

88 Waterloo Road, Macquarie Park

Prepared for Cottonwood Development Pty Ltd

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Document Information

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Introduction

Northrop Consulting Engineers have been engaged by Cottonwood Development Pty Ltd to prepare a Flood Impact and Risk Assessment (FIRA) Report to support the State Significant Development Application (SSDA) submission for the proposed redevelopment of 15-21 Cottonwood Crescent, Macquarie Park NSW 2113, herein known as 'the subject site' or 'the site'. To ensure consistent referencing can be achieved across the locality and immediate precinct within the Macquarie Park Corridor, the site that is the subject of this Application will be described in this report as 88 Waterloo Road, Macquarie Park.

The proposed SSDA seeks development consent for the demolition of existing buildings and construction of a residential development comprising two residential flat buildings above a common basement car park / sleaved podium incorporating residential, car parking, and a retail component within the Waterloo Road frontage.

Other key parameters include:

- Provision of 10% affordable housing per the uplift sought.
- 1 x 60-storey tower (205.5 m); and, 1 x 52-storey tower (179.4m)
- Floor Space Ratio (FSR) of 14.5:1

The proposal includes provision to amend Clauses 4.3 and 4.4 of the Ryde Local Environmental Plan 2014 (RLEP2014) by virtue of the concurrent rezoning process. This includes the following amendments:

- Clause 4.3 – Height of Buildings:
 - Amend the current 65m maximum building height to 205.5m
- Clause 4.4 – FSR:
 - Amend the current FSR of 4.5:1 to 14.5:1

Included herein is a:

- A summary of the purpose of the assessment
- Methodology for our assessment.
- Description of the subject site and proposed development.
- Overview of the flood behaviour in the vicinity of the site including a review of upstream flows derived from Elouera Reserve and Lauchlan Avenue.
- A summary of the development's response to the flood behaviour including the proposed Flood Protection Strategy
- Review of development compliance with:
 - Council's 2014 DCP, in particular Part 8.2 Stormwater and Floodplain Management.
 - Council's Stormwater and Floodplain Management Technical Manual.
 - Council's Local Environmental Plan (LEP) (2014) in particular part 5.21 – Flood Planning.
- A review of the suitability of on-site detention for the site.

Purpose of this Report

The purpose of Flood Impact and Risk Assessment (FIRA) is to assess the flood risk of the proposed development in accordance with the requirements of the Secretary's Environmental Assessment Requirements (SEARs) (SSD-9400608) and the government agency comments listed below.

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

This report has been prepared in response to the flood related Secretary's Environmental Assessment Requirements (SEARs), specifically Item 19 (Flood Risk) provided by the Department for this project (SSD-94006708) and dated the 8th of October 2025. A summary of the flood related SEARS and a response is presented in Table 1 below.

Table 1 – Response to SEARs

REQUIREMENT	RESPONSE
Identify the Flood Planning Area and level as set out in the relevant EPI and other supporting documents to determine; • The flood extent and velocity up to the Probable Maximum Flood and risk on-site having regard to adopted flood studies and, floodplain risk management studies and plans. • The site access and egress routes. • The potential effects of climate change. • Any relevant provisions of the NSW Flood Risk Management Manual, and any other relevant guidelines.	Ryde City Council's latest Harmonisation Study (WMAwater, 2025) presents the Flood Planning Area (FPA) and associated Flood Control Lots (FCL) across the Local Government Area (LGA). The study (WMAwater, 2025) recognises numbers 19 and 21 Cottonwood Cresnet to be a FCL however, have only been recognised under Clause 9(2) which relates to sensitive or hazardous development only. The development does not propose a sensitive or hazardous use, rather it proposes a mixed-use development which includes both retail and residential uses. Based on these classifications, the proposed development may not strictly require consideration to the flood controls outlined by Council's Local Environmental Plan (LEP) or Development Control Plan (DCP). Please refer to the Council Requirements Section of this report for further details. Due to its scale, flood related development controls have been reviewed for the proposed development so as to minimise the flood risk for the proposed facility. Please refer to the Council Requirements section of this report for further details. The flood extent and levels at the site are presented in the Flood Behaviour section of this report and have been extracted from the Flood Information Certificates provided by the City of Ryde Council for 15, 17, 19 and 21 Cottonwood Cresnet, Macquarie Park. These are summarised in the Flood Behaviour Section of this report. The site access and egress routes are presented in the Proposed Flood Protection Strategy of this report. It is also noted that refuge above the PMF is expected to be available within the facility. Provisions set out by the Council's LEP and DCP are summarised in the Council Requirements section of this report.
Where the development is occurring on flood prone land a flood impact and risk assessment (FIRA) must be prepared having regard to the Flood Impact and Risk Assessment – Flood Risk Management Guide LU01. When determining the scope and category of the FIRA the requirements outlined in the FIRA guide must be considered.	The subject site is not recognised to be located on a FCL for the type of development proposed as noted in Council's latest Harmonisation Study (WMAwater, 2025). This FIRA has been prepared generally in accordance with the Flood Impact and Risk Assessment Guidelines (LU01) as well as Local Council Guidelines. This report identifies the existing flood behaviour on the subject site, the flood risk to the proposed development and outlines how the proposed development responds to the existing flood risk so as to minimise risk to the community and to the users of the facility.

REQUIREMENT	RESPONSE
Detail any flood risk management measures that are to be incorporated as part of the development having regard to relevant guidelines (including any design solutions, flood modification measures, property modification measures, operational procedures or Flood Emergency Response Plan).	Flood risk management measures have been incorporated into the proposed design. All proposed residential apartments, retail spaces and the proposed basement is protected to a level at or above (whichever is higher): - 150mm above the adjacent road reserve levels - The 1% AEP + 300mm for flows derived by the Lachlan Avenue/ Elouera Reserve; - The 1% AEP + 500mm for flooding where adjacent to Cottonwood Crescent / Waterloo Road intersection sag; - The Probable Maximum Flood. See the Proposed Flood Protection Strategy section of this report and Figure 4 for additional details. Information with respect to development compliance with Council's LEP, DCP and technical manual are summarised in the Council Requirements section of this report.

CITY OF RYDE COUNCIL

This report has been prepared with consideration to the requirements set out in the City of Ryde Council

Table 2 – Response to City of Ryde Requirements and Report Reference

REQUIREMENT	RESPONSE
A HEC-RAS / TUFLOW 2D computer model file analysing pre and post development situations to confirm that the proposal does not have adverse impact on the adjacent properties. The applicant shall prove that the proposed development is not adversely affecting the flood conditions of neighbouring properties or downstream catchment.	Flood modelling at the subject site has been captured as part of Council's recently adopted Harmonisation Study (WMAwater, 2025). As noted above, Council's Harmonisation Study (WMAwater, 2025) recognises Numbers 19 and 21 Cottonwood Crescent to be a FCL and these lots have only been recognised under Clause 9(2) which relates to sensitive or hazardous development only. The development does not propose a sensitive or hazardous use, rather it proposes a mixed-use development which includes both retail and residential uses. Based on these classifications, the proposed development does not require consideration to the flood controls outlined by Council's Local Environmental Plan (LEP) or Development Control Plan (DCP). Please refer to the Council Requirements Section of this report for further details. As noted above, although perhaps not strictly required, flood related development controls have been reviewed for the proposed development so as to minimise the flood risk for the proposed facility. Please refer to the Council Requirements section of this report for further details.

REQUIREMENT	RESPONSE
	The Flood Information Certificates presented in Appendix A suggests the subject site is not prone to flooding from major overland flow during a 1% AEP and as such, the proposed development is not expected to significantly alter the existing flood behaviour at the subject site or in adjacent properties during this event.
Full electronic copies of executable TUFLOW modelling file compatible with QGIS software (including batch file for run and flood difference file) clearly identifying each scenario shall be submitted to Council for further assessment. Electronic copy of modelling results for pre and post development scenario for velocity, depth, flood level, VxD and VxD afflux, flood level afflux for 1% AEP in .asc format shall be submitted to Council for further assessment. If HECRAS 2D software is used, full electronic copies of executable HECRAS 2D modelling file compatible with QGIS software clearly identifying each scenario shall be submitted to Council for further assessment.	Site Specific and detailed flood modelling has not been prepared as part of this submission due to: • The absence of flood affectation across the subject site during the 1% AEP design storm event, as presented in Council's Flood Information Certificates presented in Appendix A (a strategy to manage local overland flows is presented herein); and • The lots not being classified as a flood control lot in accordance with Council's Harmonisation Study (WMAwater, 2025). Flood behaviour presented herein is based on Council's supplied Flood Information Certificates.
The pre and post development flood levels are to clearly be shown, inside the property and inside the neighbouring properties.	Flood behaviour in the vicinity of the subject site is presented in Council's supplied Flood Information Certificates, which are provided in Appendix A. As noted above, site specific and detailed flood modelling has not been prepared as part of this submission due to: • The absence of flood affectation across the subject site during the 1% AEP design storm event, as presented in Council's Flood Information Certificates presented in Appendix A; and • The lots not being classified as a flood control lot in accordance with Council's Harmonisation Study (WMAwater, 2025). As outlined in Council's Harmonisation Study (WMAwater, 2025) overland flows not recognised by the Harmonisation study is expected to be managed through typical site stormwater design, generally in accordance with Australian Standards and Council's Development Control Plan. Flood behaviour presented herein is based on Council's Flood Information Certificates which captures the latest flood data from Council's Harmonisation Study (WMAwater, 2025).
Flood level must be shown clearly inside and outside the development site, including neighbouring properties with 0.2m contour interval. Flood level afflux map must be shown clearly inside and outside the development site for 1% AEP flood event at 10-20mm interval, VxD maps at 0.2 m2/s interval and VxD afflux map at 0.04-0.05 m2/s interval in the flood report.	Flood behaviour in the vicinity of the subject site is presented in Council's Flood Information Certificates, which are provided in Appendix A. Additional information is also presented in the Flood Behaviour section of this report as well as Council's Harmonisation Study (WMAwater, 2025).

REQUIREMENT	RESPONSE
Describe the flood level impact and VD impact inside and outside the development site due to proposed development in the report.	Flood behaviour in the vicinity of the subject site is presented in Council's Flood Information Certificates, which are provided in Appendix A. Additional information is also presented in the Flood Behaviour section of this report as well as Council's Harmonisation Study (WMAwater, 2025).
Any cut and fill to be indicated in the flood model.	Please refer to the Civil Plans prepared by Enstruct for proposed site levels.
VD product (Velocity x depth) of overland flows to be supplied and, if increased inside the development, restricted to below 0.4 m ² /s. VxD map to be included in the Flood Study, including neighbouring properties (no increments in VD product is allowed inside the neighbouring property).	Flood behaviour in the vicinity of the subject site is presented in Council's Flood Information Certificates, which are provided in Appendix A. Additional information is also presented in the Flood Behaviour section of this report as well as Council's Harmonisation Study (WMAwater, 2025).
The proposed development should not adversely affect the existing flooding conditions of neighbouring properties or downstream catchment both within the 1% AEP flooding condition and PMF.	The Flood Information Certificates presented in Appendix A suggests the subject site is not prone to major overland flow flooding during a 1% AEP and as such, the proposed development is not expected to significantly alter the existing flood behaviour at the subject site or in adjacent properties during this event. The proposed development has the potential to partially fill within the extent of the PMF however, with the absence of sensitive or critical development in the vicinity of the subject site, potential changes in flood levels during the PMF are not expected to adversely impact vulnerable communities.
The proposed basement ramp crest must be raised up to Probable Maximum Flood (PMF) level before descending to basement to ensure flood immunity. A cross section of the basement ramp to be provided.	The proposed basement ramp has been raised above the PMF design storm event. Please refer to the Proposed Flood Protection Strategy section of this report for further details. Furthermore, please refer to the architectural plans for building sections.
Any other openings leading to the basement (e.g. emergency exits, vents etc.) must be located up to PMF level.	All proposed building entrances leading to the basement are raised or protected above the PMF design storm event. Please refer to the Proposed Flood Protection Strategy section of this report for further details.
Provide a certificate from the flood engineer that the proposed basement openings are not inundated during PMF flood event.	It is anticipated that the findings of this report will satisfy this requirement.

