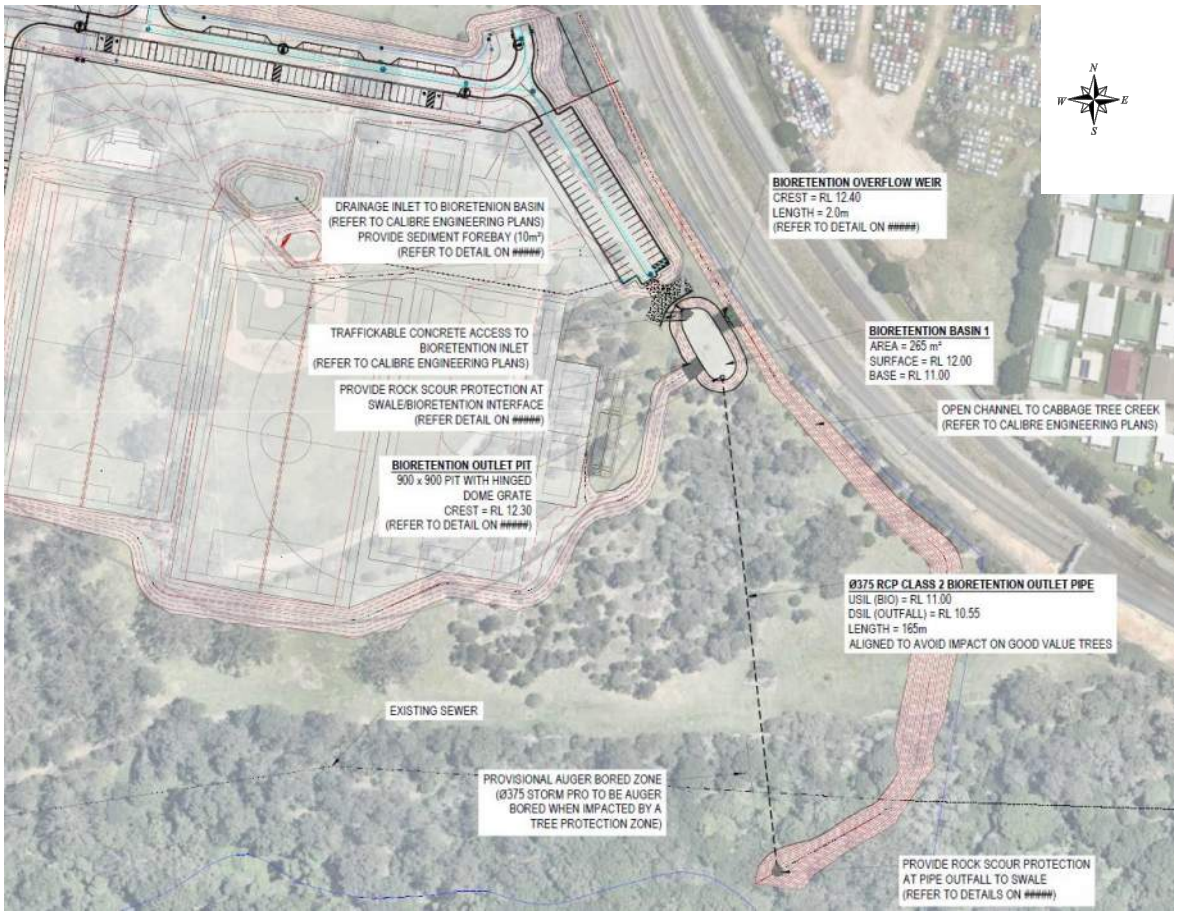


Figure 6 Bioretention basin B1 general arrangement

Bioretention Basin B2

Bioretention Basin B2 (filter area 500m² at RL12.0) treats parts of Stage 1 and 3 (west) development as well as Stages 4 and 5. The basin is proposed to be located within the footprint of the existing QUT research facility at the southern end of the site. This area, covering approximately 6,500m², is due to be decommissioned in 2020.

This treatment site could be incorporated as part of a future stormwater reuse scheme, by directing treated stormwater from the bioretention basin to an adjacent storage pond, which can then be used to supply harvested water for sports field irrigation.

Detail designs have now been completed for this bioretention. A general arrangement is shown in Figure 7.

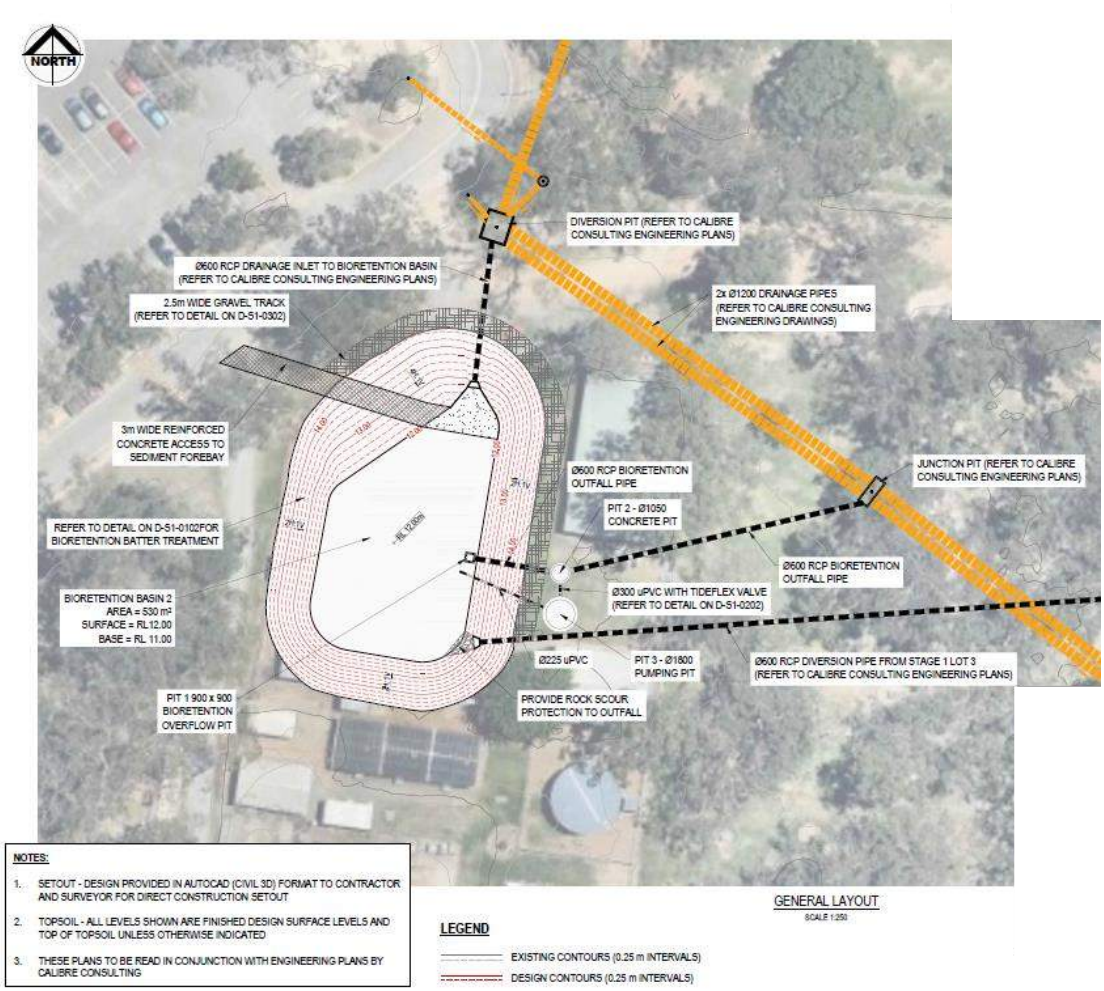


Figure 7 Bioretention basin B2 general arrangement

A diversion pit will direct development low flows to the bioretention basin at the northern end. In addition, a diversion pipe (600mm dia) will direct drainage from Stage 1 Lot 3 (1.07ha) to the bioretention basin at the southern end. High flows will continue to the drainage outfall to Cabbage Tree Creek via twin 1200mm dia pipes.

Treated outflows and bioretention overflows will be piped from the bioretention basin to the proposed 2x1200 mm dia drainage outfall pipes to Cabbage Tree Creek. A dia 1800mm pit is included with the bioretention basin works to facilitate connection to a future stormwater harvest scheme, should this proceed. This will allow the retrofit of future pumping infrastructure within this pit to pump bioretention treated outflows to a future holding pond. Regardless, the bioretention basin can operate under gravity to drain treated flows and overflows to the outfall of Cabbage Tree Creek i.e. the bioretention basin is not reliant on the inclusion of a stormwater harvest scheme and can operate entirely independently and under gravity.

Swale S1 (~230m)

Swale S1 (~230m) represents the drainage reserve formed at the eastern boundary of the development. Drainage from part of Stages 1 to 3 and Stage 4 will discharge to this

drainage reserve. This area is a minimum 10m wide and will be grassed and treed to form a buffer to the rail corridor. Drainage gradients along this zone are typically flat (~0.3%).

Swale S2 (~150m)

Swale S2 receives and treats drainage from the Stage S sports fields and directs this drainage to Bioretention Basin B1. This swale is turfed with 6H:1V batters. Drainage gradients are typically 0.6%.

Swale S3 (~230m)

Swale S3 connects drainage from the eastern half of the development zone to Cabbage Tree Creek. To minimise the impact on vegetation within the Cabbage Tree Creek riparian zone, batter slopes of 3H:1V are used. Drainage gradients along this zone are typically 0.6%. The swale will be vegetated with a mix of groundcovers and riparian vegetation to provide a treatment function and aid stability.

3.2 FLOOD MANAGEMENT

The majority of development runoff is directed southward to discharge to Cabbage Tree Creek. Development earthworks are configured to facilitate overland flows eastward and southward to allow the majority of development drainage to Cabbage Tree Creek. Developed lots are above 1% AEP levels (Q100), however the sports field earthworks allow flooding of the sports fields in events higher than the 5% AEP (Q20) . This aids in offsetting loss of flood storage as a result of development and avoids flood impacts along Cabbage Tree Creek.

A new swale along the eastern boundary of the site drains stormwater from the eastern half of the site to Cabbage Tree Creek. A 1200mm dia culvert is included along this swale with a one-way flap valve to minimise backwatering effects of Cabbage Tree Creek flows into the development from this new swale.

A flood barrier is also included along the eastern boundary of the site to contain development flows within the site and avoid impacts along the rail corridor. This flood barrier can take the form of a low block wall (~1m high) and/or bund and can be incorporated with the future acoustic fence along this boundary. Further details are provided in Section 5.2.2.

4 STORMWATER QUALITY TREATMENT ASSESSMENT

MUSIC modelling was conducted to quantitatively assess the stormwater treatment performance of the proposed stormwater treatment strategy. MUSIC version 6.3 was used for the assessment and the parameters have been established in accordance with the MUSIC Modelling Guidelines for South East Queensland (Water by Design, 2010).

Details of the modelling assumptions, parameters used and results are presented in the following sections.

4.1 MODEL STRUCTURE

The structure of the MUSIC model is shown in Figure 8 with the general data upon which the model is based provided in Table 4.

Catchments have been derived from the proposed masterplan layout, considering the pipe drainage system that would apply (refer to Figure 5 previously). Only areas under development are included in the model.

The model adopts a lumped catchment approach.

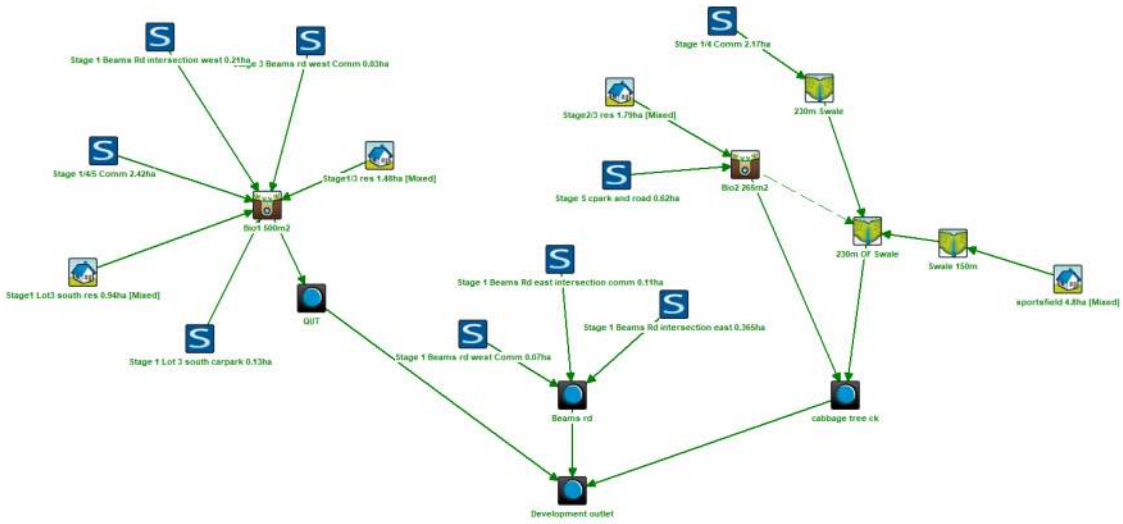


Figure 8 MUSIC model

Table 4 MUSIC model data summary

Parameter	Value
Source Data	
Rainfall data set	1990-1900 – Brisbane Aero Station No. 40223
Modelled time step	6 minute
Mean annual rainfall 1980--1990	1155 mm (for the period used)
Potential evapotranspiration	1,526mm (Table 3.1 Music modelling guidelines for SEQ)
Soil properties (runoff generation parameters)	Table 3.7 Music Modelling Guidelines for SEQ
Pollutant concentrations (base and storm flow concentration parameters)	Table 3.9 Music Modelling Guidelines for SEQ
Percent impervious	Table 3.6 Music Modelling Guidelines for SEQ Residential/mixed use (50dw/ha): 80% impervious Retail/commercial: 90% impervious Road: 90% impervious
Treatment Devices	
Bioretention	Filter media depth = 0.6 m Extended detention depth = 0.3 m Seepage = 0 mm/hr Saturated hydraulic conductivity 200mm/hr TN content[1] 400 mg/kg Orthophosphate content[1] 30mg/kg
Swale	Base width = 1m Top width = 10m Depth = 0.5m (S1 and S2); 1.5m (S3) Vegetation height = 0.05m (S1 and S2); 0.25m (S3) Slope 0.3% (S1); 0.6% (S2 and S3)

Note:

1. Water By Design have recently completed a review of important default values for bioretention basins. In terms of bioretention the parameters adopted are consistent with new values for filter media OP and TN content recently adopted by Healthy Waterways

4.2 RESULTS

The results of the MUSIC modelling are presented in Table 5.

Table 5 Summary of MUSIC modelling – Carseldine Urban Village

Treatment ID	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction achieved (%)	Water quality objective
CARSELDINE URBAN VILLAGE					
Bio B1 Filter area 265m²	TSS TP TN	5720 10.8 65.6	802 2.2 26.7	86.0 79.7 59.2	Water quality objective applies to the combined site discharge
Bio B2 Filter area 500m²	TSS TP TN	11000 25.0 151	1910 6.08 66.7	82.6 75.7 55.8	
Swale S1 Length = 230m	TSS TP TN	4660 12.2 70.5	535 3.44 50.4	88.5 71.9 28.5	
Swale S2 Length = 150m	TSS TP TN	1570 4.06 32.6	654 2.48 27.6	58.2 39.1 15.3	
Swale S3 Length = 230m	TSS TP TN	1950 7.75 94.5	1200 6.41 86.2	38.4 17.3 8.8	
Stage 1 – Beams Rd 0.54ha untreated	**TSS** **TP** **TN**	1820 3.45 17.4	1820 3.45 17.4	**0** **0** **0**	
TOTAL	**TSS** **TP** **TN**	**24700** **55.6** **337**	**4970** **16.3** **181**	**80.0** **70.7** **46.4**	**80** **60** **45**

The results demonstrate that load based objectives are achieved for the Carseldine Urban Village Development with the proposed stormwater treatment strategy.

5 FLOOD ASSESSMENT

Flood modelling has been based on Brisbane City Council (BCC) supplied URBS and TUFLOW regional flood models for Cabbage Tree Creek. These models have been updated as necessary to make suitable for an impact assessment of the Carseldine Urban Village development.

The following describes model updates made to the Council supplied URBS and TUFLOW models to complete assessments on the impacts of the development.

5.1 URBS

URBS has been used to generate flows for the pre-developed and developed case scenarios for incorporation into TUFLOW. The following describes the model updates and assumptions used.

5.1.1 Pre-developed catchments

The Council supplied URBS model includes 70 sub catchments that delineate the approximate 43.1km^2 Cabbage Tree Creek catchment. URBS catchments covering the Carseldine Urban Village development zone within the Cabbage Tree Creek catchment have been refined to allow better representation of local catchment flooding characteristics in and around the development.

Sub-catchment 29 in the URBS model covers the proposed Carseldine Urban Village development zone. This has been split into 5 sub-catchments (291 to 295) to represent in finer detail site drainage based on existing topography obtained from Council supplied DEM model and ground truthing of current drainage.

Pervious and impervious fractions have been updated for these catchments, together with catchment slopes. Catchment slopes have been updated and estimated using the equal area method for each new sub catchment modelled.

All other URBS catchments have been retained as per the original Council supplied model setup, including catchment slopes.

Figure 9 shows the predeveloped catchments relevant to the Carseldine Urban Village development. Table 6 provides a summary of sub-catchment land uses, areas and slopes modelled in and around the development. URBS model land use is applied by using various land use categories within each sub-catchment. URBS model land use categorisation has been adopted in accordance with the BCC model. Land use categories and associated fractions impervious values are:

- Urban Low Density (10% Impervious)
- Urban Medium Density (50% Impervious)
- Urban High Density (90% Impervious)
- Rural (0% Impervious)

Table 6 Pre-developed catchments

ID	Area	Land use (%)				Catchment
	ha	Low density	Medium density	High density	Rural	Slope %
291	18.63	0%	0%	18.0%	82.0%	1.14
292	6.57	0%	0%	9.7%	90.3%	2.04
293	6.52	0%	0%	3.6%	96.4%	0.63
294	5.09	0%	0%	0%	100%	0.55
295	82.15	0%	19.3%	38.3%	42.4%	0.70
32	36.52	0%	83.3%	3.8%	12.8%	1.30

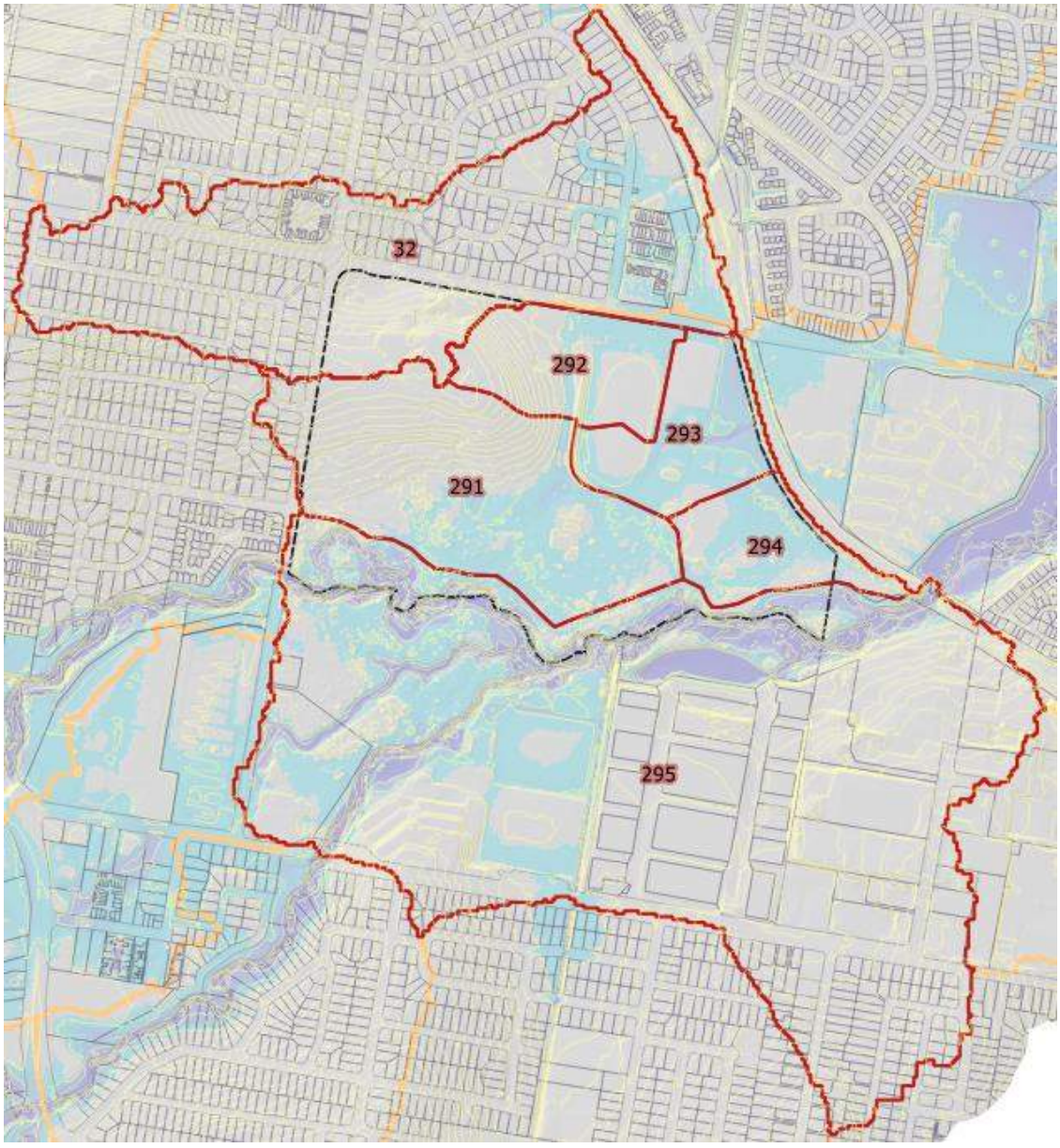


Figure 9 Refined URBS sub-catchments relevant to the development – base case

5.1.2 Developed case catchments

Sub-catchments where development applies were adjusted to represent the proposed development for Carseldine Urban Village. This applies to sub catchments 291, 292, 293, 294 and 32. These sub-catchments are shown in Figure 10.

Catchment land uses have been adjusted to account for the increased impervious area associated with the development. Adjustments to sub-catchment boundaries have also been applied, where necessary to align with the drainage strategy of the developed site.

Sub-catchments 293 and 294 drain southwards to Cabbage Tree Creek via a new drainage swale between the railway line and the development. Sub-catchments 291 and 292 will drain to Cabbage Tree Creek via stormwater pipes that will discharge in the vicinity of the two existing outfalls. The final details of this drainage configuration will be undertaken as part of future detail design phases.

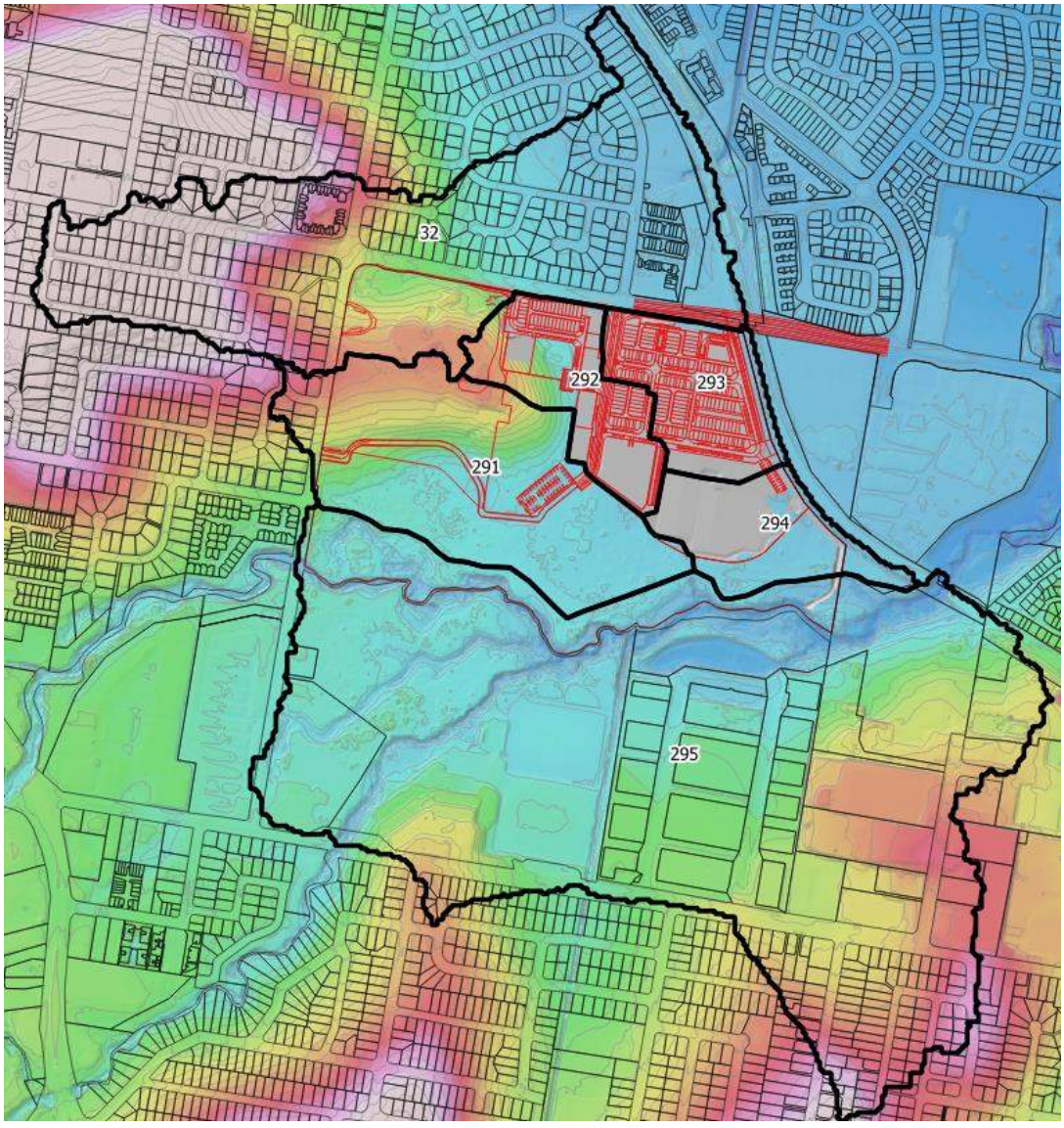


Figure 10 Developed case sub-catchments

Pervious and impervious areas were derived based on expected fraction impervious values for the various land uses. Percent impervious values applied to each land use were based on recommended values in QUDM (2007). The following values have been applied:

- pre-developed vegetation: 0%
- Urban residential: 90%
- Retail/commercial: 90%
- Sports fields: 0%

Modelled catchment areas and slopes for post developed conditions are summarised in Table 7.

