Appendix E Stormwater Management Plan



STORMWATER MANAGEMENT PLAN

56 Blinzinger Road, Banyo

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HCE ENGINEERS

REPORT CONTROL SHEET

HCE Ref No:	26074
Site:	56 Blinzinger Road, Banyo
Report Title:	Stormwater Management Plan
Prepared For:	AR Developments Pty Ltd

Rev No	Date	Written by	Reviewed by	Authorised by	Signed
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1. Introduction

A management subdivision has been approved by Economic Development Queensland (Application No. DEV-2026-BAN-5069) for a 4 into 3 lot reconfiguration, that will create three lots: Lots 100, 101 & 102, suitable for further development.

A Material Change of Use application is to be lodged over proposed Lot 100, to allow the construction of 216 townhouses over proposed Lot 100.

This SMP identifies stormwater quality and quantity management measures proposed to be incorporated within the development.

This report has been prepared expressly to provide commentary regarding compliance with for the proposed development on the subject site. Information presented in this report should not be applied to properties or developments other than the subject development. No responsibility is accepted for use of any part of this report in any other context or for any other purposes or by any third party.

2. Existing Site and Catchment Description

The overall development site consists of 4 lots with a total area of approximately 6.4 ha. The site was utilised as an Energex depot, but this use was ceased and the land remediated. Following remediation, the land has been left as grassland that generally falls from the south-west to the north-east at very gentle grades. Towards the north-eastern corner the land was shaped creating a topographic sag, which until recently was undrained. A field inlet has been constructed in recent months within the sag point.

Lot reconfiguration (4 into 3 lots) is proposed and will create Lot 100, which will have a site area of approximately 4.85ha.

Incidental surface runoff from residential properties, that abut the eastern side of the side, occurs.

More substantial flows are experienced from lands to the west of the site. There is an existing BCC pipe drainage system that collects runoff within Blinzinger Road and conveys it through the site. On exceedance of pipe capacity some surface flow into the site from Blinzinger Road will occur.



Image– Existing Site Conditions (Nearmap.com)

Site runoff is directed within the BCC pipe infrastructure north with discharge into the Virginia Golf Club. Areas to the north of the site are subject to both Creek & Overland Flow flooding.

3. Water Quantity Management

Stormwater runoff is to be controlled to achieve development objectives, without unreasonable impact and in accordance with relevant safety parameters.

Stormwater runoff from the site is proposed to discharge to the existing stormwater drainage traversing the subject site.

On-site detention is proposed to mitigate runoff to ensure no adverse impact to surrounding properties. A total storage volume of 1975m^3 is proposed within five detention tanks as shown on the accompanying concept design drawings.

Upstream connections are provided to proposed Lot 101 & 102 with a lawful point of discharge.

Upstream connections are also provided to Lots 1 &2 on RP94403 and Lot 1 on RP144879 (122,124 & 18 Wellington Street).

Surface runoff from the residential properties that abut the site to the east will be managed by a spoon drain at the perimeter of the site, with collection via a filed inlet adjacent the rear of 54/56 Meymot Street.

Internally, a pipe drainage system will be provided compliant with the requirements the BCC Infrastructure PSP and major storm flows will be conveyed within internal driveway system.

The impacts of development on local flooding and the performance of the broader stormwater network have been examined via 2D/1D TUFLOW modelling. In order to achieve no undue adverse impacts some external and internal stormwater infrastructure upgrades are proposed. This includes upgrades within Huron St, within Blinzinger Road and the upsizing of some of the existing pipes within the development site. Further information on management of stormwater drainage is contained within the report prepared by DC Flood Engineering.

4. Water Quality Management

4.1 Construction Phase

4.1.1 Pollutants of Concern

The construction phase stormwater quality design objectives which may be relevant to this development as set by the *Urban Stormwater Quality Planning Guidelines 2010* are as follows:

Objective	Measure
Drainage Control	Design life and design storm of temporary drainage works in accordance with time the disturbed area is exposed. <12 months – 1 in 2 ARI 12-24 months – 1 in 5 ARI >24 months – 1 in 10 ARI
Erosion Control	Minimise exposure of disturbed soils at any time. Avoid or minimise large construction activities in the wet season. Divert water run-off from undisturbed areas around disturbed areas. Use erosion risk ratings to determine appropriate erosion control measures.
Sediment Control	Use soil loss rates to determine appropriate sediment control measures. Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water runoff.
Water Quality Outcomes	Coarse sediment is retained on site. Nitrogen and phosphorus are managed through sediment control. Prevent litter/waste entering the site, the stormwater or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins. Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. Washdown water is prevented from entering the stormwater system or internal watercourses that discharge from the site. Cations and anions including aluminium, iron and sulphate are managed as required under an approved acid sulphate soil management plan.
Stormwater Drainage / Flow Management	Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: • Peak flow for the one year and the 100 year ARI event. • Runoff frequency and volumes entering receiving waters. • Uncontrolled release of contaminated stormwater.

Table 1 - Design objectives for Stormwater Quality Management Plan – Construction phase table

4.1.2 Water Quality Treatment

Appropriate erosion and sediment control measures can be prepared and implemented on site during construction activities to ensure 'best management practices' are achieved.

4.2 Operational Phase

4.2.1 Pollutants of Concern

Suspended Solids, Nutrients, Litter and Hydrocarbons are the common pollutants of concern for Urban Development projects.

4.2.2 Water Quality Treatment

The development is a Material Change of Use for an urban purpose which involves greater than 2,500m^2 of land that will result in an impervious area greater than 25% of the net developable area.

The development is a Material Change of Use for an urban purpose which involves greater than 2,500m^2 of land that will result in 6 or more dwellings.

Accordingly, the stormwater management design objectives, outlined in State Planning Policy (SPP-2017) are applicable.

Pollutant	Minimum Reduction in Mean Annual load
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (>5mm)	90%

Table 2 - Water quality design objectives for Southeast Queensland table

A proprietary cartridge-based filter system is proposed within the site to achieve the target reductions for stormwater quality treatment. There are seven proposed catchments to manage stormwater quality treatment within the site. Catchment 1 is proposed to bypass all treatment and discharge to Blinzinger Road and Wellington Street. Catchment 2 is proposed to bypass quality treatment within tanks and be treated through OceanGrauds within gullies in the road. Catchments 3-7 will all have treatment through both tanks and gullies.

Refer to engineering design drawings and catchment plan appended.

4.2.3 Pollutant Export Modelling

4.2.3.1 Model Selection

To determine the onsite pollutant generation, and the effectiveness of the proposed stormwater quality improvement devices, the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) version 6.4 was used.

4.2.3.2 Model Setup

The MUSIC model was set up in accordance with the Health Waterways, Water by *Design's MUSIC Modelling Guidelines Version 3.0 – 2018*. The rainfall runoff parameters and pollutant export parameters have been set up according to Table 3.9 of this guideline.

All roof water drainage for site and most of the internal driveway runoff can be discharged to the proposed stormwater system.

Refer to the image for the schematic model setup and the MUSIC Rainfall data table for the rainfall data and modelling time step that were used.

Rainfall Period	Rainfall Station	Modelling Time Step
1980 - 1989	Brisbane Aero 40223	6 Minute

Table 13 - MUSIC Rainfall data table

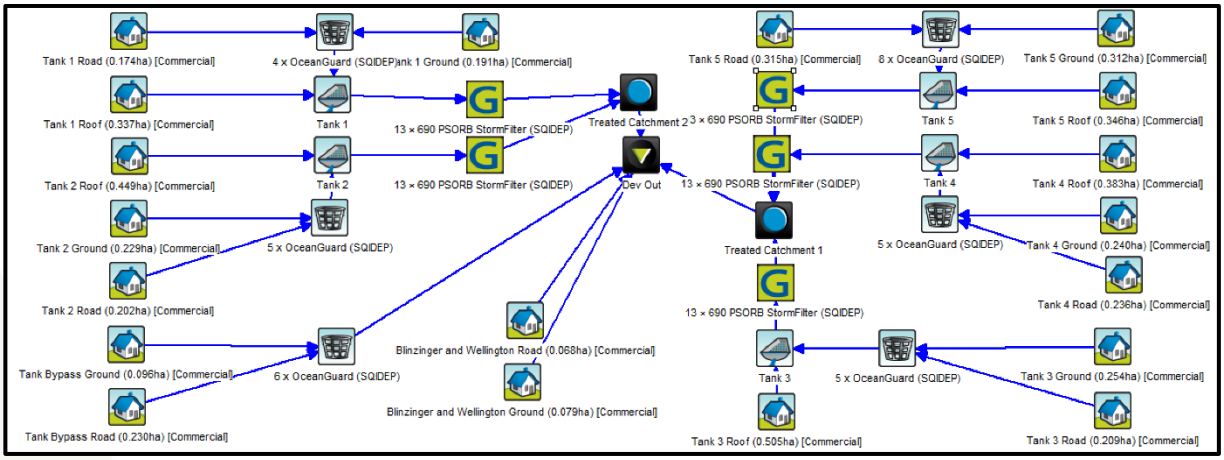


Image MUSIC Model setup

Source Node Catchment data as per the MUSIC model source nodes table.

Node	Catchment Area (ha)	Impervious Percentage
Blinzinger and Wellington Road	0.068	100%
Blinzinger and Wellington Ground	0.079	20%
Tank Bypass Road	0.230	100%
Tank Bypass Ground	0.096	20%
Tank 5 Roof	0.346	100%
Tank 5 Road	0.315	100%
Tank 5 Ground	0.312	20%
Tank 4 Roof	0.383	100%
Tank 4 Road	0.236	100%

Tank 4 Ground	0.240	20%
Tank 3 Roof	0.505	100%
Tank 3 Road	0.209	100%
Tank 3 Ground	0.254	20%
Tank 2 Roof	0.449	100%
Tank 2 Road	0.202	100%
Tank 2 Ground	0.229	20%
Tank 1 Roof	0.337	100%
Tank 1 Road	0.174	100%
Tank 1 Ground	0.191	20%

Table 14 - MUSIC model source nodes table

4.2.3.3 Model Results

The above proposed treatment measures have been modelled using MUSIC version 6.4 and the following pollutant load-based reductions have been predicted for the site.

Target Pollutant	Required Load Based Reduction	Achieved Reduction
Total Suspended Solids (TSS)	80%	80%
Total Phosphorus (TP)	60%	78%
Total Nitrogen (TN)	45%	56%
Gross Pollutants (GP)	90%	98%

Table 16 - MUSIC Modelling Results table

As the MUSIC modelling results table demonstrates, the installation of the proposed stormwater treatment measures achieves the required reduction requirements for Total Suspended Solids, Total Phosphorus, Total Nitrogen and Gross Pollutants. Refer to appendices for the MUSIC results.

The proposed treatment measures are therefore compliant with the State Planning Policy.

Trace and heavy metals are usually associated with fine sediment. The proposed treatment train removes very significant proportions of suspended solids therefore it is expected that the removal of trace and heavy metals will be acceptable to adequately protect downstream habitats and ecosystems from heavy metal contamination. No major sources of hydrocarbons are expected on site.

4.2.4 Water Quality Monitoring

No monitoring of water quality of the runoff from the site is proposed. Untrialled stormwater quality management measures are not proposed. Additionally, the level of treatment proposed is considered best practice and little improvement in the treatment train proposed could be provided.

4.2.5 Maintenance

4.2.5.1 OceanGuard Maintenance

Maintenance and cleaning of the Ocean Protect 'OceanGuard' is to be undertaken per the Operation and Maintenance manual. A copy of this can be viewed in the appendices for Maintenance Guidelines.

4.2.5.2 StormFilter Maintenance

Maintenance and cleaning of the Ocean Protect 'StormFilter' is to be undertaken per the Operation and Maintenance manual. A copy of this can be viewed in the appendices for Maintenance Guidelines.

5. Conclusions

A stormwater management plan has been developed which manages site generated runoff in accordance with the Brisbane City Council Infrastructure Design Planning Scheme Policy.

Lawful discharge will be achieved through the mitigation of the impacts of development on peak flow, through a series of detention tanks, and connection to existing Brisbane City Council infrastructure that traverses the site.

Stormwater connectivity is provided to relevant upstream properties and easements in favour of Council and/or the upstream private landowners are proposed.

Inflows from external areas have been considered and accounted for.

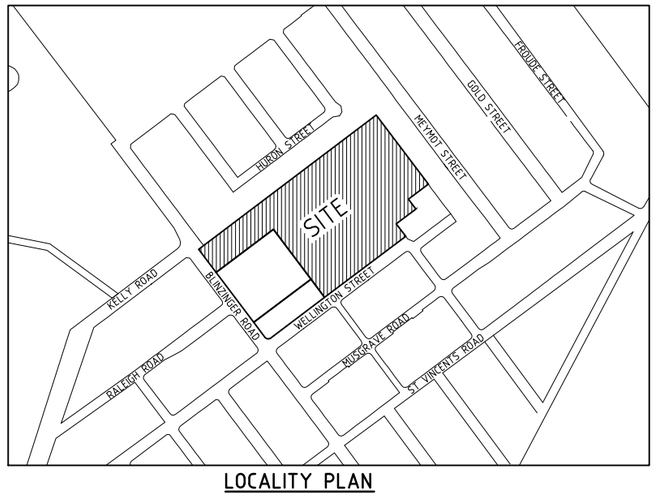
No adverse offsite impacts are anticipated, supported by rigorous 2D/1D TUFLOW modelling.

Stormwater quality treatment is proposed through filter-based systems to achieve target load reductions.

Engineering Drawings

216 UNIT SITE DEVELOPMENT
WELLINGTON STREET &
BLINZINGER ROAD
BANYO, QLD 4104

DRAWING INDEX	
DRAWING No.	DESCRIPTION
26074-SK20	LOCALITY PLAN AND DRAWING INDEX
26074-SK21	CONCEPT SERVICES LAYOUT PLAN
26074-SK22	CONCEPT EARTHWORKS PLAN
26074-SK23	CONCEPT EARTHWORKS SECTIONS
26074-SK26	CONCEPT STORMWATER DRAINAGE QUALITY CATCHMENT PLAN
26074-SK27	CONCEPT PROPOSED FOOTPATH PLAN AND TYPICAL SECTIONS



LOCALITY PLAN
SCALE 1:5000

GENERAL NOTES (v26.1)

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL TEMPORARY AND PERMANENT SIGNAGE AND LINEMARKING TO BE IN ACCORDANCE WITH MAIN ROADS STANDARDS (MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES).
3. ALL DIMENSIONS ARE TO BE CHECKED ON-SITE BEFORE WORK COMMENCES.
4. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DRAWING.
5. DURING CONSTRUCTION BARRIERS, LIGHTS & SIGNS SHALL BE MAINTAINED TO ENSURE SAFE PASSAGE OF TRAFFIC AND PEDESTRIANS IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
6. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH S.A.A. CODES & BY-LAWS AND ORDINANCES OF THE RELEVANT LOCAL AUTHORITY AND WORKPLACE HEALTH AND SAFETY REQUIREMENTS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ALL RELEVANT AUTHORITIES AND PAYING ALL FEES NECESSARY BEFORE COMMENCING WORK, FOR LOCATING ALL EXISTING SERVICES AND FOR REPAIR OF ANY SERVICES DAMAGED AS A RESULT OF THE WORKS.
8. CONTRACTOR TO VERIFY ALL INVERT LEVELS, SURFACE LEVELS, COVER OVER DRAINAGE LINES, AND MINIMUM FALLS ARE CORRECT & OBTAINABLE PRIOR TO COMMENCEMENT OF WORK.
9. THE CONTRACTOR'S ATTENTION IS DRAWN TO THE REQUIREMENTS OF THE WORK HEALTH AND SAFETY ACT 2011. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THIS ACT AND IN PARTICULAR THE CONTRACTOR IS TO ENSURE THE REQUIREMENTS OF THIS SPECIFICATION WITH REGARD TO 'NOTIFICATION IN RELATION TO A NOTIFIABLE PROJECT, ARE FULFILLED.
10. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORK. ALL EXISTING SERVICES AND STRUCTURES ARE TO BE MAINTAINED IN GOOD ORDER FOR THE DURATION OF THE CONTRACT. ANY COST ASSOCIATED WITH REPAIRING DAMAGE TO EXISTING SERVICES SHALL BE BORNE BY THE CONTRACTOR.
11. THE PERSON RESPONSIBLE FOR THE DEMOLITION WORKS SHALL ENSURE THAT ALL VEHICLES LEAVING THE SITE CARRYING DEMOLITION MATERIALS HAVE THEIR LOADS COVERED AND DO NOT TRACK SOIL OR WASTE MATERIALS ONTO THE ROAD.
12. SHOULD ASBESTOS BE PRESENT, ITS REMOVAL SHALL BE CARRIED OUT IN ACCORDANCE WITH THE NATIONAL OH&S COMMITTEE - CODE OF PRACTICE FOR SAFE REMOVAL OF ASBESTOS AND ITS CODE OF PRACTICE FOR THE MANAGEMENT AND CONTROL OF ASBESTOS IN THE WORKPLACE.

SCALE 1:500 (A1) 0 10 20 30m
(SCALE BEFORE REDUCTION)

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COMPASS ASSURANCE SERVICES ISO 9001

PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	LOCALITY PLAN AND DRAWING INDEX	AR DEVELOPMENTS

NOT FOR CONSTRUCTION. CONCEPT ONLY.

REVISION	AMENDMENT	DATE
A	ISSUED FOR COMMENT	04/09/26
B	ISSUED FOR APPROVAL	25/09/26
C	ISSUED FOR APPROVAL	02/10/26

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Designed	Drawn	Date
MB	NW	01/09/2026

Approval No.: ----
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Drawing No.: 26074-SK20
Rev.: C

LEGEND

- FINISHED SURFACE CONTOURS TERVAL)
- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- RW — ROOFWATER & COURTYARD DRAINAGE
- 5.620 — DESIGN FINISHED SURFACE LEVEL
- EX 5.470 — EXISTING SURFACE LEVEL
- S — EXISTING SEWERAGE
- PROPOSED SEWERAGE
- W — EXISTING WATER RETICULATION
- W — PROPOSED WATER RETICULATION

PROPOSED 6.500m WIDE TYPE B2 VEHICLE CROSSING GENERALLY I.A.W. BCC STD DRG BSD-2021

PROPOSED WATER METER AND SERVICE

EXISTING SEWERAGE PROPERTY CONNECTION TO BE RETAINED

EXISTING GULLIES TO BE RECONSTRUCTED

CONSTRUCT NEW MAINTENANCE STRUCTURE OVER EXISTING PIPE.

SEWERAGE PROPERTY CONNECTION. NEW MAINTENANCE STRUCTURE TO BE CONSTRUCTED OVER EXISTING SEWERAGE MAIN.

DETENTION TANK 5
440m³
IL 3.100
13x690 PSORB STORMFILTER

DETENTION TANK 4
380m³
IL 3.100
13x690 PSORB STORMFILTER

DETENTION TANK 3
440m³
IL 3.100
13x690 PSORB STORMFILTER

DETENTION TANK 2
400m³
IL 3.100
13x690 PSORB STORMFILTER

DETENTION TANK 1
315m³
IL 3.100
13x690 PSORB STORMFILTER

NOTE:
OCEANGRAUDS ARE PROPOSE IN ALL INLETS.

PROPOSED 6.500m WIDE TYPE B2 VEHICLE CROSSING GENERALLY I.A.W. BCC STD DRG BSD-2021

UPSTREAM STORMWATER CONNECTION FOR LOT 1 RP 144879

UPSTREAM STORMWATER CONNECTIONS FOR:
LOT 1 RP 94403
LOT 2 RP 94403

LOT 101 | LOT 102 | LOT 100

BLINZINGER ROAD

WELLINGTON STREET

FOR CONTINUATION REFER TO DRAWING 26074-SK27

A SK27 | B SK27

PLAN
SCALE 1:500

SCALE 1:500 (A1) 0 10 20 30m (SCALE BEFORE REDUCTION)

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PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	CONCEPT SERVICES LAYOUT PLAN	AR DEVELOPMENTS

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REVISION	AMENDMENT	DATE
A	REPORT ISSUE	04/09/26
B	MONITORING WELLS ADDED	22/09/26
C	ISSUED FOR APPROVAL	25/09/26
D	ISSUED FOR APPROVAL	02/10/26

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Drawing No.: 26074-SK21 | Rev.: D

NOTE:
400mm MINIMUM CAPPING THICKNESS. REFER TO SPECIFICATION PROVIDED BY PRENSA. ADDITIONAL EXCAVATION REQUIRED IN AREAS. REFER TO SECTIONS FOR INFORMATION.



LEGEND

- 10.0 — FINISHED SURFACE CONTOURS (0.10m INTERVAL)
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWERAGE
- W — EXISTING WATER RETICULATION
- E — EXISTING UNDERGROUND ELECTRICAL
- T — EXISTING TELECOMMUNICATIONS
- EXISTING KERB AND CHANNEL
- PROPOSED KERB AND CHANNEL
- EXISTING RETAINING WALL
- PROPOSED RETAINING WALL
- H 1.00 — MAXIMUM RETAINING WALL HEIGHT
- 5.620 — DESIGN FINISHED SURFACE LEVEL
- EX 5.470 — EXISTING SURFACE LEVEL

CUT FILL LEGEND

FROM	TO
-2.000	-1.500
-1.500	-1.000
-1.000	-0.500
-0.500	0.000
0.000	0.500
0.500	1.000
1.000	1.500
1.500	2.000
2.000	2.500
2.500	3.000

EARTHWORKS VOLUMES

TOTAL CUT	-1,640m³
TOTAL FILL	+26,000m³
BALANCE	+24,360m³

PLAN

SCALE 1:500

SCALE 1:500 (A1) 0 10 20 30m
(SCALE BEFORE REDUCTION)

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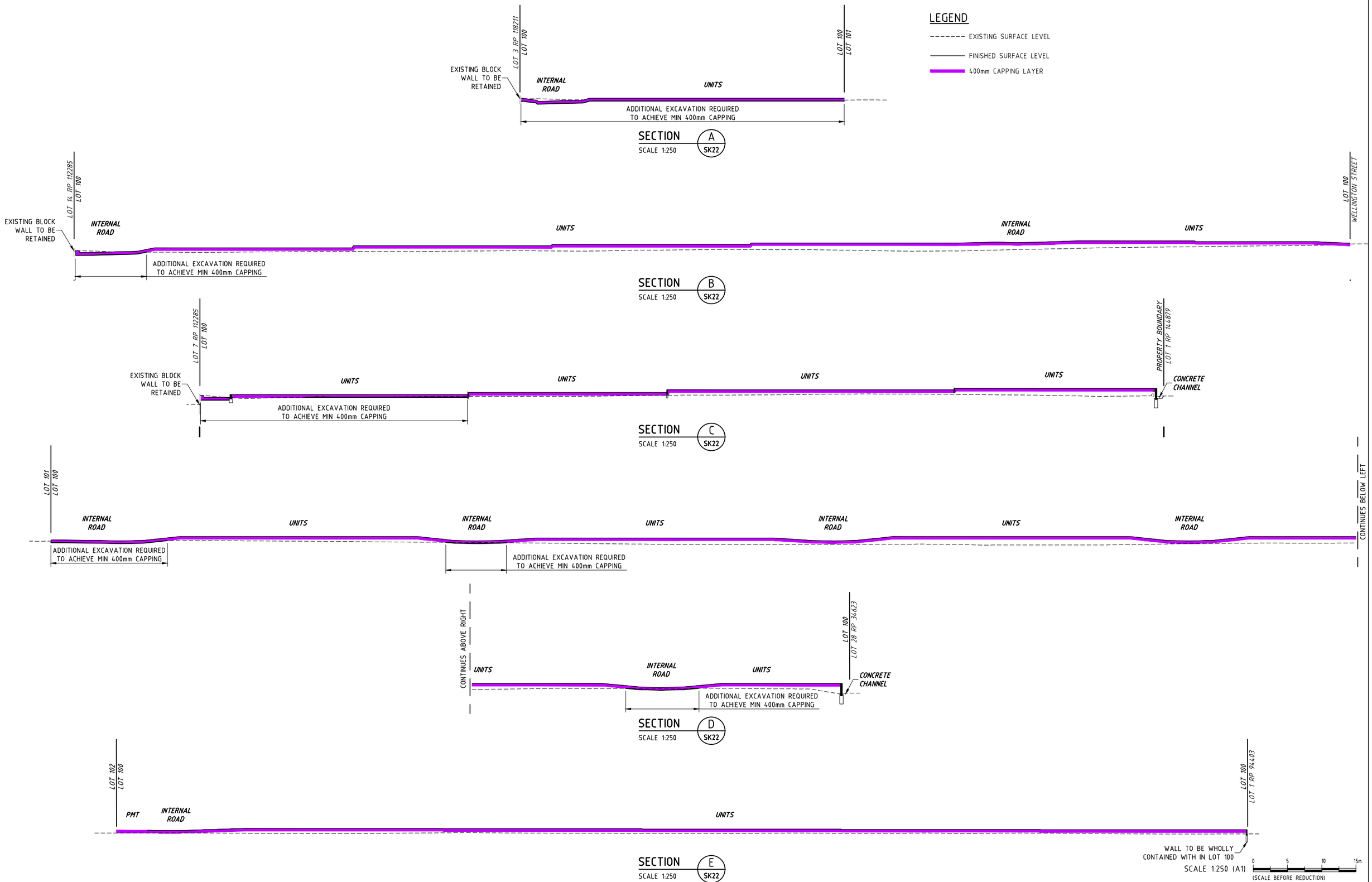
PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	CONCEPT EARTHWORKS PLAN	AR DEVELOPMENTS