REQUIREMENT	RESPONSE
The use of flood barriers, which are intended to divert overland flow and preventing it entering habitable areas, will be considered subject to the demonstration that it does not exacerbate flood risk elsewhere. The applicant is to note, the development must still attain minimum freeboard requirements.	The flood protection strategy for the proposed development is presented in the Flood Protection Strategy section of this report.
Demonstrate the indicative design of the habitable/non-habitable building areas align with the minimum freeboard requirement in Ryde DCP 2014.	A review of the proposed Finished Floor Levels with respect to the minimum freeboard requirements set out in the Ryde DCP 2014 is presented in the Flood Protection Strategy section of this report.

Methodology

This study has been prepared generally following the below methodology:

- Review of the existing site conditions and proposed development.
- Review of existing flood conditions in the vicinity of the proposed development based on available Council flood information (Presented in Attachment A).
- Assessment of the proposed development with respect to Council's requirements outlined in the CoR's 2014 DCP, Part 8.2 Stormwater and Floodplain Management and Stormwater and Floodplain Management Technical Manual and the Local Environmental Plan (LEP) (2014).

Flood information presented herein has been obtained from the below sources:

- The City of Ryde Council Flood Harmonisation Study – Flood Study Update prepared by WMAwater and dated May 2025, herein referred to as the Harmonisation Study (WMAwater, 2025).
- The City of Ryde Council Macquarie Park Catchment Floodplain Risk Management Study and Plan prepared by Bewsher Consulting Pty Ltd and dated February 2011, herein referred to as the Macquarie Park FRMS&P (Bewsher, 2011).
- The City of Ryde Council DRAINS 1D hydrological and hydraulic model for Shrimptons Creek, prepared for the purposes of the Macquarie Park Catchment FRMS&P (Bewsher, 2011). The DRAINS model was provided by the City of Ryde Council under a data license agreement for the purposes of this assessment.
- Flood Information Request Certificates provided by the City of Ryde Council for 15, 17, 19 and 21 Cottonwood Crescent, Macquarie Park dated the 8th and 15th of December 2025 and presented in Appendix A.

Existing site levels and land use have been extracted from the detailed survey prepared by CMS surveyors Pty Ltd, dated the 25th of May 2023.

The Architectural Plans used in this assessment have been provided by AJC Architects and are dated January 2025.

Subject Site and Proposed Development

Subject Site

The subject site is located within the City of Ryde Local Government Area (LGA) at the corner of Waterloo Road and Cottonwood Crescent. The site is contained within Strata Plans SP8144, SP7630, SP7892 and SP7984. The characteristics of the subject site are presented in **Photo 1**, **Photo 2**, and **Photo 3** below. The locality is presented in Figure 1 overleaf.

The existing site land use is made up of four multi-storey flat residential buildings including the associated on-grade parking and landscaped areas. Vehicular access to each building is via Cottonwood Crescent. A series of footpaths provide access to the site via both Cottonwood Crescent and Waterloo Road.



Photo 1 - Looking North-West Towards 15 & 17 Cottonwood Crescent (© Google Maps)



Photo 2 - Looking North-West Towards 19 & 21 Cottonwood Crescent (© Google Maps)



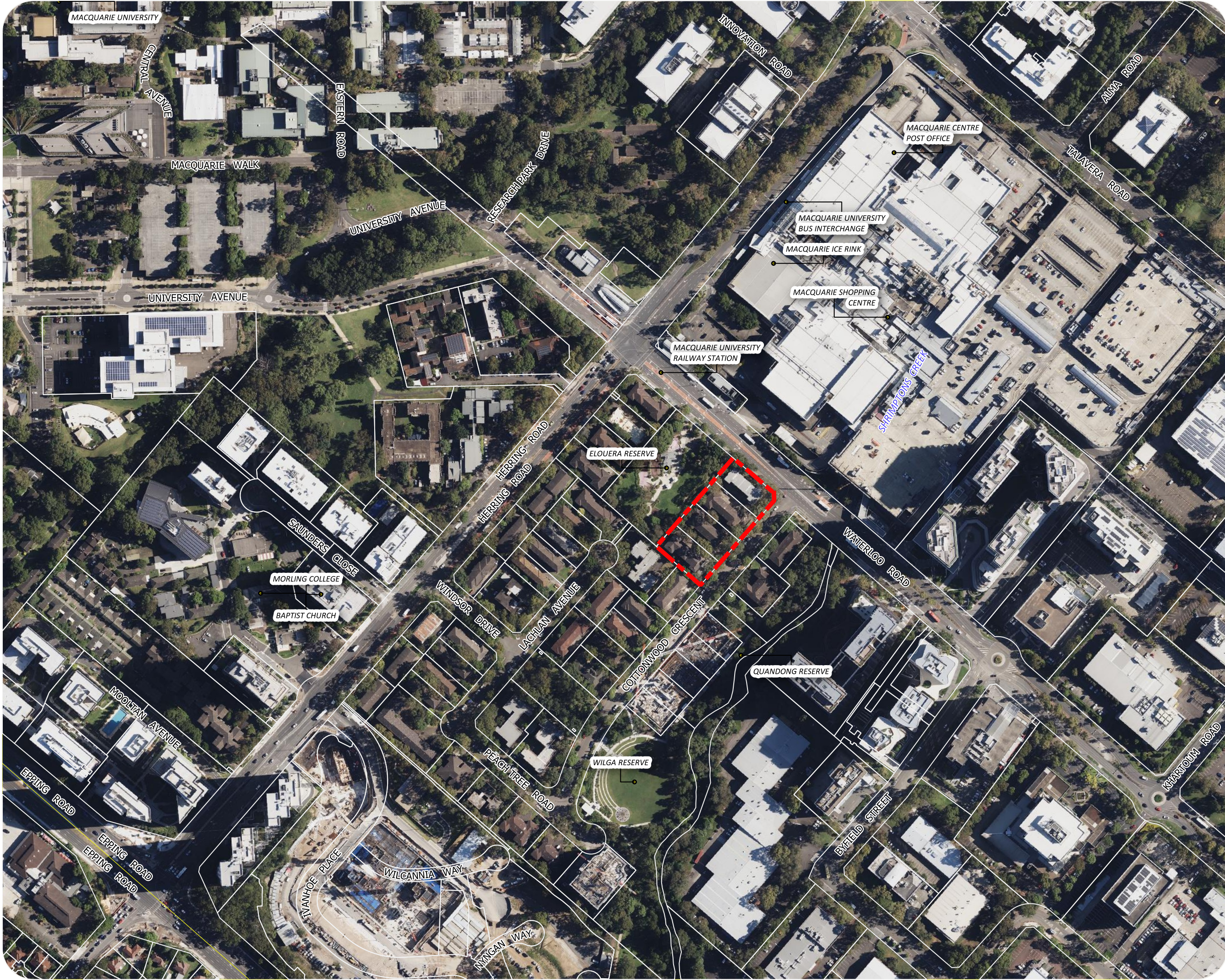
Photo 3 - Looking South-West Towards 21 Cottonwood Crescent from Waterloo Road (© Google Maps)

Proposed Development

The proposed SSDA seeks development consent for the construction of a residential development comprising two residential flat buildings above a common basement car park / sleaved podium incorporating residential, car parking, and a retail component within the Waterloo Road frontage. Other key parameters include:

- Demolition of existing residential flat buildings at the site.
- Bulk earthworks, including ground excavations to accommodate building foundations and basement car parking facilities. Augmentation of services to the site.
- Construction of two (2) residential towers above a single mixed-use podium, consisting of a 60-storey Cottonwood Tower and 52-storey Waterloo Tower.
- Vehicular access off Cottonwood Crescent to the proposed basement carparking facilities.
- Associated landscaping and vegetation around the subject site.

Refer to the architectural drawings prepared by AJC and dated December 2025 for more details.



Legend

 Subject Site

Figure 1

Locality



N

EPSG:28356
Scale 1:3000

0 50 100 m

Cottonwood Crescent
(NL231826)

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Flood Behaviour

Flood Mechanisms

Two flooding mechanisms are observed at the subject site. The first and most significant is derived by the Regional Shrimptons Creek Catchment while the second is minor flows derived by the upstream local catchment.

The regional Shrimptons Creek catchment extends south-west of the subject site into the upper reaches of Ryde and Denistone East. Flows derived by the regional catchment enter Shrimptons Creek and continue in a north-easterly direction towards Waterloo Road. Once at the Waterloo Road, flows enter a culvert which continues beneath Waterloo Road and the Macquarie Centre downstream of the site. Flows that exceed the capacity of the culvert continue overland, across Waterloo Road and onto Cottonwood Crescent. Downstream of the site, flows continue through the Macquarie Centre carpark before returning onto Shrimptons Creek and ultimately discharging to the Lane Cove River. Flooding generated by the Shrimptons Creek Catchment is largely contained within the adjacent Cottonwood Crescent and Waterloo Road located adjacent to the southern and eastern boundaries of the site.

The secondary Flooding Mechanism minor local overland flowpath which is derived the adjacent Elouera Reserve (North-west of the site) and Lachlan Avenue. It is noted that the secondary flow path is not recognised to pass over the subject site by Councils Flood Information Request Certificates (refer to Appendix A) or the Harmonisation Study (WMAwater, 2025) and as such, detailed flood modelling has not been prepared to analyse this flow path. This flow path has however, been considered when setting flood protection measures for the proposed development as discussed below.

This is generally consistent with the findings noted in Council's Harmonisation Study (WMAwater, 2025) which notes flows not defined by the study are expected to be managed through typical site stormwater design generally in accordance with Australian Standards and Council's Development Control Plan.

Regional Catchment

Flood information for the regional Shrimptons Creek catchment presented herein has been extracted from a combination of the Flood Information Certificates provided by Ryde City Council (refer to Appendix A) as well as from the Flood Harmonisation Study (WMA Water, 2025). The following Table 3 presents a summary of the Shrimptons Creek flood elevations presented in the Certificates at the site and in the vicinity.

Information presented in Council's Flood Information Certificates suggest flooding in the vicinity of the subject site is primarily focused around the road sag which is located at the intersection of Cottonwood Crescent and Waterloo Road. The remainder of both Cottonwood Crescent and Waterloo Road are observed to be primarily flood free during the 1% AEP, with some overland flow observed within the road reserve in Cottonwood Crescent during the PMF.

Table 3 – Cottonwood Crescent Site Flood Elevations

LOCATION	1% AEP FLOOD ELEVATION (M AHD)	PMF FLOOD ELEVATION (M AHD)
15 Cottonwood Crescent (South-Western Corner)	45.76*	45.97*
15/17 Cottonwood Crescent (Southern Corner of Shared Boundary)	44.76*	44.87*
17/19 Cottonwood Crescent (Southern Corner of Shared Boundary)	-	44.35
19/21 Cottonwood Crescent (Southern Corner of Shared Boundary)	-	44.29
21 Cottonwood Crescent (South-Eastern Corner)	-	44.29

LOCATION	1% AEP FLOOD ELEVATION (M AHD)	PMF FLOOD ELEVATION (M AHD)
Cottonwood / Waterloo Intersection	41.949	44.29

*Levels are based on points in the road reserve, rather than within the subject site itself.