Table 7 Carseldine Urban Village development - modelled catchment areas and slopes

ID	Area	Land use (%)				Catchment
	ha	Low density	Medium density	High density	Rural	Slope %
291	17.98	0%	0%	16.11%	83.89%	1.14
292	6.63	0%	0%	88.00%	12.00%	2.04
293	6.47	0%	0%	87.83%	12.17%	0.63
294	6.01	0%	0%	1.78%	98.22%	0.55
295	82.15	0%	19.28%	38.3%	42.4%	0.70
32	36.24	0%	83.98%	3.87%	12.15%	1.30

5.1.3 Rainfall

Design event modelling has been undertaken using Australian Rainfall and Runoff (ARR, 1987) industry standard approach of modelling multiple design rainfall burst durations and extracting the maximum values from these events.

Rainfall parameters were based on the following:

- Temporal Patterns were based on the Australian Rainfall and Runoff (1987) publication. Zone 3 is applied to this site.
- Rainfall Intensity Frequency Duration (IFD) data used is consistent with that used in previous modelling, based on AR&R.

Design storms for the 39%, 20%, 10%, 5%, 2% and 1% AEP events have been modelled for the 60, 90, 120, 180 and 360 minute duration storms.

Design event rainfall is retained as per the Council supplied URBS model.

Rainfall losses and roughness values

Loss rates are retained as per the Council supplied URBS model. The following loss rates are used for the pervious areas for all events modelled:

- initial loss – 10 mm
- continuing loss – 0mm/hr

Zero initial and continuing loss is applied to the impervious fractions.

5.2 TUFLOW

Flood modelling has been carried out using a refined version of BCC's Cabbage Tree Creek TUFLOW model. The following updates have been made to the model for this investigation:

- The model has been updated to a recent version of TUFLOW (2016-03-AE_64 _iSP_w64)
- Inflow hydrographs have been extracted from the refined URBS sub-catchments.
- TUFLOW 'gully' lines have been incorporated to improve model representation of local gullies in the study area. In particular, the existing drain adjacent to the railway has been modelled using a 'gully' line.
- Inflow hydrographs from the refined URBS sub-catchments have been applied using 2d_sa polygons that have been trimmed to control where flows are input to the TUFLOW model.
- The major drainage pipes associated with the two existing outfalls to Cabbage Tree Creek have been incorporated using 1D pipe elements

Existing stormwater drainage pipes and inlets pits within the site have been incorporated into the pre-developed case TUFLOW model as shown in Figure 11. This is based in recent survey of the existing pipe infrastructure (June 2019). Pipe diameters are shown in metres in Figure 11.

All other model parameters and assumptions remain unchanged.

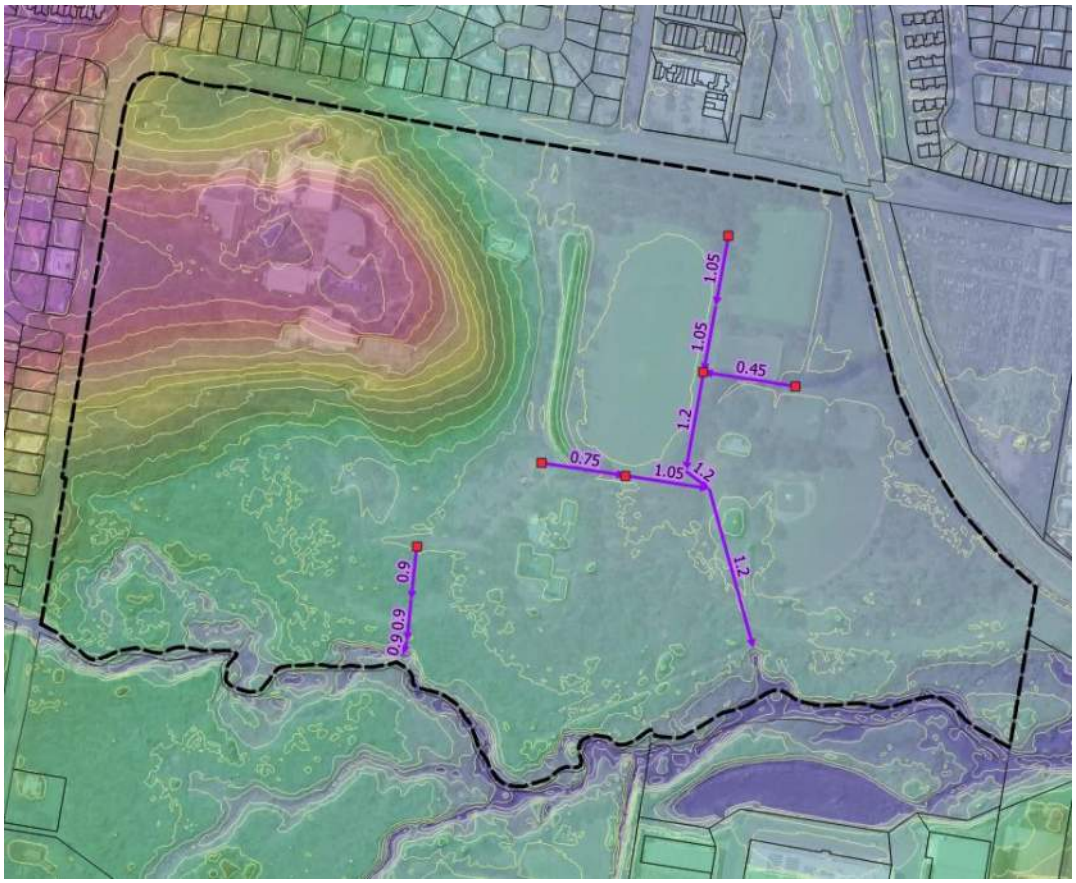


Figure 11 Existing site pipe drainage

5.2.1 Development earthworks

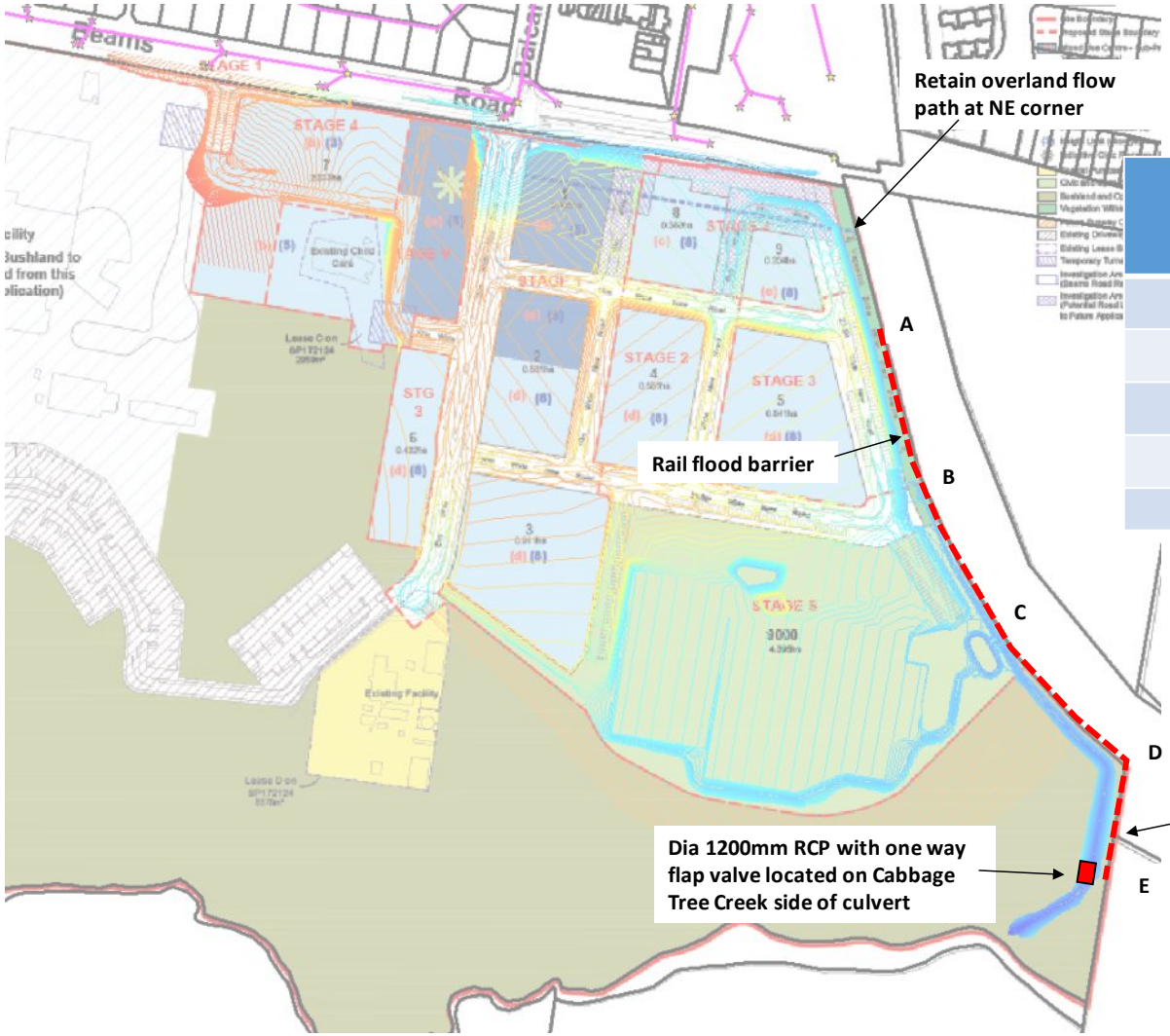
The proposed development has been incorporated into the TUFLOW model based on the latest earthworks design tin provided by the project civil engineers (Calibre Consulting).

5.2.2 Mitigation measures

Extensive iterative model assessments identified the following mitigation measures were required to avoid impacts external to the site:

- Sports field earthworks are designed to allow flooding during less frequent events (5% AEP and above)
- A 1200mm diameter culvert with a flood valve is included along the proposed eastern swale to minimize backwatering from Cabbage Tree Creek into the development via this swale – this minimizes the impacts of Cabbage Tree Creek flows into the site via this new connection to Cabbage Tree Creek.
- The rail corridor external to the property boundary will be protected from any increase in flood levels through the incorporation of an engineered flood barrier (~1m high) along the eastern boundary of the site - this avoids increases in flood levels external to the site adjacent to the rail line.

Details of the above mitigation measures are provided in Figure 12.



Pt ID	Ground Height (mAHD)	1% AEP Peak Flood Level (mAHD)	Suggested rail flood barrier top level mAHD
A	13.0	13.56	13.86
B	12.9	13.78	14.08
C	13.0	13.83	14.13
D	13.1	13.83	14.13
E	13.7	13.83	14.13

Figure 12 Proposed mitigation measures

The proposed rail flood barrier along the eastern boundary can take the form of a low blockwork wall and/or an earthen bund where space permits. This barrier can be combined with the future acoustic fence along the eastern boundary of the site e.g. the bottom of the acoustic fence takes the form of a blockwork wall with the acoustic fence installed above.

The extent and minimum flood levels for the flood barrier are provided Figure 12. This provides a 300mm freeboard to the expected 100 year developed flood levels. It should be noted that the flood barrier extends to the 1200mm dia culvert at the southern end and not to Cabbage Tree Creek to avoid constraining Cabbage Tree Creek flood flows and causing flood impacts downstream. The existing overland flow path at the north eastern end of the site is retained i.e. the rail flood barrier does not extend all to way to Beams Road.

5.3 RESULTS

Table 8 summarises peak flows immediately upstream of the Railway Bridge at Cabbage Tree Creek (reporting point 10), whilst Table 9 summarises peak water levels for pre and post conditions at various reporting location both within and external to the site. Figure 13 provides locations of reporting points.

Appendix A provides flood depth and impact maps for model runs. These include:

- Figure A1: Base case 39%AEP (Q2) flood depth
- Figure A2: Base case 5% AEP (Q20) flood depth
- Figure A3: Base case 1% (Q100) flood depth
- Figure A4: Developed case 39% AEP (Q2) flood depth
- Figure A5: Developed case 5% AEP (Q20) flood depth
- Figure A6: Developed case 1% AEP (Q100) flood depth
- Figure A7: Flood impact map 39% AEP (Q2)
- Figure A8: Flood impact map 20%AEP (Q5)
- Figure A9: Flood impact map 10% AEP (Q10)
- Figure A10: Flood impact map 5% AEP (Q20)
- Figure A11: Flood impact map 2% AEP (Q50)
- Figure A12: Flood impact map 1% AEP (Q100)
- Figure A13: Regional flood impact map 39% AEP (Q2)
- Figure A14: Regional flood impact map 1% AEP (Q100)

Table 8 Peak flows – Cabbage Tree Creek - Railway Bridge (Point 10)

AEP	Peak flow (m^3/s)			Difference
	Pre	Post	Difference	%
39% (Q2)	74.80	74.66	-0.14	-0.2%
20% (Q5)	103.39	103.54	0.15	0.1%
10% (Q10)	122.74	122.59	-0.15	-0.1%
5% (Q20)	146.77	147.19	0.42	0.3%
2% (Q50)	176.57	176.68	0.11	0.1%
1% (Q100)	202.1	202.8	0.70	0.3%

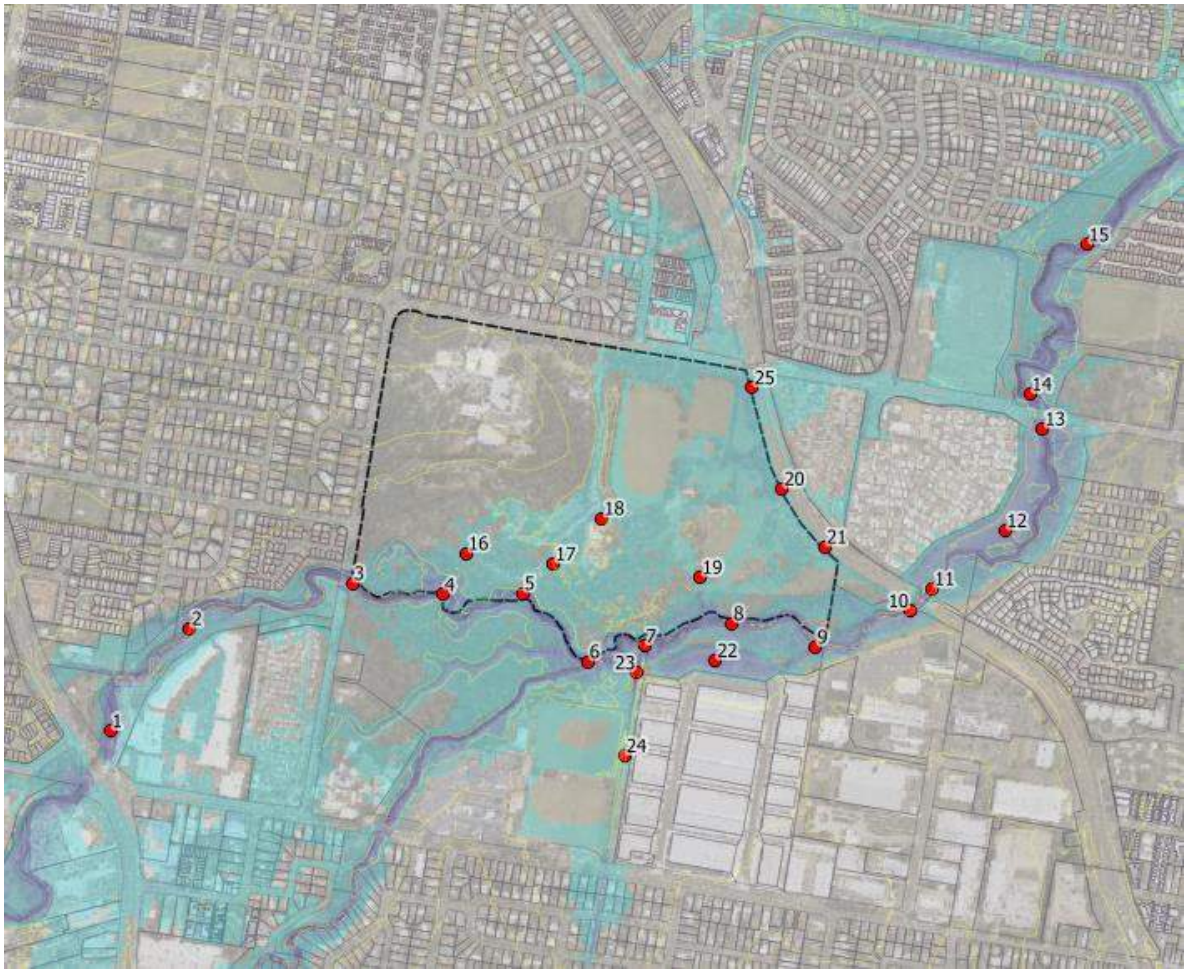


Figure 13 Reporting locations

Table 9 Peak water levels

ID	Water levels (mAHD)																	
	39%AEP			20%AEP			10%AEP			5%AEP			2%AEP			1%AEP		
	pre	post	difference	pre	post	difference	pre	post	difference	pre	post	difference	pre	post	difference	pre	post	difference
1	17.791	17.791	0.000	18.270	18.270	0.000	18.53221	18.5323	0.000	18.804	18.804	0.000	18.999	18.999	0.000	19.077	19.077	0.000
2	16.866	16.866	0.000	17.364	17.364	0.000	17.638	17.639	0.000	17.941	17.942	0.000	18.169	18.169	0.000	18.262	18.262	0.000
3	15.475	15.476	0.001	16.008	16.010	0.002	16.272	16.274	0.001	16.542	16.543	0.001	16.717	16.717	0.000	16.779	16.779	0.000
4	15.165	15.167	0.002	15.693	15.696	0.003	15.953	15.955	0.002	16.217	16.218	0.001	16.372	16.373	0.001	16.428	16.428	0.000
5	14.553	14.557	0.004	15.083	15.090	0.006	15.318	15.322	0.004	15.543	15.545	0.002	15.703	15.705	0.002	15.796	15.797	0.001
6	13.739	13.742	0.003	14.217	14.222	0.006	14.462	14.467	0.005	14.734	14.739	0.005	15.044	15.048	0.004	15.267	15.270	0.003
7	13.387	13.388	0.001	13.831	13.835	0.004	14.064	14.067	0.004	14.331	14.337	0.006	14.635	14.638	0.003	14.875	14.879	0.004
8	12.934	12.932	-0.002	13.306	13.306	-0.001	13.499	13.498	-0.001	13.715	13.718	0.004	13.961	13.964	0.003	14.191	14.197	0.007
9	12.299	12.301	0.002	12.664	12.663	-0.002	12.867	12.859	-0.008	13.126	13.122	-0.004	13.443	13.437	-0.006	13.739	13.740	0.001
10	11.684	11.683	-0.002	12.084	12.086	0.002	12.338	12.335	-0.002	12.692	12.695	0.003	13.098	13.101	0.003	13.462	13.470	0.009
11	11.405	11.402	-0.002	11.799	11.800	0.001	12.039	12.037	-0.002	12.309	12.311	0.002	12.565	12.567	0.002	12.755	12.759	0.004
12	11.134	11.131	-0.003	11.573	11.575	0.001	11.835	11.834	-0.002	12.120	12.122	0.002	12.376	12.378	0.002	12.561	12.565	0.004
13	11.029	11.027	-0.002	11.484	11.485	0.001	11.750	11.748	-0.002	12.035	12.038	0.002	12.286	12.288	0.002	12.464	12.468	0.004
14	10.955	10.953	-0.002	11.395	11.396	0.001	11.643	11.642	-0.002	11.901	11.903	0.002	12.118	12.119	0.002	12.272	12.275	0.003
15	9.854	9.851	-0.003	10.346	10.346	0.001	10.596	10.594	-0.001	10.846	10.848	0.002	11.067	11.071	0.005	11.244	11.245	0.001
16	dry	dry	NA	dry	dry	NA	dry	dry	NA	16.109	16.109	0.000	16.240	16.240	0.001	16.282	16.282	0.000
17	dry	dry	NA	dry	dry	NA	dry	dry	NA	15.037	15.039	0.001	15.148	15.148	0.001	15.206	15.207	0.001
18	dry	dry	NA	dry	dry	NA	dry	dry	NA	dry	dry	NA	14.824	14.753	-0.071	14.919	14.849	-0.070
19	dry	dry	NA	dry	dry	NA	dry	dry	NA	dry	dry	NA	dry	dry	NA	14.252	14.307	0.055
20	12.810	dry	NA	12.911	dry	NA	13.037	dry	NA	13.213	12.865	-0.347	13.426	13.175	-0.251	13.529	13.481	-0.048
21	12.401	dry	NA	12.618	12.041	-0.577	12.791	12.310	-0.482	13.095	12.690	-0.406	13.383	13.122	-0.261	13.520	13.457	-0.063
22	11.961	11.964	0.003	12.720	12.717	-0.003	12.942	12.934	-0.008	13.254	13.254	-0.001	13.692	13.692	0.001	14.024	14.030	0.007
23	13.402	13.403	0.001	13.855	13.861	0.005	14.103	14.107	0.005	14.385	14.390	0.005	14.715	14.718	0.003	14.979	14.984	0.005
24	14.969	14.969	0.000	15.222	15.228	0.006	15.275	15.285	0.010	15.318	15.313	-0.005	15.357	15.358	0.000	15.403	15.403	0.000
25	12.860	dry	NA	13.061	dry	NA	13.118	12.992	-0.126	13.247	13.234	-0.013	13.442	13.401	-0.040	13.518	13.467	-0.051

5.3.1 Peak flows

Peak flows upstream at the Railway Bridge over the range of storm events up to the 1% AEP (100yr ARI) are effectively retained at predeveloped levels (+0.3% to -0.2%). For the 1% AEP a minor increase is observed and represents a 0.3% increase. No adverse impacts downstream of the Bridge are observed in all events tested.

5.3.2 Flood inundation – existing case

Existing case flood inundation maps indicate flooding of low-lying areas at the north eastern corner of the site occurs on a frequent basis. Existing drainage within the site directs this more frequent drainage to the existing drainage outfalls to Cabbage Tree Creek. No flooding of Beams Rd is expected for the more frequent flood events. Figure 14 shows inundation mapping for the minor 39% AEP (2 yr) event.

At the 5% AEP (20 yr ARI event - see Figure 15) breakout from Cabbage Tree Creek occurs along the northern bank at the western end of the site. These breakout flows are then predicted to flow generally in a north-east direction at shallow depths through the site. Inundation in the north-east of the site is constrained west of the rail corridor. Shallow flooding of Beams Road is expected in this case and is anticipated to extend north of Beams Road.

In the 1% AEP event (refer to Figure 16) there is a significant increase in the inundation area of breakout flows through the site. While there is a large increase in the inundation extent, the actual flood depths predicted over most of this area remain typically less than 250mm. Inundation is also predicted to occur across the rail corridor at the north eastern boundary of the site and extends along Beams Road and adjacent existing developed areas to the north and east. Flow depths are noted to be mostly less than 250mm in this case, except for low lying areas adjacent to the rail corridor.

Flooding across the site resulting from Cabbage Tree Creek breakout flows is characterised by shallow (typically less than 250mm), conveyance dominated flows. Consequently, flood storage influences are expected to be minor. For this reason, it would be expected that a loss of floodplain storage in these areas would be unlikely to cause significant adverse flood impacts. This is discussed in the following sections.