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REVISION	AMENDMENT	DATE
A	REPORT ISSUE	04/09/26
B	ISSUED FOR APPROVAL	25/09/26
C	ISSUED FOR APPROVAL	02/10/26

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PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	CONCEPT EARTHWORKS SECTIONS	AR DEVELOPMENTS

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B	ISSUED FOR APPROVAL	25/09/26
C	ISSUED FOR APPROVAL	02/10/26

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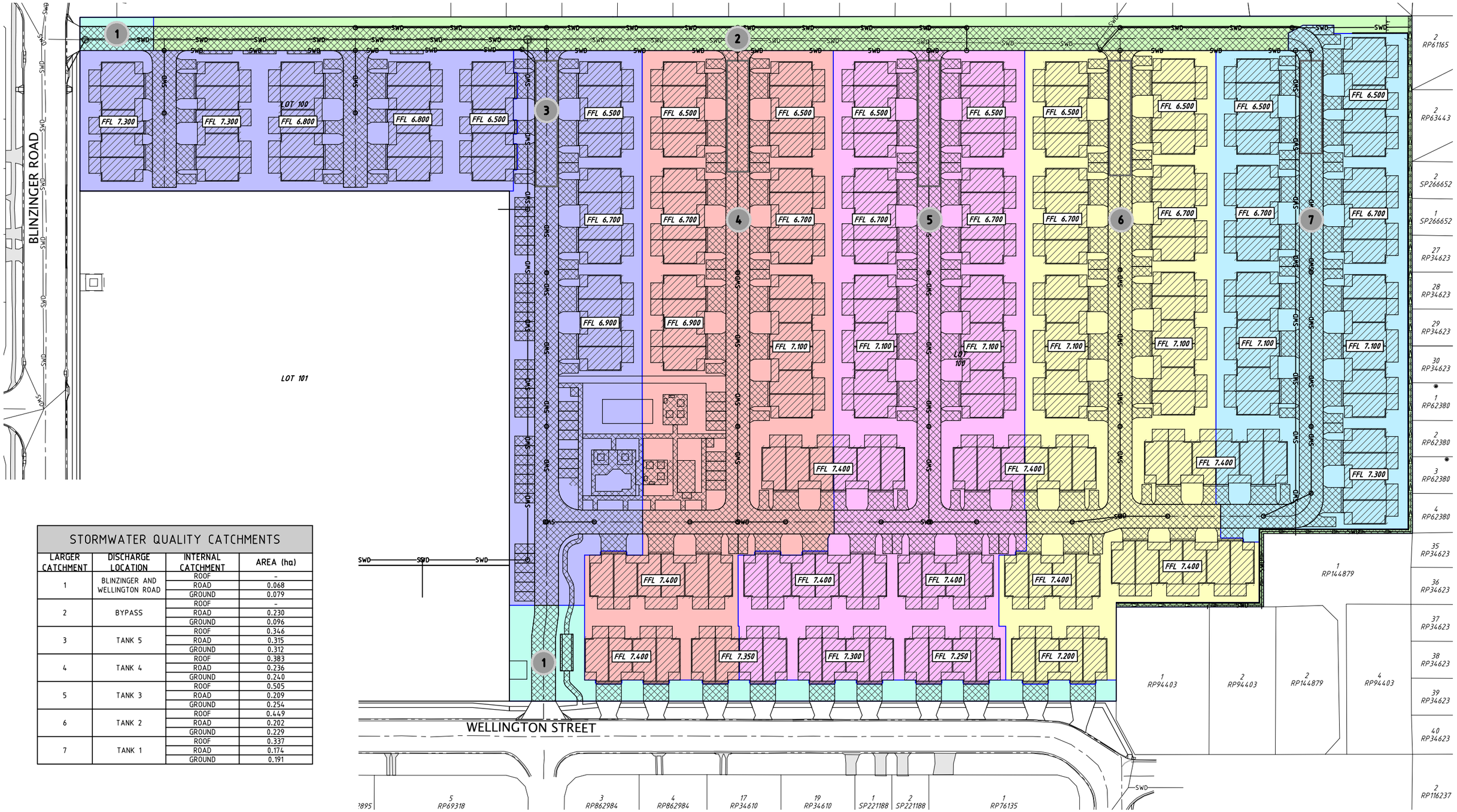
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MB	MB	21/07/2026

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Scale: AS SHOWN

Drawing No. 26074-SK23

Rev. C



STORMWATER QUALITY CATCHMENTS

LARGER CATCHMENT	DISCHARGE LOCATION	INTERNAL CATCHMENT	AREA (ha)
1	BLINZINGER AND WELLINGTON ROAD	ROOF	-
		ROAD	0.068
		GROUND	0.079
2	BYPASS	ROOF	-
		ROAD	0.230
		GROUND	0.096
3	TANK 5	ROOF	0.346
		ROAD	0.315
		GROUND	0.312
4	TANK 4	ROOF	0.383
		ROAD	0.236
		GROUND	0.240
5	TANK 3	ROOF	0.505
		ROAD	0.209
		GROUND	0.254
6	TANK 2	ROOF	0.449
		ROAD	0.202
		GROUND	0.229
7	TANK 1	ROOF	0.337
		ROAD	0.174
		GROUND	0.191

PLAN
SCALE 1:250

LEGEND
- S — EXISTING SEWERAGE
- W — EXISTING WATER RETICULATION
- T — EXISTING TELECOMMUNICATIONS
- EXISTING KERB AND CHANNEL
- PROPOSED KERB AND CHANNEL
- 1 CATCHMENT LABEL
- GROUND AREA
- ROOF AREA
- ROAD AREA

SCALE 1:500 (A1) 0 10 20 30m
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PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104 LOTS 1 & 2 RP 124669	CONCEPT STORMWATER QUALITY DRAINAGE CATCHMENT PLAN	AR DEVELOPMENTS

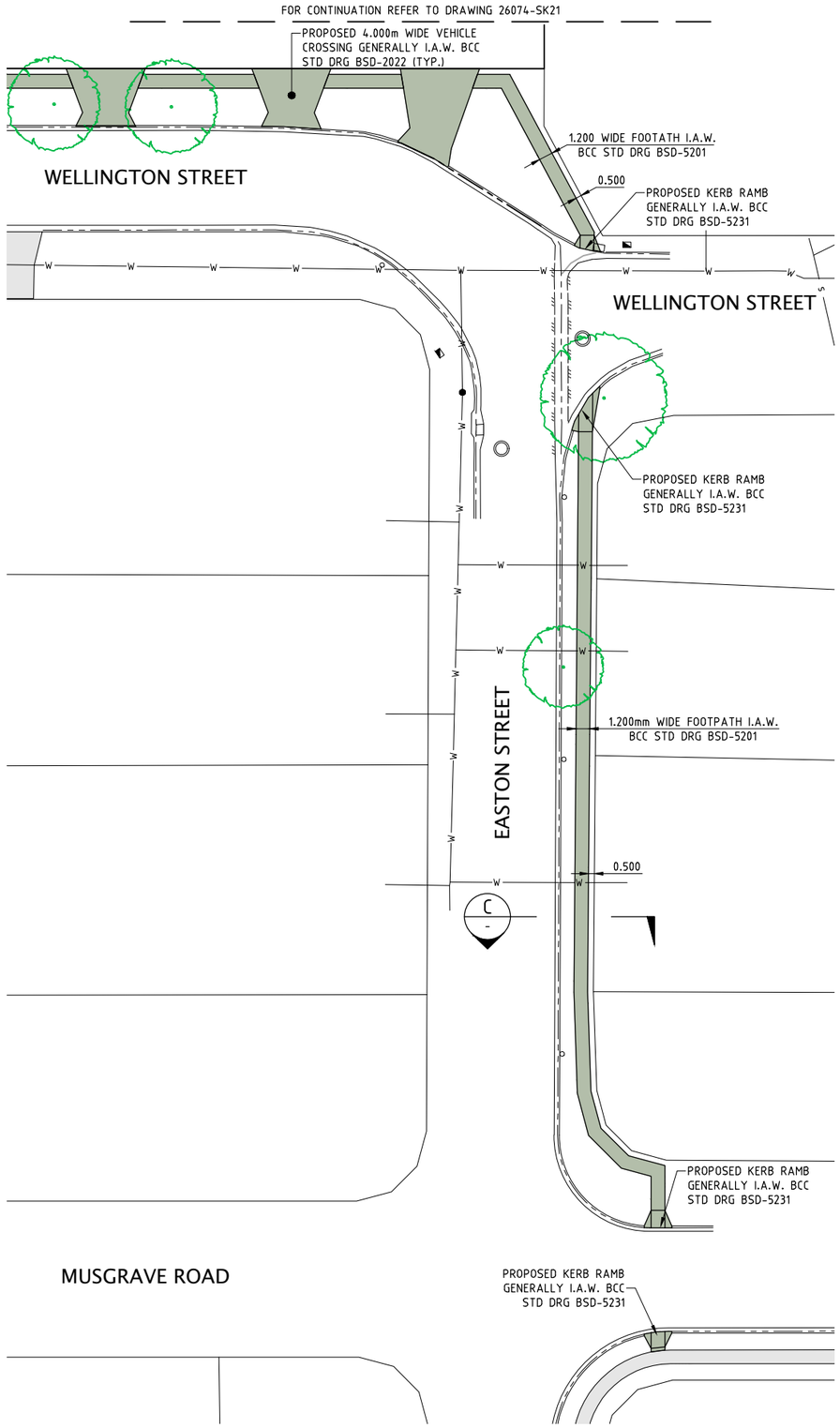
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REVISION	AMENDMENT	DATE
A	ISSUED FOR APPROVAL	02/10/26

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MB	AD	25/09/2026

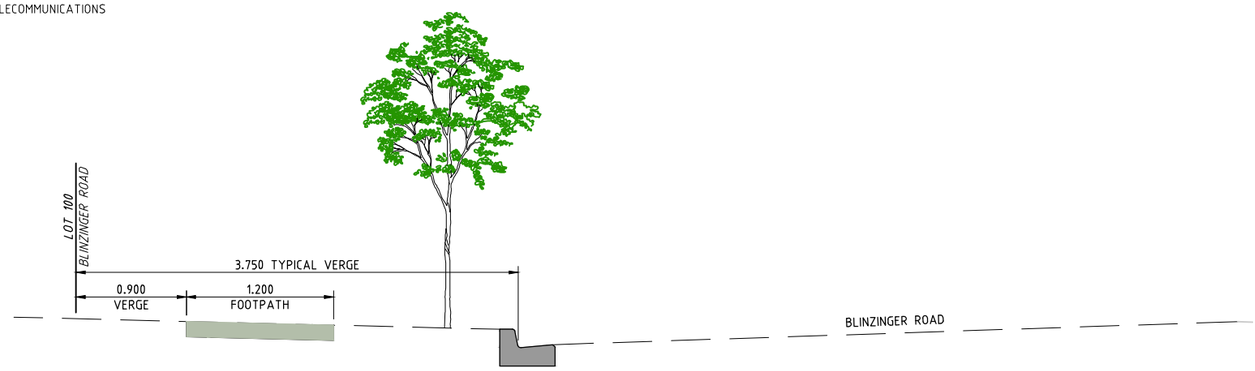
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Rev.: A



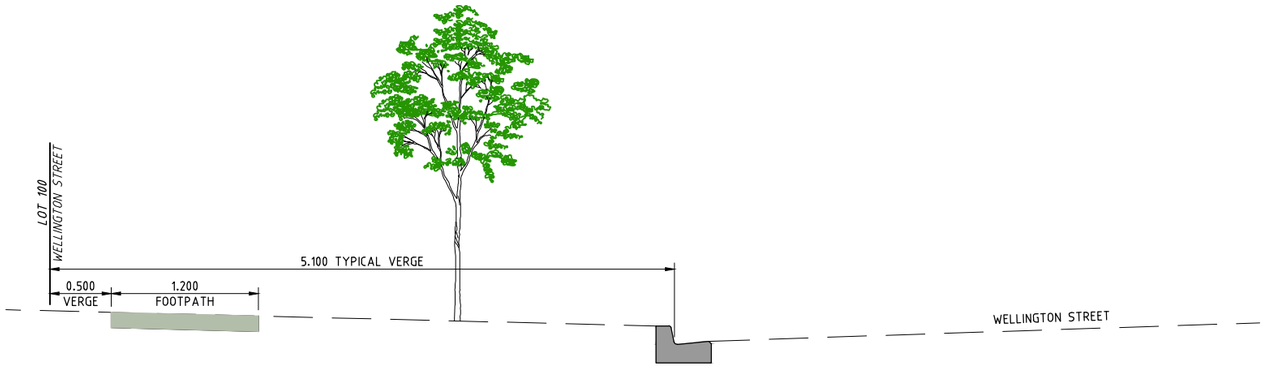
PLAN
SCALE 1:250

LEGEND

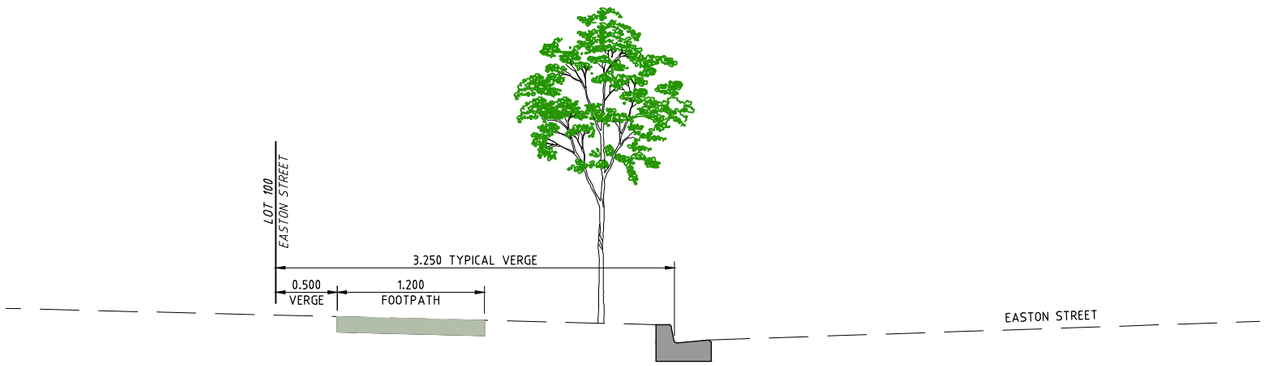
- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- EXISTING SEWERAGE
- EXISTING WATER RETICULATION
- EXISTING TELECOMMUNICATIONS



BLINZINGER ROAD TYPICAL SECTION (A / SK21)
SCALE 1:25



WELLINGTON STREET TYPICAL SECTION (B / SK21)
SCALE 1:25



EASTON STREET TYPICAL SECTION (C / -)
SCALE 1:25

SCALE 1:25 (A1) 0 0.5 1 1.5m (SCALE BEFORE REDUCTION)
SCALE 1:250 (A1) 0 5 10 15m (SCALE BEFORE REDUCTION)

HCE Engineers Pty Ltd
ABN 42 664 382 610
mail@hce-engineers.com.au
07 3829 1399

PROJECT	TITLE	CLIENT
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104 LOTS 1 & 2 RP 124669	CONCEPT PROPOSED FOOTPATH PLAN AND TYPICAL SECTIONS	AR DEVELOPMENTS

NOT FOR CONSTRUCTION. CONCEPT ONLY.

REVISION	AMENDMENT	DATE
A	ISSUED FOR APPROVAL	25/09/26
C	ISSUED FOR APPROVAL	02/10/26

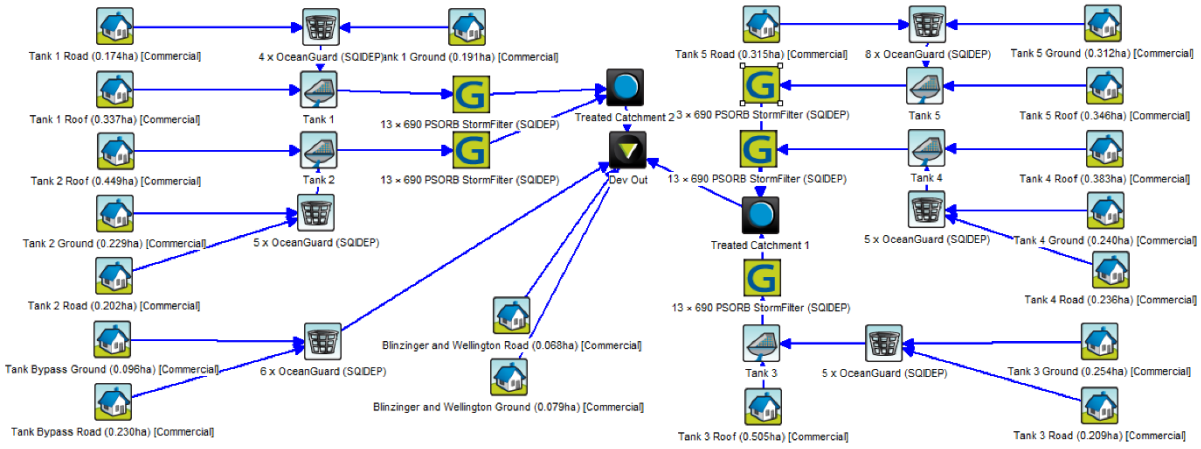
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Designed	Drawn	Date
MB	NW	25/09/2026

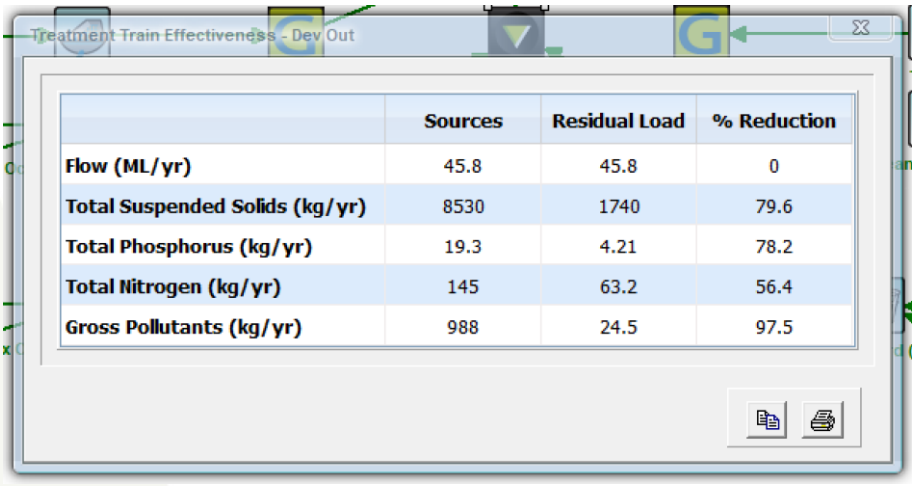
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Rev. B

Appendix A – MUSIC Modelling Results

Model



Results



	Sources	Residual Load	% Reduction
Flow (ML/yr)	45.8	45.8	0
Total Suspended Solids (kg/yr)	8530	1740	79.6
Total Phosphorus (kg/yr)	19.3	4.21	78.2
Total Nitrogen (kg/yr)	145	63.2	56.4
Gross Pollutants (kg/yr)	988	24.5	97.5

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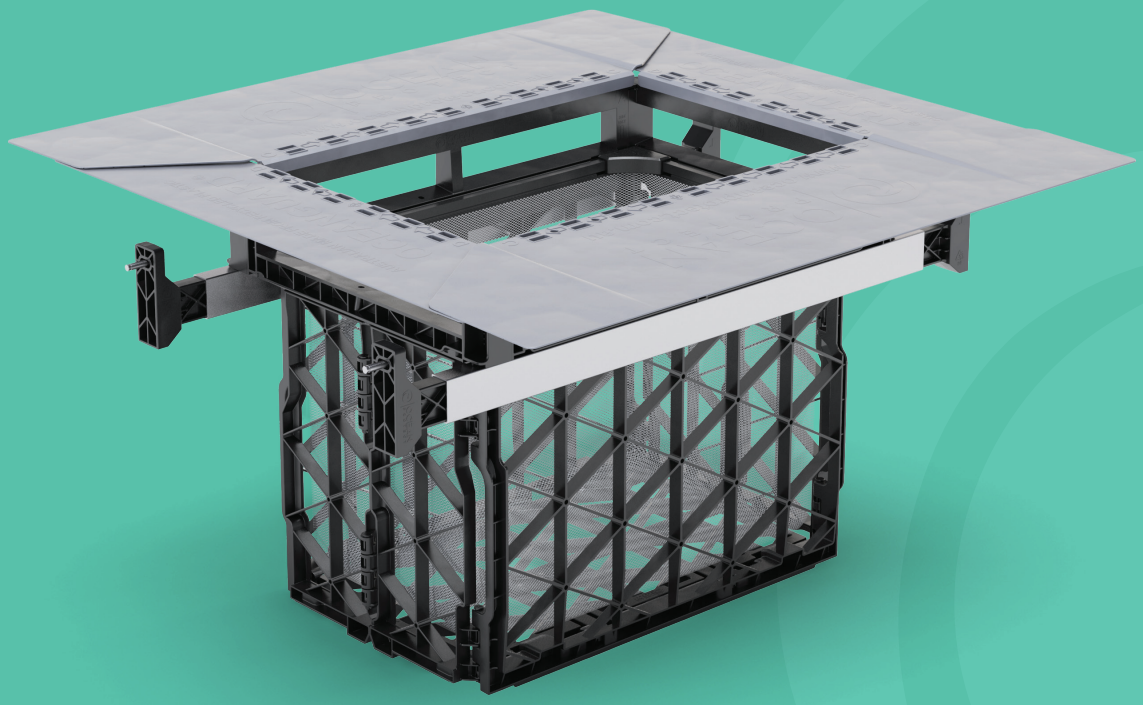
https://files.hce-engineers.com.au/12dSynergy/Publishing/dcf6bb34-a3b3-45c2-8a7a-bc1df49283c7

Appendix B – Maintenance Guidelines

OCEAN PROTECT

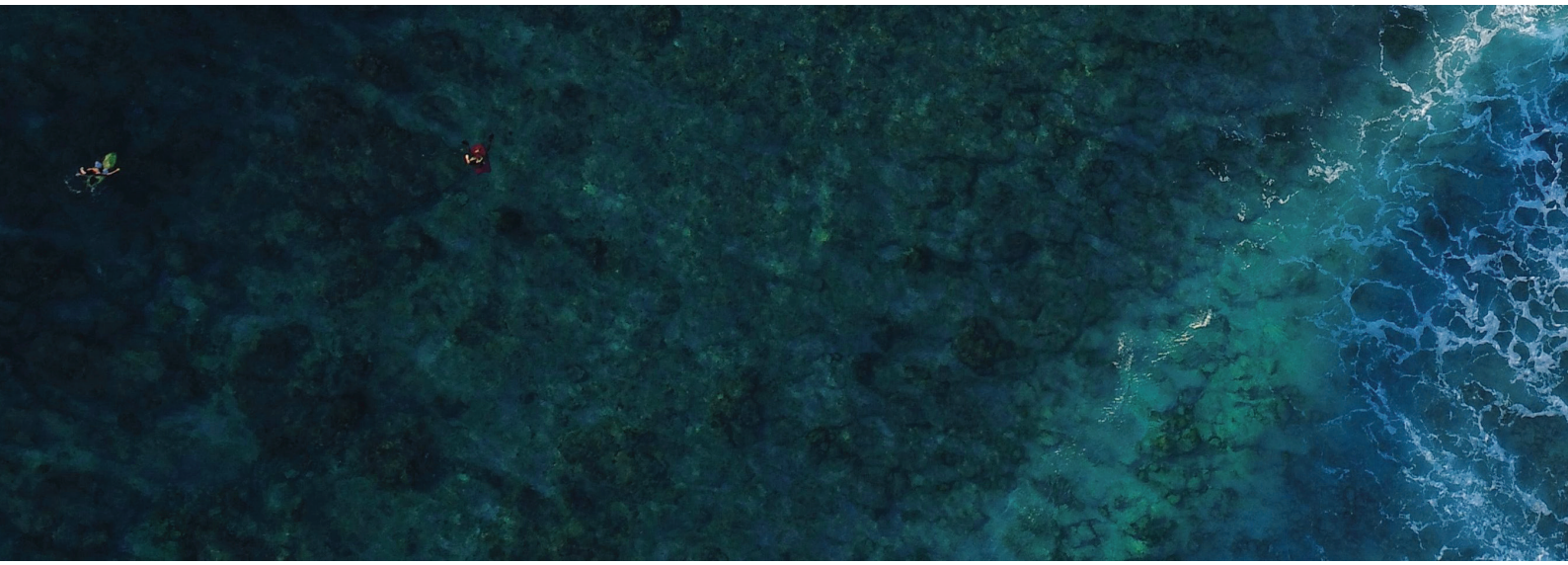
OceanGuard®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways

09/22



www.oceanprotect.com.au

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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the OceanGuard® as recommended by the manufacturer (Ocean Protect).

The OceanGuard® technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of filtration liners, designed to remove gross pollutants, solids, and other attached pollutants as either a standalone technology or as part of a 'treatment train' (e.g. with StormFilter®, Jellyfish® or biofiltration). OceanGuards are highly effective, easy to install and simple to maintain.