Review of the Flood Harmonisation Study (WMA Water, 2025) suggests that the site remains flood free in a 1% AEP event with maximum flood depths reaching up to approx. one meter at the intersection of Cottonwood Crescent and Waterloo Road.

During the PMF flooding across the site is generally contained within numbers 19 and 21 Cottonwood Road and generally less than one meter is expected across the subject site. Depths in excess of 2 meters are expected at the intersection of Cottonwood Crescent and Waterloo Road.

Flood hazard conditions at the intersection of Cottonwood Crescent and Waterloo Road are observed to range up to H2/H3 during the 1% AEP and up to H5/H6 during the PMF design storm events.

FLOOD RISK CLASSIFICATION

Review of the Flood Information Certificate presented in Appendix A suggest the subject site is partially located within a Low Flood Risk Precinct (i.e. within the extent of the PMF) as presented in the below Figure 2. This indicates that the site is partially prone to flooding during the PMF however, also lies outside the extent of the 1% AEP which is typically classified by Medium or High Flood Risk Precincts.

The Flood Harmonisation Study (WMA Water, 2025) notes Council's DCP defines these Precincts quite broadly without any prescriptive criteria. Typically, a Low Flood Risk Precinct may be considered an area where the risk to property and life is low and development controls typically apply to Sensitive, Critical and Vulnerable development types (which are not proposed as part of this development).

It is noted that the subject site is located adjacent to the Medium Flood Risk Precinct which is recognised by the Flood Harmonisation Study (WMA Water, 2025) to be the remaining area of the 1% AEP with H3 hazard and below (i.e. hazards that remain safe for people and vehicles).

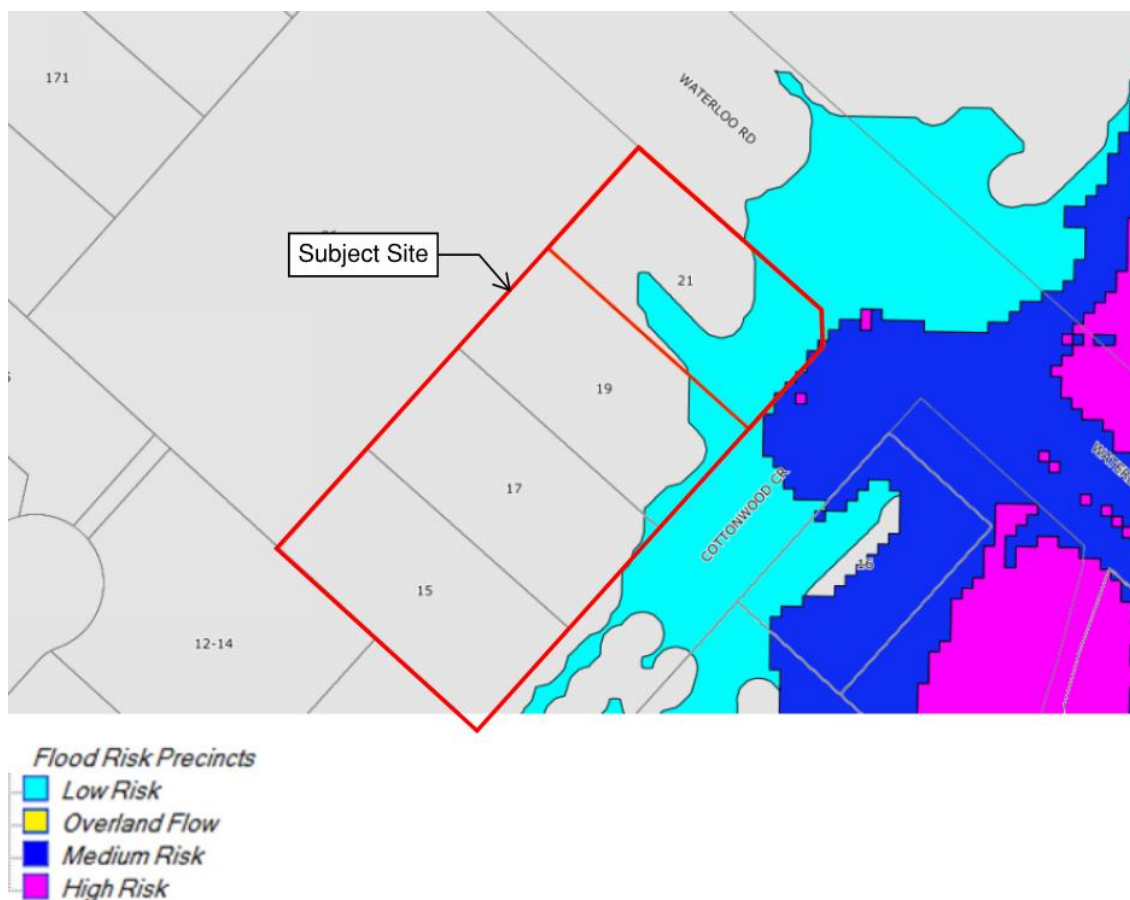


Figure 2 - Flood Risk Precincts (Ryde Council Flood Information Certificate – Refer to Appendix A).

Local Catchment

As mentioned above, a secondary minor overland flow path is recognised by this study derived by overflows from the adjacent Elouera Reserve (north-west boundary of the site) and Lachlan Avenue (south-western boundary of the site). These flow paths are presented in Figure 3 overleaf and have been considered in the design of flood mitigation measures for the proposed development.

The Macquarie Park Catchment FRMS&P (Bewsher, 2011) DRAINS model has been used to determine the approaching flows from these catchments. It is recognised that this DRAINS model has the potential to have been updated by the latest Flood Harmonisation Study (WMA Water, 2025) however, a review of the 1% AEP overland flows derived from Lachlan Avenue presented in the DRAINS model suggest the results generally align with those presented by the Flood Information Certificates provided in Appendix A.

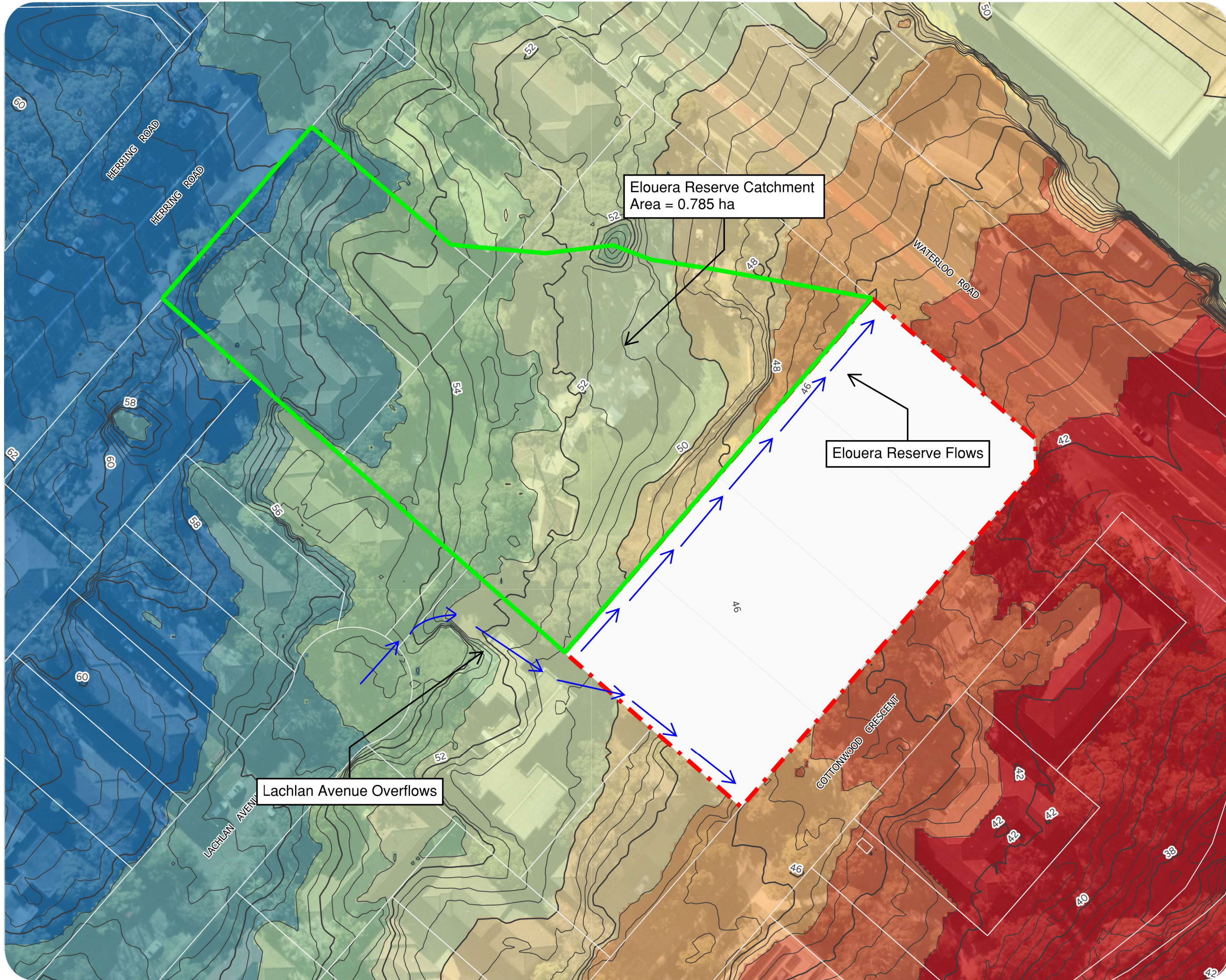
The DRAINS model provided by Council includes the stormwater network, and overland flows from Lachlan Avenue however, the Elouera Reserve flows were not. As such, to determine the flows approaching from Elouera Reserve a lumped catchment was added into the supplied DRAINS model.

Figure 3 provided overleaf presents the modelled contributing catchment from Elouera Reserve. The following Table 4 presents the 1% AEP and PMF peak flows determined by the DRAINS model from both Elouera Reserve and Lachlan Avenue.

Table 4 - Peak Flows (Elouera Reserve and Lachlan Avenue)

LOCATION	1% AEP (M³/S)	PMF (M³/S)
Elouera Reserve	0.45	1.84
Lachlan Avenue	0.23	1.75

These flows have been managed on site through the design of diversion channels and flood walls. Please refer to the Civil and Architectural plans for more details.



Legend

- Subject Site
- Upstream Catchments
- Terrain Contours (m AHD)

LiDAR Terrain (m AHD)

<= 42.5
42.5 - 45.0
45.0 - 47.5
47.5 - 50.0
50.0 - 52.5
52.5 - 55.0
55.0 - 57.5
> 57.5

Elouera Reserve Catchment
Area = 0.785 ha

Elouera Reserve Flows

Lachlan Avenue Overflows

Figure 3

Upstream Catchment

EPSG:28356
Scale 1:750

0 10 20 m

Cottonwood Crescent
(NL231826)

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Proposed Flood Protection Strategy

Although the site is not recognised as a Flood Control Lot in accordance with Council's Harmonisation Study (WMAwater, 2025), flood related development controls have been reviewed for the proposed development so as to minimise the flood risk for the proposed facility.

Flood Planning Levels noted in Table 2.1 of the Stormwater Technical manual have been considered in the Flood Protection Strategy presented in Figure 3 and Figure 4 below.