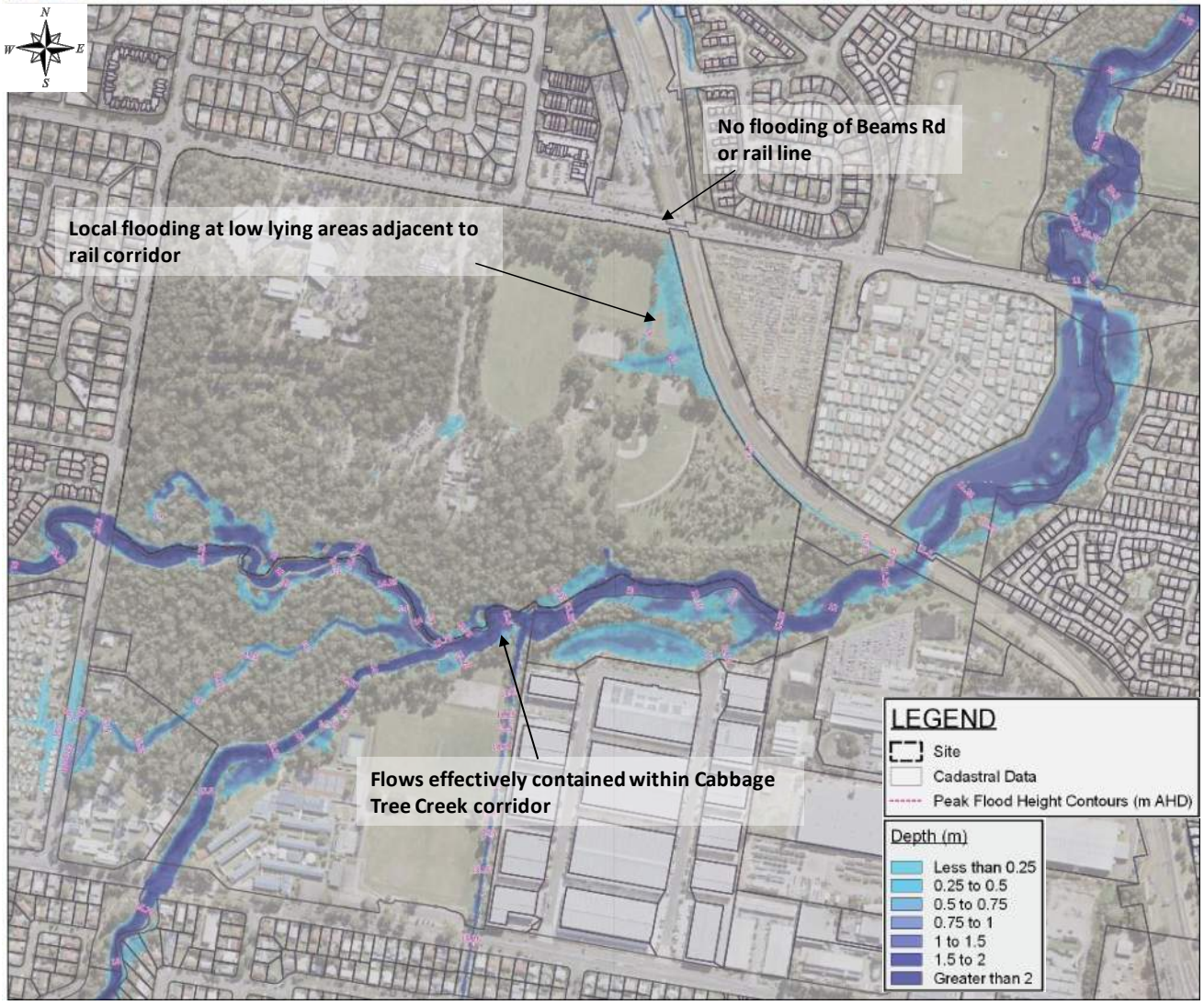


Figure 14 39% AEP flood inundation - existing conditions

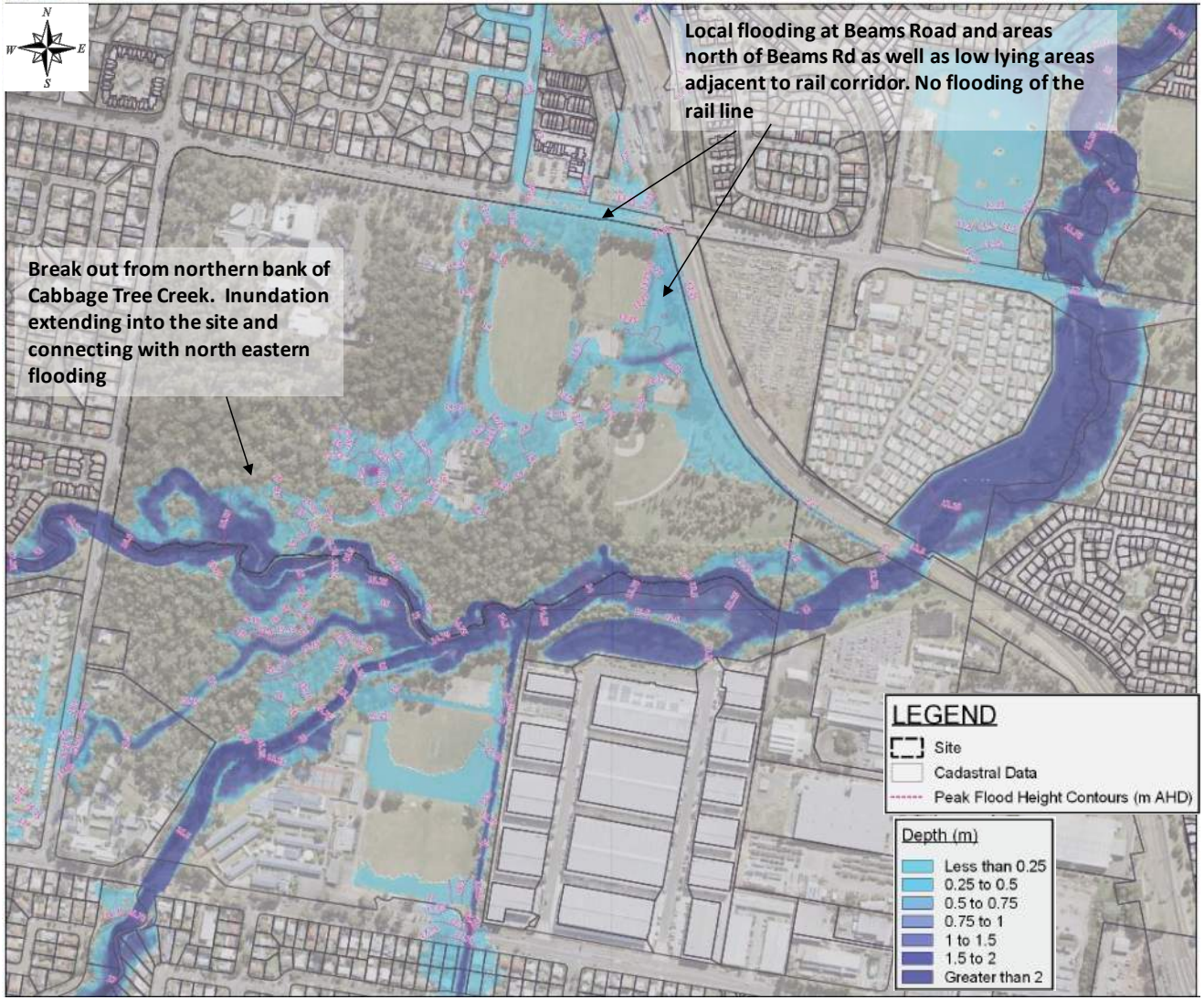


Figure 15 5% AEP flood inundation - existing conditions

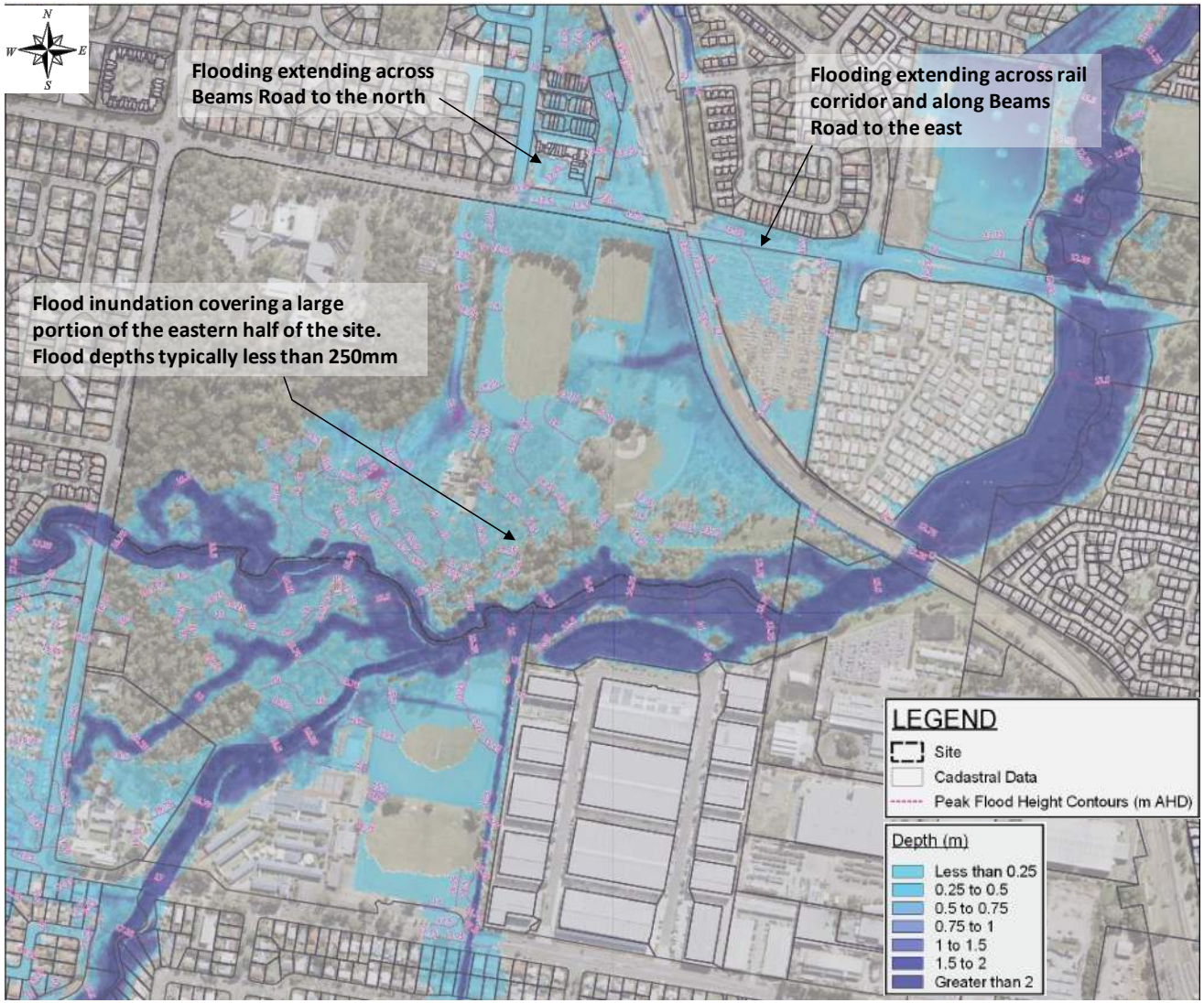


Figure 16 1% AEP flood inundation - existing conditions

5.3.3 Flood impacts

Table 9 previously summarises peak water levels for pre and post conditions at various reporting locations for the 39% AEP to 1% AEP model runs. Flood impacts maps for the 39% AEP to 1% AEP are included in Appendix A.

Flood impact maps demonstrate no significant adverse impacts occurring external to the site as a result of the development, with the proposed mitigation measures included.

Improved flood conditions are observed at Beams Road and the rail line at the north-east corner of the site. This is because much of the site drainage is directed to Cabbage Tree Creek as part of the development. Furthermore, during larger magnitude events, the proposed development filling restricts Cabbage Tree Creek breakout flow from entering this area.

Impacts noted on the afflux maps are typically contained within the site boundary and are associated with flooding of the sports fields (above 5% AEP event) and the operation of the development drainage swales. This is expected. Other low-lying riparian bushland areas already subject to flooding within the site also experience localised increases in flooding south west of the sports fields, however this does not impact on any existing facilities or infrastructure. Increases in flooding within the site as described above help offset loss of flood storage. Commercial and residential lots are protected from flooding during the 1% AEP (100 year ARI) event.

Minor impacts (typically up to 50mm) external to the site at the south eastern boundary are noted, however these occur in a low-lying bushland area currently subject to flooding from Cabbage Tree Creek and is not considered an actionable nuisance.

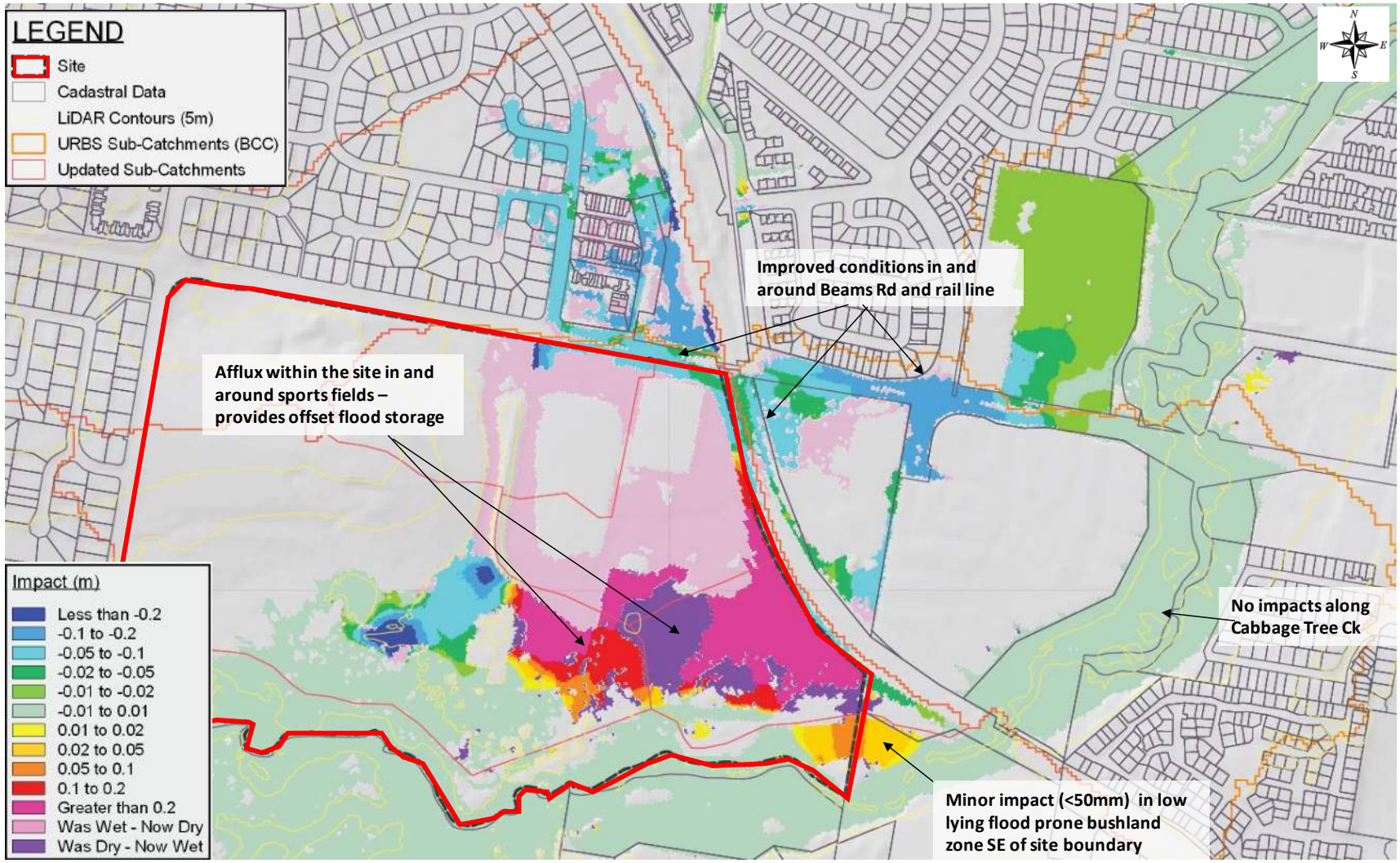


Figure 17 1% AEP flood impacts

5.3.4 Flood storage

An assessment of the impacts of development on flood storage has been completed for the 1% AEP event. This is to review compensatory earthworks, in line with BCC compensatory earthworks planning scheme policy for developments within mapped creek corridors.

Flood storage volumes within the site boundary have been calculated for the existing case and developed case scenarios. Table 10 summarises the estimated flood storage volumes, based on the current model assumptions.

Table 10 Flood storage volumes – 1% AEP

Scenario	Flood storage (m^3)
Existing conditions	44,929
Developed case	38,208
Loss in storage	6,721

Overall, the flood modelling predicts that a loss of flood storage will occur (~15%). Despite this, the modelling also demonstrates that no significant adverse offsite flood impacts are expected to occur along Cabbage Tree Creek and improved flood conditions can be expected at both Beams Road and the rail line at the north east of the site. This is because the storage loss is relatively minor in the context of the regional floodplain and the site largely serves a flood conveyance (or overland flow) function as opposed to a flood storage function for Cabbage Tree Creek floodwaters.

6 MAINTENANCE

WSUD infrastructure such as bioretention basins require ongoing inspection and maintenance to ensure they establish and operate in accordance with the design intent. Potential problems associated with WSUD as a result of poor maintenance include:

- Decreased aesthetic amenity;
- Reduced functional performance;
- Public health and safety risks; and
- Decreased habitat diversity (dominance of exotic weeds).

6.1 MAINTENANCE PLAN

A Maintenance Plan will be required prior to handover of WSUD assets. The plan will provide detailed guidance around maintenance of WSUD assets, as well as frequency of maintenance activities. The manual will include performance inspection checklists. The document will be consistent with the methodologies and principles detailed in Maintaining WSUD Assets (Water by Design, 2012).

The maintenance plan and checklists will be a living document and can be refined where required in collaboration with Council assets and maintenance departments to ensure the structure and frequency of maintenance is consistent with current Council procedures. This will also provide an opportunity for transfer of knowledge in this regard to allow Council to effectively operate the sediment ponds and bioretention basin.

6.1.1 Bioretention basins

Typical maintenance of bioretention systems during operation will involve:

- Routine inspection of the bio-retention system profile to identify any areas of obvious increased sediment deposition, scouring from storm flows, rill erosion of the batters from lateral inflows, damage to the profile from vehicles and clogging of the bio-retention system (evident by a 'boggy' filter media surface).
- Routine inspection of inflows systems, overflow pits and under-drains to identify and clean any areas of scour, litter build up and blockages.
- Removal of sediment where it is smothering the bio-retention system vegetation.
- Repairing any damage to the profile resulting from scour, rill erosion or vehicle damage by replacement of appropriate fill (to match onsite soils) and revegetating.
- Tilling of the bioretention system surface, or removal of the surface layer, if there is evidence of clogging.
- Regular watering/ irrigation of vegetation until plants are established and actively growing.
- Removal and management of invasive weeds (herbicides should not be used).

- Removal of plants that have died and replacement with plants of equivalent size and species as detailed in the plant schedule.
- Pruning to remove dead or diseased vegetation material and to stimulate growth.
- Vegetation pest monitoring and control.

Maintenance should only occur after a reasonably rain free period when the soil in the bioretention system is dry. Inspections are also recommended following large storm events to check for scour and other damage.

7 CONCLUSION

An updated stormwater management strategy has been developed for the Carseldine Urban Village to meet the requirements of the *State Planning Policy* (DLGIP, 2017), QUDM and *Brisbane City Council Planning Scheme*.

STORMWATER TREATMENT

The updated strategy includes two (2) bioretention basins that treat development runoff prior to discharge to Cabbage Tree Creek:

- Bioretention Basin B1 265m² filter area treating Stages 2, 3 (part of) and S
- Bioretention Basin B2 500m² filter area total treating the remainder of the development (Stages 1,3 (part of), 4 and 5)

Drainage swales along the eastern boundary of the site and at the southern boundary of the Stage S sports fields also provide additional treatment.

FLOODING

Flood impact assessment demonstrates no significant impacts occurring external to the site as a result of development. Some afflux (~50mm) is observed immediately south east of the development boundary, however this afflux occurs within a low-lying flood prone bushland area and is not considered an actionable nuisance.

Improved flood conditions are observed at Beams Road and the rail line at the north-east end of the site. This is because much of the site drainage will be directed to Cabbage Tree Creek. Furthermore, during larger magnitude events, the proposed development fill restricts Cabbage Tree Creek breakout flow from entering this area.

Required mitigation measures to manage flood impacts external to the site include:

- Providing flood storage over the sports field zone for events greater than the 5% AEP (20 year ARI)
- incorporation of a 1200mm dia pipe with one-way flap valve along the new drainage swale draining the eastern half of the development – this minimizes the impacts of Cabbage Tree Creek flows into the site via this new connection to Cabbage Tree Creek
- inclusion of a flood barrier along the eastern boundary of the site (~1m high) – this avoids increases in flood levels external to the site adjacent to the rail line

Updated regional modelling and detailed local modelling will occur as part of continuing design development for the site.

8 REFERENCES

Australian Rainfall and Runoff (1987). *A Guide to Flood Estimation*. Engineers Australia

Calibre (2017). *Flood Impact Assessment & Concept Stormwater Management Plan – Carseldine Urban Village (Master Plan).* Prepared for Economic Development Queensland.

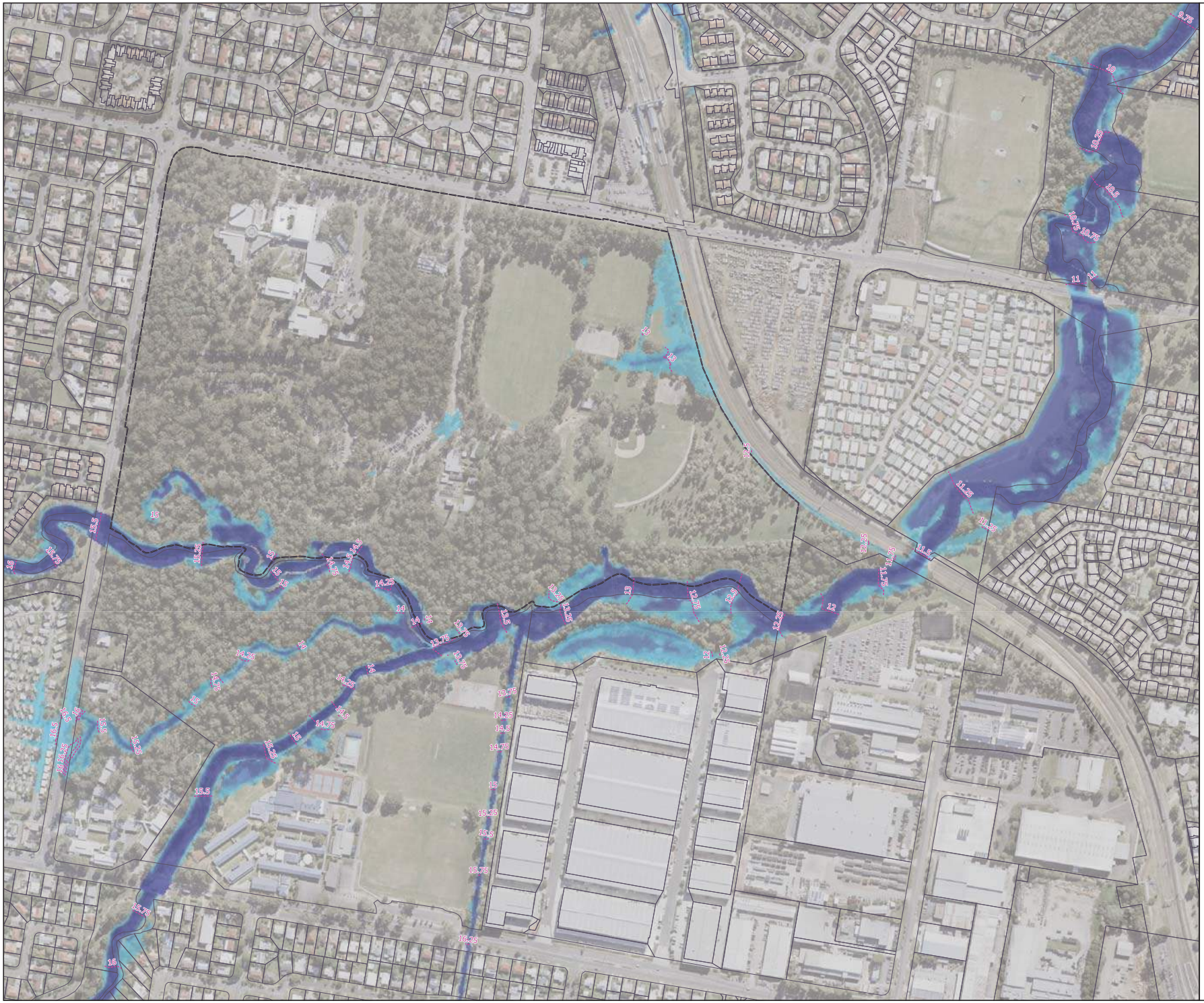
DLGIP (2017). *State Planning Policy*

Healthy Waterways (2010). *MUSIC Modelling Guidelines*

QUDM (2007). *Queensland Urban Drainage Manual*. Second Edition 2007. Department of Natural Resources and Water

SGS (2017). *Geotechnical Investigation Report – Carseldine Urban Village, Beams Road, Carseldine.* Prepared for Economic Development Queensland.