Stormwater professionals should note that Ocean Protect is not permitted to supply OceanGuard® technologies to provide pre-treatment to proprietary stormwater treatment assets that are not provided by Ocean Protect.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most importantly ensures the long term effective operation of the OceanGuard®.

Health and Safety

Access to pits containing an OceanGuard® typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard® is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it work?

OceanGuard® is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard® has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).

During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard® ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard® filtration bag. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

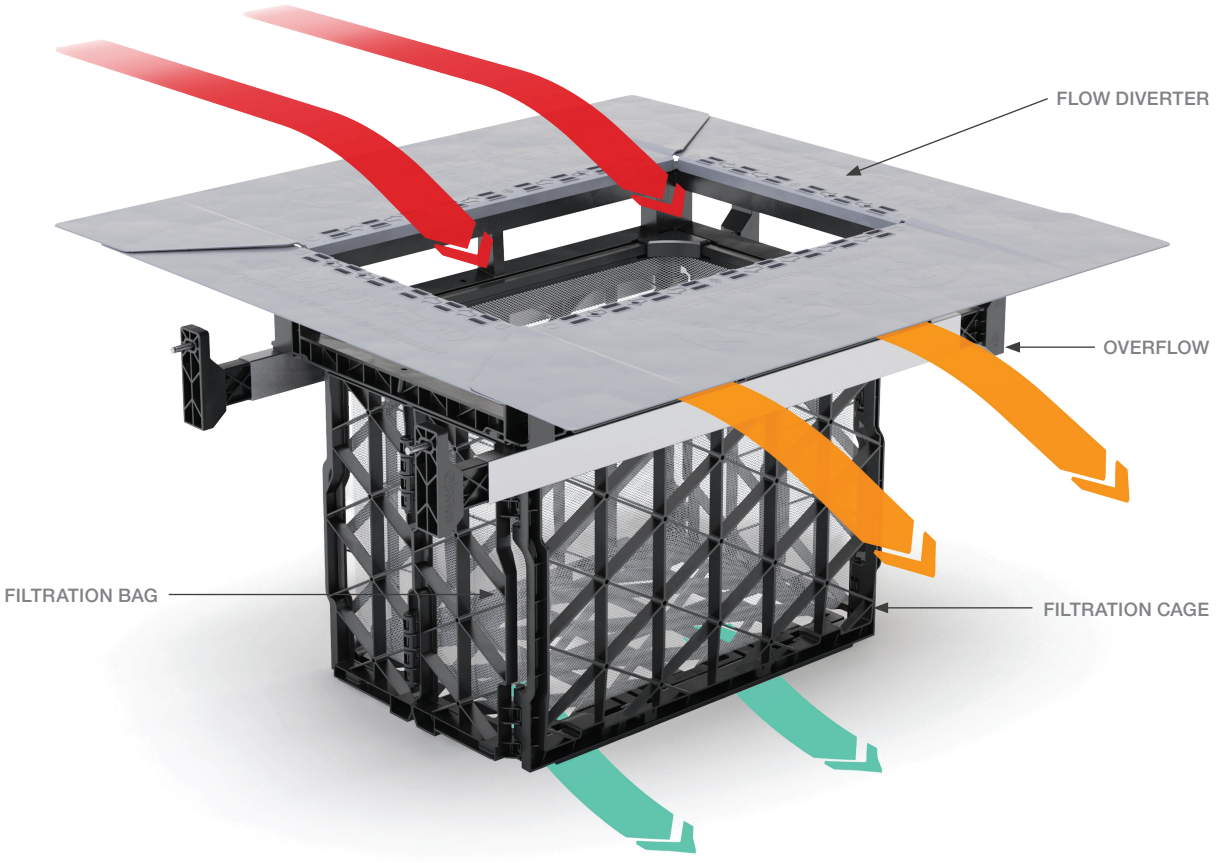


Figure 1: OceanGuard® components

Maintenance Procedures

To ensure that each OceanGuard® achieves optimal performance, it is advisable that regular maintenance is performed. The OceanGuard® requires 1-6 minor services annually (3 to 4 typical). Pending the outcome of these inspections, additional maintenance servicing may be required.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	1-6 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard® back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Use two lifting hooks to remove the filtration bag
4. Empty the contents of the filtration bag into a disposal container
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Vacuum captured pollutants from the filtration bag
4. Remove filtration bag
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard®, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components[1]

[1] Replacement filtration bags and components are available for purchase from Ocean Protect

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard® pits that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuard's internal high flow bypass functionality is designed to minimise the potential of blockages/ flooding and this configuration has been field proven for over twenty years. Flooding caused by an OceanGuard® style of pit basket is extremely rare and in the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

1. Inspect the OceanGuard® flow diverter, ensuring that they are free of debris and pollutants
2. Perform a minor service on the OceanGuard®
3. Remove the OceanGuard® to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard® after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

The accumulated pollutants found in the OceanGuard® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit www.oceanprotect.com.au

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

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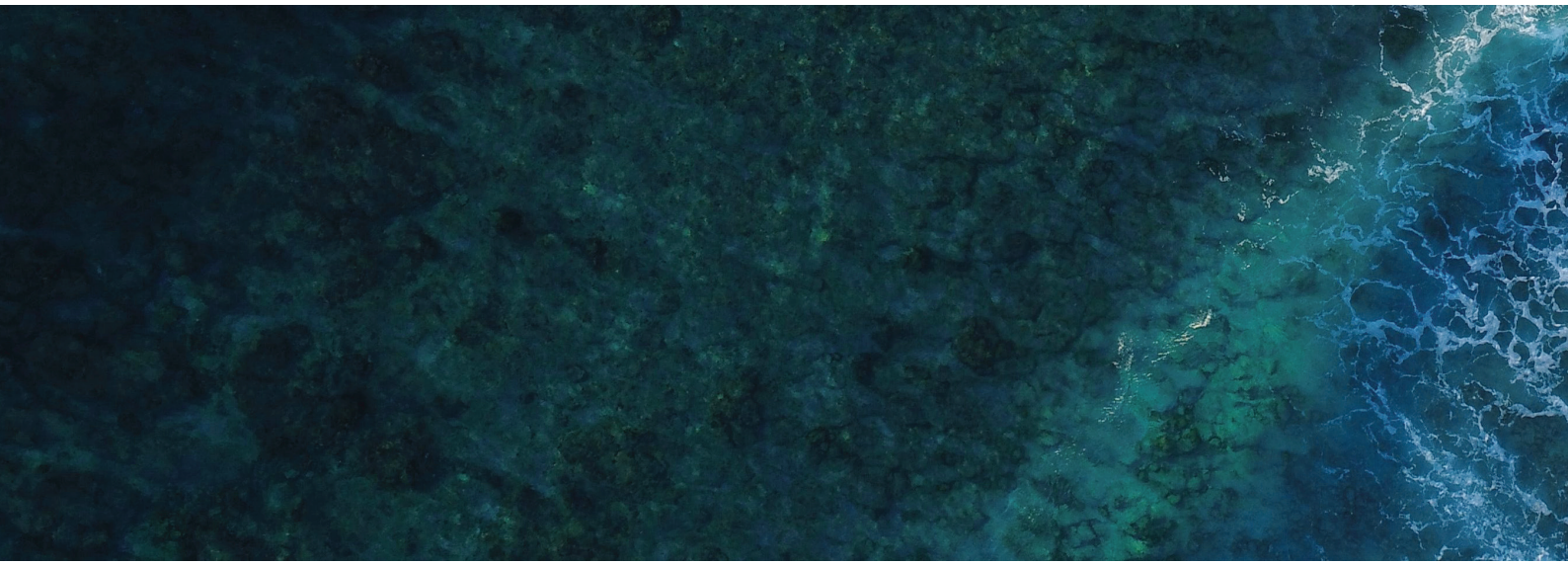
StormFilter®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways

11/24



www.oceanprotect.com.au

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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter®, as recommended by us.

The StormFilter® is designed and sized to meet stringent regulatory requirements. It removes the most challenging target pollutants (including total suspended solids, soluble heavy metals, oil, particulate and soluble nutrients) using a variety of media. For more than two decades, StormFilter® has helped clients meet their regulatory needs and, through ongoing product enhancements, the design continues to be refined for ease of use and improved performance.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter®.

Health and Safety

Access to a StormFilter® system requires removing access covers/grates, and it is necessary to enter a confined space. Pollutants collected by the StormFilter® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter®, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended (but not limited to):

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter® maintenance can be performed from surface level, there will be a need to enter the StormFilter® system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it work?

During a storm, runoff percolates through the filtration media and starts filling the cartridge central tube. The air inside the hood is purged through a one-way check valve as the water rises. When water reaches the top of the float, buoyant forces pull the float free and allow filtered water to exit the cartridge.

A siphon is established within each cartridge that draws water uniformly across the full height of the media profile ensuring even distribution of pollutants and prolonged media longevity.

As the storm subsides and the water level in the structure starts falling, a hanging water column remains under the cartridge hood until the water level reaches the scrubbing regulators at the bottom of the hood. Air then rushes through the regulators breaking the siphon and creating air bubbles that agitate the surface of the filter media causing accumulated sediment to settle on the treatment chamber floor. This unique surface-cleaning mechanism helps prevent surface blinding and further extends cartridge life.

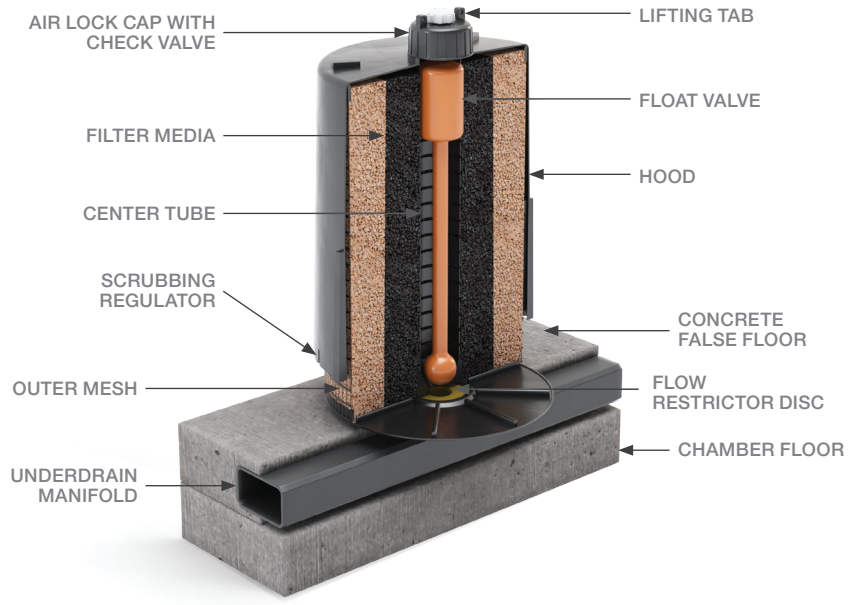


Figure 1: StormFilter® components

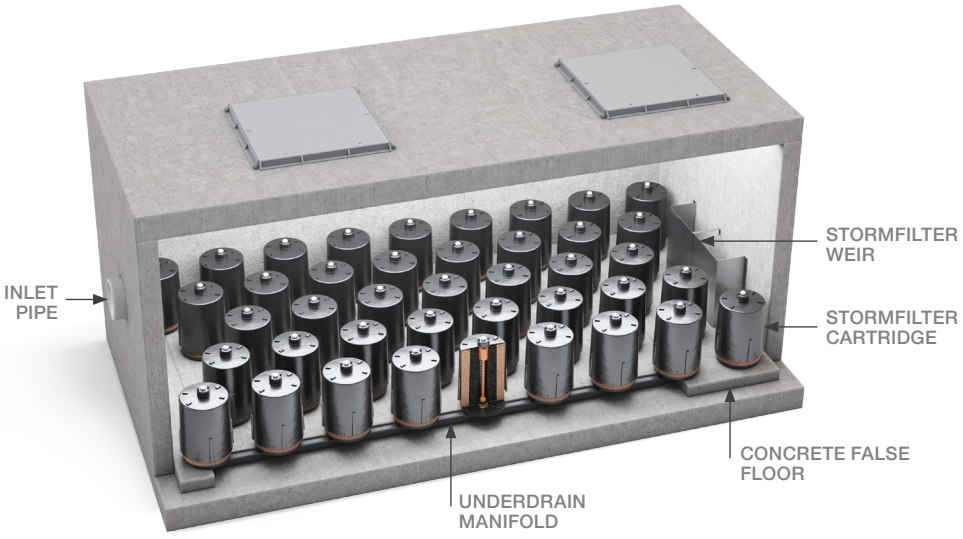


Figure 2: Example conceptual diagram of a StormFilter® system

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter® requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter® cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter®.

Service Type	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter® chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter® cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter® system is to assess the condition of the StormFilter® chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter® weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter® system, whilst assessing the condition of the cartridge media.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. Evaluate StormFilter® cartridge media (if exhausted schedule major service within 6 months)
4. Measure and record the level of accumulated sediment in the chamber (if sediment depth is less than 100 mm skip to step 9)
5. Remove StormFilter® cartridges from the chamber
6. Use vacuum unit to removed accumulated sediment and pollutants in the chamber
7. Use high pressure water to clean StormFilter® chamber
8. Re-install StormFilter® cartridges
9. Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter® system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted[1]	Replace StormFilter® cartridge media[2]

[1] Multiple assessment methods are available, contact Ocean Protect for assistance

[2] Replacement filter media and components are available for purchase from Ocean Protect

This service is designed to return the StormFilter® device back to optimal operating performance.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media
4. Utilise a vacuum unit to remove exhausted media from each cartridge
5. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
6. Use high pressure water to clean StormFilter® chamber
7. Inspect each empty StormFilter® cartridges for any damage, rectify damage as required
8. Re-fill each cartridge with media in line with project specifications
9. Re-install replenished StormFilter® cartridges
10. Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter® unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination – and, depending on the type of spill event, it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter® system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Inspect the StormFilter® unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter® after a major storm event. The focus is to inspect for damage and abnormally high sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed

.

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

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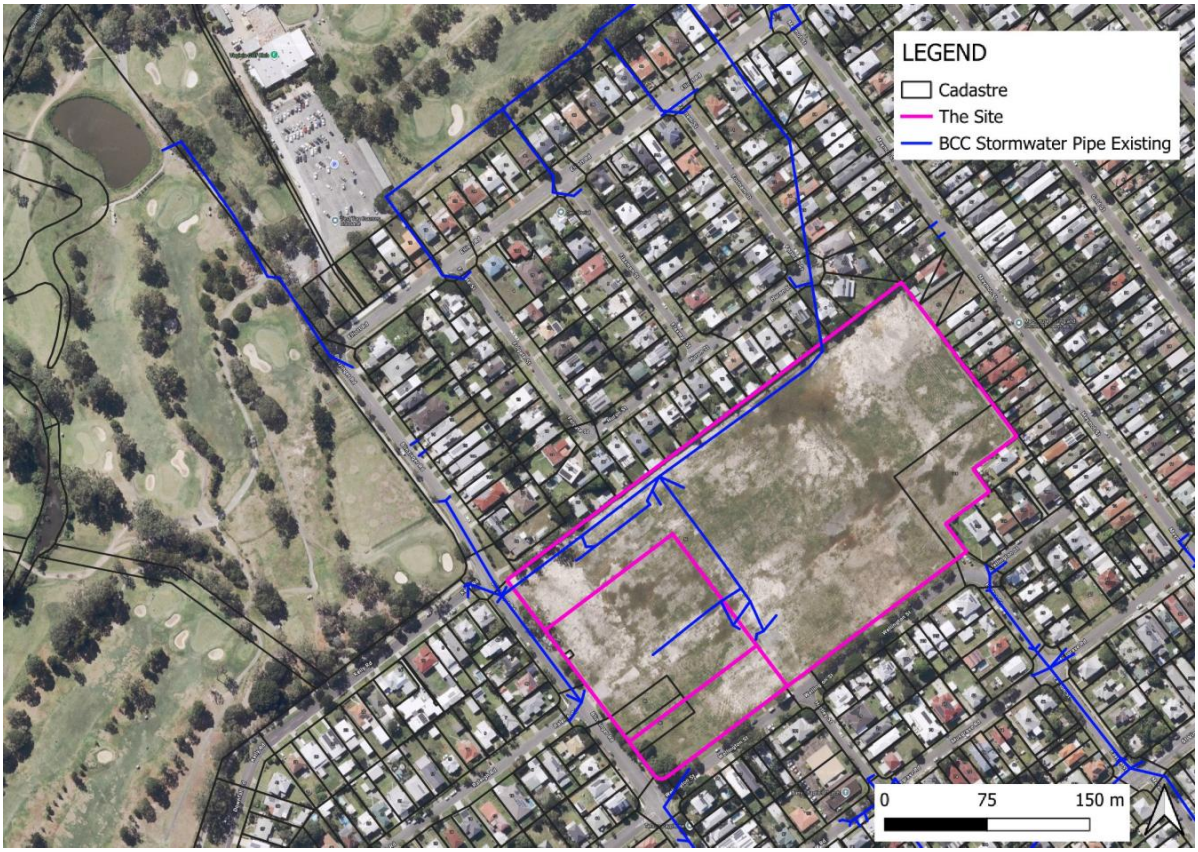
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56 BLINZINGER ROAD, BANYO

Flood Assessment

Stormwater Quantity Management and Flood Immunity Assessment

Development Application Submission



Prepared for	HCE Engineers
Project	Flood Modelling for 56 Blinzinger Road, Banyo
DCF reference	26111_R01_V01
Revision	V01
Date	06/10/2026

Document Control

Revision History

Revision	Date	Description	Prepared by
V01	06/10/2026	Issued for Development Application	D. Carroll (RPEQ)

Prepared by

DC Flood Engineering Pty Ltd
ABN 43 686 359 679



Donnie Carroll, Director / Principal Engineer, RPEQ 29980
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Limitations

This report has been prepared by DC Flood Engineering Pty Ltd (DCF) for the exclusive use of HCE Engineers and its client for the purpose of supporting the Development Application for 56 Blinzinger Road, Banyo. The assessment is based on the information, data and development concept plans available at the time of preparation, including survey, Council data and design information provided by others, which DCF has relied upon without independent verification except where stated. Flood modelling results are estimates based on the design assumptions documented in this report and should not be taken as predictions of actual flood behaviour in any particular event. DCF accepts no responsibility for the use of this report by any third party or for any purpose other than that stated.

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Executive Summary

DC Flood Engineering Pty Ltd (DCF) has been engaged by HCE Engineers to prepare this Flood Impact Assessment (FIA) in support of the Development Application for the proposed residential, affordable housing and seniors living development at 56 Blinzinger Road, Banyo ("the Site"). The Site is approximately 6.4 ha of former government-owned land (formerly an Energex depot) identified for redevelopment under the Queensland Government's Land Activation Program.

The Site is currently vacant and grassed, with a single open inlet pit discharging to Council's 1350 mm RCP trunk main. The trunk main outlets to an open swale within the Virginia Golf Club, on the Downfall Creek floodplain. The Site itself is outside the mapped Downfall Creek flood extent up to and including the 0.2% AEP event.

The key findings of the assessment are:

- **Base Case:** The Site's current grassed condition, draining via the single open pit, has been adopted as the Base Case, rather than the historical impervious Energex depot condition. In this condition the 1350 mm RCP trunk main operates well below its hydraulic capacity.
- **Stormwater quantity strategy:** The increased runoff from the development is managed within the available capacity of the existing 1350 mm RCP trunk main, with peak discharges regulated by underground detention tanks with a total storage of 2620 m^3. The strategy also includes upgrading the Huron Street drainage from a 375 mm to a 600 mm RCP, a new diversion pipe from Blinzinger Road to the trunk main, and upgrading the eastern boundary drainage from a 225 mm to a 450 mm RCP with a backflow prevention device.
- **Modelling approach:** A two-dimensional TUFLOW direct rainfall model has been developed, with design events up to and including the 1% AEP and coincident Downfall Creek tailwater conditions. Unmitigated URBS hydrographs are applied directly to the detention tanks, which are represented hydraulically with their outlet connections, so tank performance responds to conditions in the trunk network.
- **Flood impacts:** Peak water levels are reduced in Huron Street in frequent and moderate events, with no change (less than 10 mm) up to the 1% AEP, and general decreases are predicted along Blinzinger Road and the Site's eastern boundary (Meymot Street). No increases to design flood levels above the 10 mm model tolerance are predicted on private residential property. Minor increases are confined to road corridors: up to 13 mm at the corner of Elliot Road and Flaxman Street (50% AEP, hazard remaining H1), and up to 50 mm along Wellington Street due to the assumed filling of the Mission Australia Site, with no effect on immunity or trafficability. Afflux of up to 30 mm in the Virginia Golf Club swale (50% AEP) is contained within the channel banks, in an area already subject to regional Downfall Creek flooding. Trunk main peak flows are attenuated relative to the former Energex depot condition, and a high-tailwater sensitivity test does not change these findings.
- **Flood immunity:** The development achieves the required flood immunity. The Site is not affected by Downfall Creek flooding, and all proposed floor levels are well above the 1% AEP creek flood level plus 500 mm freeboard. Floor levels are therefore governed by overland flow, and the minimum habitable floor level for each building has been set 500 mm above the 2% AEP peak overland flow level (Section 8.3), meeting the Brisbane City Plan 2014 freeboard requirement. Internal roads remain trafficable, with hazard not exceeding H1, in the 10% AEP event (Section 8.4). These events were assessed with coincident Downfall Creek tailwaters of 10% and 20% AEP respectively, reflecting the large difference in catchment size (approximately 17 km^2 compared with 0.2 km^2). The design events include a 2030 climate change allowance, and the proposed floor levels remain above the 1% AEP peak flood levels even under 2100 climate rainfall (Section 8.5).

On the basis of this assessment, the development does not result in adverse flood impacts on surrounding properties or infrastructure, and is considered to comply with the relevant Brisbane City Council and QUDM flood and stormwater requirements.

1. Introduction

1.1 Purpose

This report has been prepared by DC Flood Engineering Pty Ltd (DCF) on behalf of HCE Engineers to support the Development Application (DA) for the proposed development at 56 Blinzinger Road, Banyo. It documents the flood and stormwater quantity assessment undertaken for the development, and addresses:

- the existing flooding and drainage conditions within and surrounding the Site;
- the basis for the adopted Base Case against which impacts are assessed;
- the proposed stormwater quantity management strategy, including on-site detention and external drainage upgrades;
- the flood impacts of the proposed development on surrounding properties, the Brisbane City Council (BCC) road network and the receiving waterway for events up to and including the 1% AEP; and
- the flood immunity of the proposed development, including the Downfall Creek tailwater assumptions adopted.

1.2 Site and Proposed Development

The Site comprises approximately 6.4 ha of former government-owned land, previously operated as an Energex depot, and is identified for redevelopment under the Queensland Government's Land Activation Program. The land is to be developed as three precincts:

- the AR Development Group townhouse precinct (approximately 4.8 ha);
- the Rockpool affordable housing precinct (approximately 1.2 ha); and
- the Mission Australia seniors living precinct (approximately 0.4 ha).

Figure 1 presents the locality of the Site and the key features identified. Figure 2 presents the surrounding street network names.