The development is proposed to be protected to a level at or above (whichever is higher):

1. 150mm above the adjacent surface level at the road reserve / verge
2. The 1% AEP + 300mm for flows derived by the Lachlan Avenue/ Elouera Reserve; OR
3. The 1% AEP + 500mm for Flooding where adjacent to Cottonwood Crescent / Waterloo Road Sag; OR
4. The Probable Maximum Flood

Additional information with respect to development compliance with Council's LEP, DCP and technical manual are summarised in the Council Requirements section below.

PUBLISHED DATE: 30/05/2026 09:17 PM
PUBLISHED DATE: 30/05/2026 09:17 PM
THE CONTENT OF THIS DRAWING MUST BE UNDERSTOOD IN THE CONTEXT OF THE SHEET STATUS AND READ IN CONJUNCTION WITH THE GENERAL NOTES FOUND ON THE COVER PAGE OF THIS DOCUMENT SET. DO NOT USE THE CONTENT OF THIS DRAWING FOR USES THAT ARE NOT CONSISTENT WITH THE INTENDED STATUS OF THE DRAWING. DIMENSIONS ONLY IF IN DOUBT. CONTACT AEC FOR CLARIFICATION.

CAR PARKING TYPE:

- RESIDENTIAL
CAR SHARE
VISITOR

SCH_Car Parking Schedule

Type	Comments	Count
LEVEL 03		
ACCESS		3
RESI		55
LEVEL 02		
ACCESS		3
RESI		55
LEVEL 01		
ACCESS		3
RESI		41
UPPER GROUND		
ACCESS		5
RESI		24
LOWER GROUND		
BIKE RACK		1
SHARE		1
VISITOR		32
BASEMENT 1		
ACCESS		10
RESI		74
BASEMENT 2		
ACCESS		10
RESI		75
BASEMENT 3		
ACCESS		10
RESI		75
BASEMENT 4		
ACCESS		10
RESI		75
BASEMENT 5		
ACCESS		10
RESI		75
BASEMENT 6		
ACCESS		10
RESI		77
BIKE RACK		14
Grand total: 748		

APARTMENT TYPE

- STUDIO
2B2B TH
1B1B
1B1B & MPR
2B1B
2B2B
2B2B & MPR
3B2B
3B3B
3B3B & MPR
3B4B PH
4B3B
4B5B PH

SHEET NUMBER
DA2008

REVISION
11

SCALE
As indicated

11

SHEET TITLE
UPPER GROUND

REV	DATE	DESCRIPTION	DN	AP
11	30/01/26	ISSUED FOR INFORMATION		
10	23/01/26	ISSUED FOR INFORMATION		

SHEET STATUS
NOT FOR CONSTRUCTION

General Notes
AEP = Annual Exceedance Probability
PMF = Probable Maximum Flood
NS = Natural Surface (CMS, 25/05/23)
FFL = Finished Floor Level
Flood levels shown that are not noted on the Flood Certificate levels have been interpolated between known levels noted on the Flood Certificate.

NORTHROP MARKUP
FIGURE 4 - FLOOD PROTECTION
STRATEGY FOR UPPER
GROUND FLOOR LEVEL
NL231826-01
DATE: 06/02/2026
REVISION 3

PROJECT
88 WATERLOO
DEVELOPMENT
APPLICATION
PROJECT NO
23024

LOCATION
88 Waterloo Road,
Macquarie Park, NSW,
2113

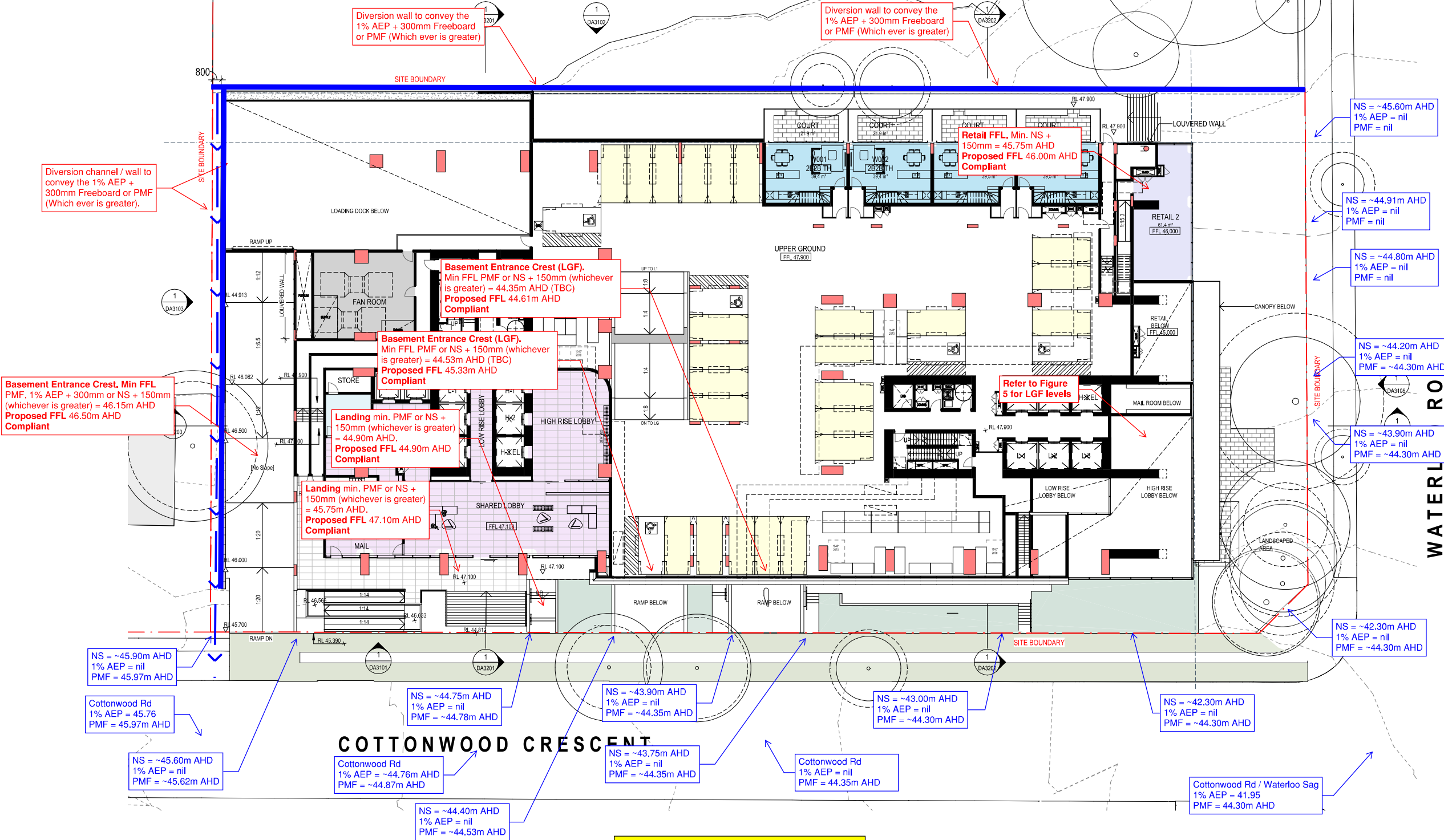
CLIENT
Bilgerie & Legacy Property
acting as Cottonwood
Development Pty Ltd

NOMINATED ARCHITECTS:
MICHAEL HEENAN 5264,
BRIAN MARIOTTI 9451,
JOHN WHITTINGHAM 7030

GADIGAL COUNTRY
79 MYRTLE STREET
CHIPPENDALE NSW, 2008 AUSTRALIA
+612 9311 8222 ARCHITECTSAJC.COM
ABN 53 003 782 250



1 DA2008 - UPPER GROUND
1:200



Council Requirements

FLOOD CONTROL LOT

Council's Harmonisation Study (WMAwater, 2025) presents the Flood Planning Area and corresponding Flood Control Lots across the Local Government Area (LGA). As outlined in the Harmonisation Study (WMAwater, 2025) the Flood Planning Area (FPA) and classification of Flood Control Lots (FCL) are typically used to identify properties across the LGA that require consideration to additional development controls so as to minimise flood risk to future development.

This is reinforced by NSW Environmental Planning Instruments (EPIs) such as the NSW Ministerial Direction and Council's Local Environmental Plan (LEP) whereby properties tagged as being located within the Flood Planning Area (FPA) are required to be assessed by LEP clauses such as 5.21 – Flood Planning as well as 5.22 – Special Flood Considerations. It is noted that at the time of preparation of this report, Ryde City Council have not adopted Clause 5.22 of the LEP which typically applies to properties located between the FPA and the PMF.

As shown in the below Figure 6 the study (WMAwater, 2025) recognises only Numbers 19 and 21 Cottonwood Crescent as a Flood Control Lot and have been identified under Clause 9(2) which relates to properties above the FPA but below the PMF. This classification (i.e. Clause 9(2)) is noted by Council's Harmonisation Study (WMAwater, 2025) to be gauged towards sensitive or hazardous development only.

The development does not propose a sensitive or hazardous use, rather it proposes a mixed-use development which includes both retail and residential uses. Based on these classifications and the absence of adoption of Clause 5.22 in the City of Ryde LEP, the proposed development does not require consideration to the flood controls outlined by Council's Local Environmental Plan (LEP) and therefore Development Control Plan (DCP).

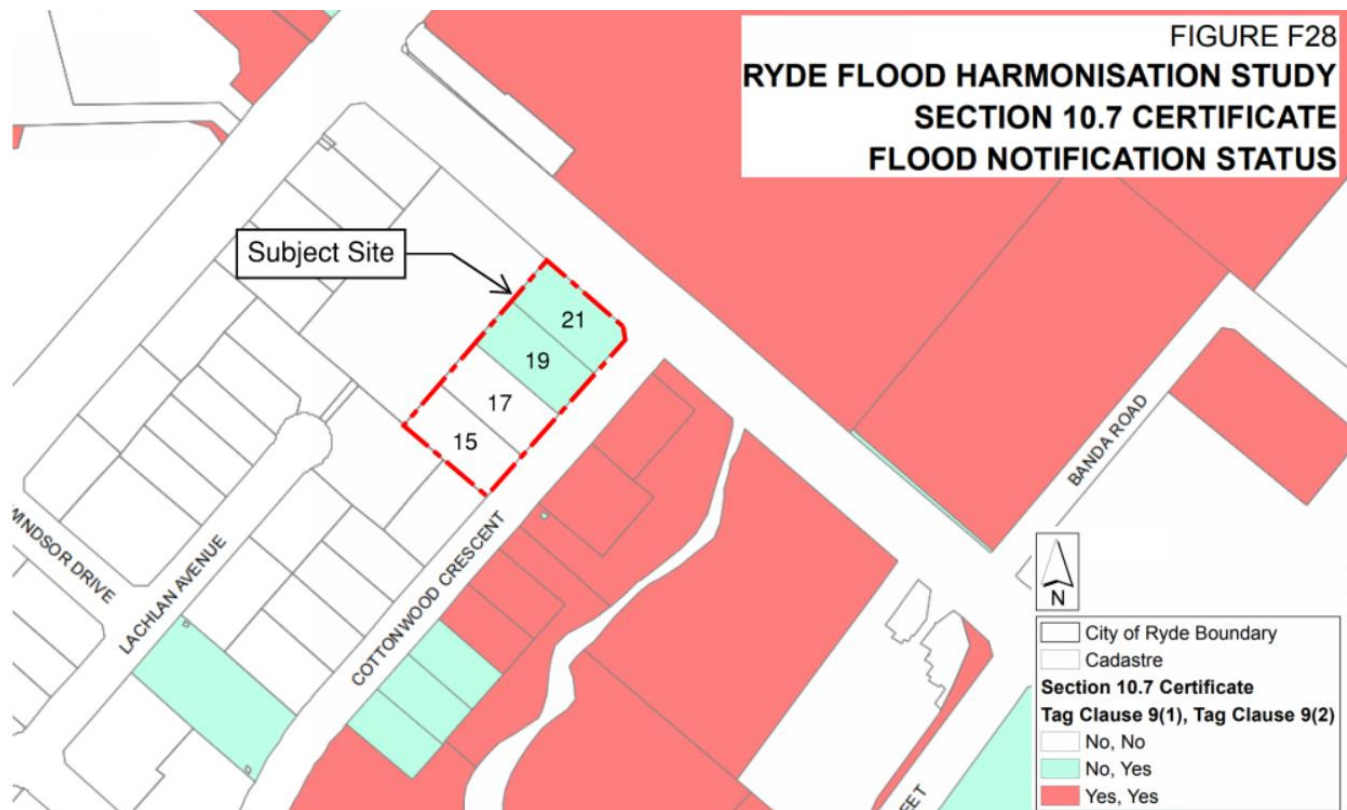


Figure 6 - Harmonisation Study Figure F28 Excerpt (WMAwater, 2025)

Due to its scale, flood related development controls have been reviewed for the proposed development, so as to minimise the flood risk for the proposed facility. A mark-up of flood protection measures for the proposed development is presented in the above Figure 4 and Figure 5. The following section presents how the proposed development satisfies the necessary flood protection requirements set out by Council's Local Environmental Plan and Development Control Plan.