APPENDIX A – TUFLOW MODEL OUTPUTS



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)

- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A1

N

50 0 50 100 m

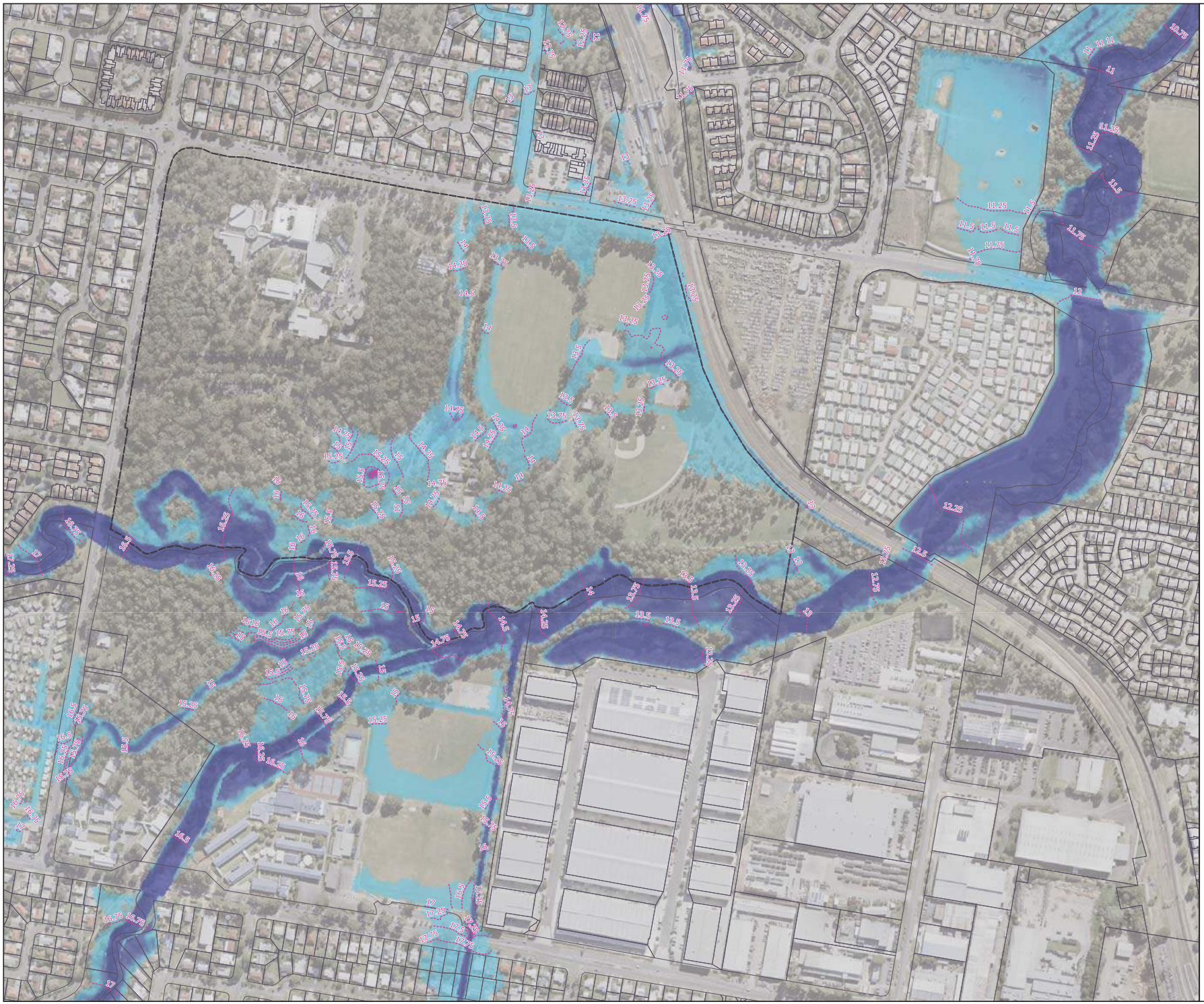
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Existing Case (TUFLOW ID B01d)

39%AEP Event (Q002)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)

- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A2

N

50 0 50 100 m

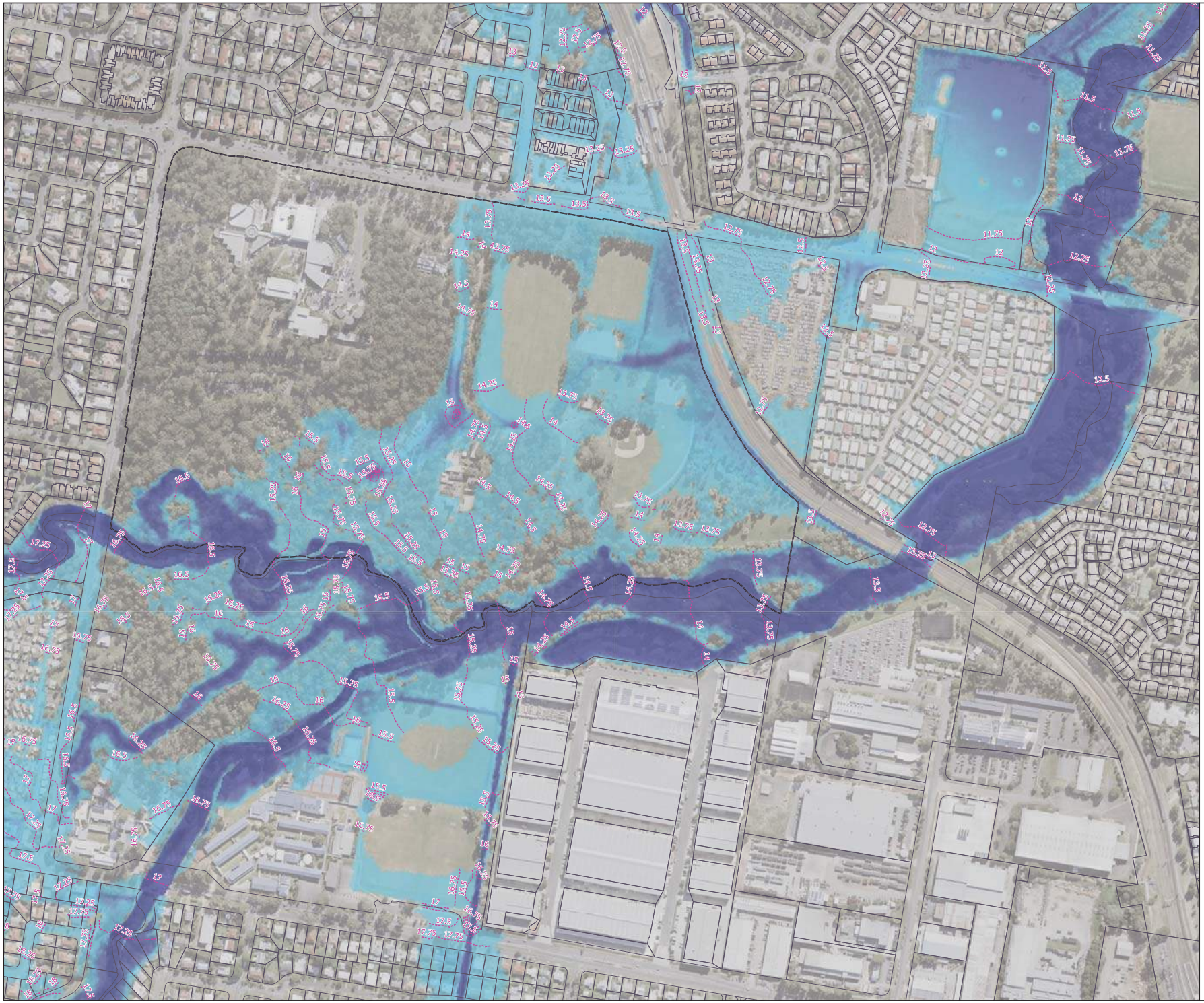
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Existing Case (TUFLOW ID B01d)

5%AEP Event (Q020)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)

- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A3

N

50 0 50 100 m

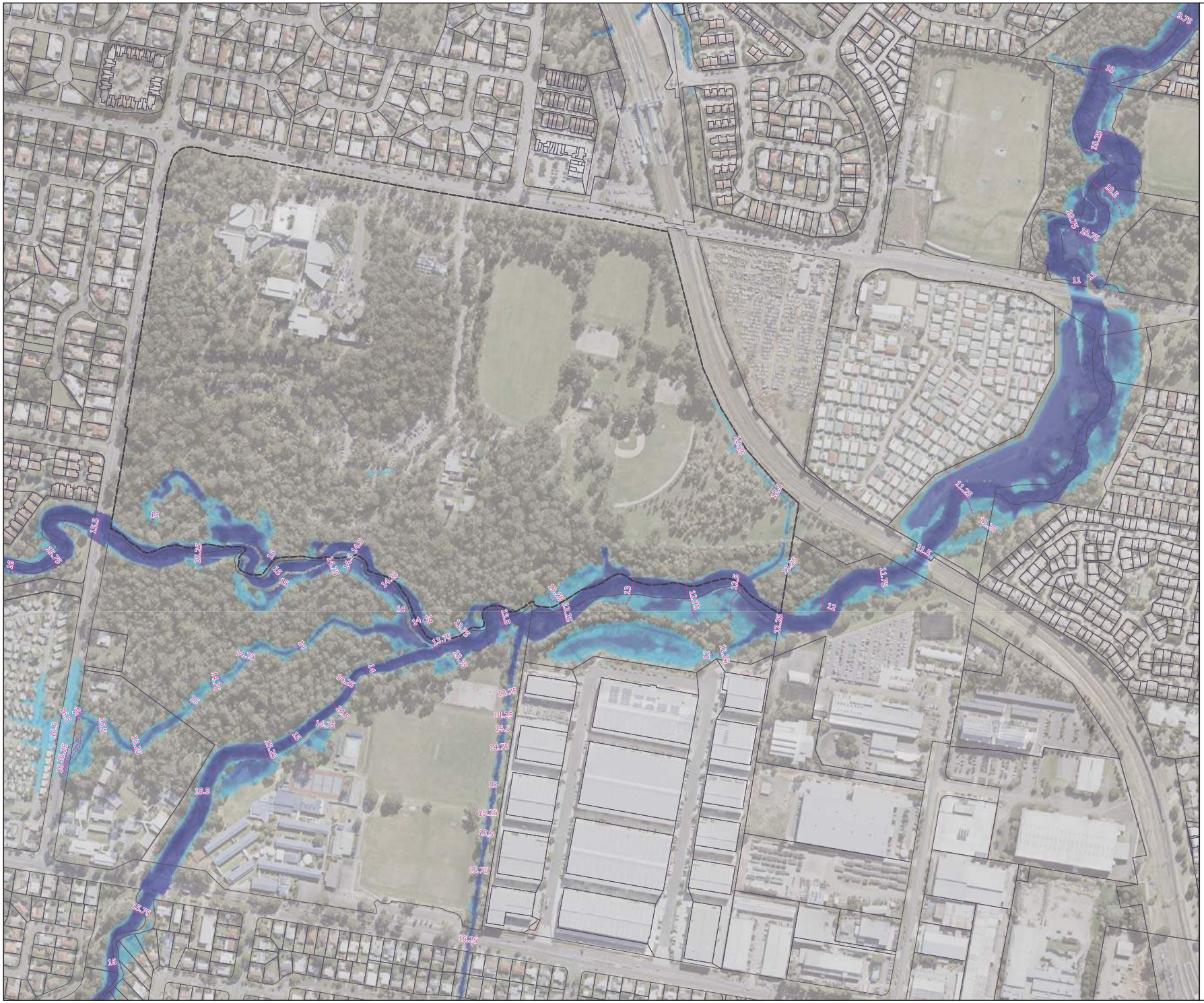
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Existing Case (TUFLOW ID B01d)

1%AEP Event (Q100)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND
- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)
- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A4

N

50 0 50 100 m

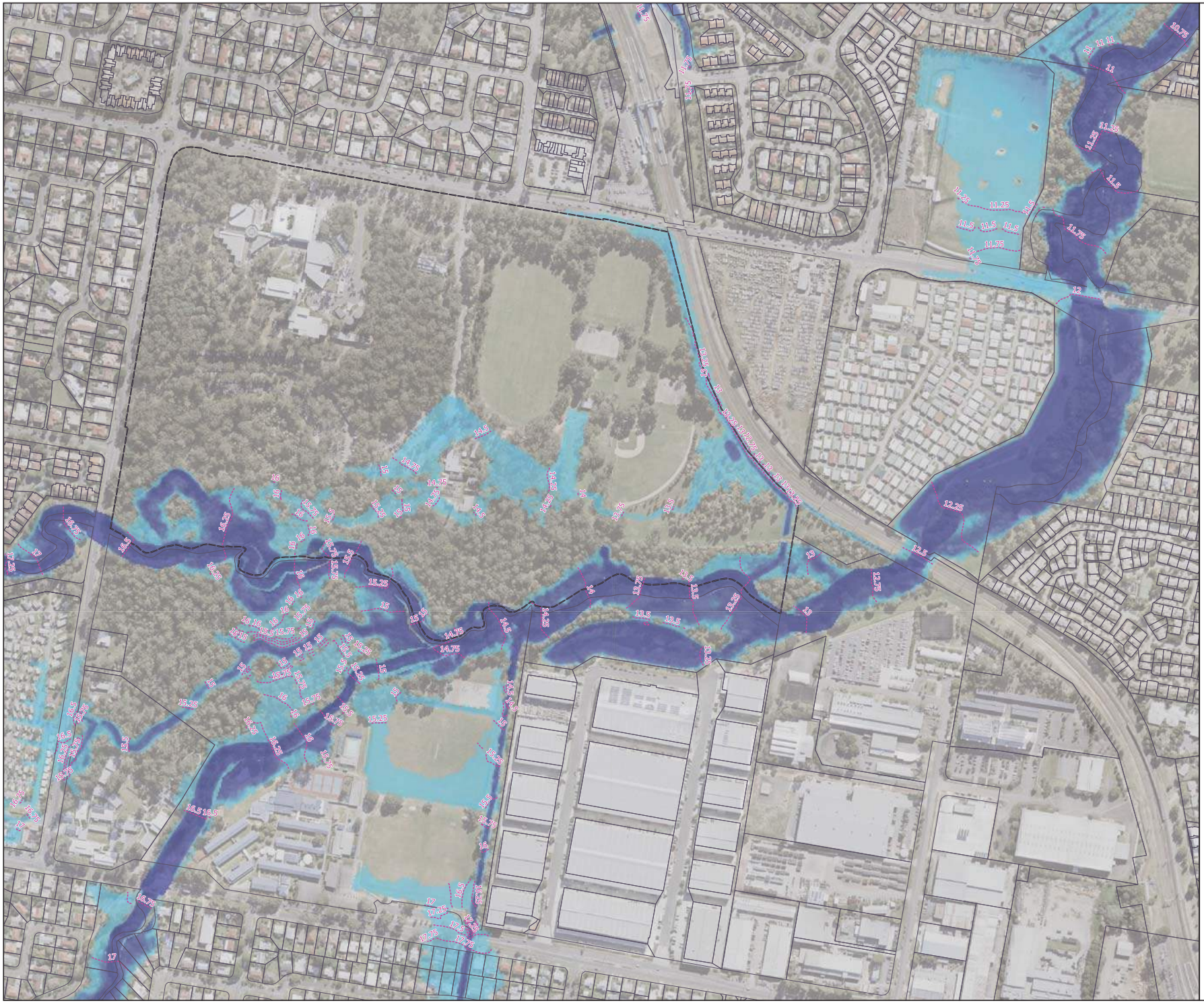
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Proposed Case (TUFLOW ID P02j)

39%AEP Event (Q2)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND
- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)
- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A5

N

50 0 50 100 m

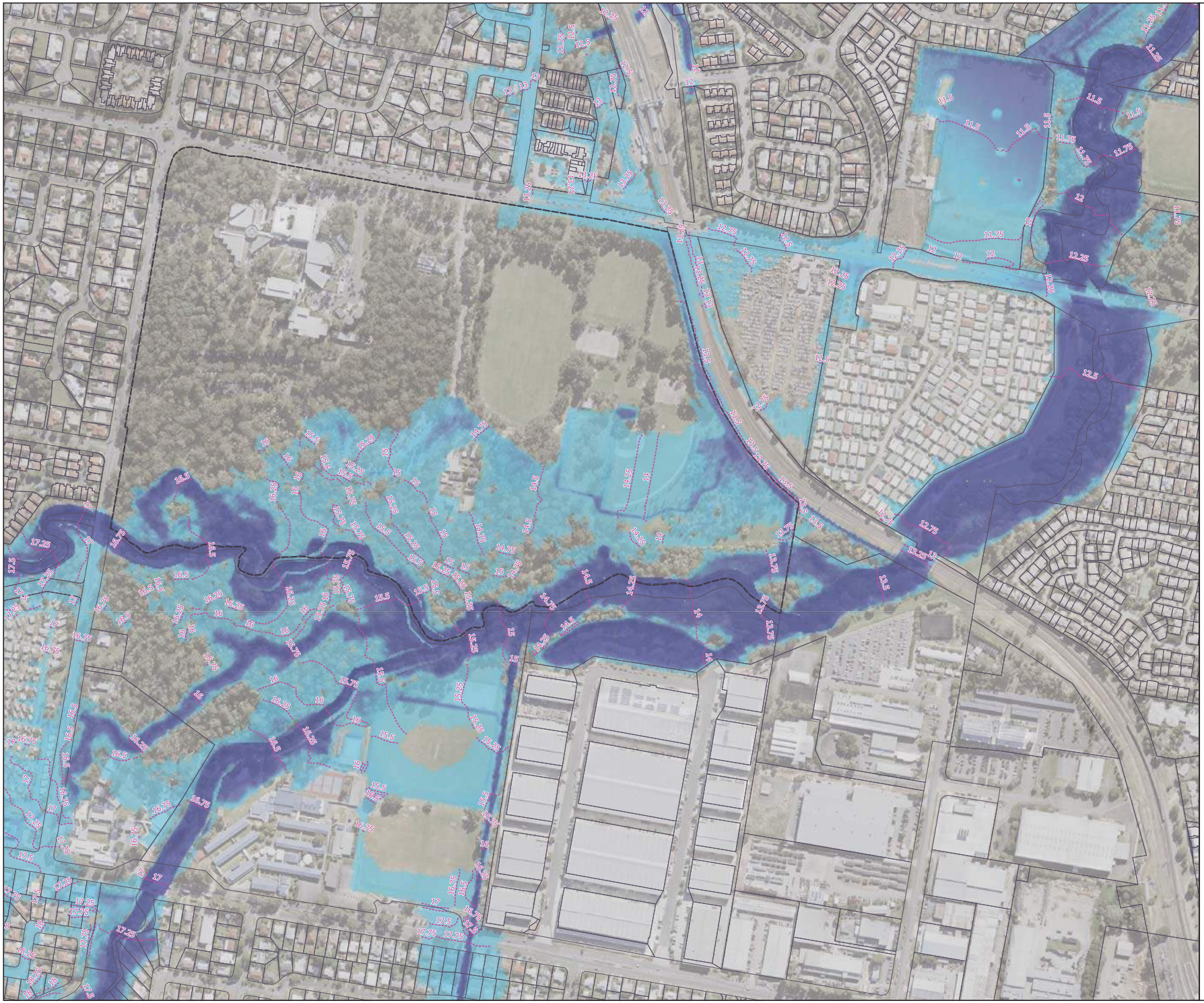
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Proposed Case (TUFLOW ID P02j)

5%AEP Event (Q20)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- Peak Flood Height Contours (m AHD)

Depth (m)

- Less than 0.25
- 0.25 to 0.5
- 0.5 to 0.75
- 0.75 to 1
- 1 to 1.5
- 1.5 to 2
- Greater than 2

FIGURE A6

N

50 0 50 100 m

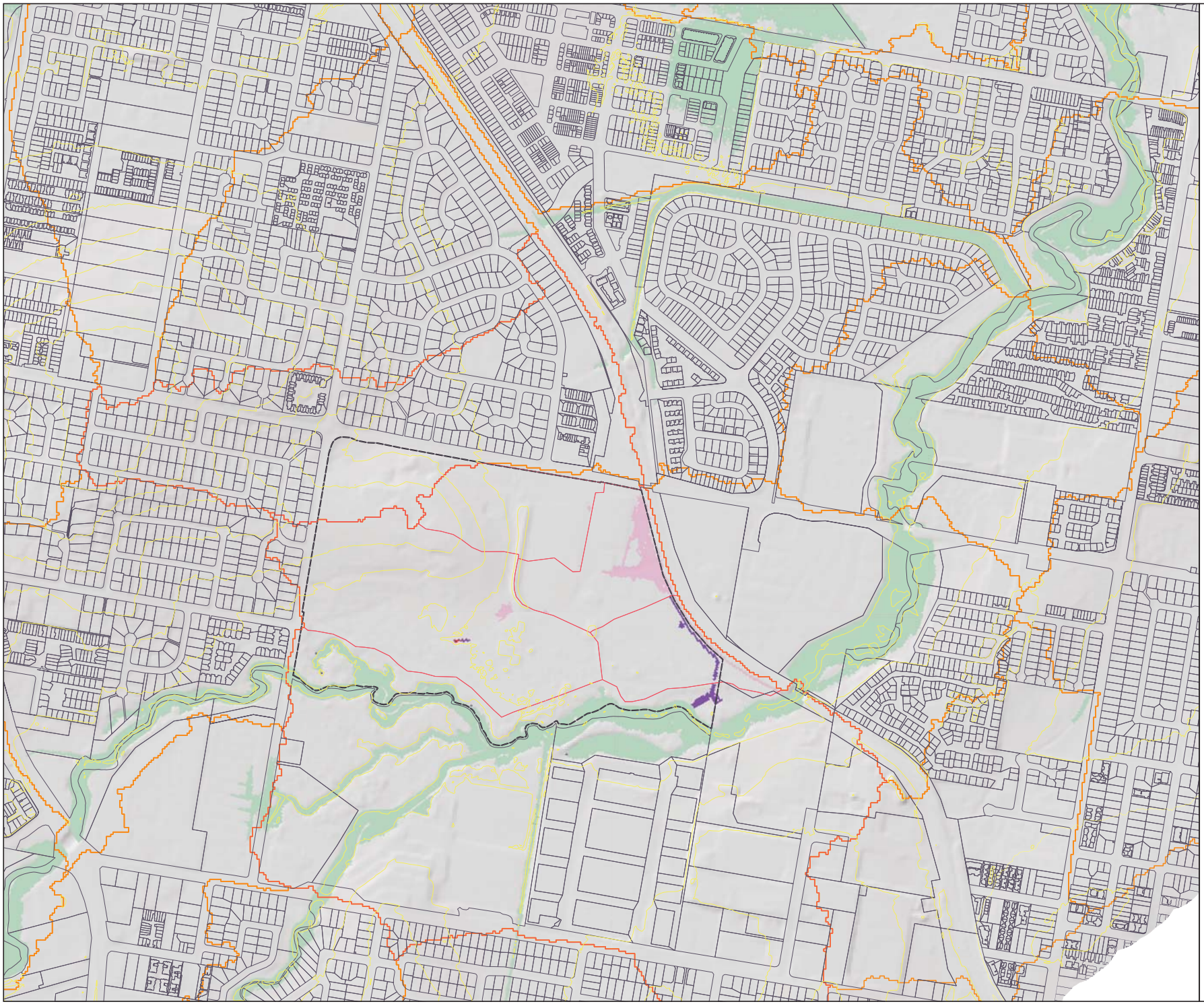
Carseldine Urban Village

Peak Flood Depth & Peak Flood Level Contours

Proposed Case (TUFLOW ID P02j)

1%AEP Event (Q100)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A7

80 0 80 160 m

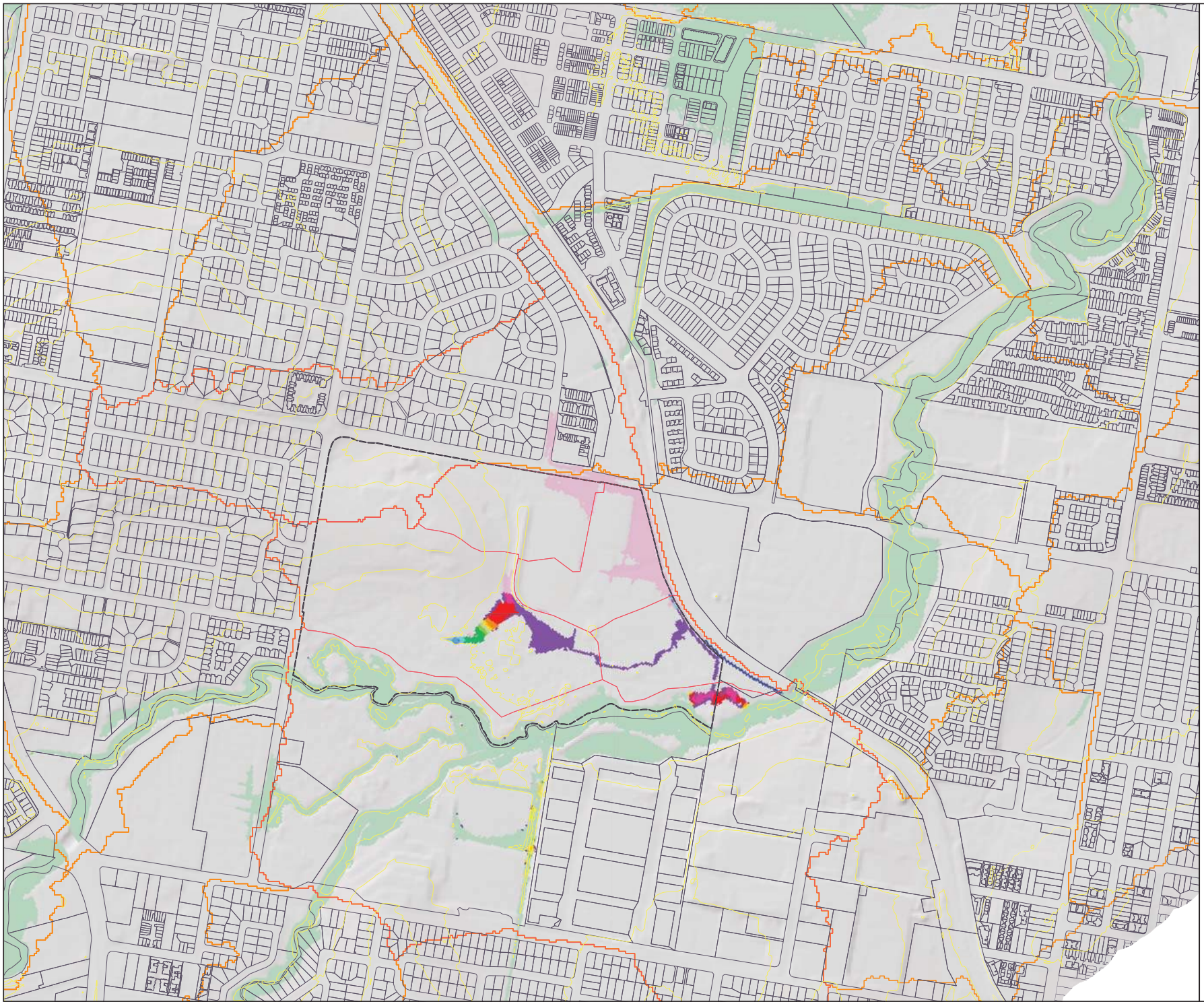
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

39%AEP Event (Q002)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A8

80 0 80 160 m

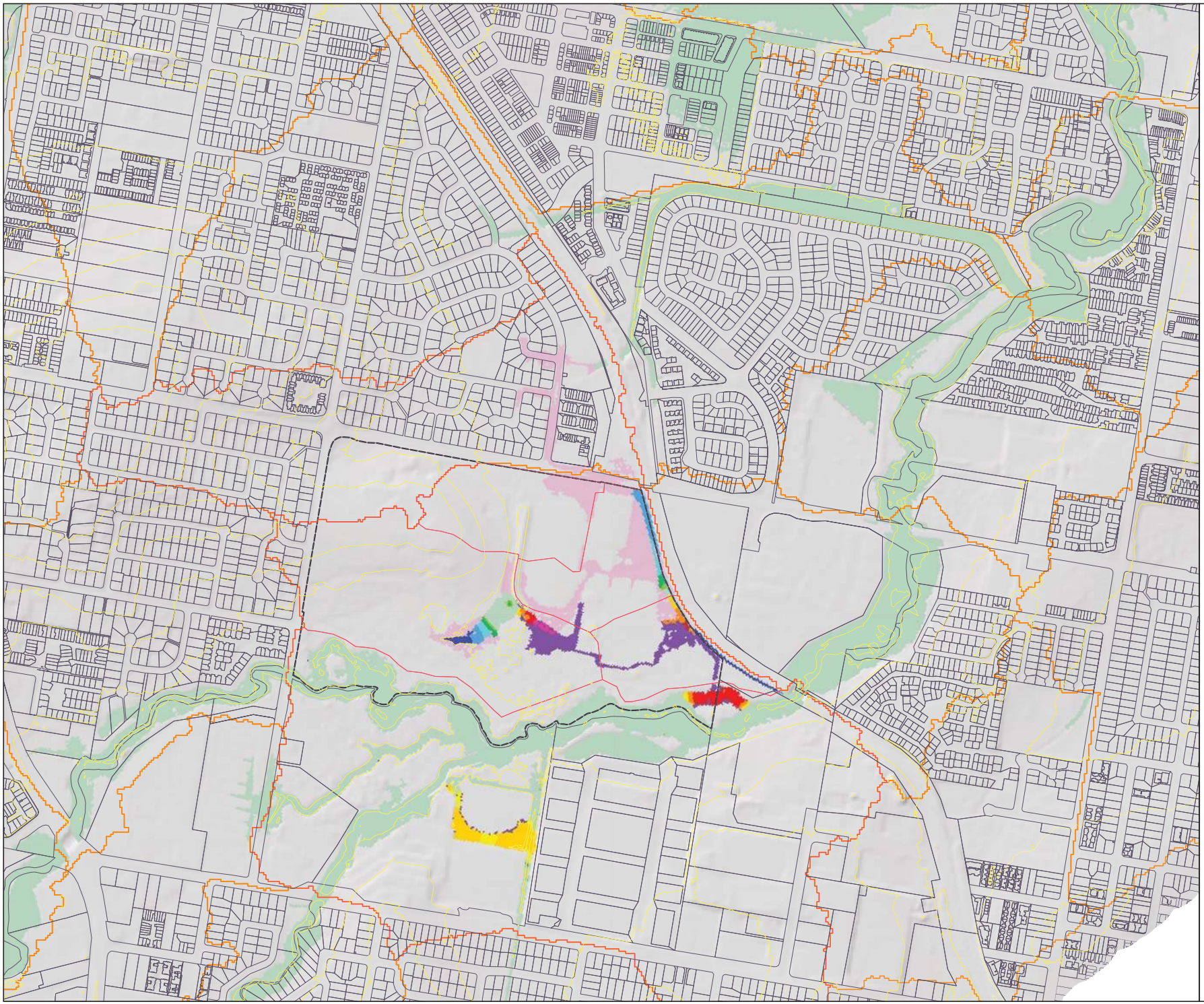
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