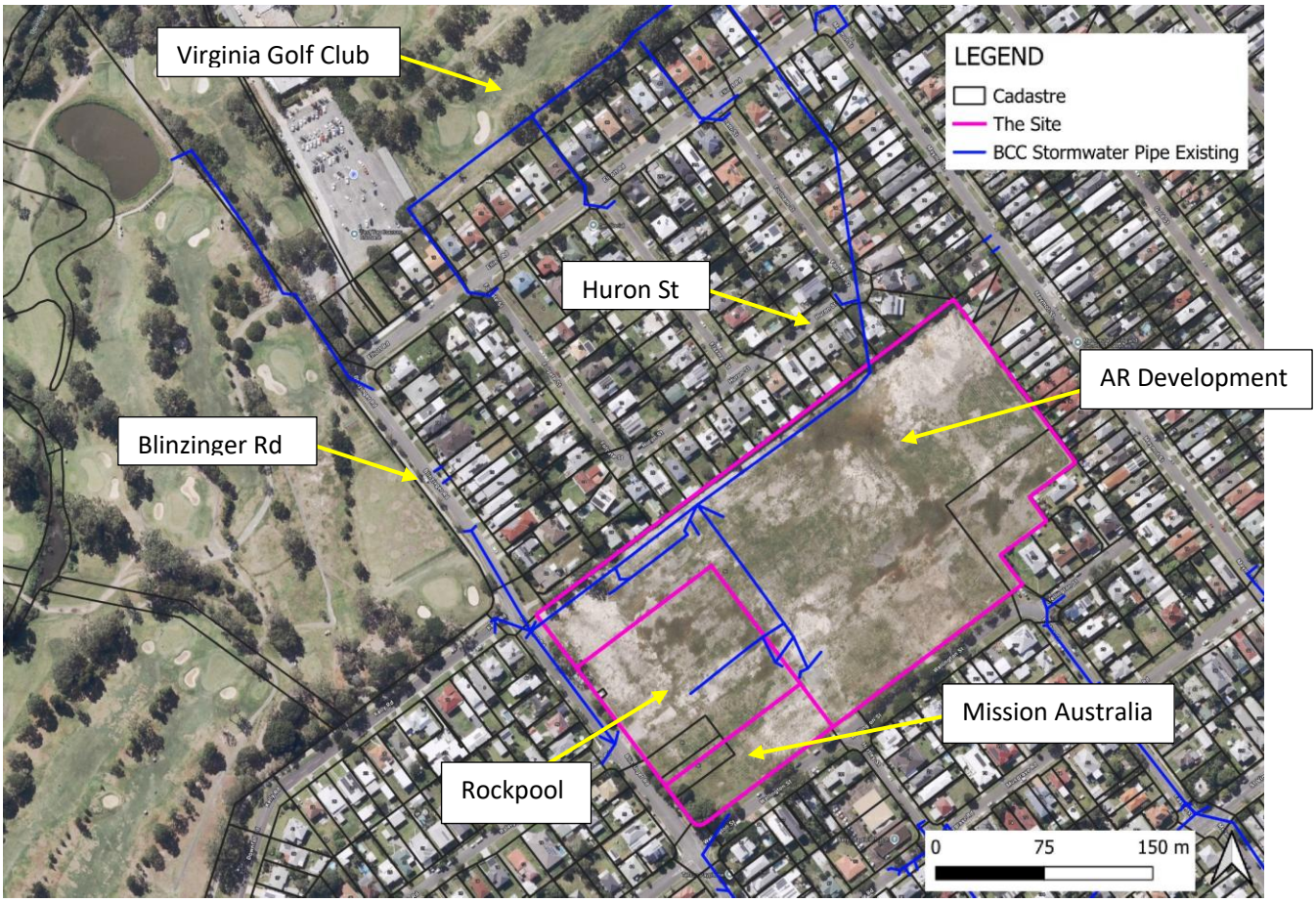


Figure 1: Site locality, cadastre and existing BCC stormwater network



Figure 2: Local street network surrounding the Site

2. Existing Site Description

The Site is currently vacant land maintained under grass. It is generally flat, with unsealed access tracks exhibiting wheel rutting and surface ponding, indicative of poor natural drainage across the Site.

The northern Site boundary is defined by a concrete-based retaining wall with Colorbond steel panels, separating the Site from the adjoining residential properties to the north. Stormwater currently discharges from the Site via a single accessible inlet, a circular rendered pit approximately 600 mm in diameter, located at the Site's low point along the northern boundary. This is the only open pit within the Site, and it connects into Council's existing 1350 mm RCP trunk stormwater main. At Huron Street, an existing 375 mm RCP connects into the trunk main downstream of the Site. Beyond this connection there are no further inflows to the network before it discharges to an open drainage swale on Virginia Golf Club land. The swale and golf course form part of the wider Downfall Creek floodplain, with 5% AEP flood levels inundating the majority of the course, including the receiving swale.

The Site's topography and key catchments are illustrated in Figure 3. The Site receives runoff from three main catchments:

- An urban catchment of approximately 5.2 ha to the west of the Site drains towards the BCC network along Blinzinger Road, which enters the Site as a 900 mm RCP. Flows in excess of the network's capacity continue north along Blinzinger Road, away from the Site.
- The Site itself forms a catchment of approximately 6 ha that drains to the north, with its upstream limit effectively defined by the Site's southern boundary. A small portion of the Site drains to the south towards Wellington Street.
- To the east of the Site, several residential properties (approximately 0.9 ha in total) drain to the rear of their allotments towards a small channel along the eastern boundary of the Site. This flow discharges through a 225 mm RCP in the north-eastern corner of the Site, which drains to the 1350 mm RCP trunk main.

A site inspection was undertaken on 1 July 2026. Key features are shown in Figure 4 to Figure 7.

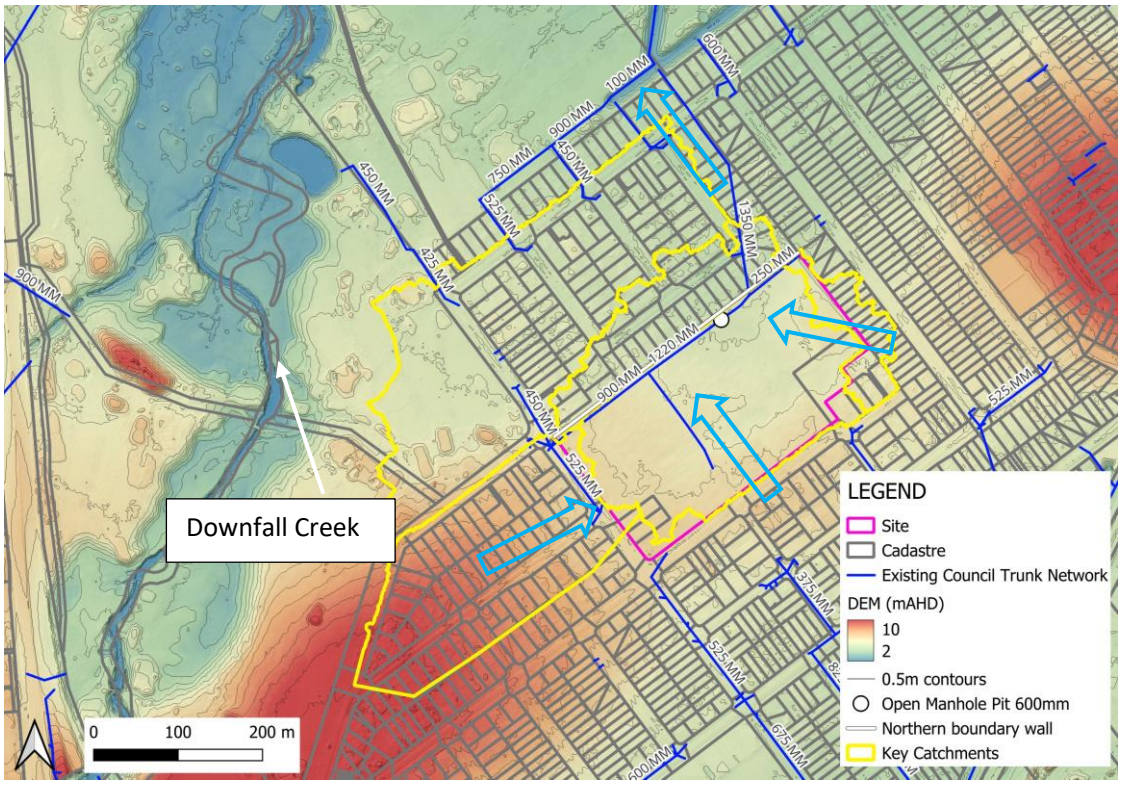


Figure 3: Site topography, existing Council drainage network and key catchments



Figure 4: Site inspection – vacant grassed Site with wheel rutting and surface ponding



Figure 5: Site inspection – single open 600 mm pit at the Site low point on the northern boundary



Figure 6: Site inspection – concrete retaining wall with Colorbond panels along the northern boundary (modelled as impermeable)



Figure 7: Site inspection – channel along the eastern boundary at the rear of adjoining residential allotments

3. Data Review

3.1 Previous Stormwater Management Plan (EDQ)

Stantec Australia Pty Ltd prepared a Stormwater Quantity Management Plan (SMP) for Economic Development Queensland (EDQ), dated November 2025 (ref. 304570217), as part of an initial due diligence assessment of the Site. The key findings of that assessment, and their relevance to this assessment, are summarised below:

- The assessment was based on a one-dimensional DRAINS hydrologic/hydraulic model, developed using ARR2019 procedures, BCC stormwater GIS data and 2019 LiDAR-derived survey.
- A pre-development (existing) condition reflecting the Site's former industrial land use was adopted, with approximately 95% impervious cover.
- Site runoff was found to be conveyed via a drainage network ranging from 825 mm to 1350 mm diameter, draining north through private property before discharging via a 1500 mm pipe to a drain within the Virginia Golf Club, with a secondary pit/pipe system draining south towards Wellington Street and Blinzinger Road.
- A pre-development 1% AEP peak flow of approximately 1.83 m^3/s was reported in the trunk drainage pipe.
- A "no-worsening" design objective was adopted, whereby post-development peak flows at each discharge point should not exceed the pre-development (95% impervious) peak flows. From this, a preliminary detention requirement of approximately 3,800 m^3 across two proposed basins was derived.
- The trunk network's downstream tailwater was noted to be influenced by flooding on Downfall Creek at the golf course outlet, while the Site itself lies outside the mapped Downfall Creek flood extent.

The SMP did not consider the Site's current grassed and pervious condition (refer Section 4) and was based on a 1D DRAINS model. This assessment adopts a two-dimensional hydraulic model, which better represents the interaction between overland flow, the trunk drainage network and on-site storage.

3.2 Survey

Detailed survey has been undertaken for the Site. Figure 8 shows the extent of the fine-resolution DEM incorporated into the hydraulic model. Pipe sizes and inverts are based on a combination of site survey, BCC publicly available data and site measurements.

An existing bund is located at the north-eastern corner of the Site. The bund's low point was surveyed at 5.95 mAHD, which acts as the controlling level for uncontrolled discharge from the Site.



Figure 8: Detailed survey DEM extents

3.3 Council Data

BCC's FloodWise mapping and publicly available flood overlays were reviewed for the Site and its surrounds, as shown in Figure 9.

Council's overland flow mapping identifies only minor overland flow across the Site. Overland flow is also mapped along Huron Street, downstream of the Site, reflecting the poor drainage performance of the existing 375 mm RCP in that street.

Council's creek flood mapping (Nundah Creek Flood Study 2015) identifies the downstream Virginia Golf Club land as flood affected by Downfall Creek (Figure 9 and Figure 10), with inundation occurring in events as frequent as the 5% AEP. The Site itself is mapped as flood immune from Downfall Creek in the 0.2% AEP event, and regional creek flooding is therefore not a direct constraint on the Site. It does, however, govern tailwater conditions at the trunk network's downstream outlet, as discussed in Section 6.4.

Council flood levels have been extracted from the digital grid data available at https://data.brisbane.qld.gov.au/explore/dataset/flood-study-nundah-creek/information/.

Key flood levels where the trunk drainage connects to the Virginia Golf Club swale (Point B) are summarised in Table 1. To the west (Point A), flood levels in Downfall Creek are higher; however, there is no direct connection to the Site, as elevated ground levels of up to 6 mAHD form a levee between the creek and the Site. Floodwaters in events up to and including the 1% AEP can therefore only reach the Site via backwater through the trunk system. It is noted that the BCC FloodWise property report quotes a flood level of 6.1 mAHD; however, review of the raw model results confirms that this level does not apply to the Site.

Table 1: Downfall Creek peak flood levels at Point A and the Site's stormwater network outlet (Point B)

Event	Point A	Point B (hydraulically connected)
50%	4.6	3.5
20%	4.8	3.7
10%	4.9	3.8
5%	5.0	3.9
2%	5.1	4.0
1%	5.2	4.1
1% AEP ultimate development (DFE)	5.4	4.2



Figure 9: BCC FloodWise creek flood and overland flow mapping for the Site and surrounds



Figure 10: Downfall Creek 1% AEP ultimate development scenario flood extent

3.4 Development Concept Plans

The development layout, design surface levels and detention tank concept have been sourced from HCE Engineers' civil concept drawings (Appendix A). The concept design surface has been incorporated into the Developed Case hydraulic model as a design TIN.

4. Adopted Base Case

The Base Case is the existing condition against which the flooding and stormwater impacts of the proposed development are assessed. Because the condition of the Site has changed materially since it was last in active use, the basis for the adopted Base Case is set out below.

The Site operated as an Energex depot until its decommissioning. In that condition it was largely sealed, with an impervious fraction of approximately 95%, and was serviced by a network of inlet pits discharging to the 1350 mm RCP trunk main along the northern boundary. Historical imagery showing the change in land use is presented in Figure 11.

Since decommissioning, the depot infrastructure has been removed and the Site has been maintained as grass. Runoff from the Site is currently captured by a single open pit at the Site's low point on the northern boundary, this being the only inlet identified as open during the site inspection. The Site is therefore now predominantly pervious and conveys less flow to the 1350 mm RCP than it did in its former industrial use.

In its current condition the Site attenuates runoff and effectively functions as an incidental detention basin, with the 1350 mm RCP conveying substantially less flow than its available capacity. Surrounding roads and properties, both upstream and downstream, have benefited from this arrangement over approximately the past nine years. With less flow discharging from the Site, the upstream pits (Blinzinger Road) and the downstream pipe network (Huron Street) have been less constrained by tailwater conditions.

For this assessment, the Site's current condition (grassed and pervious, draining via the single open pit) has been adopted as the Base Case.



Figure 11: Historical aerial imagery of the Site, January 2016 to April 2023 (source: Google Earth)

5. Proposed Stormwater Quantity Management Strategy

5.1 Objectives

In its current grassed, largely pervious condition the Site generates comparatively low runoff. With discharge constrained by a single open pit, it attenuates that runoff before it reaches the trunk network. Under the proposed development the Site becomes substantially impervious, with a townhouse precinct, an affordable housing development, a seniors living facility and a formalised internal drainage network, increasing both the volume and the rate of runoff to the outlet.

The objective of the strategy is to manage this increase in peak flow without worsening flood conditions for upstream properties on Blinzinger Road and Meymot Street, downstream properties on Huron Street, or the receiving swale within the Virginia Golf Club, for events up to and including the 1% AEP.

5.2 Proposed Strategy

The proposed strategy utilises the existing 1350 mm RCP trunk drainage network up to its available hydraulic capacity, rather than constraining post-development discharge to the Site's current, incidentally low, contribution to the network. The key elements of the strategy are:

- **On-site detention:** Peak discharge from the development is regulated by underground detention tanks within the development precincts, as shown on HCE Engineers' concept drawing SK25. The tanks provide a total storage of 2620 m^3 and discharge to the 1350 mm RCP trunk main via controlled outlets (refer Table 5).
- **Huron Street drainage upgrade:** The downstream 375 mm RCP within Huron Street, which is undersized and currently exhibits poor drainage performance, is to be upgraded to a 600 mm RCP. This upgrade offsets the increased discharge from the Site so that conditions within Huron Street are not worsened relative to the Base Case.
- **Blinzinger Road diversion pipe:** In the Existing Case, flow escapes Blinzinger Road in the 1% AEP event and travels through the Site (Rockpool). Because Rockpool is to be filled, this flow path will be lost. To offset this, a new 525 mm RCP drainage connection is proposed from Blinzinger Road to the main trunk drainage, conveying the flow that previously passed through the Site.
- **Eastern boundary drainage:** Several residential properties to the east currently discharge to a drain along the Site's eastern boundary, conveyed by a 225 mm RCP from the north-eastern corner of the Site. This pipe is significantly undersized, and excess flow travels north-east towards Meymot Street. The existing channel is to be retained (reconstructed) along the eastern boundary, the 225 mm RCP upgraded to a 450 mm RCP, and a backflow prevention device installed to prevent surcharge from the increased flows in the 1350 mm RCP.
- **Wellington Street diversion:** The contributing catchment to the eastern drain is reduced by diverting a small existing catchment at Wellington Street (approximately 0.3 ha) through a new pipe system through the Site (bypasses detention tank).

The 1350 mm RCP network ultimately transitions to a 1500 mm RCP before discharging to a swale within the Virginia Golf Club, which forms part of the Downfall Creek floodplain and is subject to regional flooding. Given this receiving environment is already governed by regional flood behaviour, the increased flow and the associated minor afflux predicted under the proposed strategy (refer Section 7) are not considered to result in a material increase in flood risk.

The key parameters of the proposed strategy, relative to the Base Case, are summarised in Table 2. The strategy is illustrated in Figure 12.

Table 2: Proposed stormwater management summary

Parameter	Base Case (current condition)	Developed Case
Site outlet trunk drainage pipe (1350 mm RCP) peak flow – 1% AEP	~1.55 m^3/s	2.5 m^3/s
Site outlet trunk drainage pipe (1350 mm RCP) peak velocity – 1% AEP	1.30 m/s	1.75 m/s
Site contribution peak flow – 1% AEP	~0.53 m^3/s (limited by 600 mm pit capacity)	~1.4 m^3/s
On-site detention volume	–	2620 m^3 (underground tanks)
Huron Street drainage	375 mm RCP	600 mm RCP (upgraded)
Eastern flow path pipe	225 mm RCP	Upgraded, 450 mm RCP, with backflow prevention device
Blinzinger Road new pipe into Site (@Rockpool)	-	525 mm RCP



Figure 12: Proposed development stormwater quantity management strategy

5.3 Other Options Considered

Alternative discharge options were also considered, each of which would have required the acquisition of existing private properties and extensive drainage works external to the Site. The proposed strategy is preferred because it minimises disruption to surrounding residents, avoids property acquisition and minimises works beyond the Site. Furthermore, through the upgrade of the undersized 375 mm RCP in Huron Street, the strategy improves drainage performance for downstream properties, particularly in more frequent storm events.

6. Hydrologic and Hydraulic Modelling

6.1 Approach

Given the urbanised nature of the catchment and the significant interaction between on-site storage, overland flow and the trunk drainage network, a two-dimensional TUFLOW direct rainfall (rain-on-grid) model has been adopted. A URBS runoff-routing model has been developed in conjunction with the TUFLOW model, for model validation and for the derivation of post-development inflow hydrographs for the development precincts.

In the Developed Case, the unmitigated post-development hydrographs from URBS are applied directly to the detention tanks, which are represented hydraulically within TUFLOW together with their outlet connections to the trunk network (refer Section 6.6). This approach captures the dynamic interaction between the tanks and the hydraulic grade line in the 1350 mm RCP, including the effect of Downfall Creek tailwater on outlet performance.

6.2 Design Rainfall and Losses

Design rainfall and loss parameters were sourced from the ARR2019 Data Hub, with the latest (2024) Bureau of Meteorology IFD data upscaled to reflect projected 2030 climate conditions (SSP2-4.5), consistent with current ARR guidance on incorporating climate change into design rainfall estimates.

Design rainfall has been sourced from the latest HARC 2024 IFD project funded by QRA.

Initial loss and continuing loss values of 13 mm and 2.2 mm/hr respectively were adopted, as per the ARR Data Hub. Pre-burst rainfall has been applied to the design storms, distributed equally over a four-hour period preceding the burst.

6.3 Hydraulic Model

The TUFLOW model layout is shown in Figure 13. The trunk drainage network, including the 1350 mm and 1500 mm RCP trunk main, the Blinzinger Road and Huron Street networks and the eastern boundary drainage, is represented as a linked 1D network. The northern boundary wall is represented as an impermeable barrier.

The model terrain is represented on a 2 m grid, with sub-grid sampling (SGS) applied to more accurately represent the storage volume within each grid cell and the conveyance across cell faces.



Figure 13: TUFLOW rain-on-grid model layout

Critical storm durations from 15 minutes to 2 hours were simulated, with a single median temporal pattern adopted for each duration, selected from URBS simulations of all ten ARR2019 temporal patterns. Durations were consolidated to four per AEP after initial simulations. The model was run for the 50%, 20%, 10%, 5%, 2% and 1% AEP events for both the Base Case (Section 6.5) and the Developed Case (Section 6.6). The modelled storms are presented in Table 3.

Table 3: Modelled design storms by AEP (2030, SSP2-4.5)

AEP	Storms modelled (duration / temporal pattern)
50% AEP	30min TP09, 60min TP04, 90min TP10, 120min TP03
20% AEP	30min TP09, 60min TP04, 90min TP10, 120min TP03
10% AEP	30min TP09, 60min TP07, 90min TP10, 120min TP07
5% AEP	30min TP09, 60min TP07, 90min TP10, 120min TP07
2% AEP	30min TP02, 60min TP09, 90min TP09, 120min TP10
1% AEP	30min TP02, 60min TP09, 90min TP09, 120min TP10

6.4 Downstream Boundary Conditions

The trunk drainage network serving the Site discharges to the Virginia Golf Club swale, which lies within the Downfall Creek floodplain. Water levels in Downfall Creek therefore set the tailwater at the network outlet and

can influence the HGL in the 1350 mm RCP trunk main, the performance of the detention tank outlets, and overland flow levels in the lower parts of the local catchment.

The Downfall Creek catchment to the golf course is approximately 17 km², whereas the local catchment contributing to the Site's trunk drainage network is approximately 0.2 km², a catchment area ratio of approximately 85:1. Because of this difference in scale, the two systems respond to very different storm events:

- The critical storm durations for the local catchment are short (15 minutes to 2 hours), and the local trunk network peaks well before Downfall Creek responds to the same rainfall.
- Downfall Creek peaks in response to longer-duration rainfall across a much larger catchment, by which time local runoff has largely receded.

It is therefore highly unlikely that a local design event and a Downfall Creek flood of the same AEP would occur coincidentally at the outlet. Pairing a local event with a Downfall Creek level of equal probability would overstate the combined flood risk. Consistent with established joint probability practice for tributary catchments discharging to much larger receiving waterways (e.g. QUDM), a more frequent Downfall Creek tailwater has been paired with each local design event, as summarised in Table 4.

Downfall Creek flood levels at the outlet have been sourced from the Nundah Creek Flood Study (BCC, 2015). The adopted tailwater levels are applied as a static water level at the downstream boundary for the full simulation period. This is conservative, as it does not account for the time offset between the local and regional flood peaks.

The adopted tailwater levels are noted to be higher than the invert of the detention tank outlets (as low as 3.1 mAHD). Because the tanks and their outlets are modelled hydraulically, any reduction in outlet capacity due to tailwater is represented directly in the immunity and impact results.

Table 4: Adopted Downfall Creek tailwater conditions

Local catchment AEP	Coincident Downfall Creek static tailwater (AEP)	Applied static tailwater level (mAHD)
50% AEP	Normal slope	N/A
20% AEP	50%	3.5
10% AEP	20%	3.7
5% AEP	10%	3.8
2% AEP	10%	3.8
1% AEP	5%	3.9

6.5 Base Case Results

Appendix B provides peak flood depth and hazard mapping for all events ranging from 50% to 1% AEP.

The Base Case modelling confirms the existing 1350 mm RCP is operating well below its hydraulic capacity, recording a peak velocity of 1.2 m/s in the 1% AEP event. As a legacy of the Site's decommissioning, only a single stormwater pit remains open. Consequently, the Site effectively functions as an incidental detention basin, attenuating runoff before it enters the downstream network and lowering the hydraulic grade line (HGL) for upstream and downstream properties relative to the network's historical industrial design condition. A 50 mm cut-off depth has been applied to the rain-on-grid results.

Within the Site, ponding is concentrated in a depression adjacent to the northern boundary wall, immediately upstream of the single open pit. In the 50% AEP event, depths in this depression generally range from 300 to 500

mm, while the balance of the Site records only shallow sheet flow of less than 150 mm. Depth and extent increase progressively with event magnitude, reaching 500 mm across the majority of the depression in the 10% AEP event and up to 750 mm in the 1% AEP event, with shallow inundation extending across much of the northern half of the Site.

Ponding is contained wholly within the Site boundary in the 50% and 10% AEP events. In the 1% AEP event, there is minor overtopping of the existing bund in the north-eastern corner (low point 5.95 mAHD), with overflow discharging onto private property.

Downstream of the Site, overland flow is evident along Huron Street in all modelled events. Depths are generally up to 200 mm in the 50% AEP event, increasing to up to 500 mm in the 10% AEP event and locally exceeding 600 mm in the 1% AEP event, with inundation affecting private properties. This is consistent with Council's mapped overland flow path along Huron Street (Section 3.3) and reflects the limited capacity of the existing 375 mm RCP drainage system.

6.6 Developed Case Representation

The Developed Case incorporates the concept design surface (design TIN), the internal drainage network, the underground detention tanks and the external drainage upgrades (Huron Street, Blinzinger Road diversion and eastern boundary). Figure 14 presents the TUFLOW Developed Case configuration.

Runoff from the development precincts is represented using URBS subcatchments, which generate the unmitigated post-development inflow hydrographs. These hydrographs are applied directly to the detention tanks in TUFLOW. Tank storage requirements were initially sized using the URBS hydrologic model and have since been refined in the detailed TUFLOW model to account for the complex hydraulic interactions with tailwater and the trunk main HGL.

Each detention tank is represented hydraulically in TUFLOW as a 1D storage element, defined by the tank's stage–storage relationship, with its outlet (orifice and/or outlet pipe) modelled as a 1D structure connecting to the BCC stormwater network. With tank inverts as low as 3.1 mAHD, the tank outlets can be influenced by the HGL in the trunk main and by Downfall Creek tailwater. The hydraulic representation captures this interaction, including any reduction in outlet capacity when the trunk main is running full.

The key assumptions of the Developed Case modelling are:

- The development catchments draining to the detention tanks total approximately 6.4 ha, as summarised in Table 5.
- For the AR Development Site, the catchment areas draining to each of the five tanks are assumed to be equal. This is considered suitable for the current stage of design and can be refined if localised catchment areas change during detailed design.
- Impervious fractions ranging from 65% to 95% were applied to the development footprint based on the proposed land use. A URBS urbanisation fraction of 1.0 was adopted to represent the reduced catchment storage and faster response of the proposed piped drainage network.
- No design TIN was available for the Rockpool or Mission Australia precincts. At Rockpool, storage above the top of the tank has been estimated from the stage–storage relationship of the proposed car park. At Mission Australia, overflow is not significant in the 1% AEP event, and floodwater is effectively contained within the tank.