LOCAL ENVIRONMENTAL PLAN

The proposed development has been assessed with respect to the City of Ryde Local Environmental Plan (LEP) (2014) in particular Part 5.21 – Flood Planning. The requirements of the LEP (2014) and the proposed development response is presented in the following Table 5.

Table 5 – Council LEP Requirements

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
(1)	The objectives of this clause are as follows -		
(A)	To minimise the flood risk to life and property associated with the use of land,	The proposed development has been sited in accordance with Council's Development Control Plan (2014). Similarly, refuge above the worst case PMF is expected to be available within the building, if required. With protection of the proposed facility generally in accordance with Council's Development Control Plan (2014) and availability of refuge on-site, if required, the risk to life and property on the site is considered to be managed appropriately.	Yes
(B)	To allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change.	The subject site is not recognised to be located within Floodway and is not recognised as a Flood Control Lot for the purposes of the type of development. As such, it is considered compatible with the flood function and behaviour on the land.	Yes
(C)	To avoid adverse or cumulative impacts on flood behaviour and the environment,	As noted above, and presented in the Flood Information Certificates provided in Appendix A, the subject site is not located within the FPA and is outside the 1% AEP flood extent. As such, the proposed development is not expected to create a significant adverse flood impact during these events.	Yes
(D)	To enable the safe occupation and efficient evacuation of people in the event of a flood.	With protection of the proposed facility generally in accordance with Council's Development Control Plan (2014) and availability of refuge on-site, if required, the risk to life and property on the site is considered to be managed appropriately. As such, the proposed development is considered to enable the safe occupation and efficient evacuation of people in the event of a flood.	Yes

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
(2)	Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development.		
(A)	Is compatible with the flood function and behaviour on the land, and	The proposed development is not identified to be located within floodway hydraulic behaviour and is not classified as a FCL for the purposes of the type of development. As such, it is considered compatible with the flood function and behaviour of the land.	Yes
(B)	Will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	As noted above, and presented in the Flood Information Certificates provided in Appendix A, the subject site is not located within the FPA and is outside the 1% AEP flood extent. As such, the proposed development is not expected to create a significant adverse flood impact during these events.	Yes
(C)	Will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	Refuge above the worst case PMF is expected to be available within the building. As such, the proposed development is not expected to impact existing evacuation routes in the event of a flood.	Yes
(D)	Incorporates appropriate measures to manage risk to life in the event of a flood, and	The proposed development has been sited generally in accordance with Council's Development Control Plan (2014). Similarly, refuge above the worst case PMF is expected to be available within the building, if required. As such, the proposed development is considered to incorporate appropriate measures to manage risk to life in the event of a flood.	Yes
(E)	Will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	The proposed development is not expected to adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses. The OSD assessment presented below notes that with the removal of OSD, the proposed development is expected to reduce peak flows downstream.	Yes

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
(3)	In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters:		
(A)	The impact of the development on projected changes to flood behaviour as a result of climate change.	The proposed development has been sited generally in accordance with Council's Development Control Plan (2014) with consideration to the flood levels provided in Council's Flood Information Certificates, presented in Appendix A.	Yes
(B)	The intended design and scale of buildings resulting from the development,	The proposed development has been sited generally in accordance with Council's Development Control Plan (2014) and is not expected to create a significant adverse flood impact during the 1% AEP design storm event. As such, the intended scale of the development is considered appropriate from a flooding perspective.	Yes
(C)	Whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	The proposed development has been sited generally in accordance with Council's Development Control Plan (2014). Similarly, refuge above the worst case PMF is expected to be available within the building. As such, the proposed development is considered to enable the safe occupation and efficient evacuation of people in the event of a flood.	Yes
(D)	The potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	The proposed development has been sited generally in accordance with Council's Development Control Plan (2014) and as such is considered to satisfy this requirement.	Yes

DEVELOPMENT CONTROL PLAN

The Development Control Plan (2014), Part 8.2 Stormwater and Floodplain Management outlines Council's flood related development controls. How the proposed development satisfies each of the requirements is summarised below in Table 6.

Table 6 – Council DCP Requirements

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
4.4.1 DEVELOPMENT IN THE FLOOD PLANNING AREA	For all development that is flood affected, a Flood Impact Statement must be submitted to Council. The Flood Impact Statement is to be prepared in accordance with Section 2.2 of the Stormwater and Floodplain Management Technical Manual and is required to address the various controls related to the following development types.	This Flood Assessment Report has been prepared generally in accordance with Section 2.2 of the Stormwater and Floodplain Management Technical Manual. Refuge on-site is available in the event of a major or extreme flood event. Evacuation during the 1% AEP is expected to be possible via the proposed driveway located in the south-eastern corner of the site (although not recommended during the peak of the flood event).	Yes
4.4.2 CARPARKING AREAS	To minimise property damage, the following finished surface levels must be attained for new parking areas; - For open parking areas, no less than the 100yr ARI flood level. - For enclosed parking areas, the parking area must be no less than the 100yr ARI flood level plus 150mm freeboard. - Basement parking or parking at levels below the adjacent flood levels, a bunded crest at the estimated PMF (probable maximum flood) level prior to descent into the parking area, must be provided such that inundation of the area is prevented. - For new parking areas associated with concessional development, parking areas are to be elevated to habitable floor level.	- Open parking areas are not included as part of the proposed development and therefore this item is not applicable. - Enclosed parking areas are not included as part of the proposed development and therefore this item is not applicable. - Basement carparking is proposed as part of the development. Flood protection for entrances / openings into the basement are proposed to be located at or above the PMF flood event. - The proposed development does not seek approval through the concessional development assessment pathway and as such, this item is not applicable. Please refer to Figure 4 and Figure 5 for further details with respect to proposed flood protection measures.	Yes
	New parking areas must not divert overland flow or reduce flood storage such to adversely impact the surrounding area.	The subject site is not identified to be located within the FPA and therefore, this item is not applicable.	N/A

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
	Large open parking areas (greater than 10 car spaces) must provide adequate restraints or barriers to prevent vehicles leaving the site up to the 100yr ARI flood event.	Open car parking is not proposed as part of the proposed and therefore, this item is not applicable.	N/A
	The utilisation of existing parking areas must not result in the increased risk to property damage or threat to public safety.	Existing parking areas are not proposed to be re-used as part of the development and therefore, this item is not applicable.	N/A
4.4.3 LANDFORM DEVELOPMENT	For landform development exposed to Low Risk and above Flood Risk Category (or where this is not known, the indicative extent of inundation on Councils mapping system) the following must occur. - Fences are permeable, open or otherwise a frangible structure, such to permit the conveyance of floodwaters below the 100yr ARI flood event. In the event the flood level is unknown, 200mm above ground level is to be adopted. - The face of retaining walls, pools or garden beds aligned towards overland flows are no greater than 200mm in height, unless it can be demonstrated such a structure will not have an adverse impact to the surrounding area by way of a Flood Impact Statement.	The proposed development is partially located within a Low Flood Risk Precinct/ Category (i.e. PMF) and is not identified to be located within an Overland Flow Precinct or the modelled 1% AEP extent as presented in the Flood Information Certificates provided in Appendix A. As such, the proposed development is not expected obstruct the modelled 100yr ARI (i.e. 1% AEP) flood extents.	Yes
4.4.5 RESIDENTIAL	Residential development on land subject to flood risk categorised as high will not be permitted unless it can be clearly demonstrated that development under this section can be undertaken on the land without jeopardising public safety and access, property damage or adverse ramifications of the pre-developed flood regime by means of a Flood Impact Statement.	The proposed development is not located in a High Flood Risk Precinct and as such, this item is not applicable.	N/A

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
	Floor levels of habitable and non-habitable areas must comply with the freeboard requirements as stated in Table 2.1 of the Stormwater Technical Manual.	Flood Planning Levels noted in Table 2.1 of the Stormwater Technical manual have been considered in the Flood Protection Strategy presented in Figure 4 and Figure 5 above. Refer to the Proposed Flood Protection Strategy section of this report for details.	Yes
	New structures subject to flooding and overland flow (excluding those sites located in Overland Flow Precincts) must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater, below the minimum freeboard requirement, the development structure must: • Be constructed of flood compatible building components in accordance with the Stormwater and Floodplain Management Technical Manual. • A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the 100yr ARI flood event.	All parts of the development are proposed to be protected to the necessary FPL as presented in Figure 4 and Figure 5. The proposed flood mitigation measures are to be designed to withstand flood forces. Structural capacity is expected to be reviewed at Construction Certificate phase. Given the robust nature of the proposed building, flood affects are not expected to be limiting in design. Additionally, all external building elements below the Flood Planning Level are to be designed using flood compatible building components.	Yes
	Development must not divert major overland flows or reduce flood storage such to adversely impact the neighbouring property or surrounding area. It must be demonstrated the development does not; • Reduce the pre-developed level of flood storage. • Increase flood levels or velocities such to adversely impact adjoining dwellings.	The subject site is not located within an Overland Flow Precinct or Flood Storage Area as noted in Council's Flood Information Certificates.	Yes
	If the development under this development type category involves subdivision of the land, it must be demonstrated that any potential development of this newly created allotment can comply with the controls under this section.	The proposed development does not include subdivision of land therefore, this item is not applicable.	N/A

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
	A restrictive covenant must be placed on the title of the land to ensure there are no further significant works and alterations to the landform or development are undertaken without the approval of Council such to impact on flooding.	Consideration to a restrictive or positive covenants may be made for the proposed flood mitigation measures to ensure mitigation measures remain in-place and are maintained for the life of the development.	Yes
4.4.6 COMMERCIAL OR INDUSTRIAL	Commercial development on land subject to flood risk categorised as high will not be permitted unless it can be clearly demonstrated that development under this section can be undertaken on the land without jeopardising public safety and access, property damage or adverse ramifications of the pre-developed flood regime by means of a Flood Impact Statement.	The proposed development is not located in a High Flood Risk Precinct and as such, this item is not applicable.	N/A
	Floor levels of habitable and non-habitable areas must comply with the freeboard requirements as stated in Table 2.1 of the Stormwater Technical Manual. If these levels cannot be practically achieved for the entire floor area (E.g. for reasons of accessibility from a public space) then a lesser level may be considered subject to consideration of the extent or scale of property damage and risk to public safety.	Flood Planning Levels noted in Table 2.1 of the Stormwater Technical manual have been considered in the Flood Protection Strategy presented in Figure 4 and Figure 5 above. Refer to the Proposed Flood Protection Strategy section of this report for details.	Yes
	New structures subject to flood waters and major overland flows (excluding those sites located in Overland Flow Precincts) must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater, below the minimum freeboard requirement, the development structure must: • Be constructed of flood compatible building components in accordance with the Stormwater Technical Manual. • A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater,	All parts of the development are proposed to be protected to the necessary FPL as presented in Figure 4 and Figure 5. The proposed flood mitigation measures are to be designed to withstand flood forces. Structural capacity is expected to be reviewed at Construction Certificate phase. Given the robust nature of the proposed building, flood affects are not expected to be limiting in design. Additionally, all external building elements below the Flood Planning Level are to be designed using flood compatible building components.	Yes