20%AEP Event (Q5)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A9

80 0 80 160 m

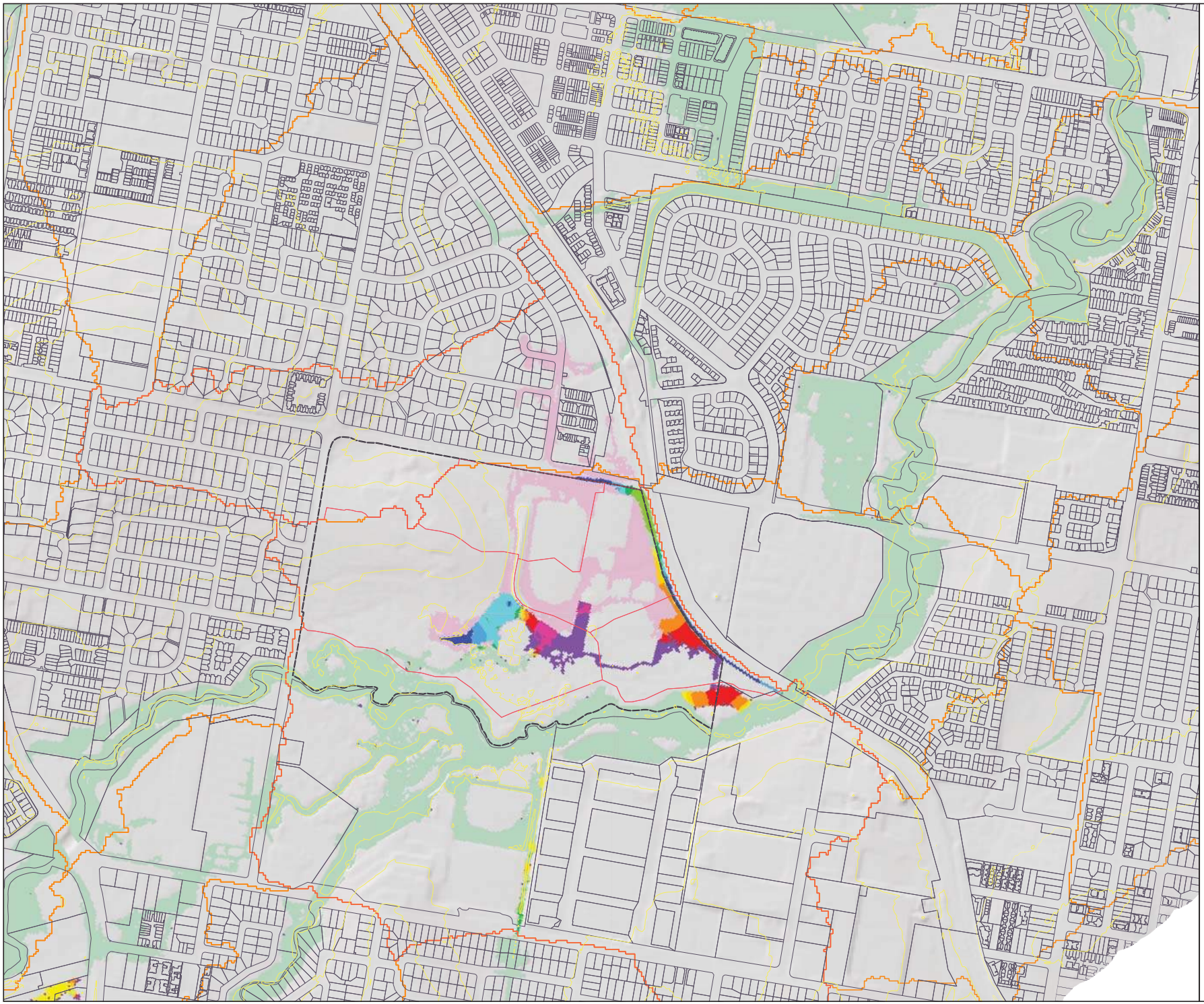
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

10%AEP Event (Q10)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A10

80 0 80 160 m

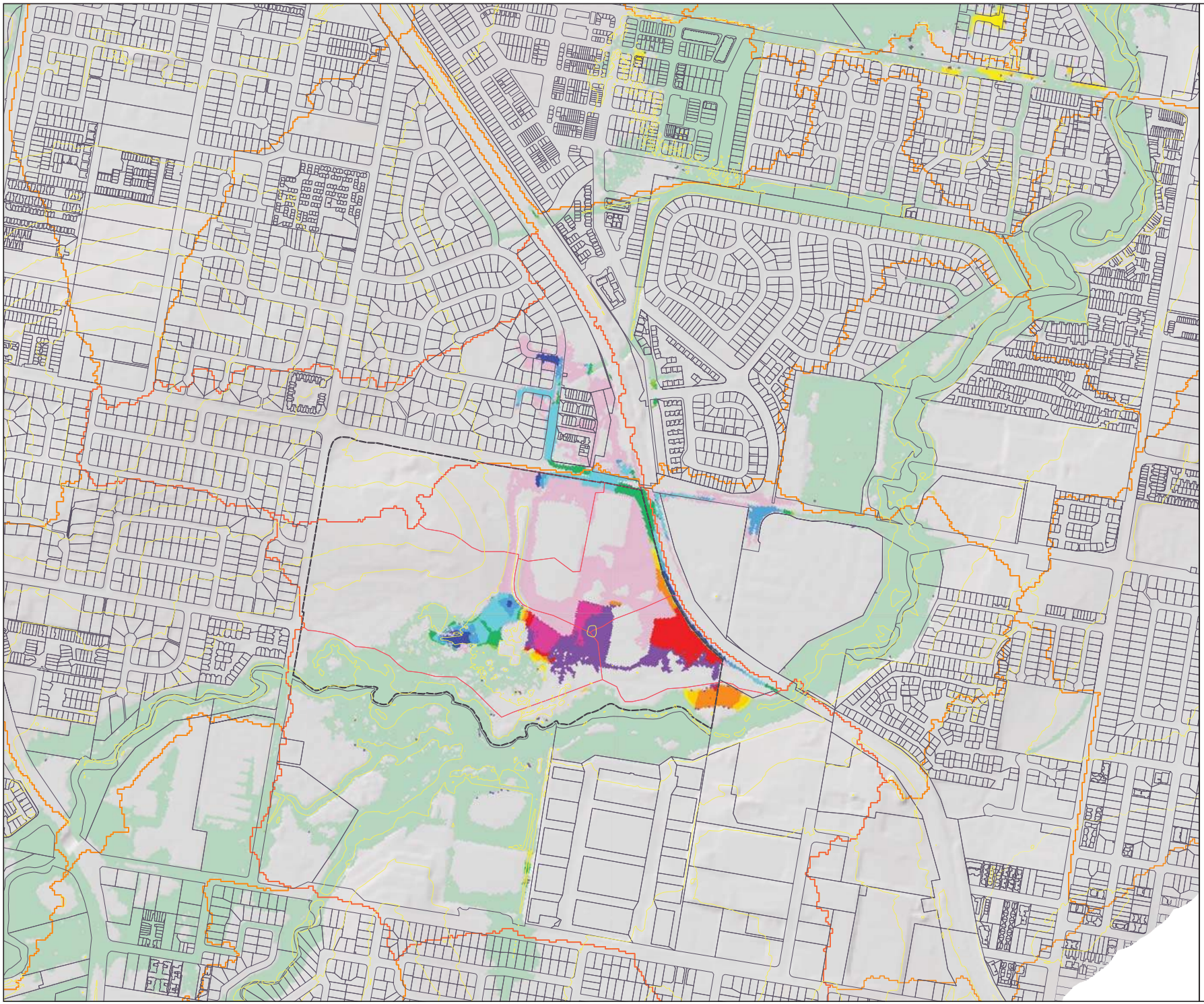
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

%A QEP Event (5 20)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A11

80 0 80 160 m

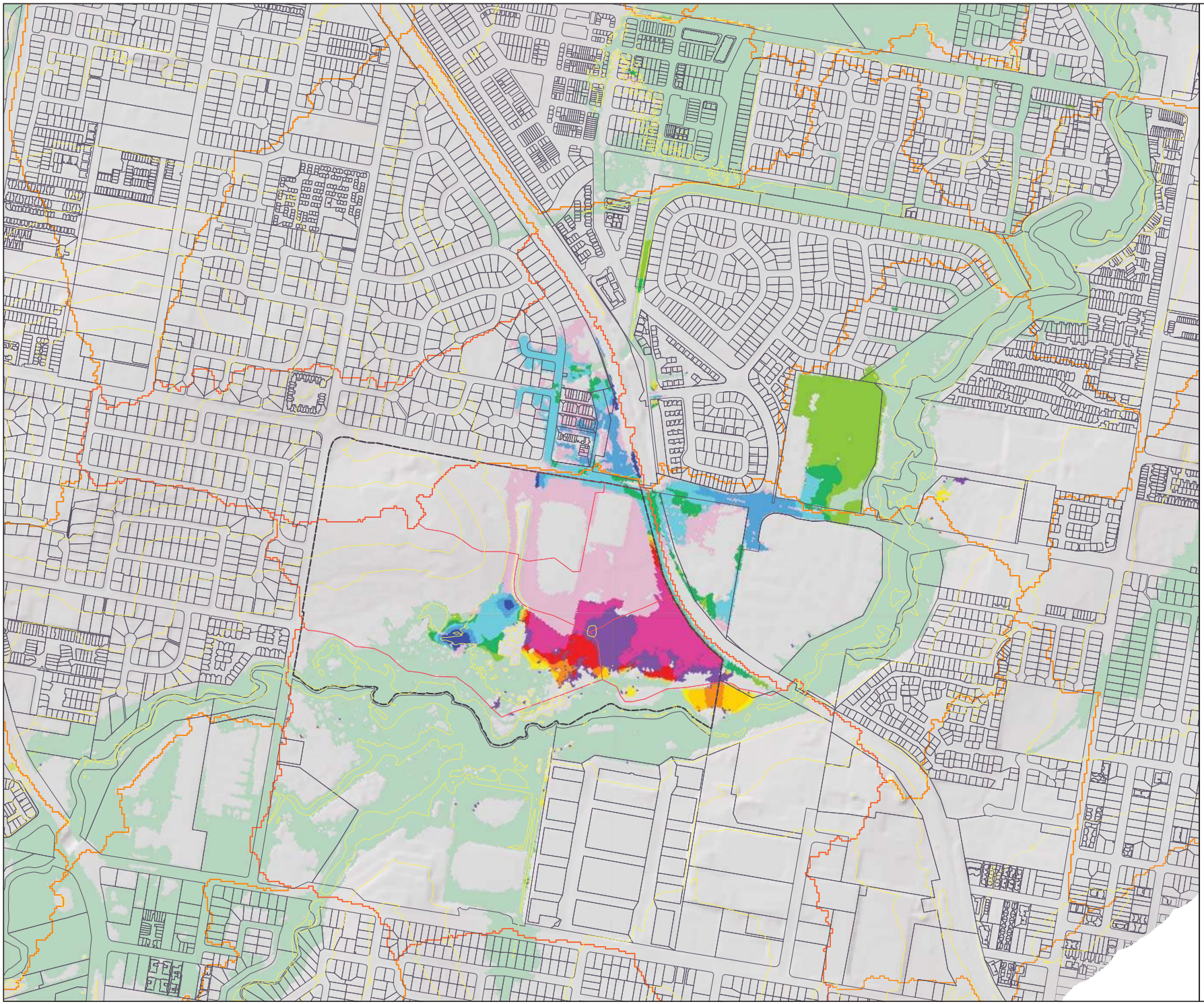
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

2%AEP Event (Q050)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A12

80 0 80 160 m

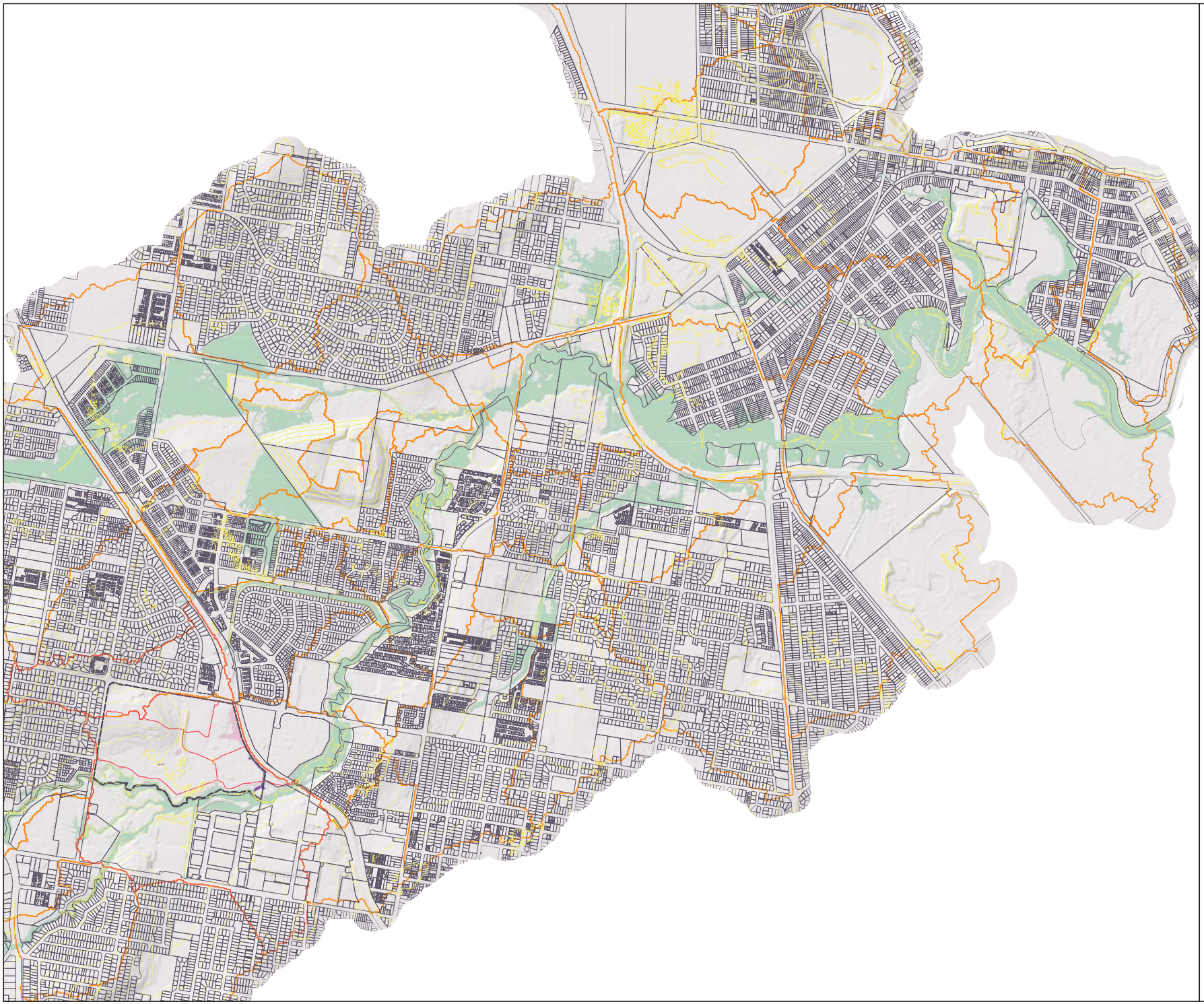
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

1%AEP Event (Q100)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A13

200 0 200 400 m

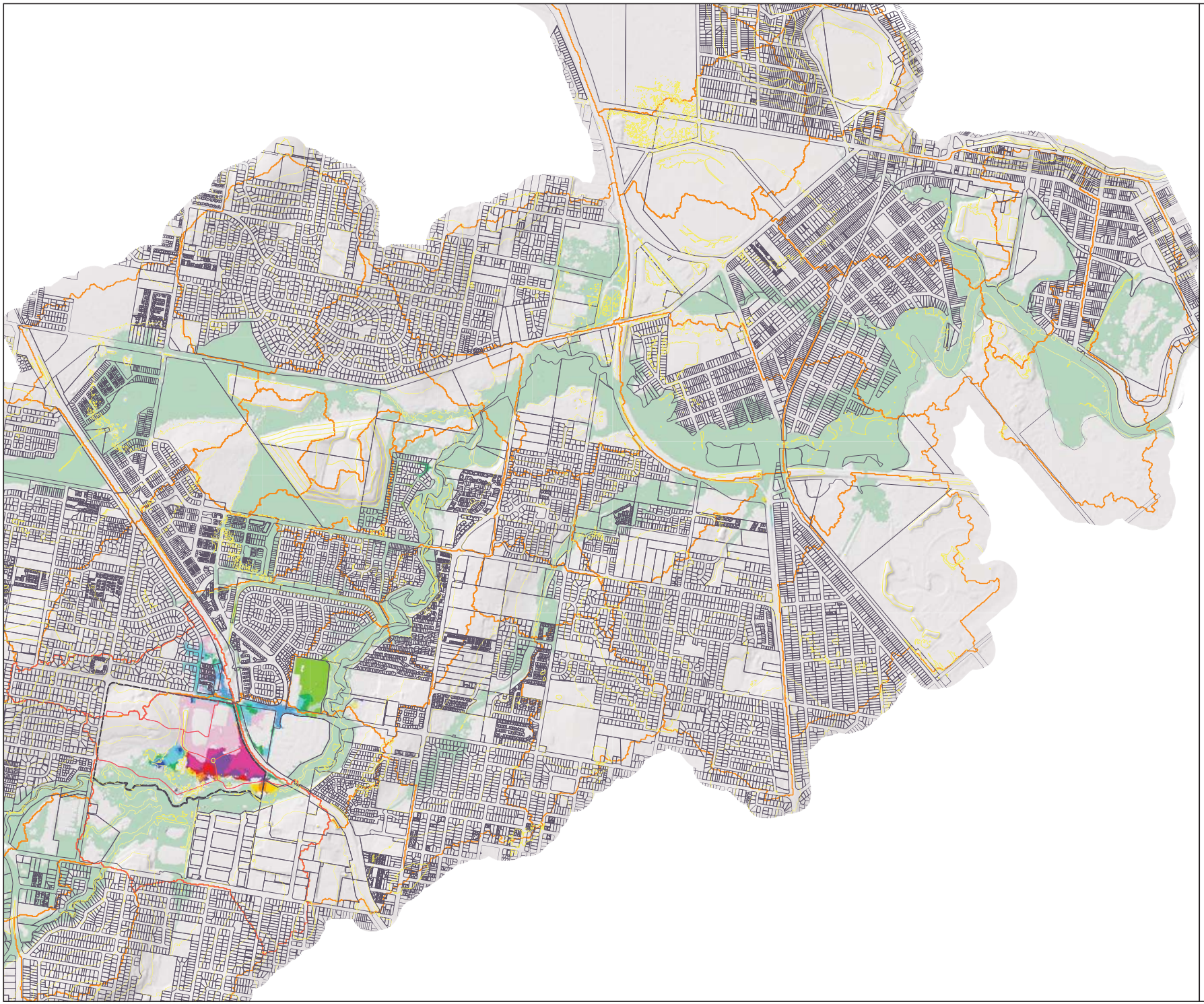
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

39%AEP Event (Q2)

Client: Economic Development Queensland



Hydrology & Water Management Consulting

DesignFlow

LEGEND

- Site
- Cadastral Data
- LiDAR Contours (5m)
- URBS Sub-Catchments (BCC)
- Updated Sub-Catchments

Impact (m)

- Less than -0.2
- -0.1 to -0.2
- -0.05 to -0.1
- -0.02 to -0.05
- -0.01 to -0.02
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- Greater than 0.2
- Was Wet - Now Dry
- Was Dry - Now Wet

FIGURE A14

200 0 200 400 m

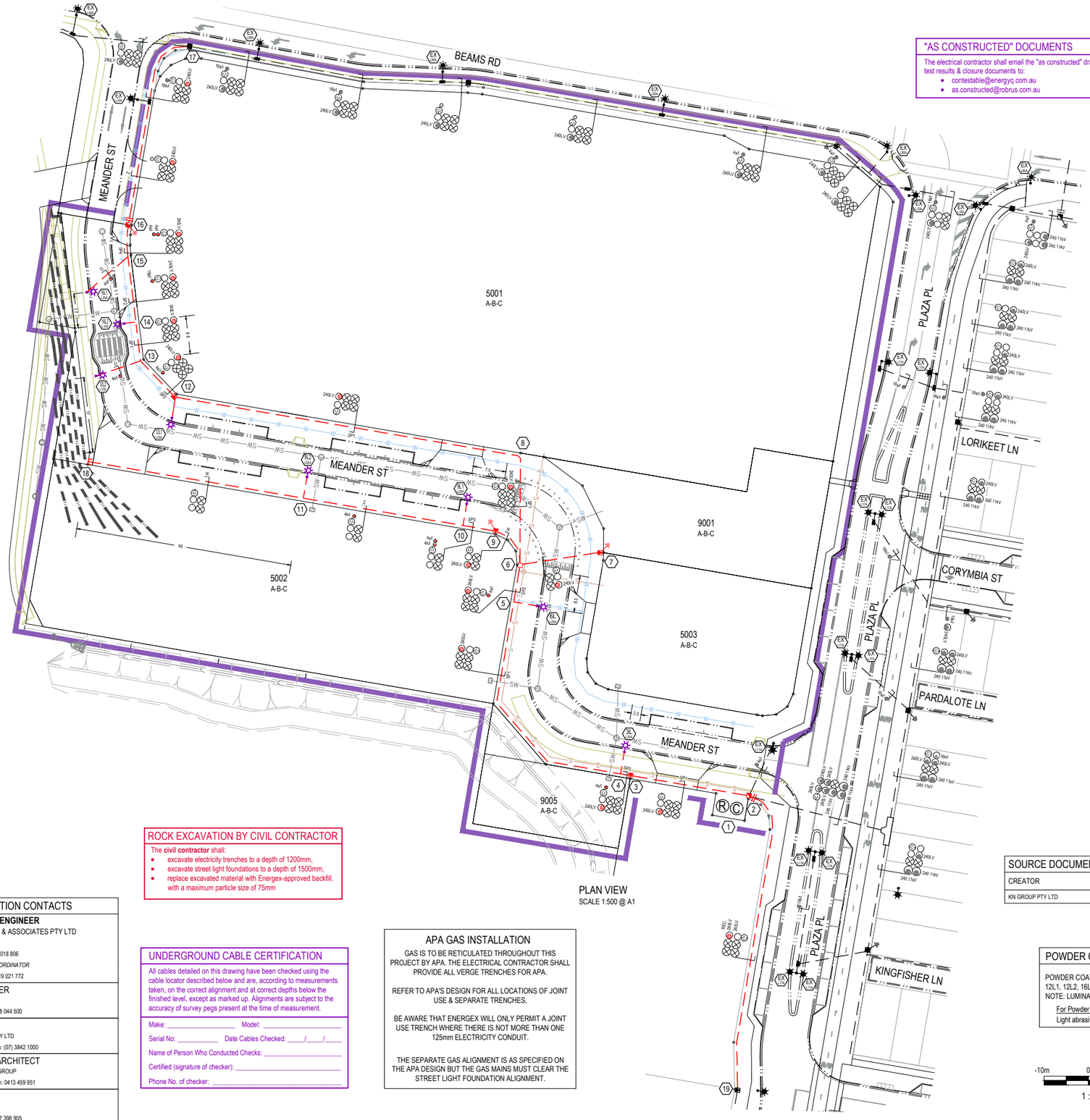
Carseldine Urban Village

Peak Flood Level Impacts
Proposed Vs Existing Case

(TUFLOW Case P02j Vs B01d)

1%AEP Event (Q100)

Client: Economic Development Queensland



PLAN VIEW
SCALE 1:500 @ A1

"AS CONSTRUCTED" DOCUMENTS

The electrical contractor shall email the "as constructed" drawing, test results & closure documents to:

- contestable@energyq.com.au
- as.constructed@robrus.com.au

GENERAL NOTES

In the event of conflict between this works plan and drawings and specifications of the relevant future asset owner, i.e. Energex, Ergon, local authority, Department of Transport & Main Roads, NBN™, etc., the drawings and specifications of the future asset owner shall take precedence. Exceptions apply where RRA design documentation specify clearances, depths & separations greater than the minimum required by the authorities.

The contractor shall not accept a verbal instruction from any person to depart from the requirements of this works plan or RRA General Specification. Any departure from the works plan or specification must first be authorised in writing by the Contract Superintendent.

ELECTRICAL CONTRACTOR

The works detailed on this drawing shall be constructed in accordance with Robin Russell & Associates' General Specification for Installation of Electricity Reticulation and Street Lighting - Issue 'AA'.

CIVIL CONTRACTOR

The installation of all electrical conduits shall be supervised by the holder of an electrical work licence - Electrical Safety Act 2002.

Energex conduits and transformer site retaining walls shall be installed strictly in accordance with Energex's specifications (see below). They will be inspected for compliance upon completion.

Where road-crossing conduits are installed deeper than usual (under culverts or pipes) they must rise to a depth of not more than 1200mm at each end. If uncertain, seek advice from RRA Construction Coordinator.

The civil contractor shall install enveloping conduits under retaining walls behind pillars - two 100mm conduits into each lot (one for Electricity, one for Communications), 500mm deep behind the pillar, near ground level inside the lot.