Table 5: Detention tank summary

Tank / precinct	Contributing catchment (ha)	Catchment impervious (%)	Storage volume (m³)	Tank invert (mAHD)	Outlet control	Top of tank (mAHD)	Comment
AR Development Group	4.86	75	1,875 (5 × 395 m³ tanks)	3.1	300 mm or 375 mm RCP	5.4	Five tanks; equal catchment areas assumed
Rockpool	1.19	65	486	3.6	375 mm RCP	5.6	No design TIN; above-tank storage estimated from proposed car park
Mission Australia	0.35	95	160	4.6	300 mm RCP	6.6	No design TIN; 1% AEP overflow effectively contained within tank
Total	**6.4**	**74**	**2620**	–	–		

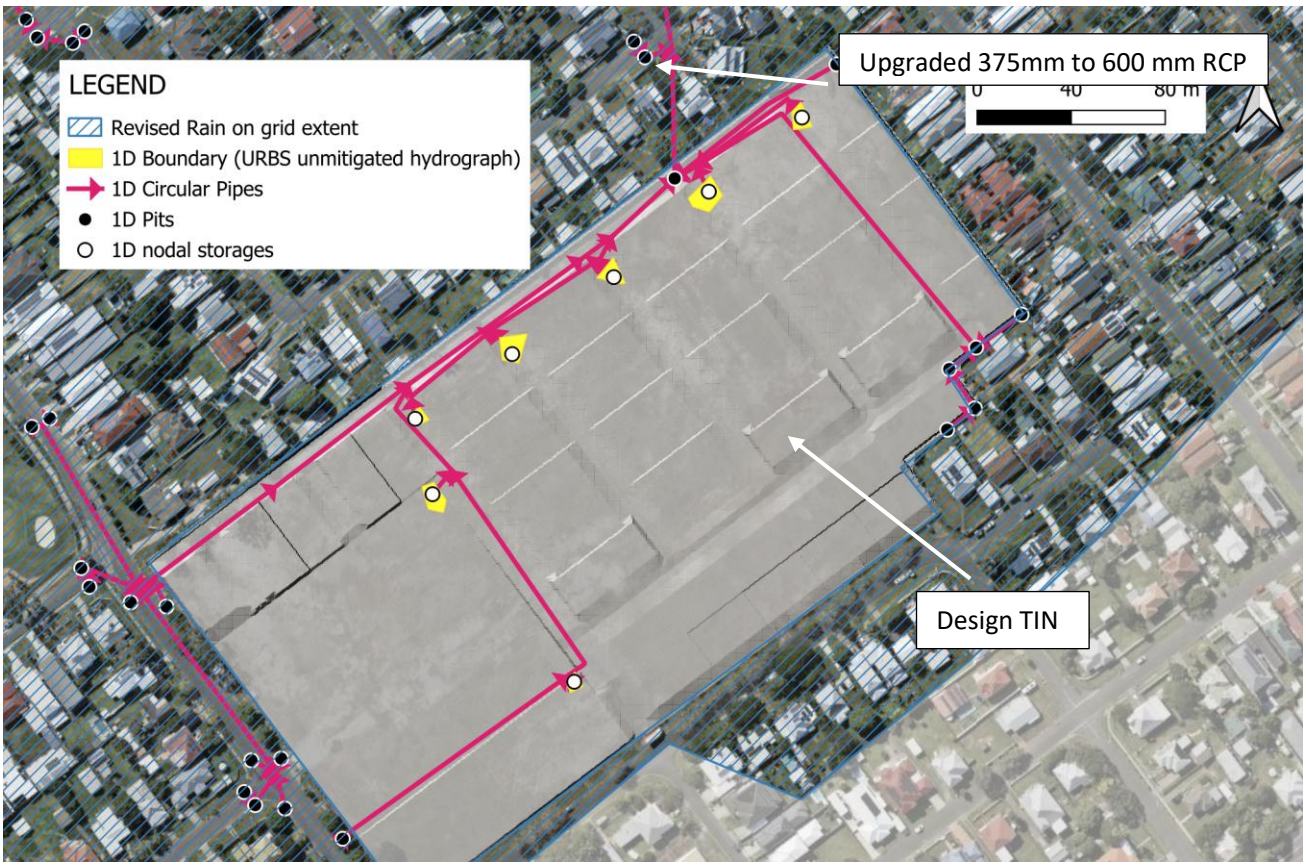


Figure 14: TUFLOW Developed Case representation

6.7 Developed Case Results

Appendix C provides peak flood depth and hazard mapping for all modelled design events. Similar to the Base Case, results have been enveloped by considering all durations for each AEP. Section 7 discusses key aspects of the results from an impact and immunity perspective.

6.8 Model Validation

As this assessment relates to an ungauged local catchment, no site-specific data is available for calibration of runoff parameters.

Accordingly, the URBS hydrologic model was validated against the Rational Method in accordance with QUDM guidance. Validation was undertaken for the Developed Case inflows applied for the AR Development portion of the Site.

The Rational Method parameters adopted for validation are as follows:

- Tc of 12 minutes.
- Total catchment area of 4.8 ha.
- C10 value of 0.9.

Table 6: Rational Method comparison summary (AR Development Site)

Design event	Rational Q (m^3/s)	URBS peak flow (m^3/s) (unmitigated)	Variation (%)
50% AEP	0.9	1.1	+22
10% AEP	1.5	1.7	+13
1% AEP	2.7	2.5	-7

The URBS results are within 22% of the Rational results for key events. These flow comparisons are considered acceptable for the purposes of this study (to be applied to the TUFLOW model) and accordingly the URBS model was adopted to inform design inflows for this study.

7. Flood Impact Assessment

7.1 Assessment Criteria

The proposed development has been assessed against a no-worsening objective for external properties and the BCC road network, for events up to and including the 1% AEP. Changes in peak water level of less than 10 mm are considered to be within model tolerance.

7.2 Context

Sites of this scale would traditionally be assessed using one-dimensional (1D) pipe and road flow calculations in accordance with QUDM, which report a single water level for each flow path. This assessment instead uses a linked 1D/2D TUFLOW model, which calculates a water level in every grid cell and provides considerably more detail. This approach offers distinct advantages in representing storage and its interaction with the hydraulic grade line along the main drainage system, and its results are most reliable when interpreted at this drainage system scale. However, particularly where direct rainfall is applied, there are limitations in predicting flood behaviour at the scale of individual lots or features.

At this finer scale, the model cannot fully resolve features such as kerbs, fences, retaining walls, driveways and minor changes in surface level, and the vertical accuracy of the terrain data is typically coarser than 10 mm. Numerical effects, particularly at the edges of the flood extent and where the terrain has been modified along the Site boundary, can also shift predicted levels without any real change in flood behaviour. As both cases use the same model, inputs and boundary conditions, most of these effects cancel out, and changes of less than 10 mm are considered to be within model tolerance (Section 7.1).

Where changes greater than 10 mm are predicted, they should be considered in this context, having regard to whether they form a continuous area of increase and represent a material worsening of flood risk to neighbouring properties, or are a product of modelling artefacts.

7.3 Peak Flood Levels Impacts

Changes in peak flood level between the Base Case and the Developed Case for all events are presented in Appendix D. The mapping illustrates the following key outcomes of the proposed stormwater management strategy:

- **The Site:** A significant reduction in peak water levels occurs within the Site boundary, shown by the widespread “was wet, now dry” extents. This reflects the filling of the Site and the formalisation of the internal drainage and underground detention system.
- **Huron Street (downstream):** Peak water levels are reduced along Huron Street in the frequent and moderate events. For rare events up to the 1% AEP event, the model predicts no change (i.e. less than 10 mm). This improvement in frequent and moderate events is attributable to the upgrade of the undersized 375 mm RCP to a 600 mm RCP, which offsets the increased Site discharge through the downstream trunk network.
- **Virginia Golf Club:** An afflux of up to 30 mm is predicted within the receiving open drainage swale at the Virginia Golf Club in the 50% AEP event. The impacts are contained within the banks of the channel. As this area forms part of the wider Downfall Creek floodplain and is already subject to regional inundation, this minor increase is not considered to materially affect flood risk.
- **Elliot Road and Flaxman Street:** The modelling predicts a minor increase of up to 13 mm within the road corridor at this corner in the 50% AEP event, due to slightly raised tailwater conditions in the Virginia Golf Club swale. This is not considered an impact, as it is contained within the road corridor, does not affect

private properties, and the flood hazard remains H1 in both the Base Case and Developed Case. No changes are predicted in any other modelled event.

- **Blinzinger Road and Elliot Road:** The modelling predicts general decreases along Blinzinger Road, particularly in the eastern trafficable lane, due to the new 450 mm RCP diversion pipe. In the 1% AEP event, changes in flood level are negligible.
- **Eastern residential properties (Meymot Street):** With the diversion of the southern catchment at Wellington Street into the Site and the allowance for a 1 m wide channel along the eastern boundary, reductions in peak water levels are predicted along the Site's eastern boundary. The Base Case modelling shows overtopping of the eastern bund; with this overtopping removed, general decreases are predicted, particularly in the 1% AEP event. Some isolated fluctuations above 10 mm occur in the 1% AEP event along the development boundary. These are attributed to model noise, as the model resolution cannot capture fine-scale drainage elements, and are not considered an impact.
- **Wellington Street:** Across all design events, minor increases in peak flood depth of up to 50 mm occur along Wellington Street. These increases are confined to the roadway and result from the assumed filling of the Mission Australia Site, for which stormwater design is ongoing and design levels have not yet been provided. The increases remain within the traffic lane and do not affect the flood immunity or trafficability of Wellington Street, and are therefore not considered an adverse impact.

Overall, the proposed development is not considered to adversely affect flood risk external to the Site.

7.4 Trunk Network Flow Comparison

Figure 15 presents hydrograph comparisons within the trunk network, for both the downstream Huron Street drainage and the 1350 mm RCP trunk main. The hydrographs demonstrate that, despite the increased flow in the trunk main resulting from the development, the pipes do not surcharge once the Huron Street drainage upgrade is in place. In the 1% AEP event there is a noticeable reduction in available capacity in Huron Street while the main network peaks. However, the upgraded drainage conveys sufficient additional flow both before and after the main flood wave passes to offset this reduction.

As discussed in Section 4, the Site previously operated as an Energex depot. In that condition it was largely sealed and drained to the 1350 mm RCP trunk main through a network of inlet pits. To understand how the trunk main performed at that time, an additional scenario was modelled with the Site in its former Energex condition (fully impervious) and with unlimited pit inlet capacity, so that all Site runoff entered the trunk main. The Developed Case peak flows in the trunk main are broadly similar to those in this Energex scenario. In effect, the development reinstates the trunk main flows that occurred while the depot was operating, but with lower peaks because the proposed detention tanks attenuate Site discharge, which the depot did not have. The development also includes external drainage works to offset both the increased Site discharge and the effects of filling the Site. These works are the upgrade of the Huron Street drainage from a 375 mm RCP to a 600 mm RCP, the new 525 mm RCP diversion pipe in Blinzinger Road and the eastern boundary drainage upgrade.

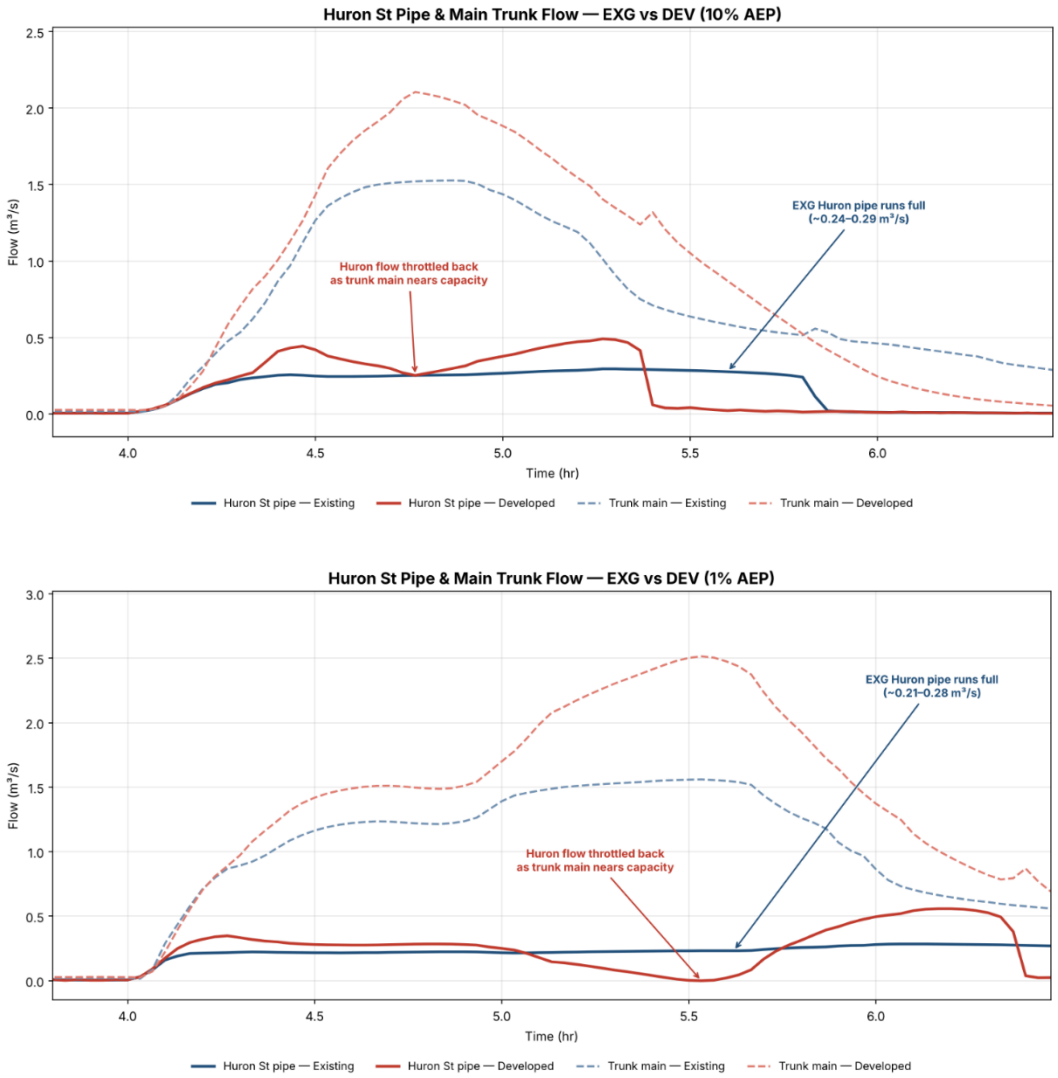


Figure 15: 1350 mm RCP trunk main and Huron Street drainage hydrograph comparisons

7.5 Tailwater Sensitivity on Impacts

Section 6.4 sets out the joint probability basis for the Downfall Creek tailwater conditions paired with each local design event. To test the sensitivity of the flood impact results to this assumption, an additional 1% AEP scenario was assessed, combining a high Downfall Creek tailwater (1% AEP) with a coincident 5% AEP local catchment event. The scenarios compared are summarised in Table 7.

Peak flood levels at key locations, including Huron Street and Blinzinger Road, were lower in the high-tailwater scenario than in the 1% AEP local event with the adopted tailwater. As the reported design flood levels are an envelope of the critical events, the high-tailwater scenario is not critical and does not change the flood impact results presented in Section 7.3.

A low-tailwater scenario was also tested during model iterations and design optioneering. Under a low Downfall Creek level, the 1350 mm trunk main that receives flows from the Site discharges freely to the golf club swale, giving the network more effective capacity and producing smaller flood impacts than the adopted tailwater. This scenario is therefore less conservative and has not been relied upon. Testing both a higher and a lower tailwater

confirms that the adopted joint probability tailwater provides a robust and conservative basis for the impact assessment.

Table 7: Tailwater sensitivity scenarios (1% AEP)

Scenario	Local catchment event	Downfall Creek tailwater
Design case (adopted)	1% AEP	5% AEP (3.9 mAHD)
Tailwater sensitivity	5% AEP	1% AEP (4.1 mAHD)

8. Flood Immunity Assessment

8.1 Immunity Criteria

The flood immunity of the proposed development has been assessed against the requirements of the Brisbane City Plan 2014 Flood overlay code and the Infrastructure design planning scheme policy. The Site may be affected by two flood mechanisms: regional (creek) flooding from Downfall Creek, and local overland flow generated within the Site and its upstream catchments. The adopted immunity criteria are summarised in Table 8.

Table 8: Adopted flood immunity criteria

Flood mechanism	Defined Flood Event	Downfall Creek tailwater	Criterion / Freeboard
Creek flooding (Downfall Creek)	1% AEP	n/a	Habitable floor levels a minimum of 500 mm above the peak creek level.
Overland flow – building immunity	2% AEP	10% AEP	Habitable floor levels a minimum of 500 mm above the peak overland flow level
Overland flow – road immunity	10% AEP	20% AEP	Internal roads trafficable, with hazard not exceeding H1 in AEM categories.

The design events adopted for this assessment use 2024 IFD data upscaled to projected 2030 climate conditions (SSP2-4.5), as described in Section 6.2. The Brisbane City Plan 2014 overland flow immunity criteria do not require a longer-term climate change allowance. It is acknowledged that the 2024 update to the climate change guidance in Australian Rainfall and Runoff (ARR 2019 Version 4.2, Book 1, Chapter 6) substantially increases the projected rainfall intensities for short-duration storms over longer planning horizons, and these storms are critical for small urban catchments such as the Site. The sensitivity of the proposed floor levels to 2100 climate rainfall has therefore been tested in Section 8.5, which shows that the proposed minimum floor levels remain above the 1% AEP peak flood levels under 2100 climate conditions.

8.2 Creek Flood Immunity

Downfall Creek does not directly flood the Site. BCC FloodWise mapping shows the Site is outside the creek flood extent in events up to and including the 0.2% AEP (Section 3.3, Figure 9 and Figure 10). Elevated ground of up to 5.8 mAHD separates the creek from the Site, so creek water can only reach the Site as backwater through the trunk drainage outlet (in events up to 1% AEP).

At this outlet (Point B), the 1% AEP ultimate development Downfall Creek level (DFE) is 4.2 mAHD (Table 1). The lowest proposed floor level is 6.41 mAHD (Table 9), more than 2 m above the DFE and well in excess of the 500 mm freeboard requirement. The 6.1 mAHD level quoted in the BCC FloodWise property report does not apply to the Site, as confirmed by review of the Nundah Creek Flood Study (2015) model results (Section 3.3).

Creek flooding therefore does not govern Finished Floor Levels (FFL) within the Site. Its influence on the trunk drainage is captured through the tailwater conditions applied in the hydraulic model (Section 6.4), and FFLs are governed by overland flow, as assessed in Section 8.3.

8.3 Overland Flow Immunity (2% AEP)

The Developed Case model has been run for the 2% AEP event with the coincident 10% AEP Downfall Creek tailwater. Appendix C presents the peak overland flow depths and levels within and adjacent to the development, and Table 9 provides the required FFLs with the 2% AEP peak flood levels at each building or precinct.

Table 9: Proposed floor levels and 2% AEP flood immunity

Building / precinct	2% AEP peak flood level (mAHD)	Minimum required FFL (mAHD)
AR Development Group townhouses	5.91	6.41
Rockpool	6.35	6.85
Mission Australia	6.48	6.98

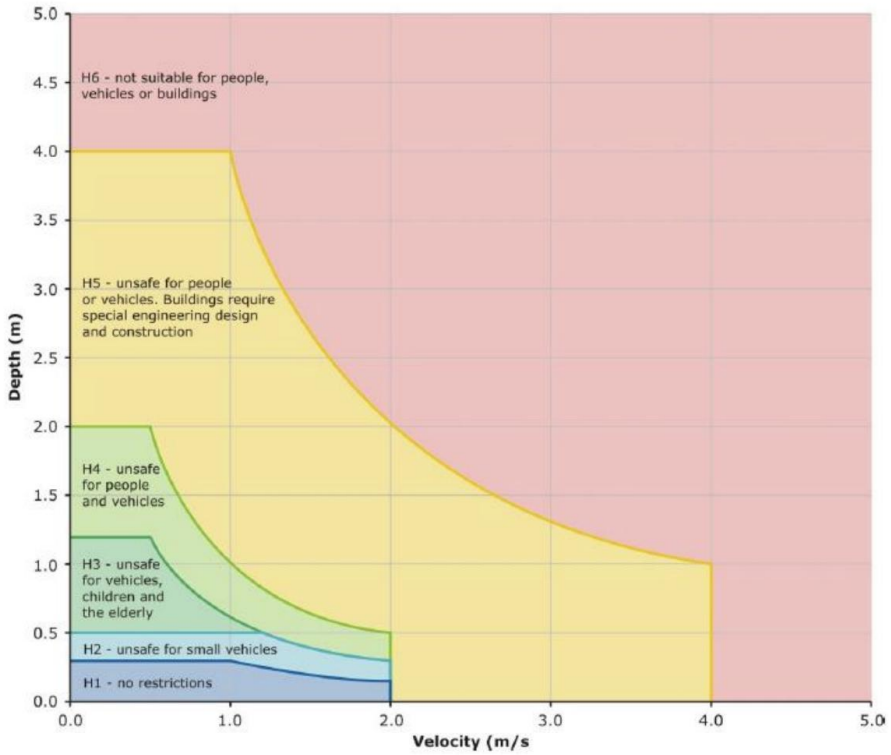
8.4 Internal Road Immunity (10% AEP)

Road immunity has been assessed for the 10% AEP design event with the coincident 20% AEP Downfall Creek tailwater. Flood hazard has been categorised using the combined hazard curves of the Australian Emergency Management Institute (2014), as adopted in ARR 2019, to assess the trafficability of the site access and internal roads for vehicles and pedestrians, including for emergency egress. The peak flood hazard across the internal road network and site access points is presented in Figure 16.

In the Developed Case, the peak flood hazard along the new access road (along the northern boundary) is H1 (generally safe for vehicles, people and buildings, see Figure 17 for category descriptions) in the 10% AEP event. This satisfies the road immunity criterion in Section 8.1, consistent with QUDM, which requires local collector roads to remain trafficable with a hazard not exceeding H1 in the 10% AEP event. The internal roads also remain trafficable up to the 2% AEP event. This level of immunity is comparable to the existing condition of the Site's access at Blinzinger Road, which also experiences H1 conditions in the 10% AEP event.



Figure 16: 10% AEP Developed Case peak flood hazard – road immunity



Hazard Classification	Description
H1	Relatively benign flow conditions. No vulnerability constraints.
H2	Unsafe for small vehicles.
H3	Unsafe for all vehicles, children and the elderly.
H4	Unsafe for all people and all vehicles.
H5	Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
H6	Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

Figure 17: Australian Emergency Management Hazard Categories

8.5 FFL Immunity Sensitivity

Two (2) sensitivity scenarios have been assessed: a 1% AEP event with the adopted 2030 design rainfall, to test the effect of adopting a higher immunity standard, and a 1% AEP event with 2100 rainfall under the SSP2-4.5 climate scenario, to test the potential effect of future climate change (under latest guidance). The results are summarised in Table 10. Relative to the 2% AEP event, peak flood levels increase by up to 140 mm at the AR Development Group townhouses. Levels at Rockpool and Mission Australia are more uncertain, as design surfaces (DEMs) for the above-ground storage areas are not yet available. At Rockpool, a simplified 1D representation of the car park storage indicates increases of up to approximately 330 mm. The increase at the AR Development Group site is modest because the internal road network provides substantial additional storage once the detention tanks reach capacity. An increase of approximately 220 mm is indicated at Mission Australia (refer note to Table 10). In all scenarios, the proposed minimum finished floor levels remain above the predicted peak flood levels, with a minimum clearance of approximately 170 mm (Rockpool, 1% AEP 2100 climate). The 500 mm freeboard therefore provides adequate protection against both a higher design standard and future climate rainfall.

Table 10: Immunity sensitivity – 1% AEP and future climate (2100) peak flood levels

Building / precinct	2% AEP peak flood level (mAHD)	Minimum required FFL (mAHD)	1% AEP peak flood level – 2030 climate (mAHD)	1% AEP peak flood level – 2100 climate (mAHD)
AR Development Group townhouses	5.91	6.41	5.98	6.05
Rockpool	6.35	6.85	6.50*	6.68*
Mission Australia	6.48	6.98	6.70*	6.70*

** Design surfaces (DEMs) are not yet available for the above-ground storage at Rockpool and Mission Australia, and the peak water level exceeds the tank storage. Reported levels are indicative only; the Rockpool levels are based on a simplified 1D storage representation of the car park.*

9. Conclusions

This assessment has considered the stormwater quantity management and flood immunity of the proposed redevelopment of the Site, including:

- the capacity of the existing trunk drainage network, with reference to the flows that occurred when the Site operated as an Energex depot;
- design events up to and including the 1% AEP, with a 2030 climate change allowance and a 2100 climate sensitivity test;
- coincident Downfall Creek tailwater conditions, including a low and high-tailwater sensitivity tests;
- flood impacts on surrounding properties, the BCC road network and the Virginia Golf Club swale; and
- flood immunity of the Site, habitable floor levels and internal roads.

The proposed strategy, comprising underground detention tanks, the Huron Street drainage upgrade, the Blinzinger Road diversion pipe and the eastern boundary drainage upgrade, manages the increased runoff from the development within the available capacity of the existing trunk network.