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
	debris, buoyancy forces anticipated by the 100yr ARI flood event.		
	Development must not adversely impact the existing flood regime in terms of diverting major overland flows or reduce flood storage such to adversely impact Stormwater and Floodplain Management in the surrounding area. The submitted Flood Impact Statement must demonstrate the development does not; • Reduce the pre-developed level of flood storage. • Increase flood levels or velocities such to adversely impact adjoining dwellings.	The subject site is not located within an Overland Flow Precinct or Flood Storage Area as noted in Council's Flood Information Certificates.	N/A
	All goods and materials must be stored at the minimum habitable floor level, complying with the freeboard requirements as stated in Table 2.1 of the Stormwater Technical Manual, unless the site is located in an Overland Flow Precinct in which case this may be reduced to 500mm above the adjoining ground level. Exemptions from this may be considered if it can be demonstrated in the Flood Impact Statement, that the materials will not adversely impact the surrounding environment or can be damaged if subject to stormwater inundation.	Flood Planning Levels noted in Table 2.1 of the Stormwater Technical manual have been considered in the Flood Protection Strategy presented in Figure 4 and Figure 5 above. Refer to the Proposed Flood Protection Strategy section of this report for details. As such, any storage of goods and materials internally is expected to be protected to a minimum of the levels presented by the Flood Protection Strategy. The storage of goods and materials external to the building is to be limited to areas above the Flood Planning Level.	Yes
	If the development under this development type category involves subdivision of the land, it must be demonstrated that potential development of this newly created allotment can comply with controls under this section.	The proposed development does not involve subdivision of the land therefore, not applicable.	N/A

CLAUSE	REQUIREMENT	ASSESSMENT	COMPLIANT?
	A restrictive covenant must be placed on the title of the land to ensure there are no further significant works and alterations to the landform or development are undertaken without the approval of Council such to impact on floodwaters.	Consideration to a restrictive or positive covenants may be made for the proposed flood mitigation measures to ensure mitigation measures remain in-place and are maintained for the life of the development.	Yes

Onsite Detention Assessment

A review of the appropriateness of stormwater detention for the proposed development has been performed to understand what benefit On-Site Detention (OSD) may have for the site and for the regional Shrimptons Creek catchment.

The City of Ryde Council DRAINS 1D hydrological and hydraulic model for Shrimptons Creek has been used for the purposes of the analysis. This model was provided by Council under a license agreement for the purposes of the assessment.

Three major reporting points have been reviewed as part of the analysis. These are presented in Figure 7 below and include flows in Shrimptons Creek, both upstream (location 1) and downstream (location 3) of Waterloo Road and flows passing from Cottonwood Road, approaching the sag in Waterloo Road, directly downstream of the subject site (location 2).

Note that flows reported downstream of Shrimptons Creek are based on the excess flows that overtop Waterloo Road (i.e. overland flows that exceed the capacity of the culvert beneath Waterloo Road).

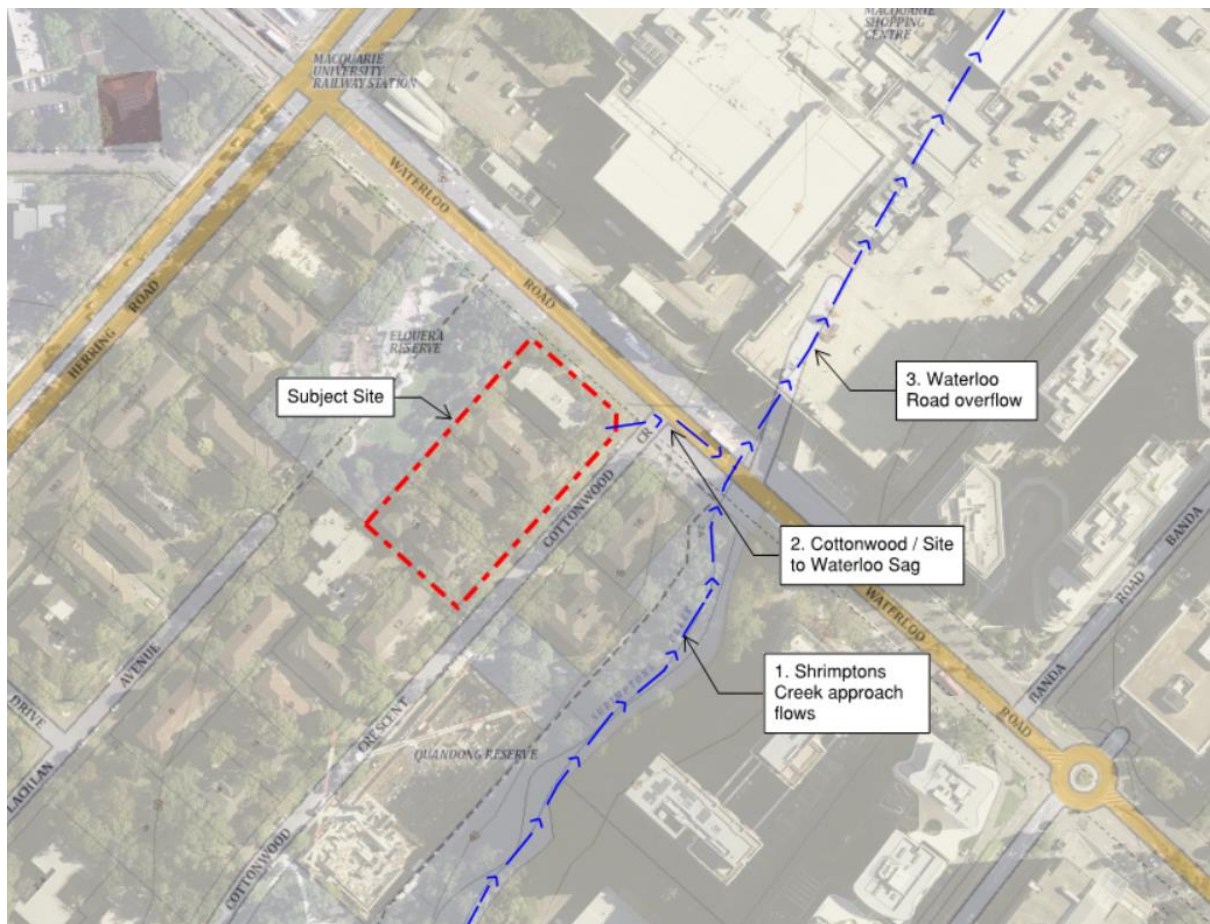


Figure 7 - DRAINS Reporting Points

For the purposes of the analysis, the 1% AEP 120-minute design storm event has been considered, which is defined by the Macquarie Park Flood Study (Bewsher, 2011) as the critical duration for the catchment.

Three site scenarios have been reviewed for the analysis, as summarised below:

1. Pre-Developed conditions (i.e. 0% impervious)
2. Developed Site without OSD (80% impervious)
3. Developed Site with OSD (80% impervious)

The on-site detention design was based on the information presented in the DRAINS model received from Enstruct (i.e. the project civil engineer) on the 11th of June 2024. The OSD design provided by Enstruct was entered into Council's Macquarie Park FRMS&P DRAINS model (Bewsher, 2011) for the analysis.

Council's updated Macquarie Park FRMS&P DRAINS model was then run using the above three scenarios. Below is a comparison of the DRAINS peak flows observed in Shrimptons Creek downstream of the subject site during the Developed Scenarios both with and without OSD:

Developed **With** OSD = 72.01m³/s

Developed **Without** OSD = 71.98m³/s

The results above suggest that a reduced peak flow is expected downstream of the site in Shrimptons Creek when OSD is removed at the subject site.

The below Figure 8 presents an explanation as to why a lower peak flow is observed in Shrimptons Creek downstream when OSD is removed. Note that flows in Shrimptons Creek have been moved to a secondary axis, along the right side of the graph. A summary of observations made is listed below (refer Figure 8 for the location of each numbered observation):

1. An early response from the site is observed during developed conditions is observed (both with and without OSD). This is expected from a developed catchment (with impervious areas introduced)
2. The peak of the developed site hydrographs occurs early, prior to the peak of regional Shrimptons Creek catchment.
3. An extended hydrograph tail is observed during developed conditions with OSD included (when compared to pre-developed and developed without OSD)
4. A higher site discharge rate is observed when OSD is included (when compared to without OSD) at the time of when the regional Shrimptons Creek peak occurs.
5. The tail of the No OSD hydrograph more closely aligns with the Pre-Developed Scenario (i.e. 0% impervious) suggesting that the No OSD scenario is likely to more closely represent pre-development conditions at the site as rainfall and flood water subsides.

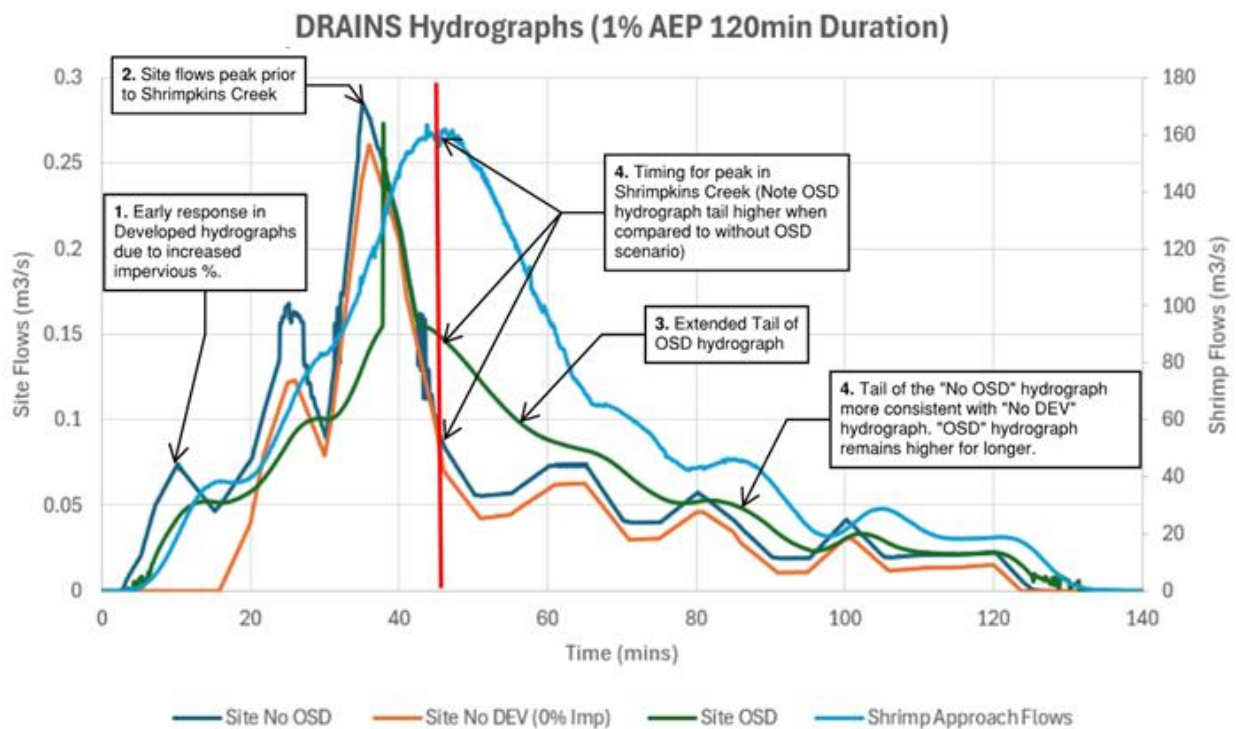


Figure 8 - DRAINS Hydrograph Comparison

In addition to the review of Regional catchment flows at Shrimptons Creek, a comparison of the DRAINS peak flows observed overland, immediately downstream of the subject site (i.e. location 2 as presented in the above Figure 7) has been performed. Below is a summary of the peak flows observed.