Relevant specifications in Energex's Underground Distribution Construction Manual are found at -

Section C1: Conduits
Section C2: Excavation
Section C3: Transformer Sites

These sections of the manual can be downloaded from the following Energex web site:
https://swp.energex.com.au/service_providers/technical_docs/asp/technical_documents.asp
Civil engineers who have registered for access to the following RRA website may download extracts from Energex's manual at:
http://www.robrus.com.au

The civil contractor shall ensure that all conduits have been installed before constructing retaining walls, paths, driveways & water services. The civil contractor shall please inform the electrical contractor of any 'as constructed' departures from the civil design.

Care: Existing street lights shall not be recovered unless replacement street lights will be commissioned before nightfall. Lighting of new or altered existing roads might not comply with specified standards until new road lighting has been commissioned. The civil contractor shall apply appropriate risk management. e.g. warning signs, speed restrictions, temporary lighting, etc.

ON-SITE SERVICES CHECKS

Robin Russell & Associates gives no warranty regarding the presence or location of buried services, including newly-installed services. "As Constructed" locations may differ from what is drawn on this works plan. Contractors shall be responsible to identify and locate all buried services. Initial identification can be obtained from:

Dial Before You Dig Service

Telephone 1100
Fax 1300 652 077

On-line enquiries can be made at:
http://www.1100.com.au.

Having determined which services may be present, on-site locations should then be arranged with relevant service authorities.

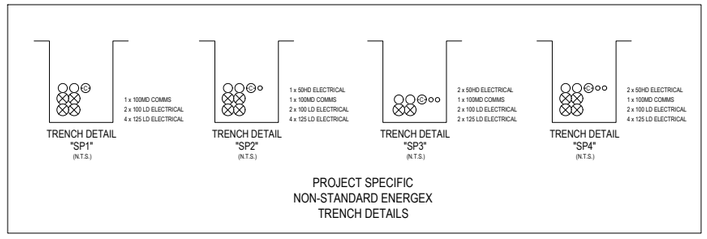
Sewerage and water plans for the subdivision may be obtained on request from the Superintendent.

INSTALLATION OF RRA DESIGNED TELECOMMUNICATIONS CONDUITS

Telecoms conduits and pits shall be supplied and installed by the civil and electrical contractors as specified on the associated RRA works plan.
In *residential* subdivisions, Telecommunications conduits shall be installed generally in shared trenches, directly above the electrical conduits.
In *commercial* subdivisions or other situations where this is not possible, Telecommunications conduits shall be installed in a separate trench on the specified communications alignment.

LEGEND: ELECTRICAL

- EXISTING UNDERGROUND CABLE
- PROPOSED UNDERGROUND CABLE
- FUTURE UNDERGROUND CABLE
- BORED CONDUIT
- STATION NUMBERS
- PADMOUNT TRANSFORMER, EXISTING / PROPOSED / FUTURE
- RING MAIN UNIT, EXISTING / PROPOSED / FUTURE
- POLE TRANSFORMER, EXISTING / PROPOSED / FUTURE
- CABLE FAULT INDICATOR
- SERVICE PILLAR, EXISTING / PROPOSED / FUTURE
- LINK PILLAR, EXISTING / PROPOSED / FUTURE
- LV LINKS (OPEN), EXISTING / PROPOSED / FUTURE
- LV LINKS (CLOSED), EXISTING / PROPOSED / FUTURE
- EXISTING OVERHEAD ELECTRICITY MAINS
- PROPOSED OVERHEAD ELECTRICITY MAINS
- FUTURE OVERHEAD ELECTRICITY MAINS
- HV POLE, EXISTING / PROPOSED / FUTURE
- HV + LV POLE, EXISTING / PROPOSED / FUTURE
- LV POLE, EXISTING / PROPOSED / FUTURE
- EARTH, EXISTING / PROPOSED / FUTURE
- STREET LIGHT, EXISTING / PROPOSED / FUTURE
- EXISTING RATE 3 STREETLIGHT CABLE
- PROPOSED RATE 3 STREETLIGHT CABLE
- FUTURE RATE 3 STREETLIGHT CABLE
- RATE 3 STREET LIGHT, EXISTING / PROPOSED / FUTURE
- RATE 3 SWITCHBOARD, EXISTING / PROPOSED
- EXISTING CONSUMERS UNDERGROUND CABLE
- PROPOSED CONSUMERS UNDERGROUND CABLE
- TO BE RECOVERED
- CABLE, EXISTING / PROPOSED
- 32/40mm HD CONDUIT
- 80/100mm LD CONDUIT
- 100mm WHITE ENERGEX COMMS. CONDUIT
- 125mm LD CONDUIT
- "ENERGEX ELECTRIC CABLE" MARKER PLATE



PROJECT SPECIFIC
NON-STANDARD ENERGEX
TRENCH DETAILS

ROCK EXCAVATION BY CIVIL CONTRACTOR

The **civil contractor** shall:

- excavate electricity trenches to a depth of 1200mm,
- excavate street light foundations to a depth of 1500mm,
- replace excavated material with Energex-approved backfill, with a maximum particle size of 75mm

SOURCE DOCUMENTS

CREATOR	DRAWING	DWG. NO.	REV. NO.	DATE
KN GROUP PTY LTD	CIVIL BASE	x20-150-base.dwg	-	27/06/2023

CONSTRUCTION CONTACTS

ELECTRICAL ENGINEER
ROBIN RUSSELL & ASSOCIATES PTY LTD
DESIGNER
N.MAMALIS Ph: 0488 018 806
CONSTRUCTION COORDINATOR
SHANE HYDE Ph: 0419 021 772

CIVIL ENGINEER
KN GROUP PTY LTD
MARK SHAW Ph: 0488 044 500

SURVEYOR
LAND PARTNERS PTY LTD
ROSS McDOWALL Ph: (07) 3842 1000

LANDSCAPE ARCHITECT
SAUNDERS HAVILL GROUP
ROBERT McILROY Ph: 0413 459 951

GAS
APA GROUP
SILVIA HART Ph: 0477 398 905

UNDERGROUND CABLE CERTIFICATION

All cables detailed on this drawing have been checked using the cable locator described below and are, according to measurements taken, on the correct alignment and at correct depths below the finished level, except as marked up. Alignments are subject to the accuracy of survey pegs present at the time of measurement.

Make: _____ Model: _____
Serial No: _____ Date Cables Checked: ____/____/____
Name of Person Who Conducted Checks: _____
Certified (signature of checker): _____
Phone No. of checker: _____

APA GAS INSTALLATION

GAS IS TO BE RETICULATED THROUGHOUT THIS PROJECT BY APA. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL VERGE TRENCHES FOR APA.

REFER TO APA'S DESIGN FOR ALL LOCATIONS OF JOINT USE & SEPARATE TRENCHES.

BE AWARE THAT ENERGEX WILL ONLY PERMIT A JOINT USE TRENCH WHERE THERE IS NOT MORE THAN ONE 125mm ELECTRICITY CONDUIT.

THE SEPARATE GAS ALIGNMENT IS AS SPECIFIED ON THE APA DESIGN BUT THE GAS MAINS MUST CLEAR THE STREET LIGHT FOUNDATION ALIGNMENT.

POWDER COATING OF COLUMNS & OUTREACHES

POWDER COAT COLUMNS & OUTREACHES AT STATIONS 3L, 6L, 9L1, 9L2, 12L1, 12L2, 16L1 & 16L2
NOTE: LUMINAIRES MUST NOT BE PAINTED.

For Powder Coating:
Light abrasive blast, followed by powder coating in COLOUR BLACK

-10m 0 10 20 30m
1 : 500 (A1 - NOT REDUCED)

TELECOMMUNICATIONS INFRASTRUCTURE

CONDUITS & PITS	to be designed by:	Robin Russell & Associates
	to be installed by:	civil & electrical contractors
	to be owned by:	
TELECOMMUNICATIONS INFRASTRUCTURE	to be provided by:	NBNCo Limited

SITE INFORMATION

TOTAL NUMBER OF LOTS
5

PROPERTY DESCRIPTION
LOTS 5001-5003, 9001 & 9005 CANCELLING PART OF LOT 7002 ON SP311913 & PART OF LOT 322 ON SP311781

DATE	REV	REVISION	APP.
10/08/2023	A	PRELIMINARY ISSUE	RR

CURRENT REVISION CHANGES:
Rev A- Preliminary design for review & issue.

Robin Russell & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS - ELECTRICAL
SUBDIVISION ELECTRICAL SERVICES
204/6 Babarra Street, Stafford, QLD 4053
Tel: (07) 3872 5555
Fax: (07) 3872 5566
Email: rr@robrus.com.au
www.robrus.com.au
A.B.N. 78 010 589 661

COUNCIL	EDQ/BCC	DESIGNED	N.MAMALIS
COUNCIL REF	DEV2022/1321	DRAWN	N.MAMALIS
UBD REF	Map 109 Grid Q18	CHECKED	D.LLOYD RPEQ 5060
DWT REV.	V53-6 20211124	APPROVED	ROBIN RUSSELL RPEQ 1546
DATE	10/08/2023	SIGNED	

DESCRIPTION
ELECTRICITY RETICULATION - RESIDENTIAL

CLIENT
ECONOMIC DEVELOPMENT QUEENSLAND

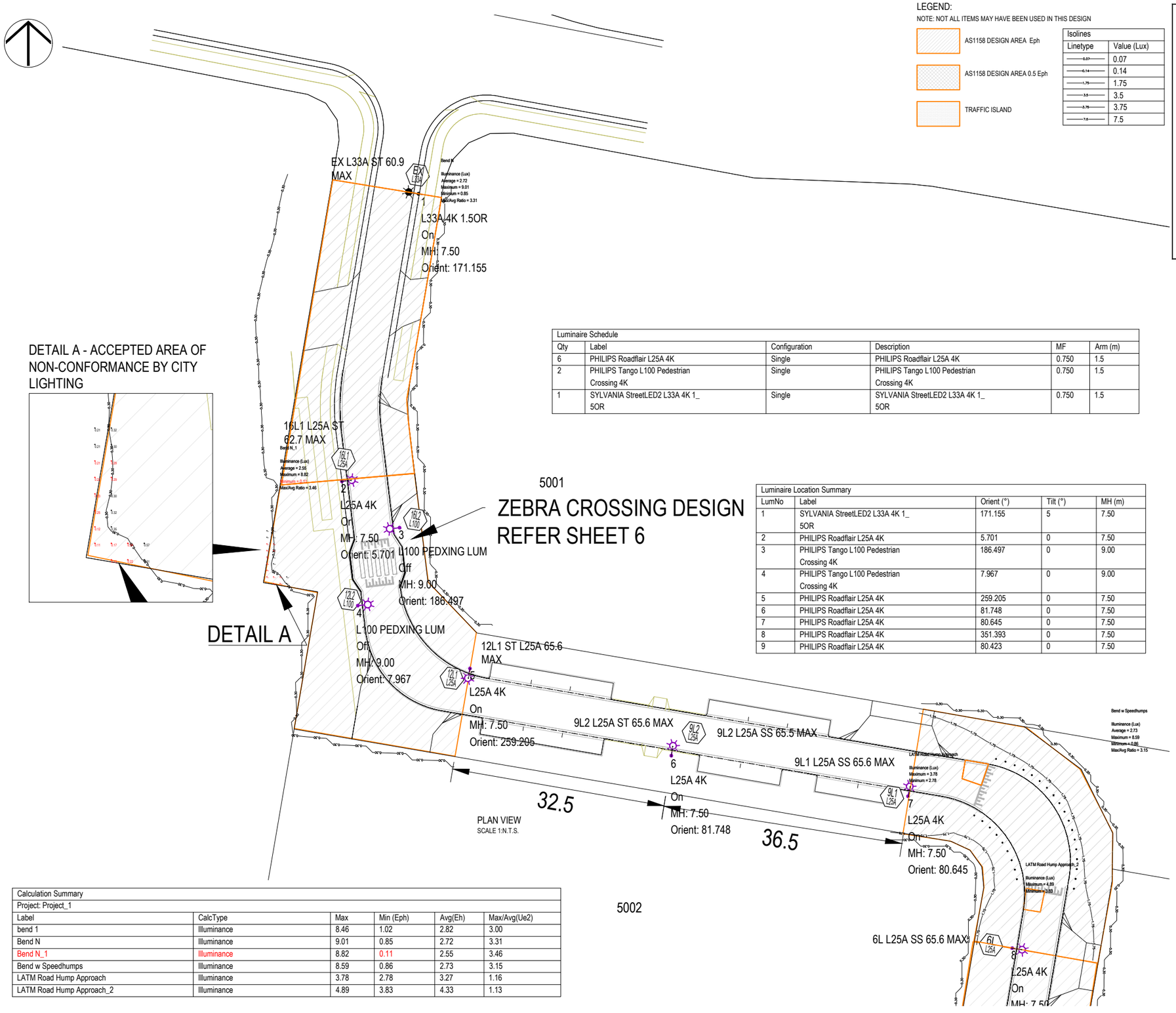
LOCATION
CARSLENDINE VILLAGE - STAGE V
520 & 532 BEAMS RD
CARSELDINE Q 4034

A1

DRAWING No.
D726-01A

ENERGEX PROJECT No.
S0107346

SHEET No.
1 OF 6



DETAIL A - ACCEPTED AREA OF NON-CONFORMANCE BY CITY LIGHTING

LEGEND:

NOTE: NOT ALL ITEMS MAY HAVE BEEN USED IN THIS DESIGN

AS1158 DESIGN AREA Eph

AS1158 DESIGN AREA 0.5 Eph

TRAFFIC ISLAND

Isolines	
Linetype	Value (Lux)
0.07	0.07
0.14	0.14
1.75	1.75
3.5	3.5
3.75	3.75
7.5	7.5

GENERAL NOTES:

CALCULATIONS WITHIN THIS DESIGN ARE SUBJECT TO THE TOLERANCES OUTLINED IN AS/NZS 1158.2 & AS/NZS 3827.1.

ILLUMINANCE CALCULATION FIELDS USE A 1m X 1m HORIZONTAL GRID ARRAY.

SETTINGS HAVE BEEN ADJUSTED TO ENSURE ALL CALCULATIONS ARE UNDERTAKEN TO A MINIMUM OF 2 DECIMAL PLACES.

LINEAR ILLUMINANCE ARRAYS CREATED HAVE BEEN SET UP WITH A MAXIMUM SPACING OF 2.0m.

ISOLUX VALUES, WHERE SHOWN ON DIAGRAMS, HAVE BEEN ROUNDED TO 2 DECIMAL PLACES TO ENSURE CLARITY.

LUMINAIRES MAY BE MOVED BY UP TO 200mm IN EITHER DIRECTION LATERALLY, AND/OR AWAY FROM THE PATHWAY, WHILE REMAINING COMPLIANT.

DEFINITIONS:

OFFSET: THE HORIZONTAL DISTANCE BETWEEN THE PHOTOMETRIC CENTRE OF A LUMINAIRE AND THE RP BOUNDARY OR EDGE OF PATH.

OVERHANG: THE HORIZONTAL DISTANCE BETWEEN THE PHOTOMETRIC CENTRE OF A LUMINAIRE AND THE ADJACENT KERB OR CARRIAGEWAY EDGE.

OUTREACH: THE HORIZONTAL DISTANCE BETWEEN THE PHOTOMETRIC CENTRE OF A LUMINAIRE, TO—

(a) THE CENTRE OF THE POLE (E.G. STANDALONE STREET LIGHT POLES); OR

(b) THE FACE OF POLE FOR BRACKET ARMS (E.G. TIMBER POWER POLES).

Luminaire Schedule					
Qty	Label	Configuration	Description	MF	Arm (m)
6	PHILIPS Roadflair L25A 4K	Single	PHILIPS Roadflair L25A 4K	0.750	1.5
2	PHILIPS Tango L100 Pedestrian Crossing 4K	Single	PHILIPS Tango L100 Pedestrian Crossing 4K	0.750	1.5
1	SYLVANIA StreetLED2 L33A 4K 1_ 5OR	Single	SYLVANIA StreetLED2 L33A 4K 1_ 5OR	0.750	1.5

Luminaire Location Summary				
LumNo	Label	Orient (°)	Tilt (°)	MH (m)
1	SYLVANIA StreetLED2 L33A 4K 1_ 5OR	171.155	5	7.50
2	PHILIPS Roadflair L25A 4K	5.701	0	7.50
3	PHILIPS Tango L100 Pedestrian Crossing 4K	186.497	0	9.00
4	PHILIPS Tango L100 Pedestrian Crossing 4K	7.967	0	9.00
5	PHILIPS Roadflair L25A 4K	259.205	0	7.50
6	PHILIPS Roadflair L25A 4K	81.748	0	7.50
7	PHILIPS Roadflair L25A 4K	80.645	0	7.50
8	PHILIPS Roadflair L25A 4K	351.393	0	7.50
9	PHILIPS Roadflair L25A 4K	80.423	0	7.50

5001

ZEBRA CROSSING DESIGN REFER SHEET 6

5002

Calculation Summary					
Project: Project_1					
Label	CalcType	Max	Min (Eph)	Avg(Eh)	Max/Avg(Ue2)
bend 1	Illuminance	8.46	1.02	2.82	3.00
Bend N	Illuminance	9.01	0.85	2.72	3.31
Bend N_1	Illuminance	8.82	0.11	2.55	3.46
Bend w Speedhumps	Illuminance	8.59	0.86	2.73	3.15
LATM Road Hump Approach	Illuminance	3.78	2.78	3.27	1.16
LATM Road Hump Approach_2	Illuminance	4.89	3.83	4.33	1.13

PROJECT SPECIFIC DETAILS:
THIS DESIGN IS COMPLIANT WITH AND PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF:

AS/NZS 1158.4-2015 APPENDIX D
AS/NZS 1158.3.1:2020 APPENDIX C

LIGHTING SUBCATEGORIES:
MEANDER WAY. - PR3
ZEBRA CROSSING - PX3

APPLICABLE CLAUSES:
P CATEGORY

S4.2.2(c) FOR CURVED SECTIONS OF ROAD AND BENDS.
S4.5.2.4 OTHER LOCAL AREA TRAFFIC MANAGEMENT (LATM) DEVICES/FIGURE 4.7(b)

PX CATEGORY
S3.2.1 FOR GENERAL REQUIREMENTS/FIGURE 3.1 & 3.2
TABLE A1 FOR HORIZONTAL DISTANCE FROM PEDESTRIAN CROSSING LUMINAIRES TO CROSSING CENTRE-LINE

COUNCIL REQUIREMENTS:
BCC S9.3.5.5(2) LIGHTING OF LOCAL AREA TRAFFIC MANAGEMENT DEVICES
-Luminaires to be spaced at no more than 65m, unless agreed with City Lighting prior to design submission
-Lighting not to be spaced at S/2 or less, unless otherwise unavoidable.
-Min. avg horiz illuminance at noses of LATMD's

DESIGN METHODS:
SPACING TABLES AND DESIGN RULES FOR ROADWAYS.
ALL LUMINAIRES WITHIN THIS DESIGN ARE WITHIN THE MAXIMUM ALLOWABLE SPACING FOR THEIR CATEGORY.

ILLUMINANCE DESIGN FOR LATMD'S, ZEBRA CROSSING & CURVES/BENDS.

ROAD SURFACE REFLECTION CHARACTERISTICS:
R3

COMPUTER PROGRAM DETAILS
Name of Computer Program - Perfect Lite v5.06 & AGi32 v20.9
Source of program - Constant Energy & Lighting Analysts
Compliance - AS1158.2.2005

NON-CONFORMANCES:
PLEASE NOTE THAT THIS DESIGN CONTAINS EIGHT (8) CALCULATION POINTS OF NON CONFORMANCE TO S4.2.2 Eph REQUIREMENTS (≥0.30). THIS AREA OF NON CONFORMANCE HAS BEEN ACCEPTED BY CITY LIGHTING. REFER EMAIL "Carseldine Village Stage 5 - S0107346 - DEV2022/1321 - D726 - Non-conformance Consideration.msg"

THE LOCATION OF THIS NON-CONFORMANCE HAS BEEN LABELED HAS BEEN LABELED 'DETAIL-A'

IF THE 2X L100 FLOOD LIGHTS ARE FACTORED INTO THIS STUDY,
COMPLIANCE TO S4.2.2 IS MET WITH THE FOLLOWING LTP'S:
Bend N_1
Illuminance (Lux)
Average=21.10 Maximum=74.68 Minimum=0.77 Max/Avg=3.54

ROAD LIGHTING MAINTENANCE SCHEDULE:
THE MAINTENANCE FACTOR AND THE MAINTENANCE REGIME ARE THE RESPONSIBILITY OF THE ASSET OWNER (ENERGEX QUEENSLAND).

THIS DESIGN UTILISES A MAINTENANCE FACTOR OF 0.75 BASED ON THE IP RATING OF 6X & 0.7 BASED ON THE IP RATING OF 5X AS SPECIFIED BY ENERGY QUEENSLAND.

NOTE: THIS CERTIFICATION IS ONLY APPLICABLE IF LUMINAIRES ARE REPLACED WITH EXACT EQUIVALENTS AND MAINTENANCE IS UNDERTAKEN AS SPECIFIED.

DATE	REV	REVISION	APP.	DATE	REV	REVISION	APP.	CURRENT REVISION CHANGES:
10/08/2023	A	PRELIMINARY ISSUE	R.R.					

Robin Russell & ASSOCIATES PTY. LTD.
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204/6 Babarra Street, Stafford, QLD 4053
Tel: (07) 3872 5565
Fax: (07) 3872 5566
Email: rr@robrus.com.au
www.robrus.com.au
A.B.N. 78 010 589 661

COUNCIL	EDQ/BCC	DWT REV.	V53-3 20210504
COUNCIL REF	DEV2022/1321		
DESIGNED	AC	DRAWN	
CHECKED	DARREN LLOYD	APPROVED	DARREN LLOYD RPEQ 5060
DATE	10/08/2023	SIGNED	

DESCRIPTION: **ROAD LIGHTING DESIGN**

CLIENT: ECONOMIC DEVELOPMENT QUEENSLAND

LOCATION: **CARSLENDINE VILLAGE - STAGE V**
520 & 532 BEAMS RD
CARSELDINE Q 4034

A1

DRAWING No. **D726-L-04A**

ENERGEX PROJECT No. **S0107346**

SHEET No. 4 OF 6

LEGEND:

NOTE: NOT ALL ITEMS MAY HAVE BEEN USED IN THIS DESIGN

AS1158 DESIGN AREA Eph

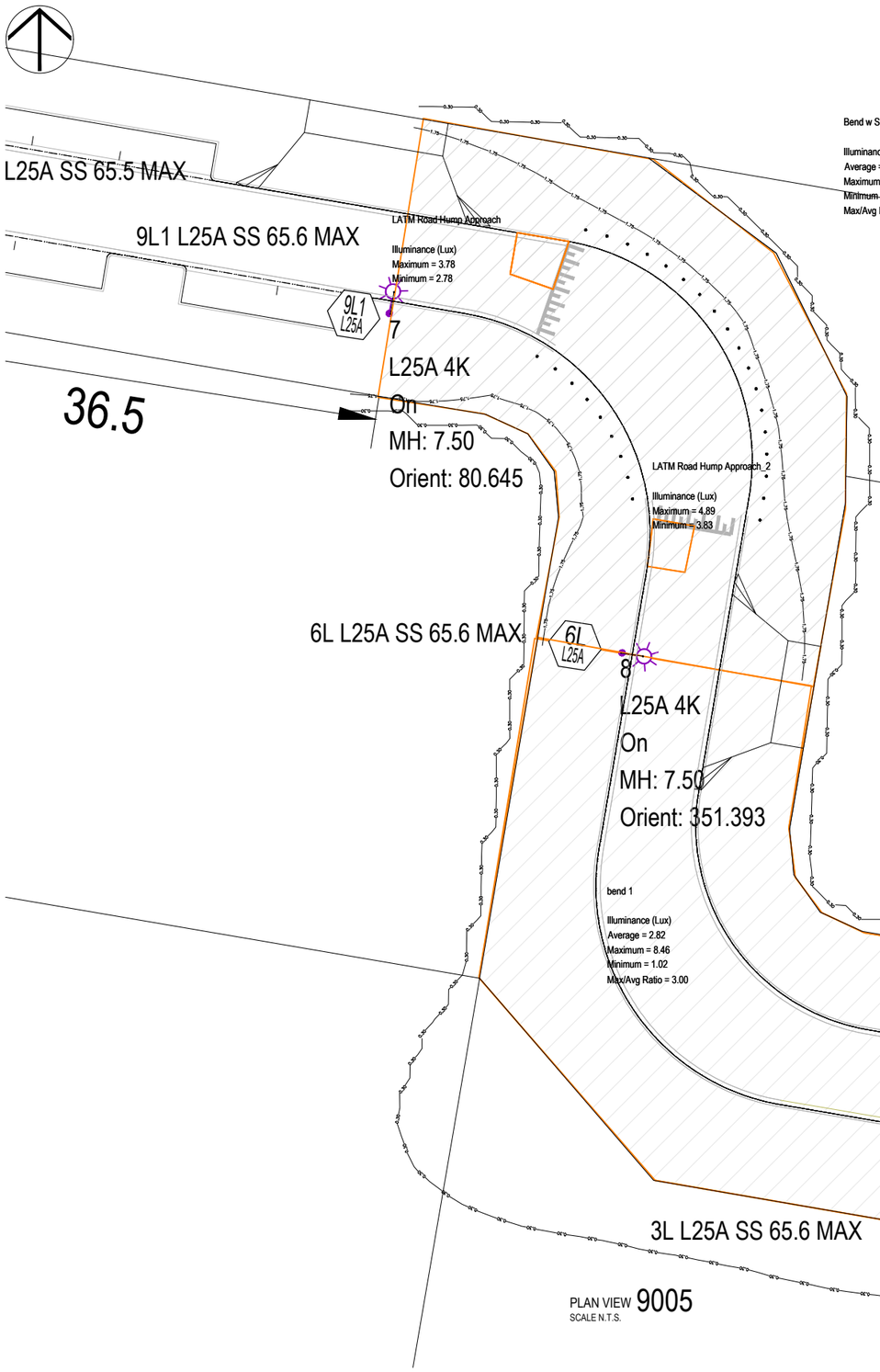
AS1158 DESIGN AREA 0.5 Eph

TRAFFIC ISLAND

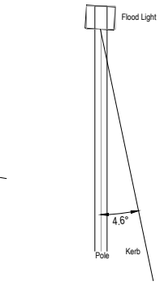
Isolines	
Linetype	Value (Lux)
0.07	0.07
0.14	0.14
1.75	1.75
3.5	3.5
3.75	3.75
7.5	7.5

Bend w Speedhumps

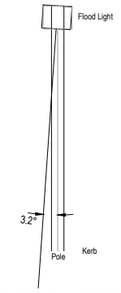
Illuminance (Lux)
Average = 2.73
Maximum = 8.59
Minimum = 0.86
Max/Avg Ratio = 3.15



PLAN VIEW 9005
SCALE N.T.S.