The assessment demonstrates that the development does not result in adverse flood impacts on surrounding properties or infrastructure, and that the Site, habitable floor levels and internal roads achieve the required flood immunity. The development is therefore considered to comply with the relevant Brisbane City Council and QUDM flood and stormwater requirements.

10. References

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I (Editors), 2019, *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia (Geoscience Australia).

Brisbane City Council, *Brisbane City Plan 2014* – Flood overlay code and Infrastructure design planning scheme policy.

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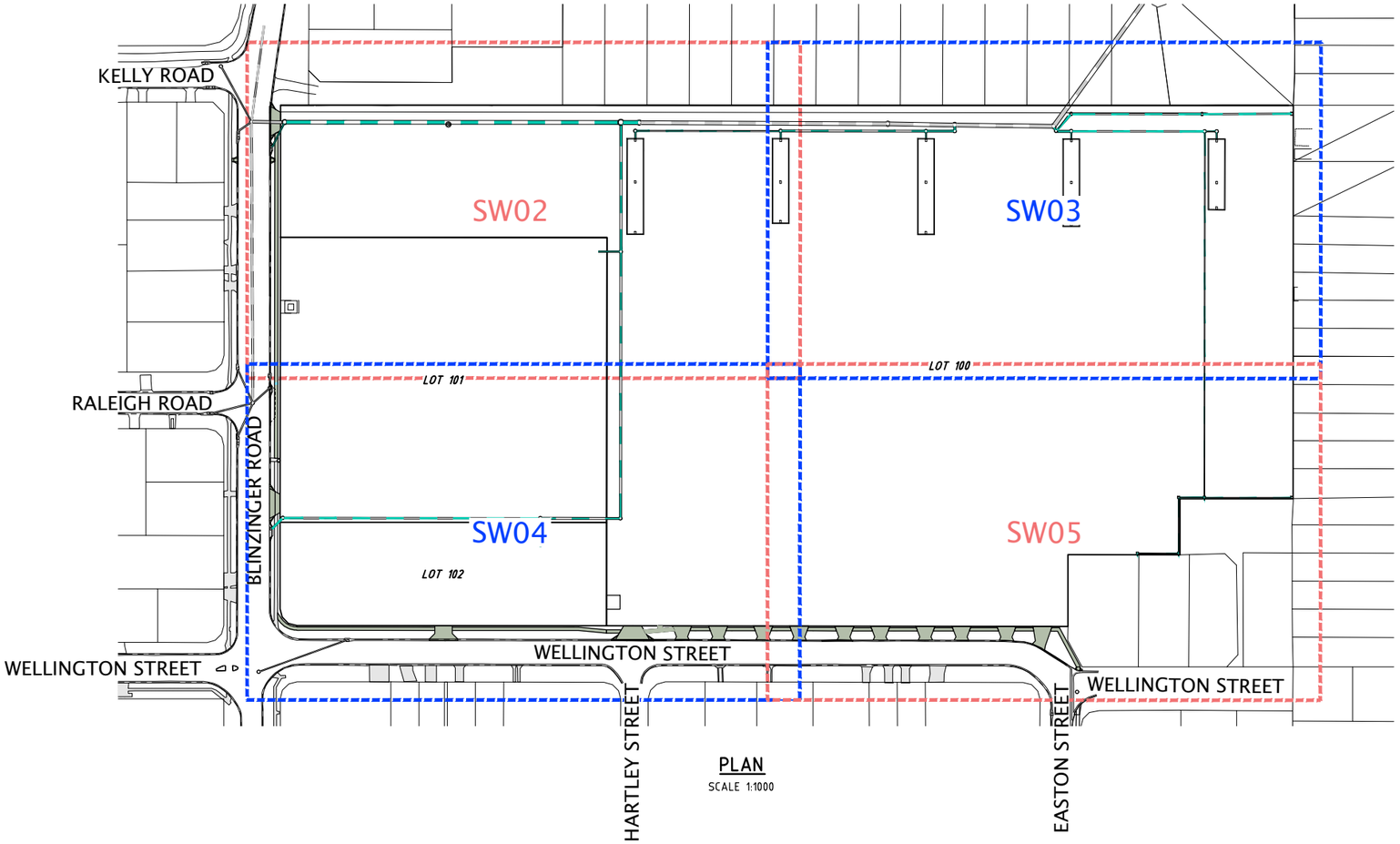
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HCE Engineers, 2026, *56 Blinzinger Road, Banyo – Civil concept drawings*

IPWEA, 2017, *Queensland Urban Drainage Manual*, Fourth Edition.

Stantec Australia Pty Ltd, 2025, *56 Blinzinger Road, Banyo – Stormwater Quantity Management Plan*, prepared for Economic Development Queensland, ref. 304570217, November 2025.

Appendix A – Civil Plans



PLAN
SCALE 1:1000

SCALE 1:1000 (A1) 0 20 40 60m
(SCALE BEFORE REDUCTION)

HCE Engineers Pty Ltd
ABN 42 664 382 610
mail@hce-engineers.com.au
07 3829 1399

PROJECT	TITLE	CLIENT	CERTIFICATION
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	RECONFIGURATION OF A LOT STORMWATER DRAINAGE KEY PLAN	AR DEVELOPMENTS	

REVISION	AMENDMENT	DATE
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22
RP68575

3
RP118211

21
RP112285

20
RP112285

19
RP112285

18
RP112285

17
RP112285

16
RP112285

BLINZINGER ROAD

LOT 100

LOT 101

3.400m WIDE
STORMWATER
EASEMENT

3.000m WIDE
STORMWATER
EASEMENT

DETENTION TANK No.4
IL 3.100

DETENTION TANK No.5
IL 3.100

LOT 101 DETENTION TANK
IL 3.600

Emt A
SP294937

FH

7.00
6.75
6.50
6.25
6.75
5.000

FOR CONTINUATION REFER TO DRAWING 26074-SW03

FOR CONTINUATION REFER TO DRAWING 26074-SW04

PLAN
SCALE 1:250

LEGEND

- 10.00 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- 1/1 — PROPOSED STORMWATER STRUCTURE
- 1/1 — EXISTING STORMWATER STRUCTURE
- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- W — EXISTING WATER RETICULATION
- W — PROPOSED WATER RETICULATION
- T — EXISTING TELECOMMUNICATIONS
- STORMWATER EASEMENT
- EXISTING CONCRETE
- PROPOSED CONCRETE
- FH — EXISTING FIRE HYDRANT
- FH — PROPOSED FIRE HYDRANT
- EXISTING VALVE
- PROPOSED VALVE

SCALE 1:250 (A1) 0 5 10 15m
(SCALE BEFORE REDUCTION)

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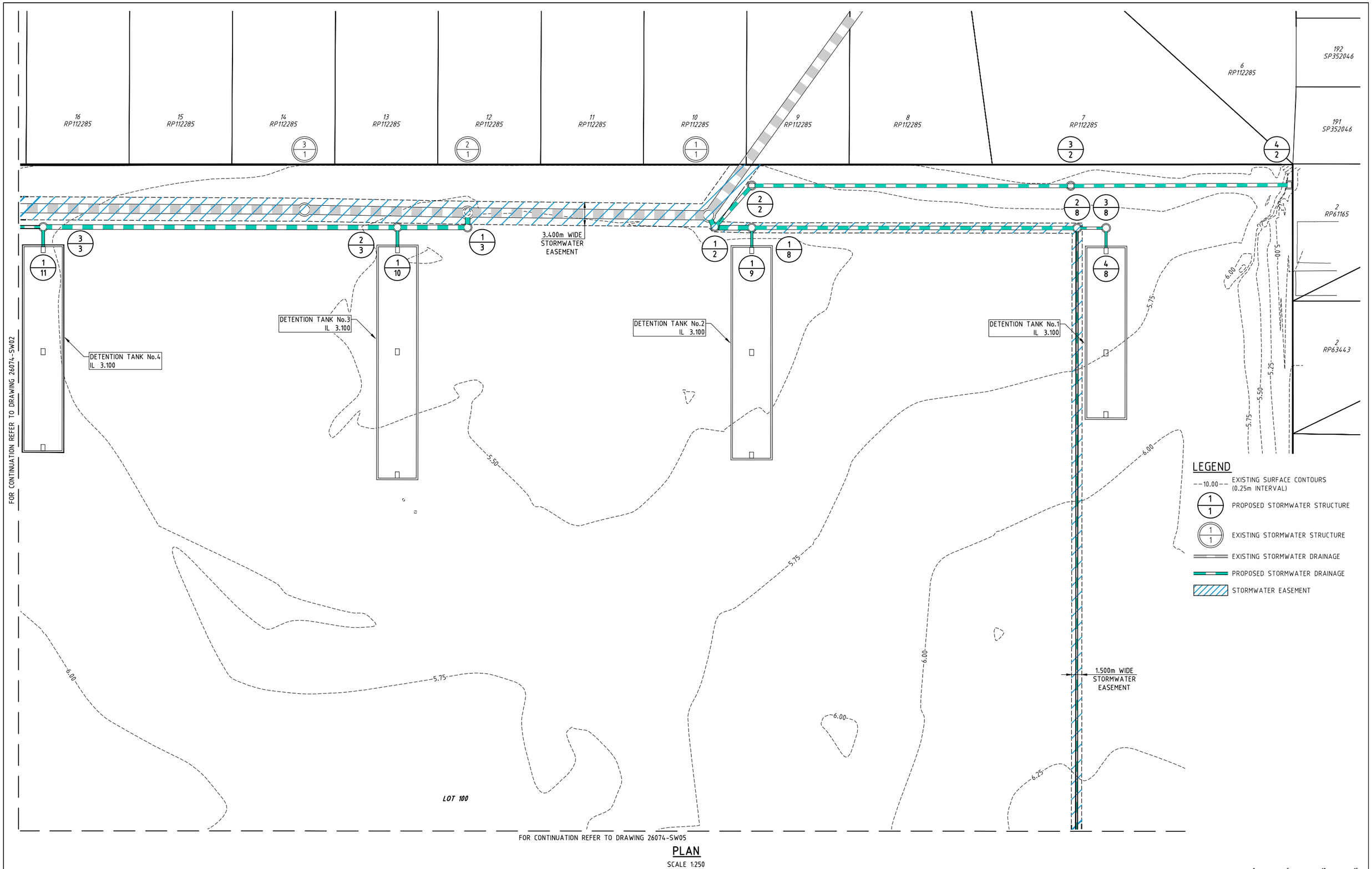
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PLAN

SCALE 1:250

SCALE 1:250 (A1) 0 5 10 15m (SCALE BEFORE REDUCTION)

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Rev. A

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PROPOSED LIP IN LINE ON GRADE TYPE 'A' STORMWATER GULLY WITH TYPE 'S' LINTEL I.A.W. BCC STD DRG BSD-8051.

LOT 101

LOT 100

LOT 102

3.000m WIDE STORMWATER EASEMENT

3.000m WIDE STORMWATER EASEMENT

23.700

1.500

5.000

LOT 102 DETENTION TANK
IL 3.950

BLINZINGER ROAD

WELLINGTON STREET

HARTLEY STREET

FOR CONTINUATION REFER TO DRAWING 26074-SW05

LEGEND

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- PROPOSED STORMWATER STRUCTURE
- EXISTING STORMWATER DRAINAGE
- PROPOSED STORMWATER DRAINAGE
- EXISTING SEWERAGE
- PROPOSED SEWERAGE
- EXISTING WATER RETICULATION
- PROPOSED WATER RETICULATION
- EXISTING TELECOMMUNICATIONS
- STORMWATER EASEMENT
- EXISTING CONCRETE
- PROPOSED CONCRETE
- EXISTING FIRE HYDRANT
- EXISTING ELECTRICAL POLE

PLAN

SCALE 1:250

SCALE 1:1000 (A1)

0 20 40 60m

(SCALE BEFORE REDUCTION)

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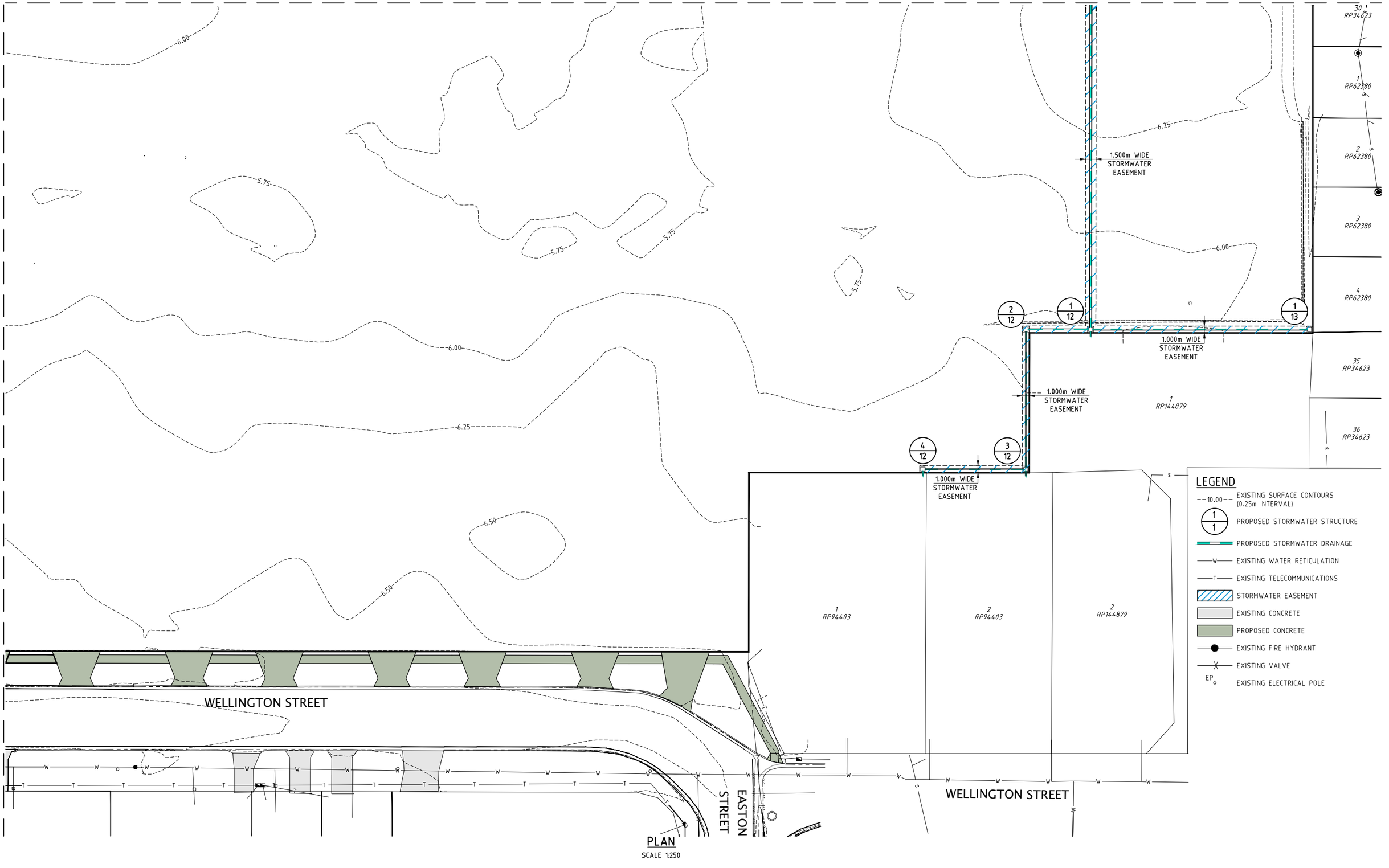
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FOR CONTINUATION REFER TO DRAWING 26074-SW04



PLAN
SCALE 1:250

LEGEND

- 10.00 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- 1/1 — PROPOSED STORMWATER STRUCTURE
- PROPOSED STORMWATER DRAINAGE
- W — EXISTING WATER RETICULATION
- T — EXISTING TELECOMMUNICATIONS
- STORMWATER EASEMENT
- EXISTING CONCRETE
- PROPOSED CONCRETE
- EXISTING FIRE HYDRANT
- EXISTING VALVE
- EP — EXISTING ELECTRICAL POLE

SCALE 1:1000 (A1)
0 20 40 60m
(SCALE BEFORE REDUCTION)

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26074-SW05	A

STRUCTURE NAME	7/1	6/1		5/1	4/1		3/1	2/1	1/1		OUT/1
STRUCTURE DESCRIPTION	EXISTING CHAMBER	1800ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID GENERALLY I.A.W. BCC STD DRG BSD-8021		1800ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID GENERALLY I.A.W. BCC STD DRG BSD-8021	EXISTING CHAMBER		EXISTING CHAMBER	EXISTING CHAMBER	EXISTING CHAMBER		NEW CHAMBER OVER EXISTING
PIPE SIZEmm (Class)		Ex. 825(3)	1200(3)		1200(3)	Ex. 1200(3)		Ex. 1200(3)	Ex. 1200(3)	Ex. 1350(3)	
PIPE GRADE %		0.40%	0.44%		0.30%	0.12%		1.08%	0.20%	0.25%	
PIPE SLOPE 1 in X		248.90	227.30		331.46	809.27		92.25	506.04	400.00	
DATUM RL -6.0											
PIPE CAPACITY AT GRADE (Cumecs)		0.930	2.625		2.174	1.391		4.121	1.760	2.721	
DEPTH TO INVERT		2.563	2.603	2.635 2.863	2.883	2.953	3.183 2.742	2.752	2.896	2.906 3.157	3.166 2.125
INVERT LEVEL OF DRAIN		3.880	3.832	3.800 3.270	3.250	3.230	3.000 2.890	2.880	2.620	2.610 2.540	2.531 2.375
EXISTING SURFACE LEVEL	6.443		6.435	6.133		6.183	5.632		5.516	5.697	4.500
STRUCTURE SETOUT	506828.861 6971867.587		506838.482 6971874.610	506934.735 6971947.118		506940.030 6971951.106	507011.378 6972004.340		507030.796 6972018.418	507059.304 6972039.444	507057.310 6972101.923
RUNNING CHAINAGE	0.000	11.947 11.947	120.471	132.418	139.047 6.629	89.019	228.066	252.050 23.984	287.473 35.423	62.511	349.984

STRUCTURE NAME	4/2	3/2		2/2	1/2	1/1
STRUCTURE DESCRIPTION	600x900 FIELD INLET WITH DOME TOP COVER I.A.W. BCC STD DRG BSD-8091	1050ø STORMWATER MAINTENANCE STRUCTURE WITH 600x900 GRATED INLET WITH CLASS D GRATE I.A.W. BCC STD DRG BSD-8021		1050ø STORMWATER MAINTENANCE STRUCTURE WITH 600x900 GRATED INLET WITH CLASS D GRATE I.A.W. BCC STD DRG BSD-8021	1350ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	EXISTING CHAMBER
PIPE SIZEmm (Class)	450(3)	450(3)		450(3)	675(3)	
PIPE GRADE %	0.50%	0.46%		0.51%	0.50%	
PIPE SLOPE 1 in X	199.58	218.05		197.45	199.30	
PIPE CAPACITY AT GRADE (Cumecs)	0.202	0.193		0.203	0.605	
DEPTH TO INVERT	1.047	2.031	2.051	2.020 2.040	1.920 2.797	2.992 3.166
INVERT LEVEL OF DRAIN	4.050	3.889	3.869	3.654 3.634	3.592 2.715	2.705 2.531
EXISTING SURFACE LEVEL	5.097	5.920		5.674	5.512	5.697
STRUCTURE SETOUT	507124.753 6972094.421	507099.186 6972074.958		507061.731 6972046.765	507061.059 6972038.499	507059.304 6972039.444
RUNNING CHAINAGE	0.000	32.132 32.132	46.880	79.012 8.293	87.305 1.993	89.298

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PIPE SIZEmm (Class)	450(3)	450(3)		525(3)	600(3)	600(3)	
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PIPE CAPACITY AT GRADE (Cumecs)	0.103	0.101		0.241	0.331	0.331	
DEPTH TO INVERT	3.001	2.985	3.005	2.888 2.908	2.685 2.705	2.709 2.729	2.886 2.906
INVERT LEVEL OF DRAIN	3.100	3.090	3.070	2.896 2.876	2.704 2.684	2.654 2.634	2.630 2.610
EXISTING SURFACE LEVEL	6.101	6.075		5.784	5.389	5.363	5.516
STRUCTURE SETOUT	506942.365 6971945.546	506940.630 6971947.850		506982.240 6971979.171	507023.850 6972010.491	507032.088 6972016.692	507030.796 6972018.418
RUNNING CHAINAGE	0.000	2.884 2.884	52.081	54.965 52.080	107.045 10.311	117.356 2.156	119.512

LINE 1 2 3

SCALE 1:100 (A1) 0 2 4 6m (SCALE BEFORE REDUCTION)

SCALE 1:1000 (A1) 0 20 40 60m (SCALE BEFORE REDUCTION)

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PROJECT	TITLE	CLIENT	CERTIFICATION
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26074-SW06		A

STRUCTURE NAME	5/4	4/4	3/4	2/4	1/4	5/1	1/5	1/4	1/6	3/4	1/7	6/1	4/8	3/8	2/8	1/8	1/2	1/9	1/8	1/10	2/3	1/11	3/3
STRUCTURE DESCRIPTION	TYPE 'A' LIP IN LINE GULLY WITH 'M' LINTEL I.A.W. BCC STD DRG BSD-8051	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1800ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID GENERALLY I.A.W. BCC STD DRG BSD-8021	FUTURE DETENTION TANK	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	FUTURE DETENTION TANK	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	TYPE 'A' LIP IN LINE GULLY WITH 'S' LINTEL I.A.W. BCC STD DRG BSD-8051	1800ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID GENERALLY I.A.W. BCC STD DRG BSD-8021	DETENTION TANK No.1	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	1350ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	DETENTION TANK No.2	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	DETENTION TANK No.3	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021	DETENTION TANK No.4	1050ø STORMWATER MAINTENANCE STRUCTURE WITH CLASS D LID I.A.W. BCC STD DRG BSD-8021
PIPE SIZEmm (Class)		525(3)	525(3)	600(3)	600(3)	675(3)		375(3)		300(3)		375(3)		300(U)	300(U)	450(3)	600(3)		300(U)		375(3)		375(3)
PIPE GRADE %		1.01%	0.50%	0.33%	0.33%	0.31%		0.56%		0.49%		2.00%		0.52%	0.52%	0.50%	0.51%		1.04%		1.05%		1.04%
PIPE SLOPE 1 in X		98.85	200.65	298.95	299.37	318.83		177.76		203.02		49.99		192.20	193.14	199.30	196.68		96.10		94.87		96.13
PIPE CAPACITY AT GRADE (Cumecs)		0.417	0.293	0.355	0.355	0.478		0.131		0.068		0.248		0.085	0.085	0.202	0.438		0.121		0.180		0.179
DEPTH TO INVERT		1.350	1.613	2.293	2.529	2.549	2.662	2.682	2.668	2.688	2.853	2.883	2.682	2.668	2.688	2.542	2.529	2.549	2.535	2.550	2.570	2.566	2.586	2.729	2.749	2.777	2.797	2.390	2.442	2.749	2.315	2.319	2.709	2.664	2.714	2.908
INVERT LEVEL OF DRAIN		5.102	5.040	4.360	3.900	3.880	3.784	3.764	3.445	3.425	3.280	3.250	3.490	3.445	3.425	3.950	3.900	3.880	4.774	4.568	3.100	3.085	3.065	3.043	3.023	2.783	2.763	2.735	2.715	3.100	3.070	2.763	3.100	3.070	2.680	3.100	3.070	2.876
EXISTING SURFACE LEVEL	6.452		6.653		6.429	6.446			6.113		6.133		6.172		6.113	6.492		6.429	6.124	6.435	5.635	5.635		5.609		5.512	5.512		5.490	5.512		5.415	5.389		5.764	5.784	
STRUCTURE SETOUT	506921.732 6971755.187		506923.297 6971761.113		506997.040 6971816.622	507019.969 6971833.881			506962.537 6971910.182		506934.735 6971947.118		506956.146 6971905.371		506962.537 6971910.182	507003.145 6971808.512		506997.040 6971816.622	506839.409 6971864.414	506838.482 6971874.670	507108.803 6972070.828	507107.069 6972073.131		507103.674 6972070.576		507065.459 6972041.811	507061.059 6972038.499		507067.194 6972039.508	507065.459 6972041.811		507125.561 6972008.217	507023.850 6972010.491		506983.974 6971976.867	506982.240 6971979.171	
RUNNING CHAINAGE	0.000	6.129	6.129	92.300	98.429	28.699	127.128	95.500	222.628	46.230	268.858		0.000	7.999	7.999	10.151	10.151		0.000	10.298	10.298	0.000	2.883	2.883	4.249	7.132	47.831	54.963	5.507	60.470	0.000	2.883	2.883	0.000	2.846	2.846	0.000	2.884	2.884	
LINE		4						5		6		7		8					9		10		11															

RELOCATED 100ø WATER

Sewer Line DN 150 (IL 4.96 approx)

58.803m

SCALE 1:100 (A1) 0 2 4 6m (SCALE BEFORE REDUCTION)

SCALE 1:1000 (A1) 0 20 40 60m (SCALE BEFORE REDUCTION)

HCE Engineers Pty Ltd
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mail@hce-engineers.com.au
07 3829 1399