Developed **With** OSD = 1.674m³/s

Developed **Without** OSD = 1.678m³/s

The above comparison shows a minor increase of 4L/s when OSD is removed (during the regional critical 1% AEP 120min event) in comparison to when OSD is included.

Although a slight increase is observed, it is important to recognise that the intersection of Cottonwood Crescent/ Waterloo Road is already inundated by approx. 1.5m during a 1% AEP. Furthermore, the increase is only minor in magnitude (i.e. 4 L/s or a 0.2% increase). This very minor increase is not expected to significantly adversely impact adjacent properties.

As a reduction of flows is observed in Shirmptons Creek and negligible change is expected in Cottonwood Crescent, when OSD is excluded, OSD has not been proposed as part of the development.

Conclusion

Northrop Consulting Engineers prepared a Flood Impact and Risk Assessment (FIRA) for the proposed development at 88 Waterloo Road, Macquarie Park.

Presented herein is a summary of the expected existing case flood behaviour for the subject site as well as an assessment of the proposed development with respect to the City of Ryde's DCP (2014), and LEP.

A review of Council's adopted Harmonisation Study (WMAwater, 2025) suggests the proposed development is not located within the Flood Planning Area for the purposes of the development type and as such, may not strictly require consideration to the flood controls outlined by Council's Local Environmental Plan (LEP) or Development Control Plan (DCP).

An analysis with respect to City of Ryde's DCP (2014), and LEP (so as to minimise flood risk to the development) notes the proposed development is expected to comply with the necessary controls outlined by this legislation and guideline.

The proposed development has been protected in accordance with Council's flood related LEP, DCP and technical guidelines. The development is proposed to be protected to a level at or above (whichever is higher):

1. 150mm above the adjacent surface level at the road reserve / verge
2. The 1% AEP + 300mm for flows derived by the Lachlan Avenue/ Elouera Reserve; OR
3. The 1% AEP + 500mm for Flooding where adjacent to Cottonwood Crescent (i.e. Low, Medium and High Risk); OR
4. The Probable Maximum Flood

On-Site Detention has been excluded from the proposed development as it is expected to have limited benefit. Removal of OSD was found to have a slight benefit downstream with a reduction of flows is observed in Shirmptons Creek.

With a reduction in peak flows observed downstream of the site, the proposed development is not expected to create a significant adverse flood impact in adjacent properties or in the downstream catchment.

NORTHROP



Appendix A – Flood Information Certificates

Laurence Gitzel
Level 1, 215 -217 Pacific Highway
CHARLESTOWN NSW 2290

8 December 2025

Our ref: D25/174193

Dear Mr. Gitzel

RE: Request for Flood Information – No. 15 Cottonwood Crescent, Macquarie Park

Reference is made to your application received on 24th of November 2025 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

The DRAINS model 100 Year ARI (Average Recurrence Interval) peak overland flow rate near the site is approximately 0.26 m³/s (1.31 m³/s pipe flow). For more detailed information, refer to DRAINS model extract at the end of this report.

This information is derived from models established as part of the Macquarie Park Flood Study Report and Floodplain Risk Management Study and Plan.

Council's database indicates the presence of a Ø375mm drainage pipe near the site.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

Any person or organisation who acts on the information provided does so at his / her / its own risk. To the extent permitted by law, the City of Ryde accepts no responsibility and excludes all liability whatsoever in respect of any use of or reliance upon this information.

Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,



Leila Faghihi
SENIOR ENGINEER STORMWATER AND FLOODPLAIN MANAGEMENT

FLOOD INFORMATION REQUEST

Property Address: No. 15 Cottonwood Crescent, Macquarie Park
Issue Date: 8 December 2025
Flood Study Reference: Macquarie Park Flood Study Report (2025)
Flood Model Reference: TUFLOW Model (2025)

Flood Level Location Map

x



Flood Level Data Table

Location	100 Year ARI Flood Event (m AHD)	Probable Maximum Flood (m AHD)
A	nil	nil
B	nil	nil
C	nil	nil
D	nil	nil
E	nil	nil
F	nil	nil
G	nil	nil
H	nil	nil

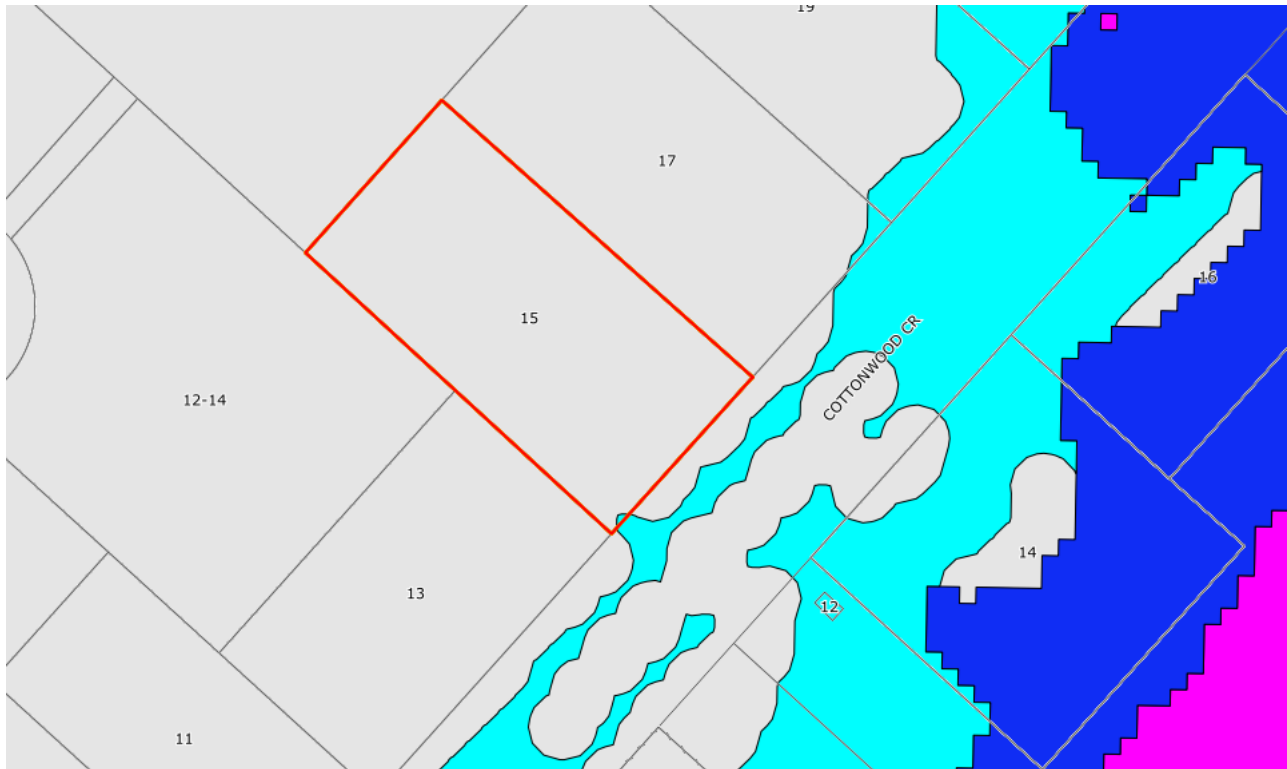


I	nil	nil
J	nil	44.32
K	nil	44.344
L	nil	44.296
M	nil	44.293
N	nil	44.317

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Aerial Laser Survey (ALS) data which is considered as approximate.
- This flood level information is for existing site conditions only.
- Concept plans are required for all new development proposals.
- The floor levels of the proposed habitable floor area should be set with a freeboard of 300 mm (Overland Flow and Low Risk) and 500 mm (Medium Risk and High Risk) to the 100 year ARI flood level. A freeboard of 150 mm (Overland Flow and Low Risk) and 300 mm (Medium Risk and High Risk) is applicable for non-habitable floor areas. Refer City of Ryde Development Control Plan 2014.
- A site specific flood study / risk assessment may be required for any future development.
- Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2023 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

Flood Risk Map



Flood Risk Precincts



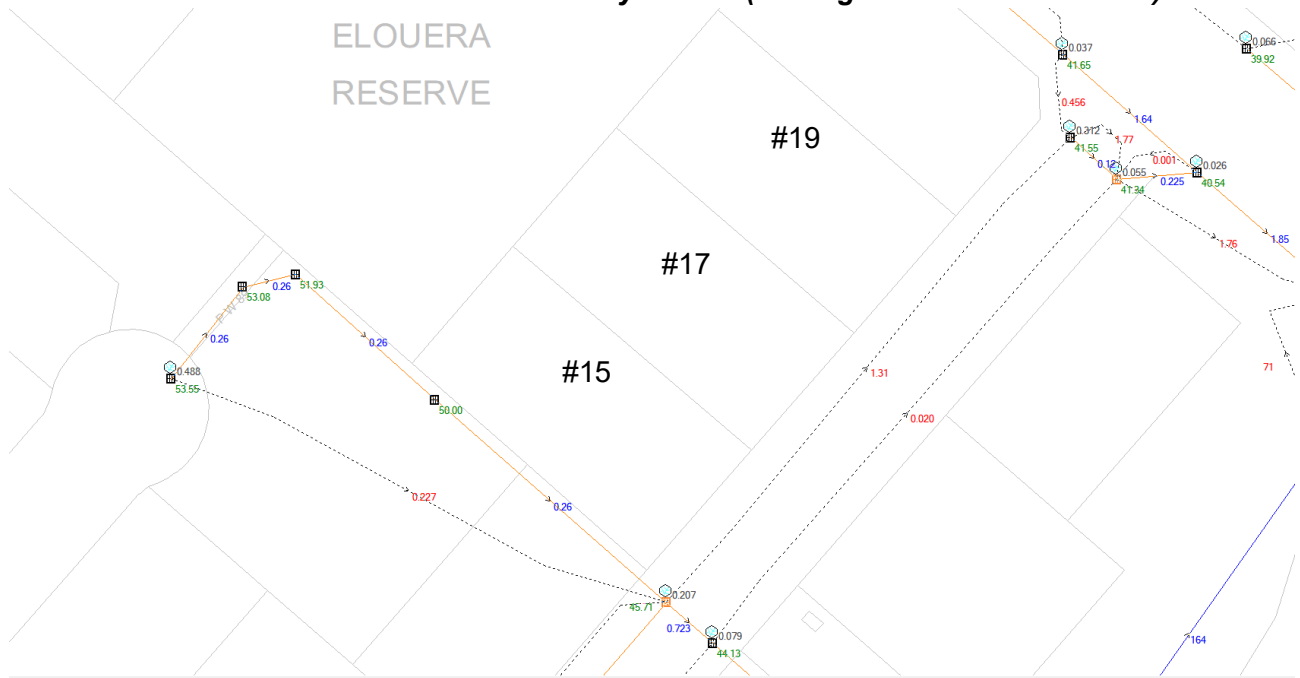
Flood Extent (100 Year ARI Event)



Flood Extent (Probable Maximum Flood)



DRAINS Model Peak Flow Rates for the 100 year ARI (Average Recurrence Interval)



Laurence Gitzel
Level 1, 215 -217 Pacific Highway
CHARLESTOWN NSW 2290

28 January 2026

Our ref: D25/174197

Dear Mr. Gitzel

RE: Request for Flood Information – No. 17 Cottonwood Crescent, Macquarie Park

Reference is made to your application received on 24th of November 2025 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

The DRAINS model 100 Year ARI (Average Recurrence Interval) peak overland flow rate near the site is approximately 0.26 m³/s (1.31 m³/s pipe flow). For more detailed information, refer to DRAINS model extract at the end of this report.