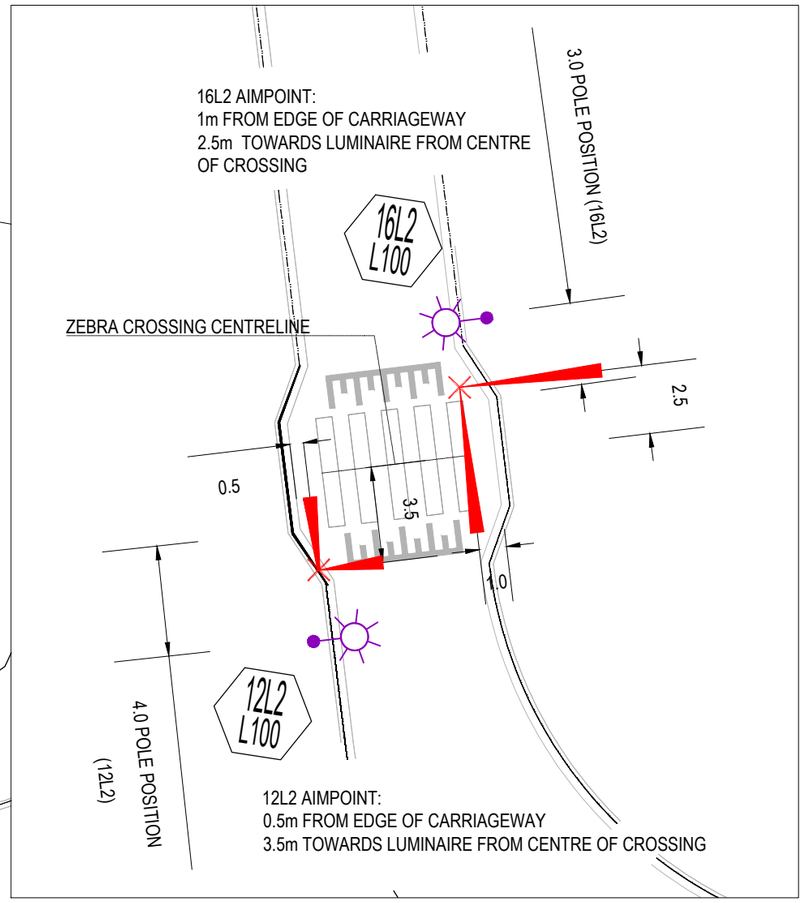
STN 16L2 - NORTH FL



STN 12L2 - SOUTH FL

DETAIL B
ZEBRA CROSSING

For questions concerning the aiming of the pedestrian crossings, contact lighting designer (Anthony Curameng) at Ph: (07) 3872 5555



PLAN VIEW
SCALE N.T.S.

DATE	REV	REVISION	APP.	DATE	REV	REVISION	APP.	CURRENT REVISION CHANGES:
10/08/2023	A	PRELIMINARY ISSUE	R.R.					

Robin Russell & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS - ELECTRICAL

SUBDIVISION ELECTRICAL SERVICES
204/6 Babarra Street, Stafford, QLD 4053
Tel: (07) 3872 5555
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www.robrus.com.au
A.B.N. 78 010 589 661

COUNCIL	EDQ/BCC	DWT REV.	V53-3 20210504
COUNCIL REF	DEV2022/1321		
DESIGNED	AC	DRAWN	
CHECKED	DARREN LLOYD	APPROVED	DARREN LLOYD RPEQ 5060
DATE	10/08/2023	SIGNED	

DESCRIPTION: **ROAD LIGHTING DESIGN**

CLIENT: ECONOMIC DEVELOPMENT QUEENSLAND

LOCATION: **CARSLENDINE VILLAGE - STAGE V**
520 & 532 BEAMS RD
CARSELDINE Q 4034

A1

DRAWING No. **D726-L-05A**

ENERGEX PROJECT No. **S0107346**

SHEET No. 5 OF 6

PLAN VIEW
SCALE 1:500

-10m 0 10 20 30m

1 : 500 (A1 - NOT REDUCED)
Note: Pits and FDH plinths are not drawn to scale.

SITE INFORMATION

TOTAL NUMBER OF LOTS
5

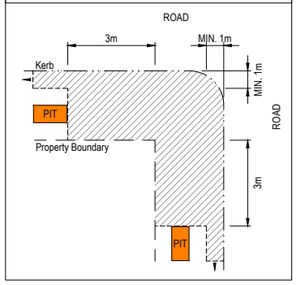
PROPERTY DESCRIPTION
Proposed lots 5001-5003, 9001 & 9005
Cancelling part of lot 7002 on SP311913 & part of lot 322 on SP311781

ORIGINAL ISSUE

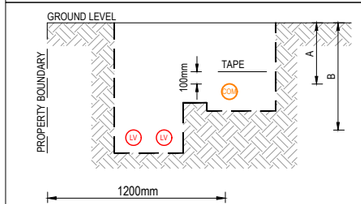
NBNCo Limited

- Telecommunications infrastructure will be provided by NBN™
- NBN™ will own the conduits and pits.
- This installation shall comply with NBN-TE-CTO-194 V11.0

DETAIL B - NO PITS IN THE SHADED AREA



TRENCH DETAIL - NBN



MINIMUM CONDUIT DEPTH *		
LOCATION	A	B
Verge	450mm	750mm
Local Road	600mm	Energex 800mm; Ergon 900mm
DTMR Road	800mm	1200mm

* supercedes Energex/Ergon requirements

LEGEND: NBN CONDUITS & PITS

- Fibre Access Node (FAN) site
- Fibre Distribution Hub (FDH) site - 1m x 1m
- Proposed 100mm Main Conduit
- Proposed 50mm Lateral Conduit
- Proposed 23mm Service Drop
- Proposed length of bored conduit
- Conduits by Civil Contractor
- Proposed shared trench
- Service Drop Access Pit
- Local Network Pit Premises Connection (Houses an MPT)
- Boundary Pit Cross-Road & Other Premises Connection (No MPT)
- Local Network Connection Pit Premises Connection & Fibre Splice Closure
- Distribution / Local Network Connection Pit at entry/exit to estate; @ 250m ccs on distribution conduit
- Fibre Distribution Hub (FDH) Pit Within 5m of FDH Site
- Multi Dwelling Unit (MDU)
- Marker Post (Post to be numbered)
- Depth over alignment indicator (used with every Marker Post)
- Descriptor Box (Description of type of work & Quantity involved)
- Transformer Pad Mount / Pole Mount
- Existing Telstra conduit trench layout (Proposed conduit indicated for comms cable)
- Existing NBN 100mm conduit
- Existing Telstra P100 conduit
- Existing or proposed Energex pole (& pole ID)
- Existing Telstra Exchange
- Existing Telstra Pits (size 2,3,4,5,6,7,8 or 9)
- Existing Telstra Manholes (Access Chambers)
- Existing Traffic Signals Box
- Existing network item to be removed/replaced
- 'C' communications marker plate

NBN CONDUIT SCHEDULE - CIVIL CONTRACTOR

CODE	ITEM	Refer: AS/NZS 1477:2006 - Table 4.2(A) WALL THICKNESS	MEAN OUTSIDE DIA.	MEAN INSIDE DIA.	QUANTITY (metres)
P20	SDU service drop	PN12	27mm	24mm	-
P50	MDU service drop	PN12	60mm	54mm	-
P50	road crossing	PN12	60mm	54mm	18
P100	road crossing	PN9	114mm	104mm	25
P100	footpath conduits adj. retaining walls	PN9	114mm	104mm	-
Additional trenching					43

NBN CONDUIT SCHEDULE - ELECTRICAL CONTRACTOR

CODE	ITEM	Refer: AS/NZS 1477:2006 - Table 4.2(A) WALL THICKNESS	MEAN OUTSIDE DIA.	MEAN INSIDE DIA.	QUANTITY (metres)
P50	MDU service drop	PN12	60mm	54mm	9
P100	MDU service drop	PN9	114mm	104mm	6
P50	footpath	PN12	60mm	54mm	5
P100	footpath	PN9	114mm	104mm	325
P100	distribution network	PN9	114mm	104mm	-
Additional trenching					330

NBN PIT SCHEDULE - ELECTRICAL CONTRACTOR

PIT CODE	ITEM	NOMINAL EXTERNAL DIMENSIONS	QUANTITY
2	service drop access pit	650 x 280 x 565mm	-
5	service/boundary pit (single lid)	700 x 450 x 650mm	3
6	local network connection pit (dual lid)	1360 x 555 x 650mm	3
8	distribution/local network connection pit (dual lid)	1360 x 555 x 860mm	1

SOURCE DOCUMENTS

CREATOR	DRAWING	DWG. NO.	REV. NO.	DATE
Robin Russell & Associates	Electrical Reticulation	D726	A	02/08/2023
KN Group	Civil Base	x20-150-base.dwg		27/06/2023
PE Consulting Engineers	Adjacent Stage NBN	STG-M000046994		-

NOTES - NBN

NBN conduits and pits shall be installed in compliance with NBN Co specification: NBN-TE-CTO-194 V 11.0 *New Developments: Deployment of the NBN Co Conduit and Pit Network - Guidelines for Developers.* This can be downloaded at: *http://www.nbnco.com.au/develop-or-plan-with-the-nbn/new-developments/design-build-install/pit-and-pipe-build-process.html*

Additional requirements and explanatory information are contained in Robin Russell & Associates' *General Specification for Installation of Electricity Reticulation and Street Lighting - Issue 'AA'.*

For details of trenching and electrical conduits, refer associated RRA works plan.

In *residential* subdivisions, NBN conduits shall be laid in shared trenches, above electricity conduits. The Civil Contractor shall install road-crossing conduits and other conduits as shown (see legend).

In *commercial* subdivisions, or where no electricity conduit is present, NBN conduits shall be laid on the standard telecommunications alignment, as specified.

On State roads, the required cover of 1200mm precludes the use of shared trenches.

The installation of white warning tape is NOT required. If conduit is not installed in a shared trench with electricity, brass "C" markers shall be installed in the kerbs directly above road-crossing conduits.

Contractors shall not access existing Telstra pits or conduits.

Pits shall be installed relative to the property boundary as shown, immediately outside the exclusion zone of the electricity pillar.

The Electrical Contractor shall ascertain final verge levels from the Civil Contractor before installing conduits & pits.

The Electrical Contractor shall give the Superintendent written notice (a) 10 business days before it anticipates achieving Practical Completion of the conduit and pit installation, and (b) on achieving Practical Completion, to allow the required notices to be given to NBN Co.

Conduit lengths are nominal horizontal distances only. Fibre lengths shall be verified in advance by actual measurement.

The electrical contractor shall perform mandrel testing of all telecommunications conduits, including cross-road and lead-in conduits installed by the civil contractor.

"AS CONSTRUCTED" DOCUMENTS

The electrical contractor shall email the "as constructed" drawing, test results & closure documents to:

- as.constructed@robrus.com.au

'AS CONSTRUCTED' CERTIFICATION

I certify as follows:

The installation of NBN conduits and pits has been completed in accordance with this drawing & NBN specification *NBN-TE-CTO-194*, subject to any changes marked up in red.
Mandrel testing of all conduits has been preformed as detailed on the attached Mandrel Test Report.
The minimum depths of conduits are as specified, except as marked up in red.

signature of certifier:

name of authorised certifier:

date of certification:

name of company:

CONSTRUCTION CONTACTS

ELECTRICAL ENGINEER
ROBIN RUSSELL & ASSOCIATES PTY LTD
ELECTRICAL DESIGNER
Nick Mamalis Ph. 0448 018 806
COMMS CONDUIT DESIGNER
Shane Mills Ph. 07 3353 4660
CONSTRUCTION COORDINATOR
Shane Hyde Ph. 0419 021 772

CIVIL ENGINEER
KN Group
Mark Shaw Ph. 07 3017 1900

SURVEYOR
LandPartners
Ross McDowall Ph. 07 3842 1000

LANDSCAPE ARCHITECT
Saunders Havill Group
Robert McIlroy Ph. 07 3251 9444

DATE	REV	REVISION	APP.	DATE	REV	REVISION	APP.	CURRENT REVISION CHANGES:
03/08/2023	A	INITIAL ISSUE	RR					:

Robin Russell & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS - ELECTRICAL
SUBDIVISION ELECTRICAL SERVICES
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www.robrus.com.au
A.B.N. 78 010 589 661

COUNCIL	EDQ - BRISBANE	DESIGNED	SHANE MILLS	DESCRIPTION: TELECOMMUNICATION
COUNCIL REF	DEV2022/1321	DRAWN	SHANE MILLS	
UBD REF	Map 109 Grid Q18	CHECKED	K.R.	
DWT REV	V48 20210504	APPROVED BY	ROBIN RUSSELL RPEQ 1546	CLIENT: ECONOMIC DEVELOPMENT QUEENSLAND
DATE	03/08/2023	SIGNED		

LOCATION
CARSELDINE VILLAGE - STAGE V
520 & 532 BEMS ROAD
CARSELDINE, 4034

A1

DRAWING No.
D726-N-01A

NBN ID REQUEST No./TELSTRA AFR: STG-M000097169

SHEET No.: 1 OF 1

FloodWise Property Report

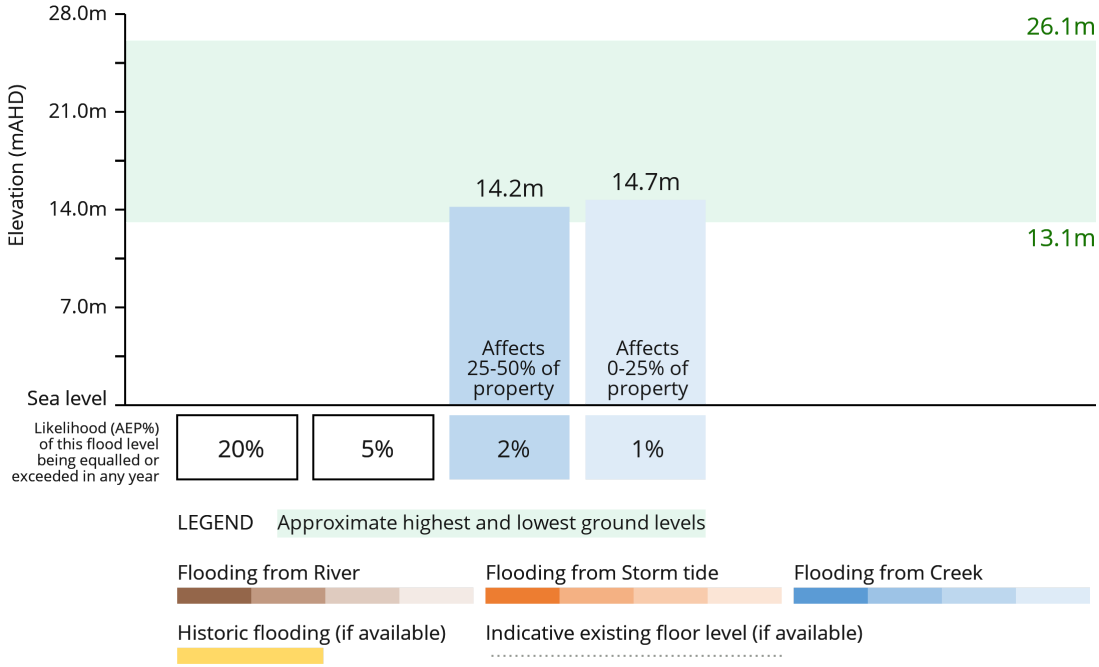
520 BEAMS RD, CARSELDINE 4034
Lot 7003 on SP331690

Dedicated to a better Brisbane

THE PURPOSE OF THIS REPORT IS FOR BUILDING AND DEVELOPMENT

Brisbane City Council's FloodWise Property Report **provides technical flood planning information** including estimated flood levels, habitable floor level requirements and more. **This report uses the adopted flood planning information in CityPlan**, that guides how land in Brisbane is used and developed for the future. Find out more about planning and building. To understand how to be **resilient and prepare for floods**, visit Council's Be Prepared webpage. Find more information about how to read a FloodWise Property Report.

Graph showing only the highest source/type of flooding for 1%, 2%, 5% and 20% likelihoods. Also shows historic flood levels. Other flood types and levels may be present and will be listed in the Flood Planning Information table below. This graph does not include overland flow flooding. If applicable, overland flow information is shown in the Planning and Development Information section below. **NOTE:** See Useful Definitions section to explain terminology.



Combined 1% AEP for river, creek and storm tide flood extent (if applicable). Aerial map shows river and creek flooding extent from the adopted CityPlan. Read more about CityPlan.

Are you resilient and ready for flood?

- Sign up to the Brisbane Severe Weather Alert at **brisbane.qld.gov.au/beprepared**
- Visit bom.gov.au for the latest weather updates.
- Have an evacuation plan, emergency kit and important phone numbers ready.
- Observe where water flows from and to during heavy rain.
- Consider how flood-resilient building techniques will have you home faster and with less damage.

Life threatening emergencies **000** Police/fire/ambulance (mobiles **000** and **112**)

State Emergency Service (SES) **132 500**
Energex **13 19 62**
Brisbane City Council **3403 8888**

Technical Summary

This section of the FloodWise Property Report contains more detailed flood information for this property so **surveyors, builders, certifiers, architects, and engineers can plan and build** in accordance with Council's planning scheme.

Find more information about planning and building in Brisbane or talk to a Development Services Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

Property Information Summary

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

Property Summary	Level (mAHD) / Comment	Data Quality Code
Minimum ground level	13.1	C
Maximum ground level	26.1	C
Source of highest flooding	Creek/Waterway	

Flood Planning Information

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning and Development Information section below for further information.

Note this table does not include overland flow. If overland flow is applicable to this property, refer to the Flood Planning and Development section below for further information.

Likelihood / Description	Level (mAHD)	Source
20%	N/A*	
5%	N/A*	
2%	14.2	Creek/Waterway (Cabbage Tree Creek)
1%	14.7	Creek/Waterway (Cabbage Tree Creek)
0.2%	14.7	Creek/Waterway (Cabbage Tree Creek)
Minimum Habitable Floor Level (dwelling house)	N/A*	

* Council does not have this data available. Customers are recommended to engage a Registered Professional Engineer of QLD for further advice.

Flood Planning and Development Information

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

Flood overlay code

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the flood planning areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme.

Flood planning areas (FPA)		
River	**Creek / waterway**	**Overland flow**
	FPA4	Not Applicable
	FPA5	

To find more information about Council's flood planning areas (FPAs) for Brisbane River and Creek/waterway flooding to guide future building and development in flood prone areas, please review Council's Flood Planning Provisions.

Coastal hazard overlay code

The Coastal hazard overlay code of Council's planning scheme uses the following information to provide guidelines when conducting new developments. The table below summarises the coastal hazard categories that apply to this property. Development guidelines for the following Coastal hazard overlay sub-categories are explained in Council's planning scheme.

Coastal hazard overlay sub-categories
There are currently no Coastal hazard overlay sub-categories that apply to this property.

Note: Where land is identified within one for more flood planning areas on the Flood overlay or is identified within one of the Storm tide inundation area sub-categories on the Coastal hazard overlay, the assessment criteria that provides the highest level of protection from any source of flooding applies.

Property development flags
Large allotment - This property is either a Large Allotment of over 1000 square metres or is located within a Large Allotment. Flood levels may vary significantly across allotments of this size. Further investigations may be warranted in determining the variation in flood levels and the minimum habitable floor level across the site. For more information or advice, please consult a Registered Professional Engineer of Queensland (RPEQ).

Useful Flood Information Definitions

Australian Height Datum (AHD) - The reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance.

- **0.2% AEP** - A flood event of this size is considered rare but may still occur. A flood of size or larger has a 1 in 500 chance or a 0.2% probability of occurring in any year.
- **1% AEP** - A flood of this size or larger has a 1 in 100 chance or a 1% probability of occurring in any year.
- **2% AEP** - A flood of this size or larger has a 1 in 50 chance or a 2% probability of occurring in any year.
- **5% AEP** - A flood of this size or larger has a 1 in 20 chance or a 5% probability of occurring in any year.
- **20% AEP** - A flood of this size or larger has a 1 in 5 chance or a 20% probability of occurring in any year.

Data quality

- **Data Quality Code A** - Level data based on recent surveyor report or approved as-constructed drawings.
- **Data Quality Code B** - Level data based on ground-based mobile survey or similar.
- **Data Quality Code C** - Level data derived from Airborne Laser Scanning or LiDAR information.

Defined Flood Level (DFL) - The DFL is used for commercial and industrial development. The Defined flood level (DFL) for Brisbane River flooding is a level of 3.7m AHD at the Brisbane City Gauge based on a flow of 6,800 m /s. DFL is only applicable for non-residential uses affected by Brisbane River flooding.

Flood planning area (FPA) - Council has developed five Flood planning areas (FPAs) as part of City Plan Flood overlay mapping for Brisbane River, Creek/waterway flooding and Overland flow to guide future building and development in flood prone areas. Storm tide flooding is mapped separately. The FPAs are designed to recognise the flood hazard for different flooding types. Flood hazard is a combination of frequency of flooding, the flood depth, and the speed at which the water is travelling. Find more information here.

Maximum and minimum ground level - Highest and lowest ground levels on the property based on available ground level information. A Registered Surveyor can confirm exact ground levels.

Minimum habitable floor level (dwelling house) - The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family, and rumpus rooms) must be constructed as required by the Brisbane City Plan.

Indicative existing floor level - The approximate level in metres AHD of the lowest habitable floor in the existing building. This data is sourced from a range of sources with varying accuracy levels.

Property - A property will contain 1 or more lots. The multiple lot warning is shown if you have selected a property that contains multiple lots.

Residential flood level (RFL) - This flood level for the Brisbane River equates to the 1% annual exceedance probability (AEP) flood level.

To learn more, visit Brisbane City Council's Flood Information Hub

Brisbane City Council's Online Flood Tools

Council provides several online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

Council's online flood tools for planning and development purposes include:

- **FloodWise Property Report**
- **Flood Overlay Code**

For more information on Council's planning scheme and online flood tools for planning and development:

- phone (07) 3403 8888 and ask to talk to a Development Services Planning Information Officer

- visit brisbane.qld.gov.au/planning-building

Council's Planning Scheme - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

Disclaimer

1. Defined flood levels and residential flood levels, minimum habitable floor levels and indicative existing floor levels are determined from the best available information to Council at the date of issue. These levels, for a particular property, may change if more detailed information becomes available or changes are made in the method of calculating levels.
2. Council makes no warranty or representation regarding the accuracy or completeness of a FloodWise Property Report. Council disclaims any responsibility or liability in relation to the use or reliance by any person on a FloodWise Property Report.

Planning to build or renovate?

For information, guidelines, tools and resources to help you track, plan or apply for your development visit brisbane.qld.gov.au/planning-building

You can also find the Brisbane City Plan 2014 and Neighbourhood Plans as well as other information and training videos to help, with your building and development plans.

APPENDIX D

BRISBANE CITY COUNCIL CODES

PERFORMANCE OUTCOMES	ACCEPTABLE OUTCOMES	SOLUTIONS[1]	COMMENTS	COUNCIL USE ONLY
Section A - If for a material change of use, reconfiguring a lot, operational work or building work Note—Compliance with the performance outcomes and acceptable outcomes in this section should be demonstrated by the submission of a site-based stormwater management plan for high risk development only				
PO1 Development provides a stormwater management system which achieves the integrated management of stormwater to: (a) minimise flooding; (b) protect environmental values of receiving waters; (c) maximise the use of water sensitive urban design; (d) minimise safety risk to all persons; (e) maximise the use of natural waterway corridors and natural channel design principles. *Editor's note—The stormwater management system to be developed to address PO1 is not intended to require management of stormwater quality.*	**A01** Development provides a stormwater management system designed in compliance with the Infrastructure design planning scheme policy.	✓	The proposal complies with the Infrastructure Design Planning Scheme Policy.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

P02 Development ensures that the stormwater management system and site work does not adversely impact flooding or drainage characteristics of premises which are up slope, down slope or adjacent to the site.	**AO2.1** Development does not result in an increase in flood level or flood hazard on up slope, down slope or adjacent premises. **AO2.2** Development provides a stormwater management system which is designed in compliance with the standards in the **Infrastructure design planning scheme policy.**	✓ ✓	The proposal meets the requirements of Council's Infrastructure design planning scheme policy and does not result in an increase in flood level or flood duration on upstream, downstream or adjacent properties.	
PO3 Development ensures that the stormwater management system does not direct stormwater run-off through existing or proposed lots and property where it is likely to adversely affect the safety of, or cause nuisance to properties.	**AO3.1** Development ensures that the location of the stormwater drainage system is contained within a road reserve, drainage reserve, public pathway, park or waterway corridor. **AO3.2** Development provides a stormwater management system which is designed in compliance with the standards in the **Infrastructure design planning scheme policy.** **AO3.3** Development obtains a lawful point of discharge in compliance with the standards in the **Infrastructure design planning scheme policy.**	N/A ✓ ✓	The design demonstrates that a drainage network will be provided that will comply with Council's Infrastructure design planning scheme policy. Conceptual drainage requirements for the proposal are identified in the SBSMP.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

	AO3.4 Where on private land, all underground stormwater infrastructure is secured by a drainage easement.	**N/A**		
PO4 Development provides a stormwater management system which has sufficient capacity to safely convey run-off taking into account increased run-off from impervious surfaces and flooding in local catchments.	**AO4.1** Development provides a stormwater conveyance system which is designed to safely convey flows in compliance with the standards in the **Infrastructure design planning scheme policy.** **AO4.2** Development provides sufficient area to convey run-off which will comply with the standards in the **Infrastructure design planning scheme policy.**	✓ ✓	The design demonstrates that a drainage network will be provided that will comply with Council's **Infrastructure design planning scheme policy** which safely conveys runoff taking into account increased runoff and flooding in local catchments.	
P05 Development designs stormwater channels, creek modification works, bridges, culverts and major drains to protect and enhance the value of the waterway corridor or drainage path for fauna movement.	**AO5** Development ensures the design of stormwater channels, creek modifications or other infrastructure, permits terrestrial and aquatic fauna movement.	**N/A**	The proposed development does not have any channel, creek modification, bridge, culvert or major drain works.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PO6 Development ensures that location and design of stormwater detention and water quality treatment: (a) minimises risk to people and property; (b) provides for safe access and maintenance; (c) minimises ecological impacts to creeks and waterways.	**AO6.1** Development locates stormwater detention and water quality treatment: (a) outside of a waterway corridor; (b) offline to any catchment not contained within the development.	A/S	This development is part of the Carseldine Village Heart Precinct which has "communal" bioretention basins that satisfy all criteria except Gross Pollutants Reduction Target. Only this gross pollutant reduction target is met on-site. The rest discharges to the stormwater mains that lead to the bioretention basin.	
PO7 Development is designed, including any car parking areas and channel works to: (a) reduce property damage; (b) provide safe access to the site during the defined flood event.	**AO7.1** Development (including any ancillary structures and car parking areas) is located above minimum flood immunity levels in Table 9.4.9.3.B, Table 9.4.9.3.C, Table 9.4.9.3.D,Table 9.4.9.3.E and Table 9.4.9.3.F. *Note—Compliance with this acceptable outcome can be demonstrated by the submission of a hydraulic and hydrology report identifying flood levels and development design levels (as part of a site-based stormwater management plan).* **AO7.2** Development including the road network provides a stormwater management system that provides safe pedestrian and	✓	The proposed development design provides flood immunity levels in accordance with the **Infrastructure design planning scheme policy.** A SBSMP has been prepared and demonstrates this The proposed development design provides a stormwater management system that ensures the safe pedestrian and vehicle access in accordance with	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

	vehicle access in accordance with the standards in the **Infrastructure design planning scheme policy.**		the **Infrastructure design planning scheme policy.**	
PO8 Development designs stormwater channels, creek modification works and the drainage network to protect and enhance the environmental values of the waterway corridor or drainage path.	**AO8.1** Development ensures natural waterway corridors and drainage paths are retained. **AO8.2** Development provides the required hydraulic conveyance of the drainage channel and floodway, while maximising its potential to maximise environmental benefits and minimise scour. Editor's note—Guidance on natural channel design principles can be found in the Council's publication **Natural channel design guidelines.** **AO8.3** Development provides stormwater outlets into waterways, creeks, wetlands and overland flow paths with energy dissipation to minimise scour in compliance with the standards in the **Infrastructure design planning scheme policy.** **AO8.4** Development ensures that the design of modifications to the existing design of new stormwater channels, creeks and major drains is in compliance with the standards in the **Infrastructure design planning scheme policy.**	N/A **N/A** **N/A** **N/A**	The proposed development stormwater designs are in accordance with the **Infrastructure design planning scheme policy.** The proposed development does not include any channel or creek modification works.	