COMPASS ASSURANCE SERVICES ISO 9001

PROJECT	TITLE	CLIENT	CERTIFICATION
WELLINGTON STREET & BLINZINGER ROAD BANYO QLD 4104	RECONFIGURATION OF A LOT STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 2 OF 3	AR DEVELOPMENTS	

REVISION	AMENDMENT	DATE
A	ISSUED FOR COMMENT	

DO NOT SCALE. CONFIRM ALL DIMENSIONS ON SITE. Copyright ©

Designed	Drawn	Date
MB	NW	28/09/2026

Approval No.	Scale
----	AS SHOWN

Drawing No.	Rev.
26074-SW07	A

| | | |

Appendix B – Existing Case Flood Mapping



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

50% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Existing Case

50% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

20% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Existing Case

20% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

10% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

5% AEP design event

0 100 200 m

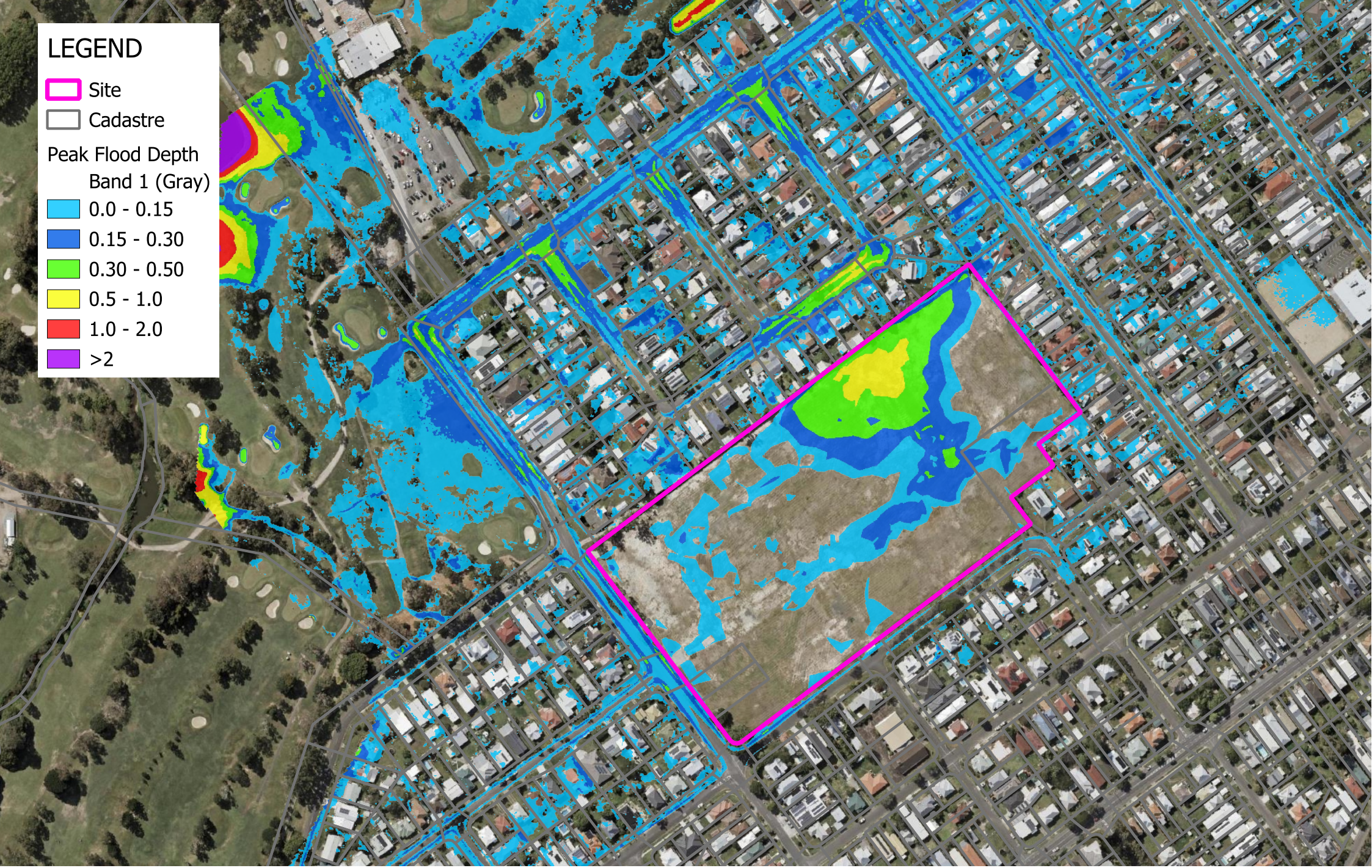


DCF ENGINEERING

Peak Flood Hazard Map - Existing Case

5% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

2% AEP design event

0 100 200 m

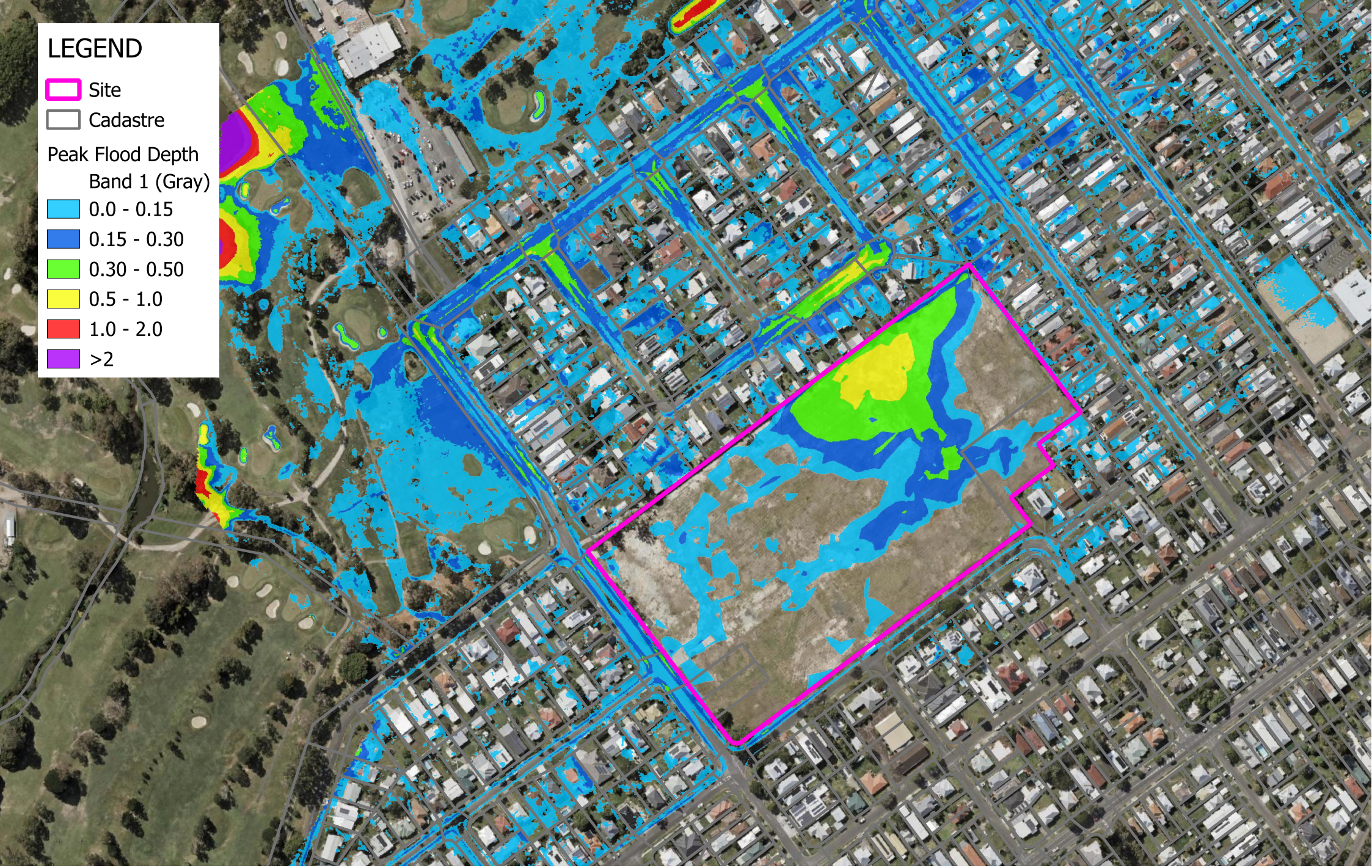


DCF ENGINEERING

Peak Flood Hazard Map - Existing Case

2% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Existing Case

1% AEP design event

0 100 200 m



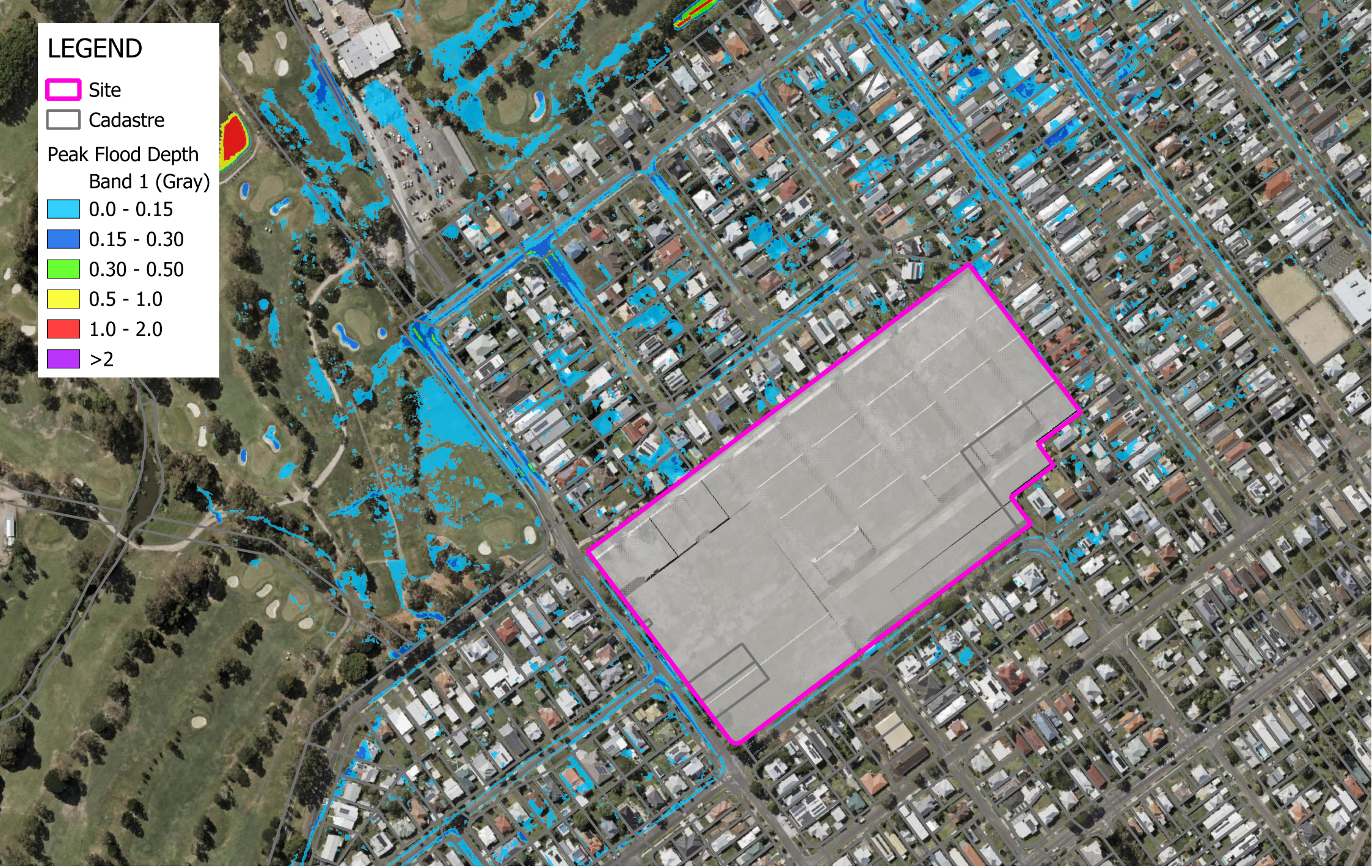
DCF ENGINEERING

Peak Flood Hazard Map - Existing Case

1% AEP design event

0 100 200 m

Appendix C – Developed Case Flood Mapping



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

50% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

50% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

20% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

20% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

10% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

10% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

5% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

5% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

2% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

2% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Depth Map - Developed Case

1% AEP design event

0 100 200 m



DCF ENGINEERING

Peak Flood Hazard Map - Developed Case

1% AEP design event

0 100 200 m

Appendix D – Afflux Mapping



DCF ENGINEERING

Flood Level Difference Map

50% AEP

0 100 200 m



DCF ENGINEERING

Flood Level Difference Map

20% AEP

0 100 200 m



DCF ENGINEERING

Flood Level Difference Map

10% AEP

0 100 200 m



DCF ENGINEERING

Flood Level Difference Map

5% AEP

0 100 200 m



DCF ENGINEERING

Flood Level Difference Map

2% AEP

0 100 200 m



DCF ENGINEERING

Flood Level Difference Map

1% AEP

0 100 200 m

Appendix E – BCC Code Response

8.2.11 Flood overlay code

8.2.11.1 Application

1. This code applies to assessing development in the Flood overlay, if:
    a. accepted development subject to compliance with identified requirements, where acceptable outcomes of this code are identified requirements in a table of assessment for an overlay (section 5.10); or
    b. assessable development where this code is an applicable code identified in the assessment benchmarks column of a table of assessment for an overlay (section 5.10); or
    c. impact assessable development.
2. Land in the Flood overlay is identified on the Flood overlay map and is included in the following sub-categories:
    a. Brisbane River flood planning area 1 sub-category;
    b. Brisbane River flood planning area 2a sub-category;
    c. Brisbane River flood planning area 2b sub-category;
    d. Brisbane River flood planning area 3 sub-category;
    e. Brisbane River flood planning area 4 sub-category;
    f. Brisbane River flood planning area 5 sub-category;
    g. Creek/waterway flood planning area 1 sub-category;
    h. Creek/waterway flood planning area 2 sub-category;
    i. Creek/waterway flood planning area 3 sub-category;
    j. Creek/waterway flood planning area 4 sub-category;
    k. Creek/waterway flood planning area 5 sub-category;
    l. Overland flow flood planning area sub-category.

Editor's note—For the purposes of the overlay, the Pine and South Pine rivers are treated as Creek/waterway flood planning area sub-categories.

Note—The Flood overlay is a 'natural hazard area' for the purpose of the State Planning Policy. Within this area, susceptibility to flooding has been identified. The natural hazard area identified on the Flood overlay map may not reflect the full extent of the flood affected area.

3. When using this code, reference should be made to section 1.5 and section 5.3.3.

Note—The following purpose, overall outcomes, performance outcomes and acceptable outcomes comprise the assessment benchmarks of this code.

Note—Where this code includes performance outcomes or acceptable outcomes that relate to:

- management of flood hazard or hydraulic hazard, guidance is provided in the Flood planning scheme policy;
- filling or excavation within the Creek/waterway flood planning area sub-categories, guidance is provided in the Compensatory earthworks planning scheme policy;
- handling or storage of hazardous materials, guidance is provided in the Management of hazardous chemicals in flood affected areas planning scheme policy;
- standards and specifications for public assets in a park, guidance is provided in the Infrastructure design planning scheme policy;
- standards and specifications for stormwater drainage assets, guidance is provided in the Infrastructure design planning scheme policy.

Editor's note—For a proposal to be accepted development subject to compliance with identified requirements, it must meet all the identified acceptable outcomes of this code that relate to the applicable sub-category and any other applicable code. Where it does not meet all identified acceptable outcomes, the proposal becomes assessable development and a development application is required. Where a development application is required, only the specific acceptable outcomes that the proposal fails to meet need to be assessed against the corresponding assessable acceptable outcomes or performance outcomes and relevant overall outcomes. Other identified acceptable outcomes that are met are not assessed as part of the development application.

8.2.11.2 Purpose

1. The purpose of the Flood overlay code is to:
    a. Implement the policy direction in the Strategic framework, in particular:
        i. Theme 2: Brisbane's outstanding lifestyle, and Element 2.3 — Brisbane's healthy and safe communities;
        ii. Theme 4: Brisbane's highly effective transport and infrastructure networks, and Element 4.3 — Brisbane's coordinated infrastructure planning and delivery.
    b. Provide for the assessment of the suitability of development in the Flood overlay.
2. The purpose of the Flood overlay code will be achieved through the following overall outcomes:
    a. Development minimises exposure of people and property to unacceptable risk from flood hazard in all flood events.
    b. Development and infrastructure mitigates the flood risk through its location, siting, design, construction and operation whilst maintaining amenity.
    c. Development does not unduly burden the city's counter-disaster response capacity, including emergency services access during a flood emergency.
    d. Development provides for efficient evacuation and access for evacuation resources including emergency services during flood events, or otherwise plans for the prospect and impact of isolation or hindered evacuation during flooding.
    e. Development involving essential community infrastructure remains functional during and immediately after flood events.
    f. Development ensures that emergency management plans respond to the number and capacity of future users of the development to safely participate in emergency measures such as evacuation.
    g. Development ensures that essential building services or services essential for the development are designed, located and operated to minimise the flood risk to people, minimise damage to property, disruption to building function, and re-establishment time after a flood event.
    h. Development involving hazardous materials manufactured, handled or stored in bulk does not adversely impact on public safety and the environment as a result of the impacts of floodwater.
    i. Development does not, directly or cumulatively, cause or increase adverse impacts on other properties or land within the floodplain from flooding.
    j. Development and infrastructure mitigates the impacts of hydraulic hazard due to predictable future increases in rainfall intensity on flooding.
    k. Development prioritises, in order, the safety of people, protection of public infrastructure and protection of private property, in the management of the economic, social and environmental impacts of flooding.

8.2.11.3 Performance outcomes and acceptable outcomes

Table 8.2.11.3.A—Performance outcomes and acceptable outcomes

Performance outcomes	Acceptable outcomes	Comments
Section A—If for accepted development subject to compliance with identified requirements (acceptable outcomes only) 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 any secondary 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 the dwelling house and any secondary dwelling are structurally designed to be able to resist hydrostatic and hydrodynamic loads associated with flooding up to and including the defined flood event. **AO1.2** Development for a dwelling house and any secondary dwelling complies with the minimum flood planning levels in Table 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 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. **AO1.3** Development involving a building undercroft complies with the minimum clearance requirements in Table 8.2.11.3.E.	**Not applicable.** Section A applies to a dwelling house only. The proposal is a material change of use for multiple dwellings (townhouses), affordable housing and seniors living, assessed against Sections B and C.

	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 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.	**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 Note—This undercroft area is not suitable 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 policy provides 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's FloodWise Property Report. c. a flood study from a Registered Professional Engineer Queensland with expertise in undertaking flood studies 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 principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy and ensure that where an undercroft is required to manage flood impacts it complies with Table 8.2.11.3.E.	**Not applicable.** PO2 forms part of Section A (dwelling house). Flood impacts of the proposal are addressed under PO7.

Section B—If accepted development subject to compliance with identified requirements (acceptable outcomes only) or assessable development other than for a dwelling house or reconfiguring a lot Note—If development that is accepted development subject to compliance with identified requirements 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 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.	**AO3** Development for a material change of use is identified in Table 8.2.11.3.C as compatible with the flood hazard in the relevant flood planning area.	**Complies with PO3.** The Site is not affected by Downfall Creek flooding in events up to and including the 0.2% AEP (FIA (DCF ref. 26111_R01_V01), Sections 3.3 and 8.2). Flood hazard on the Site is limited to local overland flow, which has been assessed through a site-specific TUFLOW flood study (FIA (DCF ref. 26111_R01_V01)). Habitable floor levels are set a minimum of 500 mm above the 2% AEP peak overland flow level (Table 9). Sensitivity testing shows minimum FFLs remain above the 1% AEP peak flood level under both 2030 and 2100 climate rainfall, with a minimum clearance of approx. 170 mm (Section 8.5). This minimises risk to people, damage to property and the need to rebuild after floods larger than the defined flood event. Internal roads and site access experience H1 hazard (generally safe for vehicles and people) in the 10% AEP event and remain trafficable up to the 2% AEP event (Section 8.4), so emergency services access is maintained. Critical durations of the local catchment are short (15 min to 2 hours), so any disruption is brief.
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;	**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**	**Not applicable.** The development is not for a park.

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.	Development involving a building or structure in a park 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 flow path.	
Section C—If accepted development subject to compliance with identified requirements (acceptable outcomes only) for a park or 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 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	**AO5.1: Complies.** Council flood levels are not available for overland flow on the Site, so the 2% AEP overland flow levels have been derived by an RPEQ through a site-specific flood study (FIA (DCF ref. 26111_R01_V01), Section 8.3). Minimum habitable FFLs are 500 mm above the 2% AEP peak overland flow level: AR Development Group townhouses 6.41 mAHD, Rockpool 6.85 mAHD and Mission Australia 6.98 mAHD (Table 9). The Site is immune from Downfall Creek flooding up to the 0.2% AEP, so creek flooding does not govern floor levels (Section 8.2). **AO5.2: Complies with PO5.** Following filling of the Site and formalisation of the internal drainage and detention system, overland flow within the Site is shallow and confined to internal roads (H1 hazard in the 10% AEP, Section 8.4).

	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 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 secondary pump system with a backup power source for the pump.	**Complies with AO6.1 (to be confirmed at detailed design).** Essential electrical services (e.g. main switchboards, substations and meters) are to be located at or above the minimum habitable FFLs in Table 9 of the FIA. No basements are proposed; underground detention tanks are stormwater structures only and do not contain electrical services or storage areas. **AO6.2: Not applicable.** No basement relying on a pumped solution is proposed. Detention tanks drain by gravity to the 1350 mm RCP trunk main.
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	**AO7.1: Complies.** An RPEQ flood study (FIA (DCF ref. 26111_R01_V01), Section 7) has assessed impacts for all events from the 50% to 1% AEP using a linked 1D/2D TUFLOW model with coincident Downfall Creek tailwater. No increase in flood risk is predicted on private property. Peak levels are reduced in Huron Street in frequent and moderate events (no change up to the 1% AEP) and generally decrease along Blinzinger Road and the Site's eastern boundary (Meymot Street).

	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 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.	**AO7.2: Complies with PO7.** The existing eastern boundary channel is retained (reconstructed) and its 225 mm RCP outlet upgraded to a 450 mm RCP with backflow prevention. The Blinzinger Road escape flow that currently crosses the Rockpool precinct is replaced by a new 450 mm RCP diversion to the trunk main, and the Huron Street drainage is upgraded from a 375 mm to a 600 mm RCP. Flows exceeding the tank capacity are stored and conveyed within the internal road network (Section 8.5). The flood study demonstrates that this arrangement does not result in a material adverse impact on upstream, downstream or adjacent properties (Section 7.3). **AO7.3: Complies.** Earthworks remove the existing on-site ponding (shown as 'was wet, now dry' in Appendix D). Hydraulic hazard on the Site is reduced, with H1 hazard on internal roads in the 10% AEP event (Section 8.4).
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. 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.	**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 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.	**Not applicable.** The Site is outside the Downfall Creek flood extent up to and including the 0.2% AEP and is not within the Creek/waterway flood planning area 1, 2 or 3 sub-categories. Filling occurs in an area affected by overland flow only. The impact of filling on overland flow has been assessed under PO7.

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 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.	**AO9.1** 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. **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 that is free draining; b. does not involve excavation below ground level of more than 300mm within the undercroft area.	**AO9.1 and AO9.2: Not applicable. Complies with PO9.** No building undercroft is proposed; flood immunity is achieved through filling and minimum FFLs.
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. support efficient emergency services access and site evacuation with consideration to the scale of development. 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.	**AO10** 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 and Table 8.2.11.3.D; 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. 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.	The seniors living (Mission Australia) precinct is treated as a vulnerable use. Refer to their assessment for further details on this response.
PO11	**AO11.1**	**AO11.1: Complies with PO11.** The access road along the northern boundary has H1 hazard (generally safe for vehicles and people) in the 10% AEP

Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.	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 policy.	event and remains trafficable up to the 5% AEP event (Section 8.4). Shallow overland flow may occur on the access in the 10% AEP event, comparable to the existing access at Blinzinger Road, which also has H1 conditions. Safe vehicular, pedestrian and emergency access is therefore maintained. The access is not within the Creek/waterway flood planning area 1 sub-category. **AO11.2: Not applicable.** The Site is not within the Creek/waterway flood planning area 1, 2, 3 or 4 sub-categories.
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.	**Complies with PO12.** The new internal roads meet the QUDM local collector road criterion of hazard not exceeding H1 in the 10% AEP event, and remain trafficable up to the 2% AEP event (Section 8.4). Impacts on external roads are within tolerance or confined to the road corridor with no change in trafficability
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. **AO13.2** All new on-road cyclist and pedestrian facilities comply with the flood planning levels and trafficability standards	**Complies with AO13.1 and AO13.2.** Internal pedestrian paths are located on or alongside the internal road network, which remains trafficable up to the 5% AEP event (Section 8.4). No cyclist or pedestrian facilities are proposed through a park or adjacent to a watercourse.

	for the applicable category of road in Table 8.2.11.3.F or Table 8.2.11.3.K.	
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 1% AEP flood level is greater than 12.8m AHD involving: a. an increase in the number of residential dwellings; or b. additional residential lots 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.	**Not applicable.** The Site is not within the Brisbane River flood planning area sub-categories.
Additional performance outcomes and acceptable outcomes 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; 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;	**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 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	**Not applicable.** The development does not involve essential community infrastructure.