1. Solution: ✓ = Acceptable Solution
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PO9 Development is designed to manage run-off and peak flows by minimising large areas of impervious material and maximising opportunities for capture and re-use.	**AO9** No acceptable outcome is prescribed.	**N/A**		
PO10 Development ensures that there is sufficient site area to accommodate an effective stormwater management system. *Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.*	**AO10** No acceptable outcome is prescribed.	✓	The proposed development ensures there is sufficient site area to accommodate an effective stormwater management system. This is demonstrated in the SBSMP. The proposed development will comply with Council's **Erosion and Sediment Control Standard.** An Erosion and Sediment Control Plan will be submitted in the detailed design phase of the development. Strategies that will be implemented have been outlined in the SBSMP. A Detailed Erosion and Sediment Control Program will be prepared and submitted during the Operation Works phase of the development.	
PO11 Development provides for the orderly development of stormwater infrastructure within a catchment, having regard to the: (a) existing capacity of stormwater	**AO11.1** Development with up-slope external catchment areas provides a drainage connection sized for ultimate catchment conditions that is directed to a lawful point of discharge.	N/A		

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
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infrastructure within and external to the site, and any planned stormwater infrastructure upgrades; (b) safe management of stormwater discharge from existing and future up-slope development; (c) implication for adjacent and down-slope development.	**AO11.2** Development ensures that existing stormwater infrastructure that is undersized is upgraded in compliance with the **Priority infrastructure plan** and the standards in the **Infrastructure design planning scheme policy.**			
PO12 Development provides stormwater infrastructure which: (a) remains fit for purpose for the life of the development and maintains full functionality in the design flood event; (b) can be safely accessed and maintained cost effectively; (c) ensures no structural damage to existing stormwater infrastructure.	**AO12.1** The stormwater management system is designed in compliance with the **Infrastructure design planning scheme policy.** **AO12.2** Development provides a clear area with a minimum of 2m radius from the centre of an existing manhole cover and with a minimum height clearance of 2.5m.	✓ N/A		
PO13 Development ensures that all reasonable and practicable measures are taken to manage the impacts of erosion, turbidity and sedimentation, both within and external to the development site from construction activities, including vegetation clearing, earthworks, civil construction, installation of services, rehabilitation, revegetation and landscaping to protect:	**AO13** No acceptable outcome is prescribed.	N/A		

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
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(a) the environmental values and water quality objectives of waters; (b) waterway hydrology; (c) the maintenance and serviceability of stormwater infrastructure. *Note—The Infrastructure design planning scheme policy outlines the appropriate measures to be taken into account to achieve the performance outcome*.				
PO14 Development ensures that: (a) unnecessary disturbance to soil, waterways or drainage channels is avoided; (b) all soil surfaces remain effectively stabilised against erosion in the short and long term.	**AO14** No acceptable outcome is prescribed	N/A		
PO15 Development does not increase: (a) the concentration of total suspended solids or other contaminants in stormwater flows during site construction; (b) run-off which causes erosion either on site or off site.	**AO15** No acceptable outcome is prescribed	A/S	Development ensures the standards are met once the stormwater exits the Carseldine Village Precinct to the extent that this development affects it. This is because there are "communal" bioretention basins that achieve most targets. Only the targets which aren't met are fulfilled on-site prior to discharge to the bioretention basins.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
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Section B—Additional criteria which apply to high-risk development, being one or more of the following: (a) a material change of use for an urban purpose which involves greater than 2,500m^2 of land that: (i) will result in an impervious area greater than 25% of the net developable area; or (ii) will result in 6 or more dwellings. (b) reconfiguring a lot for an urban purpose that involves greater than 2,500m^2 of land and will result in 6 or more lots; (c) operational work for an urban purpose which involves disturbing greater than 2,500m^2 of land.				
PO16 Development ensures that the entry and transport of contaminants into stormwater is avoided or minimised to protect receiving water environmental values. *Note—Prescribed water contaminants are defined in the **Environmental Protection Act 1994.*** *Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.*	**AO16** Development provides a stormwater management system which is designed in compliance with the standards in the **Infrastructure design planning scheme policy.**	✓	See PO15	
PO17 Development ensures that: (a) the discharge of wastewater to a waterway or external to the site is avoided; or (b) if the discharge cannot practicably be avoided, the development minimises wastewater discharge through re-use, recycling, recovery and	**AO17** No acceptable outcome is prescribed.	✓		

1. Solution: ✓ = Acceptable Solution
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treatment. *Note—The preparation of a wastewater management plan can assist in demonstrating achievement of this performance outcome.* *Editor's note—This code does not deal with sewerage which is the subject of the Wastewater code.*				

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
Section A—If for self-assessable or assessable development for a dwelling house including any secondary dwelling Note—Development for a dwelling house does not require assessment against any other sections of this code.				
PO1 Development involving any habitable or non-habitable part of a dwelling house, including any secondary dwelling, is located and designed to: (a) minimise the risk to people from flood hazard; (b) achieve acceptable flood immunity; (c) minimise property impacts from a flood event up to and including the defined flood event; (d) minimise disruption to residents, recovery time and rebuilding or restoration costs after a flood event up to and including the defined flood event.	**AO1.1** Development for a dwelling house including anysecondary dwelling: (a) is not located in the Brisbane River flood planning area 1, 2a or 2b sub-categories or the Creek/waterway flood planning area 1 or 2 sub-categories; or (b) is only located in these sub-categories, if a Registered Professional Engineer Queensland certifies that thedwelling house and any secondary dwelling are structurally designed to be able to resist hydrostatic and hydrodynamic loads associated with flooding up to and including thedefined flood event. **AO1.2** Development for a dwelling house and any secondary dwelling complies with the minimum flood planning levels inTable 8.2.11.3.B. Note—If located in an area that has no flood level information available from the Council such as an overland flow path, a Registered Professional Engineer of Queensland with expertise in undertaking flood studies is to certify	N/A		

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A/S = Alternative Solution
N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	that the flood level and development levels for the dwelling house and any secondary dwelling achieve the required flood planning levels in Table 8.2.11.3.B. **AO1.2** Development involving a building undercroft complies with the minimum clearance requirements in Table 8.2.11.3.E. Editor's note—For creek/waterway, storm-tide and river flooding, applicable flood planning information is available from Council's FloodWise Property Report. Note—The Flood planning scheme policy provides guidance on undercroft design.			
PO2 Development within the Creek/waterway flood planning area sub-categories or Overland flow flood planning area sub-category: (a) maintains the conveyance of flood waters to allow them to pass predominantly unimpeded through the site; (b) does not concentrate, intensify or divert floodwater onto upstream, downstream or adjacent properties;	**AO2** Development: (a) is not located within the Creek/waterway flood planning area 1, 2 or 3 sub-categories or the Overland flow flood planning area sub-category; or (b) provides an open undercroft area from natural ground level to habitable floor level for any area inundated by the defined flood event; or ote—This undercroft area is not suitable	N/A	The site is currently within the flood planning area however, this development occurs after a subdivision that is currently being undertaken which brings the entire development above the flood planning level. This criteria would have been applicable to that subdivision development.	

1. Solution: ✓ = Acceptable Solution
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N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
(c) will not result in a material increase in flood levels or flood hazard on upstream, downstream or adjacent properties.	for providing non-habitable rooms, secure storage of valuables, or future enclosing for storage or car parking. The clear area may include structural elements such as columns and floor substructure. The Flood planning scheme policyprovides guidance on undercroft design. Editor's note—An open undercroft design may be achieved through a 'valance' treatment around the perimeter of an otherwise internally clear undercroft. Editor's note—For Creek/waterway, storm-tide and river flooding, applicable flood planning information is available from Council'sFloodWise Property Report. (c) report from a Registered Professional Engineer Queensland certifies that the development in the Creek/waterway flood planning area or Overland flow flood planning area sub-categories will not result in a material increase in flood level or flood hazard on upstream, downstream or adjacent properties. Note—Flood studies demonstrate that the development and engineering design methods conform to the			

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.			
Section B—If self-assessable or assessable development other than for a dwelling house or reconfiguring a lot Note—If self-assessable development complies with the acceptable outcomes of this part, no further assessment against this code is required.				
PO3 Development: (a) is compatible with flood hazard in a defined flood event; (b) minimises the risk to people from flood hazard; (c) does not reduce the ability of evacuation resources including emergency services to access and evacuate the site in a flood emergency, with consideration to the scale of the development; (d) minimises impacts on property from flooding; (e) minimises disruption to residents, business or site operations and recovery time due to flooding; (f) minimises the need to rebuild structures after a flood event greater than the defined flood event. Note—Where Table 8.2.11.3.C identifies that a flood risk assessment is required, compliance with this performance outcome can be achieved by submitting a	**AO3** Development for a material change of use complies with Table 8.2.11.3.C.	✓	Freeboard requirements for buildings are satisfied.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
flood risk assessment, which may be included within a flood study, addressing the criteria within this performance solution. Preparing flood risk assessments and flood studies is required to be in accordance with the Flood planning scheme policy. Note—An emergency management plan prepared in accordance with the Flood planning scheme policy, which sets out procedures for evacuation due to flooding may be used to demonstrate compliance with this performance outcome.				
PO4 Development for a park ensures that the design of a park and location of structures and facilities responds to the flood hazard and balances the safety of intended users with: (a) maintaining continuity of operations; (b) impacts of flooding on asset life and ongoing maintenance costs; (c) efficient recovery after flood events; (d) recreational benefits to the city; (e) availability of suitable land within the park.	**AO4.1** Development involving a building or structure in a park complies with the flood planning levels specified in Table 8.2.11.3.D. **AO4.2** Development involving a building or structure where Table 8.2.11.3.D does not apply: (a) is not located within the 20% AEP flood extent of any creek/waterway or overland flow path; or (b) is located above the 20% AEP flood level of any creek/waterway or overland	**N/A**	No building or structure in park.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	flow path.			
Section C—If for assessable development other than for a dwelling house				
PO5 Development is located and designed to: (a) minimise the risk to people from flood hazard on the site; (b) minimise flood damage to the development and contents of buildings up to the defined flood event; (c) provide suitable amenity; (d) minimise disruption to residents, recovery time and the need to rebuild structures after a flood event up to and including the defined flood event.	**AO5.1** Development complies with the flood planning levels specified in Table 8.2.11.3.D. Note—If located in an area with no Council-derived flood levels such as an overland flow path, a Registered Professional Engineer Queensland with expertise in undertaking flood studies is to derive the applicable flood level and certify that the development meets the required flood planning levels in Table 8.2.11.3.D. The study is to demonstrate that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy. **AO5.2** Development is: (a) not located in the: i. Brisbane River flood planning area 1, 2a, or 2b sub-categories; ii. Creek/waterway flood planning area 1 or 2 sub-categories; iii. Overland flow flood planning area sub-category; or	✓	Development complies with the flood planning levels specified in Table 8.2.11.3.D.	

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	(b) only located in these sub-categories if a Registered Professional Engineer Queensland with expertise in undertaking flood studies certifies that: i. the development design, siting and any mitigation measures will ensure the development is structurally adequate to resist hydrostatic, hydrodynamic and debris impact loads associated with flooding up to the defined flood event; and ii. the risk to people is managed to an acceptable level.			
PO6 Development involving essential electrical services or a basement storage area is suitably located and designed to ensure public safety and minimise flood recovery and economic consequences of damage during a flood.	**AO6.1** Development ensures that: (a) all areas containing essential electrical services comply with the flood planning levels in Table 8.2.11.3.D; or (b) if a basement contains essential electrical services or a private basement storage area, the basement is a waterproof structure with walls and floors impermeable to the passage of water with all entry points and services located at or above the relevant flood planning level in Table 8.2.11.3.D. Note—A basement storage area does not include a bike storage room, change room, building maintenance storage and	**N/A**		

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	non-critical electrical services. **AO6.2** Development involving a basement that relies on a pumping solution to manage floodwater ingress or for dewatering after a flood provides a redundant pump system with a backup power source for those pumps.			
PO7 Development does not directly or indirectly create a material adverse impact on flood behaviour or drainage on properties that are upstream, downstream or adjacent to the development.	**AO7.1** Development: (a) does not block, or divert floodwaters for any area affected by creek/waterway or overland flow flooding, excluding storm-tide flooding and Brisbane River flooding sources; or (b) does not result in a material increase in flood level or hydraulic hazard on upstream, downstream or adjacent properties. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure	✓	The development will not cause adverse impact to upstream, downstream or adjacent properties. The development will discharge flows as per existing conditions and provide detention. Overland flow did not pass through the site prior to this development and is not expected to pass through as a consequence of this development.	

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	design planning scheme policy. **AO7.2** Development retains existing overland flow paths and does not rely wholly on piped solutions to manage major flows. **AO7.3** Development which creates a new overland flow path or significantly modifies an existing overland flow path via earthworks does not materially worsen hydraulic hazard on the site from existing conditions. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.			
PO8 Development for filling or excavation in an area affected by creek/waterway flooding does not directly, indirectly or cumulatively cause any material increase	**AO8** Development ensures that no filling or excavation greater than 100mm is located in the Creek/waterway flood planning area 1, 2 or 3 sub-categories if	✓	Note that this development is after the current subdivision that is occurring at the moment on site which lifts the whole site above the 1% AEP flood level.	

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A/S = Alternative Solution
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
in flooding or hydraulic hazard or involve significant redistribution of flood storage from high to lower areas in the floodplain. Note—This can be demonstrated by undertaking earthworks in compliance with the Compensatory earthworks planning scheme policy. Note—This part of the code applies to all development other than a dwelling house and any secondary dwelling which involves filling or excavation, whether or not the development application comprises a separate development application for operational work involving filling or excavation.	contained in the 5% AEP flood extent of any Creek/waterway flood planning area sub-category for which no waterway corridor has been mapped in the Waterway corridors overlay.			
PO9 Development ensures that the building and site design: (a) maintains the conveyance capacity of existing overland flow paths and creek/waterways; (b) ensures floodwaters and flood debris can pass predominantly unimpeded under a structure or building to minimise property or building damage, including for a flood larger than the defined flood event; (c) mitigates flood impacts by ensuring	**AO9.1** Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub-category: (a) complies with the minimum building undercroft clearance requirements in Table 8.2.11.3.E; (b) not located directly above any part of a waterway corridor as mapped in the Waterway corridors overlay.	✓	The development is not expected to affect the conveyance capacity of overland flow through the site.	

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A/S = Alternative Solution
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
that filling, excavation and location of services are designed to allow for the conveyance of floodwater across the site. Note—The Flood planning scheme policy provides guidance on relevant considerations in determining minimum undercroft clearances and treatment of ground level in undercroft areas where floodwater conveyance is required underneath development.	**AO9.2** Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub category: (a) has a ground level within the undercroft area is free draining; (b) does not involve excavation below ground level of more than 300mm within the undercroft area.			
PO10 Development for vulnerable uses, difficult to evacuate uses or assembly uses optimises vehicular access and efficient evacuation from the development to parts of the road network unaffected by flood hazard, in order to: (a) protect safety of users and emergency services personnel; (b) upport efficient emergency services access and site evacuation with consideration to the scale of development.	**AO10.1** Development for vulnerable uses, difficult to evacuate uses or assembly uses: (a) is not isolated in any event up to the relevant flood planning level specified in Table 8.2.11.3.L; or (b) has direct vehicle access to a critical route or interim critical route in the Critical infrastructure and movement network overlay for evacuation in a flood; or (c) can achieve vehicular evacuation to a suitable flood-free location.	**N/A**		

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
Note—A flood risk assessment may be required to address the performance outcomes or acceptable solutions which deal with evacuation and isolation arrangements, and the ability to take refuge. The Flood planning scheme policy provides information for undertaking flood risk assessments.	Note—A suitable flood-free location is of a size and nature sufficient to provide for the size and characteristics of the population likely to need evacuation to that area.			
PO11 Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.	**AO11.1** Development provides an access or driveway into the site which is: (a) trafficable during the defined flood event; (b) not located in the Creek/waterway flood planning area 1 sub-category; (c) not located in the Overland flow flood planning area sub-category if the hydraulic hazard is unsafe in the defined flood event; (d) the access or driveway is not inundated by a 10% AEP flood. **AO11.2** Development located in the Creek/waterway flood planning area 1, 2, 3 or 4 sub-categories locates any disabled access in the highest part of the site. Note—explanation of hydraulic hazard provided in the Flood planning scheme	✓	The site is expected to be trafficable in the events required.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	policy.			
PO12 Development involving a new road, a bridge or culvert is designed to minimise impacts to flood behaviour, minimise disruption to traffic during a flood and allow for emergency access.	**AO12** Development involving a new road complies with the flood planning levels in Table 8.2.11.3.F.	**N/A**	The development does not involve a new road, a bridge or a culvert.	
PO13 Development for pedestrian and cyclist paths: (a) provides a suitable level of trafficability; (b) manages the impacts of flooding on asset life and ongoing maintenance costs; (c) balances route availability with recreational and transport connectivity benefits to the city.	**AO13.1** Development for cyclist and pedestrian facilities other than on public roads, including those traversing through a park and adjacent to a watercourse and overland flow path, are located above the 39% AEP (2 year ARI) flood immunity from all flooding sources. Note—If the site is subject to more than one type of flooding, the requirement that affords the greatest level of protection will apply. **AO13.1** All new on-road cyclist and pedestrian facilities comply with the flood planning levels and trafficability standards for the applicable category of road in Table 8.2.11.3.F or Table 8.2.11.3.K.	**N/A**	Development of cyclist and pedestrian facilities other than on public roads, including those traversing through a park and adjacent to a watercourse and overland flow path, will be located above the 39% AEP (2 year ARI) flood immunity from all flooding sources.	

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
PO14 Development which increases the residential population within the Brisbane River flood planning area sub-categories minimises the risk to people in all flood events with consideration to flood hazard, including warning time.	**AO14** Development in the Brisbane River flood planning area sub-categories in areas where the residential flood level is greater than 12.8m AHD involving: (a) an increase in the number of residential dwellings; or (b) additional residential lots; or (c) is not subject to an unsafe hydraulic hazard in the 0.2% AEP flood event. Note—Explanation of a hydraulic hazard is provided in the Flood planning scheme policy.	**N/A**		
Additional criteria for essential community infrastructure				
PO15 Development involving essential community infrastructure: (a) remains functional to serve community need during and immediately after a flood event, or is part of a network that is able to maintain the function of the essential community infrastructure when parts of the development are unable to function during or after a flood; (b) is designed, sited and operated to avoid adverse impacts on the community or the environment due to the impacts of flooding on infrastructure, facilities or access and egress routes;	**AO15** Development involving essential community infrastructure: (a) is ancillary to and not relied upon for the provision of the essential service during a flood; or (b) is located above the flood planning levels in Table 8.2.11.3.G; (c) has access to or provides the necessary back-up emergency electricity and communications supply in times of flood; (d) is designed and constructed to resist hydrostatic and hydrodynamic forces as a result of inundation by the flood event	✓		

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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
(c) is able to remain functional or is part of a network which is able to remain functional even when other infrastructure or services (such as electricity supply) may be compromised in a flood event; (d) contains mitigation measures which are not entirely dependent on human activation to respond to a flood event. Note—Protection of function is required up to and including the flood event in Table 8.2.11.3.G.	listed for the development type in Table 8.2.11.3.G; (e) that services a local area: i. is able to be accessed in times of flood to service local community needs up to the event listed for that development type in Table 8.2.11.3.G; or ii. is consistent with the standards contained in the Management of hazardous chemicals in flood prone areas planning scheme policy and can operate without risk of environmental harm during a flood event. Note—The Management of hazardous chemicals in flood prone areas planning scheme policy sets out further information and processes including risk assessment for the management of hazardous chemicals in flood planning areas.			
Additional criteria if development involves the processes in Table 8.2.11.3.H				
PO16 Development involving the storage and handling of hazardous materials avoids or minimises risks to public health and safety and the environment, by: (a) protecting underground tanks for hazardous materials against the forces of	**AO16** (a) Development does not include the storage or handling of hazardous chemicals that are equivalent to or exceed the threshold quantities in Table 8.2.11.3.M. (b) Development involving the processes	**N/A**		

1. Solution: ✓ = Acceptable Solution
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
buoyancy, velocity flow and debris impacts; (b) securing above-ground tanks for hazardous materials against flotation and lateral movement; (c) preventing damage to hazardous materials pipework or entry of floodwater into hazardous materials pipework; (d) preventing damage to or off-site release of packages, drums or containers storing hazardous materials. Note—A chemical hazards flood risk report prepared in accordance with the Management of hazardous chemicals in flood prone areas planning scheme policy can assist in demonstrating achievement of this performance outcome. Note—A pump drainage system is not an acceptable measure to meet the performance outcome.	listed in Table 8.2.11.3.H: i. where located in the Flood overlay area, occurs only in the Creek/waterway flood planning area 5 sub-category or the Brisbane River flood planning area 5 sub-category; or ii. is consistent with the standards contained in the Management of hazardous chemicals in flood prone areas planning scheme policy and can operate without risk of environmental harm during a flood event. Note—The Management of hazardous chemicals in flood prone areas planning scheme policy sets out further information and processes including risk assessment for the management of hazardous chemicals in flood planning areas.			

1. Solution: ✓ = Acceptable Solution
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PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
Additional criteria for reconfiguring a lot				
PO17 Development locates and designs all lots resulting from reconfiguring a lot to: (a) minimise the risk to people from flood hazard; (b) minimise damage to property from flood hazard; (c) facilitate safe and efficient evacuation. Note— • Consideration of all floods up to the probably maximum flood is relevant to minimising the risk to people. • Flood warning time is not considered sufficient in the Creek/waterway planning area sub-categories or the Overland flow flood planning area sub-category. • Filling above the flood planning level for a flood event greater than the defined flood event cannot be assumed to mitigate the flood hazard.	**AO17.1** Development creating new lots is to comply with Table 8.2.11.3.I. **AO17.2** Development provides for reconfiguring a lot design that achieves a road and lot layout which: (a) provides trafficable vehicular egress for evacuation during a defined flood event; (b) optimises hazard-free movement away from sources of flood hazard within the development. Note—Further advice on road and lot layout is contained in the Flood planning scheme policy. **AO17.3** Development which creates a new residential lot in an area subject to Brisbane River flooding, if the residential flood level is greater than 12.8m AHD is not subject to a hydraulic hazard greater than 0.6m^2/s DV or 0.6m deep in a 0.2% AEP flood. Note—Refer to the Flood planning scheme policy for further explanation on the 0.2% AEP flood.	**N/A**	No reconfiguration of a lot.	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
PO18 Development involving reconfiguring a lot: (a) minimises the risk to people from flood hazard; (b) creates safe evacuation routes or avoids isolation of the development during a flood greater than the defined flood event; (c) minimises damage to property and services; (d) provides lots and roads that are not frequently flooded or subject to nuisance ponding or seepage; (e) ensures lots created for park or private open space minimise the risk to people from flood hazard and are fit for purpose; (f) provides a lot that is not substantially burdened by flood mitigation infrastructure.	**AO18.1** Development involving reconfiguring a lot ensures: (a) all lots comply with the flood planning levels in Table 8.2.11.3.J; (b) a new road complies with the flood planning levels in Table 8.2.11.3.F. **AO18.2** Development involving reconfiguring a lot creating more than 6 residential lots or a lot for industry ensures the flood planning levels of a dedicated road fronting the development or providing primary access within 200m of the development: (a) complies with Table 8.2.11.3.K; or (b) has acceptable trafficability in accordance with the requirements in the Flood planning scheme policy and the Queensland Urban Drainage Manual. Note—The Flood planning scheme policy contains supporting information about trafficability on existing roads and serviceability during floods. **AO18.3** Development protects the conveyance of flood hazard area by providing an easement over the: (a) 2% AEP flood extent for overland flow	**N/A**	No reconfiguration of a lot	

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this Proposal

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	SOLUTION[1]	COMMENTS	COUNCIL USE ONLY
	flooding; (b) 1% AEP flood extent for creek/waterway flooding.			

1. Solution: ✓ = Acceptable Solution
A/S = Alternative Solution
N/A = Not applicable to this Proposal