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.	ii. has a service continuity plan that demonstrates the continued provision of service during the relevant flood event.	
Additional performance outcomes and acceptable outcomes 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 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 affected 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.	**AO16** a. Development does not include the storage or handling of hazardous chemicals that exceed the hazardous chemicals flood hazard threshold quantities in Table 8.2.11.3.M. b. Development involving the processes 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 affected areas planning scheme policy and can operate without risk of environmental harm during a flood event. Note—The Management of hazardous chemicals in flood affected areas planning scheme policy sets out further information and processes including risk assessment for the management of hazardous chemicals in flood planning areas.	**Not applicable.** The development does not involve the storage or handling of hazardous chemicals above the threshold quantities in Table 8.2.11.3.M, or the processes in Table 8.2.11.3.H.
Additional performance outcomes and acceptable outcomes 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;	**AO17.1** Development creating new lots is identified in Table 8.2.11.3.I as suitable within the relevant flood planning area.	**Complies (where reconfiguring a lot applies).** AO17.1: All lots are outside the Downfall Creek flood extent up to the 0.2% AEP and are affected only by local overland

b. minimise damage to property from flood hazard; c. facilitate safe and efficient evacuation. Note— • Consideration of all floods up to the probable 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.	**AO17.2** 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 1% AEP 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.	flow, which is managed through filling and minimum FFLs (Sections 8.2 and 8.3). AO17.2: The road layout provides trafficable egress to Blinzinger Road during the defined flood event (H1 in the 10% AEP, trafficable to the 2% AEP; Section 8.4). AO17.3: Not applicable. The Site is not affected by Brisbane River flooding.
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.	**Complies (where reconfiguring a lot applies).** AO18.1: Lots achieve minimum FFLs 500 mm above the 2% AEP overland flow level (Table 9). Internal roads achieve H1 hazard in the 10% AEP (Section 8.4). AO18.2: Blinzinger Road (primary access) has H1 conditions in the 10% AEP event, consistent with QUDM trafficability requirements. The development generally reduces flood levels along Blinzinger Road (Section 7.3). AO18.3: Complies with PO18. Following filling, the 2% AEP overland flow within the Site is contained within internal road corridors and the drainage system. The reconstructed eastern boundary channel, which conveys external flows, is to be protected by a drainage easement (to be confirmed at detailed design).

	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 flooding; b. 1% AEP flood extent for creek/waterway flooding.	

Table 8.2.11.3.B—Flood planning levels for a dwelling house (excluding BCA building classification 10a)

Flooding source	**Minimum habitable floor level**	**Minimum non-habitable floor level (i.e. utility areas, garage, laundry, storage room and basement entries)**
Brisbane River	1% AEP flood level + 500mm	2% AEP flood level + 300mm
Creek/ waterway	1% AEP flood level + 500mm	1% AEP flood level + 300mm
Overland flow	2% AEP flood level + 500mm	2% AEP level + 300mm
	Note—Where no detailed flood level information is available from the Council such as an overland flow path, a Registered Professional Engineer Queensland with expertise in flood studies is to derive the relevant flood level and certify that the development level for the dwelling house, including any secondary dwelling, meets the required flood immunity standards.	

Note—
- Where the site is subject to more than one flooding source, the minimum flood planning level is the highest level determined from these flooding sources.
- Where development involves a building undercroft this may result in a higher floor level than the minimum habitable and non-habitable floor levels in Table 8.2.11.3.B.
- Flood planning levels for a dwelling house from storm-tide inundation are located in the Coastal hazard overlay code.

Table 8.2.11.3.C—Land use compatibility with flood hazard

C — Land use is compatible with the flood hazard subject to meeting all other relevant requirements.

— Flood risk assessment in accordance with requirements of the Flood planning scheme policy is required to demonstrate the use is compatible with the flood hazard.

Accommodation activities	**Brisbane River flood planning area sub-category**						**Creek/waterway flood planning area sub-category**					**Overland flow flood planning area sub-category**
	5	4	3	2B	2A	1	5	4	3	2	1	
Community residence	C	#	#	#	#	#	C	#	#	#	#	#
Dual occupancy	C	C	#	#	#	#	C	#	#	#	#	C
Dwelling unit	C	C	#	#	#	#	C	#	#	#	#	C
Multiple dwelling (1—3 storeys)	C	C	#	#	#	#	C	#	#	#	#	C
Multiple dwelling (4+ storeys)	C	C	C	#	#	#	C	#	#	#	#	C
Nature-based tourism	C	C	C	#	#	#	C	#	#	#	#	C
Relocatable home park	C	#	#	#	#	#	C	#	#	#	#	C
Residential care facility	#	#	#	#	#	#	#	#	#	#	#	#
Resort complex	C	C	C	#	#	#	C	#	#	#	#	C
Retirement facility	C	#	#	#	#	#	#	#	#	#	#	C
Rooming accommodation, short-term accommodation or hotel where including accommodation (1—3 storeys)	C	C	#	#	#	#	C	#	#	#	#	C

Rooming accommodation, short-term accommodation or hotel where including accommodation (4+ storeys)	C	C	C	#	#	#	C	#	#	#	#	C
Tourist park	C	C	#	#	#	#	C	C	#	#	#	C
Commercial land uses	**Brisbane River flood planning area sub-category**						**Creek/waterway flood planning area sub-category**					**Overland flow flood planning area sub-category**
	5	4	3	2B	2A	1	5	4	3	2	1	
Agricultural supplies store	C	C	#	#	#	#	C	#	#	#	#	C
Animal husbandry	C	C	#	#	#	#	C	#	#	#	#	C
Animal keeping	C	C	#	#	#	#	C	#	#	#	#	C
Aquaculture	C	C	#	#	#	#	C	#	#	#	#	C
Bulk landscape supplies	C	C	C	C	C	C	C	C	C	#	#	C
Car park ancillary to another use	C	C	C	C	C	#	C	C	#	#	#	C
Car wash	C	C	C	C	C	#	C	C	#	#	#	C
Food and drink outlet	C	C	#	#	#	#	C	C	#	#	#	C
Function facility	C	C	#	#	#	#	C	#	#	#	#	C

Garden centre	C	C	C	#	#	#	C	C	#	#	#	C
Hardware and trade supplies	C	C	#	#	#	#	C	C	#	#	#	C
Home-based business	C	C	#	#	#	#	C	#	#	#	#	C
Hotel (where not including accommodation)	C	C	#	#	#	#	C	#	#	#	#	C
Market	C	C	C	#	#	#	C	C	#	#	#	C
Nightclub entertainment facility	C	C	#	#	#	#	C	#	#	#	#	C
Office	C	C	#	#	#	#	C	#	#	#	#	C
Outdoor sales	C	C	#	#	#	#	C	C	#	#	#	C
Parking station	C	C	C	C	C	#	C	C	#	#	#	C
Roadside stalls	C	C	C	#	#	#	C	C	#	#	#	C
Sales office	C	C	#	#	#	#	C	C	#	#	#	C
Shop, Adult store	C	C	#	#	#	#	C	#	#	#	#	C
Shopping centre	C	#	#	#	#	#	C	#	#	#	#	C
Showroom	C	C	#	#	#	#	C	C	#	#	#	C
Theatre	C	C	#	#	#	#	C	#	#	#	#	C
Tourist attraction	C	C	C	#	#	#	C	C	#	#	#	C
Veterinary service	C	C	#	#	#	#	C	#	#	#	#	C
Wholesale nursery	C	C	C	C	C	C	C	C	C	#	#	C

Community land uses	**Brisbane River flood planning area sub-category**						**Creek/waterway flood planning area sub-category**					**Overland flow flood planning area sub-category**
	5	4	3	2B	2A	1	5	4	3	2	1	
Childcare centre	C	#	#	#	#	#	C	#	#	#	#	#
Club	C	C	#	#	#	#	C	C	#	#	#	C
Community care centre	C	#	#	#	#	#	C	#	#	#	#	C
Community use	C	#	#	#	#	#	C	C	#	#	#	C
Educational establishment (and outdoor education centre)	C	#	#	#	#	#	C	#	#	#	#	C
Environment facility	C	C	C	C	C	C	C	C	C	C	C	C
Health care service	C	#	#	#	#	#	C	#	#	#	#	C
Hospital	#	#	#	#	#	#	#	#	#	#	#	#
Indoor sport and recreation	C	C	#	#	#	#	C	C	#	#	#	C
Major sport, recreation and entertainment facility	C	#	#	#	#	#	C	C	#	#	#	C
Motor sport facility	C	C	C	#	#	#	C	C	C	#	#	C

Outdoor sport and recreation	C	C	C	#	#	#	C	C	#	#	#	C
Park	C	C	C	C	C	C	C	C	C	C	C	C
Place of worship	C	#	#	#	#	#	C	C	#	#	#	C
Special purpose land uses	**Brisbane River flood planning area sub-category**						**Creek/waterway flood planning area sub-category**					**Overland flow flood planning area sub-category**
	5	4	3	2B	2A	1	5	4	3	2	1	
Air service	C	#	#	#	#	#	C	#	#	#	#	C
Cemetery	C	C	C	#	#	#	C	C	#	#	#	C
Crematorium	C	#	#	#	#	#	C	#	#	#	#	C
Detention facility	#	#	#	#	#	#	#	#	#	#	#	C
Emergency services	#	#	#	#	#	#	#	#	#	#	#	#
Funeral parlour	C	#	#	#	#	#	C	#	#	#	#	C
Landing	C	C	C	C	C	C	C	C	C	C	#	C
Major electricity infrastructure	#	#	#	#	#	#	#	#	#	#	#	#
Port service	C	C	C	#	#	#	C	C	C	C	#	C
Substation	C	#	#	#	#	#	C	#	#	#	#	#
Telecommunications facility	C	#	#	#	#	#	C	#	#	#	#	#

Utility installation	C	#	#	#	#	#	#	#	#	#	#	#
Industry land uses	**Brisbane River flood planning area sub-category**						**Creek/waterway flood planning area sub-category**					**Overland flow flood planning area sub-category**
	5	4	3	2B	2A	1	5	4	3	2	1	
Extractive industry	C	C	C	#	#	#	C	C	C	#	#	C
High impact industry	C	C	#	#	#	#	C	C	#	#	#	C
Intensive animal industry	C	C	#	#	#	#	C	#	#	#	#	C
Intensive horticulture	C	C	C	#	#	#	C	C	#	#	#	C
Low impact industry	C	C	#	#	#	#	C	C	#	#	#	C
Marine industry	C	C	C	#	#	#	C	C	#	#	#	C
Medium impact industry	C	C	#	#	#	#	C	C	#	#	#	C
Research and technology industry	C	#	#	#	#	#	C	#	#	#	#	C
Rural industry	C	C	C	C	C	C	C	C	C	#	#	C
Service industry	C	C	#	#	#	#	C	C	#	#	#	C
Service station	C	#	#	#	#	#	C	#	#	#	#	C
Special industries	C	#	#	#	#	#	#	#	#	#	#	C
Transport depot	C	#	#	#	#	#	C	#	#	#	#	C

Warehouse	C	C	#	#	#	#	C	#	#	#	#	C

Note—Caretaker's accommodation and home-based business are considered ancillary to the dominant land use.

Table 8.2.11.3.D—Flood planning categories for development types

BCA building classification(1)	**Development types and design levels, assigned design floor or pavement levels**	**Category — refer to Table 8.2.11.3.L for flood planning levels**
Class 1—4	Habitable room(2)	Category A
	Non-habitable room including patio and courtyard	Category B
	Non-habitable part of a Class 2 or Class 3 building excluding the essential services(2) control room	Category B Risk management approach to Brisbane River flooding is permitted (refer to Flood planning scheme policy)
	Parking located in the building undercroft of a multiple dwelling	Category C
	Carport(4), unroofed car park; vehicular manoeuvring area	Category D
	Essential electrical services(2) of a Class 2 or Class 3 building only	Category A(6)
	Basement parking entry(3)	Category C + 300mm
Class 5, Class 6, or Class 8	Building floor level	Category C Risk management approach to Brisbane River flooding is permitted (refer to Flood planning scheme policy)
	Garage or car park located in the building undercroft(3)	Category C
	Carport(4) or unroofed car park	Category D
	Vehicular manoeuvring areas	Category D
	Basement parking entry(3)	Category C
	Essential electrical services(2)	Class 8 — Category C(6)

		Class 5 & 6 — Category A[6]
Class 7a	Refer to the relevant building class specified in this table	
Class 7b	Building floor level	Category C Risk management approach to Brisbane River flooding is permitted (refer to Flood planning scheme policy)
	Vehicular manoeuvring area	Category D
	Essential electrical services[2]	Category C
Class 9	Building floor level	Category A
	Building floor level for habitable rooms in Class 9a or 9c where for a residential care facility	0.2% AEP flood
	Building floor level for habitable rooms in Class 9b where involving children, such as a childcare centre	0.2% AEP flood
	Garage or car park located in the building undercroft[3]	Category C
	Carport[5] or unroofed car park	Category D
	Vehicular manoeuvring areas	Category D
	Essential electrical services[2]	Category A
Class 10a	Car parking facility	Refer to the relevant building class specified in this table
	Shed[5] or the like	Category D
Class 10b	Swimming pool	Category E
	Associated mechanical and electrical pool equipment	Category C
	Other structures	Flood planning levels do not apply

Notes—
[1] Refer to the Building Code of Australia for definitions of building classifications.

(2) Essential electrical services include any area or room used for fire control panel, telephone PABX, sensitive substation equipment including transformers, low voltage switch gear, high voltage switch gear, battery chargers, protection control and communication equipment, low voltage cables, high voltage cables, and lift or pump controls.
(3) Basement car parks must be suitably waterproofed and all air vents, air-conditioning ducts, pedestrian access and entry and exit ramps into the basement must comply with the applicable flood planning levels in this table.
(4) A shelter for a motor vehicle, which has a roof and one or more open sides, and which can be built against the side of a building.
(5) A slight or rough structure built for shelter and storage; or a large strongly built structure, often open at the sides or end.
(6) Where essential electrical services are proposed in a basement below the specified flood planning level, the flood immunity of all air vents, air-conditioning ducts, pedestrian access, lift shafts and entry/exit ramps at the basement entrance and any other openings into that basement must conform with the flood planning levels for Category A for Residential development, and the relevant basement entry level of all other uses. To ensure flood immunity, basements require a waterproof basement design to prevent flood waters entering the basement.

- A flood event with an AEP of 2% is the equivalent of a 50 year ARI flood event.
- A flood event with an AEP of 0.2% is the equivalent of a 500 year ARI flood event.
- Where a building has a combination of uses that includes a component of classes 2, 3 or 9, the essential services for that building shall comply with the requirements of the building class with the greatest flood planning level requirement.
- Use classes for residential development also include basement storage.

Table 8.2.11.3.E— Building undercroft clearances

Flooding source	**Minimum clearance requirement(1)(3)**
Overland flow— Hydraulic Hazard (DV <0.6 m^2/s and depth <600mm in 2% AEP flood event)	Lowest floor level is to be 1.5m(2) above the highest ground elevation in undercroft area
Overland flow— Hydraulic Hazard (DV >0.6 m^2/s or depth >600mm in 2% AEP flood event)	Lowest floor level is to be 2.5m(2) above the highest ground elevation in undercroft area
Creek/waterway (Flood planning area 1, 2 or 3 sub-categories)	Lowest floor level is to be 2.5m(2) above the highest ground elevation in undercroft area
Creek/waterway (Flood planning area 4 sub-category)	Lowest flood level is to be 1.5m(2) above the highest ground elevation in undercroft area

Notes—
(1) The minimum undercroft only relates to the minimum clearance requirements from ground level to the finished floor level and not minimum flood planning levels. Where the flood planning level requirement with freeboard results in a higher finished floor level that higher level needs to be adopted.
(2) Refer to the Flood planning scheme policy for explanatory material regarding clearances and considerations.
(3) The minimum undercroft clearance only applies to the area of undercroft above the relevant flood extent or flood planning area sub-category.

Table 8.2.11.3.F—Flood planning levels for a new road

Flooding source[1]	**Minimum design levels at the crown of the road (m AHD)[2]**	
	Residential development	**Industrial or commercial development**
Brisbane River[3]	Defined flood level	5% AEP flood level
Creek/waterway	1% AEP flood level	2% AEP flood level
Overland flow	2% AEP flood level	2% AEP flood level

Notes—
[1] Where the road is subject to more than one flooding source, the minimum flood planning level is the highest level determined from these sources.
[2] Where flood levels are not available from Council's FloodWise Property Report, such as for overland flow flooding, a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies is required to estimate the relevant flood level.
[3] A risk management approach determining flood planning levels of roads for Brisbane River flooding can be applied as an alternative to Table 8.2.11.3.F. Typically such roads would have a flood immunity no worse than the surrounding roads that support a similar land use, otherwise a Flood Risk Assessment which complies with the relevant requirements of the Flood planning scheme policy is provided.

Table 8.2.11.3.G—Flood planning levels for essential community infrastructure

Type of essential community infrastructure	**Minimum design levels**
Emergency services	0.2% AEP flood
Emergency services, where for an emergency shelter	0.5% AEP flood
Emergency services, where for police facilities	0.5% AEP flood
Hospital and health care service where associated with a hospital	0.2% AEP flood
Community facility where involving storage of valuable records or items of historic or cultural significance (e.g. galleries and libraries)	0.5% AEP flood
State-controlled roads Major or minor electricity infrastructure not otherwise listed in this table Utility installation where for rail transport services Air service Telecommunications facility	No specific recommended level but development proponents should ensure that the infrastructure is optimally located and designed to achieve suitable levels of service, having regard to the processes and policies of the administering government agency.

Power stations (as defined in the *Electricity Act 1994*) or renewable energy facility.	0.2% AEP flood
Major electricity infrastructure where a major switch yard	0.2% AEP flood
Substations	0.5% AEP flood
Utility installation where for a sewage treatment plant	Defined flood event
Utility installation where for a water treatment plant	0.5% AEP flood

Note—A flood event with an AEP of 0.2% is the equivalent of a 500 year ARI flood event.

Note—A flood event with an AEP of 0.5% is the equivalent of a 200 year ARI flood event.

Table 8.2.11.3.H—Table of processes requiring additional assessment in a flood planning area

Process
(1) Oil refining or processing
(2) Producing, refining or processing gas or fuel gas
(3) Power station, including the activity of generating electricity by using fuel
(4) Producing, quenching, cutting, crushing or grading coke
(5) Waste incinerator, including thermal treatment of waste
(6) Pulp or paper manufacturing
(7) Tannery or works for curing animal skins, hides or finishing leather
(8) Textile manufacturing, including carpet manufacturing, wool scouring or carbonising, cotton milling, or textile bleaching, dyeing or finishing
(9) Rendering plant, including meat processing
(10) Manufacturing chemicals, poisons and explosives
(11) Manufacturing fertilisers involving ammonia
(12) Manufacturing polyvinyl chloride plastic

(13) Major hazard facilities for the storage and handling of dangerous goods
(14) Storage of hazardous chemicals in quantities that would exceed the hazardous chemicals flood hazard threshold set out in Table 8.2.11.3.M
(15) Manufacturing medium-density fibreboard, chipboard, particle board, plywood, laminated board or wood veneer products
(16) Manufacturing or processing plaster
(17) Enamelling workshop
(18) Galvanising works
(19) Anodising or electroplating workshop
(20) Powder coating workshop
(21) Treating timber for preservation using chemicals including copper, chromium, arsenic, borax and creosote
(22) Manufacturing soil conditioners by receiving, blending, storing, processing, drying or composting organic material or organic waste, including animal manures, sewage, septic sludges and domestic waste
(23) Manufacturing tyres, asbestos products, asphalt, cement, glass or glass fibre, mineral wool or ceramic fibre
(24) Abattoir, including meat processing
(25) Recycling chemicals, oils or solvents
(26) Waste disposal activity (other than waste incinerator), including waste transfer station operation
(27) Recycling, storing or reprocessing regulated waste, including regulated waste treatment
(28) Manufacturing batteries and battery recycling
(29) Drum and container reconditioning
(30) Water treatment
(31) Sewage treatment

Table 8.2.11.3.I—Suitability of reconfiguring a lot within a flood planning area

C — Reconfiguring a lot is suitable within a flood planning area

— Flood risk assessment in accordance with the requirements of the Flood planning scheme policy is required to demonstrate the mitigation of risk from flood hazard

Flood planning area	**Creek/waterway flood planning area sub-categories**			**Brisbane River flood planning area sub-categories**		
	Residential	**Industrial**	**Other**	**Residential**	**Industrial**	**Other**
1	#	#	#	#	#	#
2/2a;2b	#	#	#	#	C	#
3	#	#	#	#	C	C
4	C	C	C	C	C	C
5	C	C	C	C	C	C

Notes—
- A flood risk assessment is required for residential reconfiguring a lot development where creating more than two new lots in the overland flow flood planning area sub-category.
- Additional requirements apply for the Brisbane River flood planning area sub-category if the 1% AEP flood level is greater than 12.8m AHD.
- Minimum site levels, requirements for no adverse off site impacts and other provisions in the planning scheme still apply.

Table 8.2.11.3.J—Flood planning levels for reconfiguring a lot

Flooding source(1)	**Minimum lot levels (m AHD)(2)**		
	Residential (creating 6 or less lots with no new road)	**Residential (creating more than 6 lots), or a new road**	**Other than residential**
Brisbane River	2% AEP flood level + 300mm	1% AEP flood level + 0.3m	1% AEP flood level
Creek/waterway	Minimum 300m^2 area at the 1% AEP flood level + 300mm(3)	1% AEP flood level + 300mm	2% AEP flood level
Overland flow	Minimum 300m^2 area at the 2% AEP flood level + 300mm(3)	2% AEP flood level + 300mm	2% AEP flood level

Notes—

(1) Where the site is subject to more than one flooding source, the minimum flood planning level is the highest level determined from these sources.
(2) Where flood levels are not available from Council's FloodWise Property Report such as for overland flow flooding, a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies is required to estimate the relevant flood level.
(3) The 300m^2 area is considered suitable for siting a dwelling house with open space area at or above the nominated flood planning level.

Table 8.2.11.3.K—Flood planning levels for existing road providing access to or fronting a development

Flooding source(1)	**Minimum design levels at the crown of the road (m AHD)(2)(3)**		
	Local road	**Neighbourhood road**	**District road, suburban road, arterial road**
Brisbane River	5% AEP flood level	2% AEP flood level	2% AEP flood level
Creek/waterway	5% AEP flood level	2% AEP flood level	2% AEP flood level
Overland flow	5% AEP flood level	5% AEP flood level	5% AEP flood level

Notes—
(1) Where the site is subject to more than one flooding source, the minimum flood planning level is the highest level determined from these sources.
(2) Where flood levels are not available from Council's FloodWise Property Report such as overland flow flooding a suitably qualified Registered Professional Engineer in Queensland with expertise in undertaking flood studies is required to estimate the relevant flood level. The Flood planning scheme policy sets out the requirements for a flood risk assessment process.
(3) The design standard for industry access is the 5% AEP flood level for all flooding sources.

Table 8.2.11.3.L—Categories of flood planning levels

Flooding source(1)	**Minimum design floor or pavement levels (m AHD)(2) (refer to Table 8.2.11.3.D for assignment of these categories)**				
	Category A	**Category B**	**Category C**	**Category D**	**Category E**
Brisbane River	1% AEP flood level + 500mm	1% AEP flood level + 300mm	DFL	5% AEP flood level	5% AEP flood level
Creek/ waterway	1% AEP flood level + 500mm	1% AEP flood level + 300mm	1% AEP flood level	1% AEP flood level	5% AEP flood level
Overland flow	2% AEP flood level	2% AEP flood level	2% AEP flood level	2% AEP flood level	5% AEP flood level

	+ 500mm	+ 300mm			

Notes—
(1) Where the site is subject to more than one type of flooding that is overland flow flooding, creek or waterway flooding or river flooding, the minimum flood immunity level is the highest level determined from these sources.
(2) Where flood levels are not available from Council's FloodWise Property Report such as overland flow flooding, the applicant will need to engage a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies required to estimate the relevant flood level. The Flood planning scheme policy sets out the requirements for a flood risk assessment process.

Table 8.2.11.3.M—Hazardous chemicals flood hazard threshold

Hazardous chemicals flood hazard threshold means any of the following:
A hazardous chemical listed in schedule 11 of the Work Health and Safety Regulation 2011 in a quantity that exceeds a threshold quantity stated in column 5 of schedule 11
A chemical classified as hazardous to the aquatic environment under the Australian Dangerous Goods Code in the Acute I or Chronic I category that exceeds 2500 litres or kilograms
A chemical classified as hazardous to the aquatic environment under the Australian Dangerous Goods Code in the Chronic II category that exceeds 10,000 litres or kilograms
A chemical classified as hazardous to the aquatic environment under the Australian Dangerous Goods Code and assigned to Packing Group III that exceeds 10,000 litres or kilograms
A chemical classified as hazardous to the aquatic environment under the Globally Harmonised System of Classification and Labelling of Chemicals that exceeds 10,000 litres or kilograms