This information is derived from models established as part of the Macquarie Park Flood Study Report and Floodplain Risk Management Study and Plan.

Council's database indicates the presence of a Ø375mm drainage pipe within the site.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

Any person or organisation who acts on the information provided does so at his / her / its own risk. To the extent permitted by law, the City of Ryde accepts no responsibility and excludes all liability whatsoever in respect of any use of or reliance upon this information.

Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,



Leila Faghihi
SENIOR ENGINEER STORMWATER AND FLOODPLAIN MANAGEMENT

FLOOD INFORMATION REQUEST

Property Address: No. 17 Cottonwood Crescent, Macquarie Park
Issue Date: 28 January 2026
Flood Study Reference: Macquarie Park Flood Study Report (2025)
Flood Model Reference: TUFLOW Model (2025)

Flood Level Location Map

X



Flood Level Data Table

Location	100 Year ARI Flood Event (m AHD)	Probable Maximum Flood (m AHD)
A	nil	nil
B	nil	44.345
C	nil	44.352
D	nil	nil
E	nil	nil
F	nil	nil
G	nil	nil
H	nil	nil

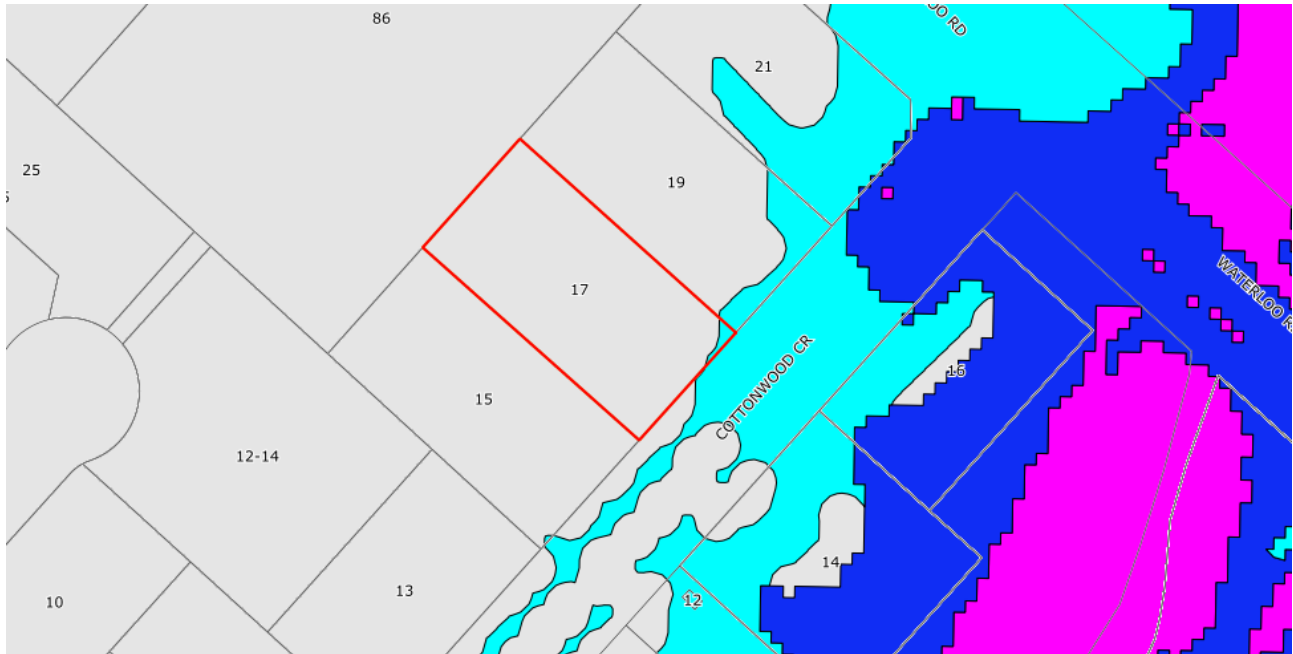


I	nil	nil
J	nil	44.346
K	nil	44.321
L	nil	44.293
M	41.981	44.266
N	45.76	45.97
O	45.02	45.226
P	44.76	44.864

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Aerial Laser Survey (ALS) data which is considered as approximate.
- This flood level information is for existing site conditions only.
- Concept plans are required for all new development proposals.
- The floor levels of the proposed habitable floor area should be set with a freeboard of 300 mm (Overland Flow and Low Risk) and 500 mm (Medium Risk and High Risk) to the 100 year ARI flood level. A freeboard of 150 mm (Overland Flow and Low Risk) and 300 mm (Medium Risk and High Risk) is applicable for non-habitable floor areas. Refer City of Ryde Development Control Plan 2014.
- A site specific flood study / risk assessment may be required for any future development.
- Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2023 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

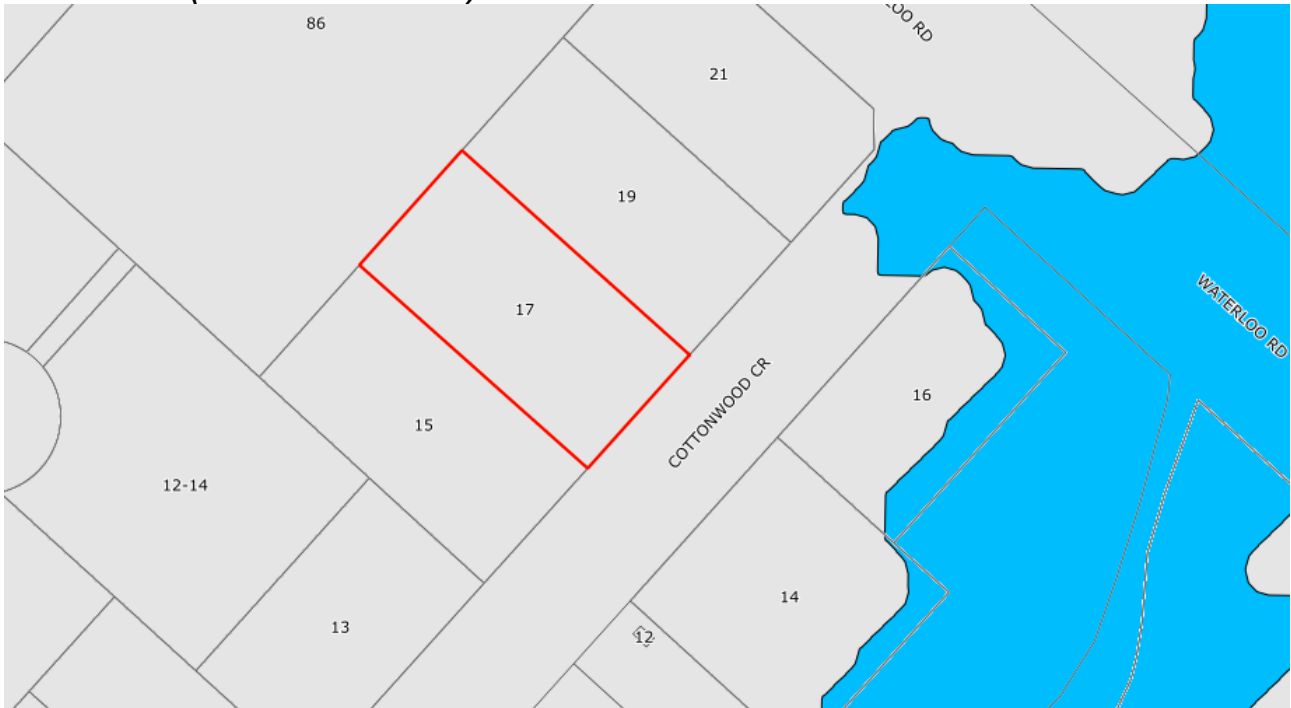
Flood Risk Map



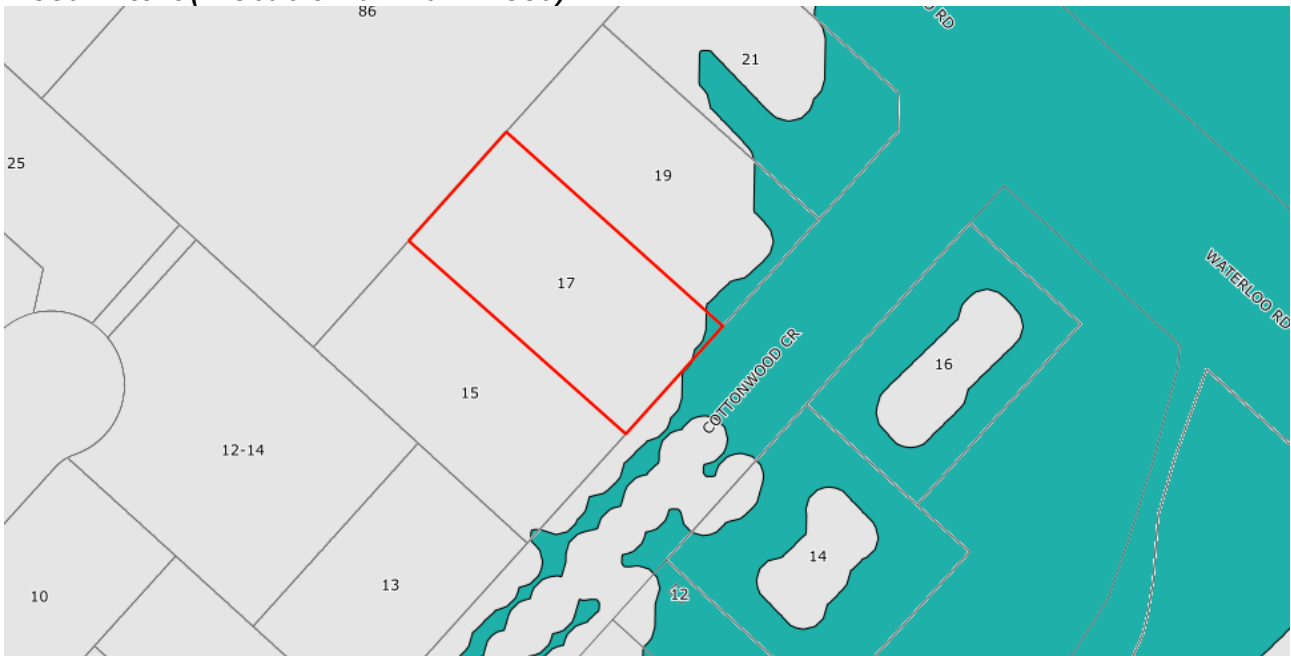
Flood Risk Precincts



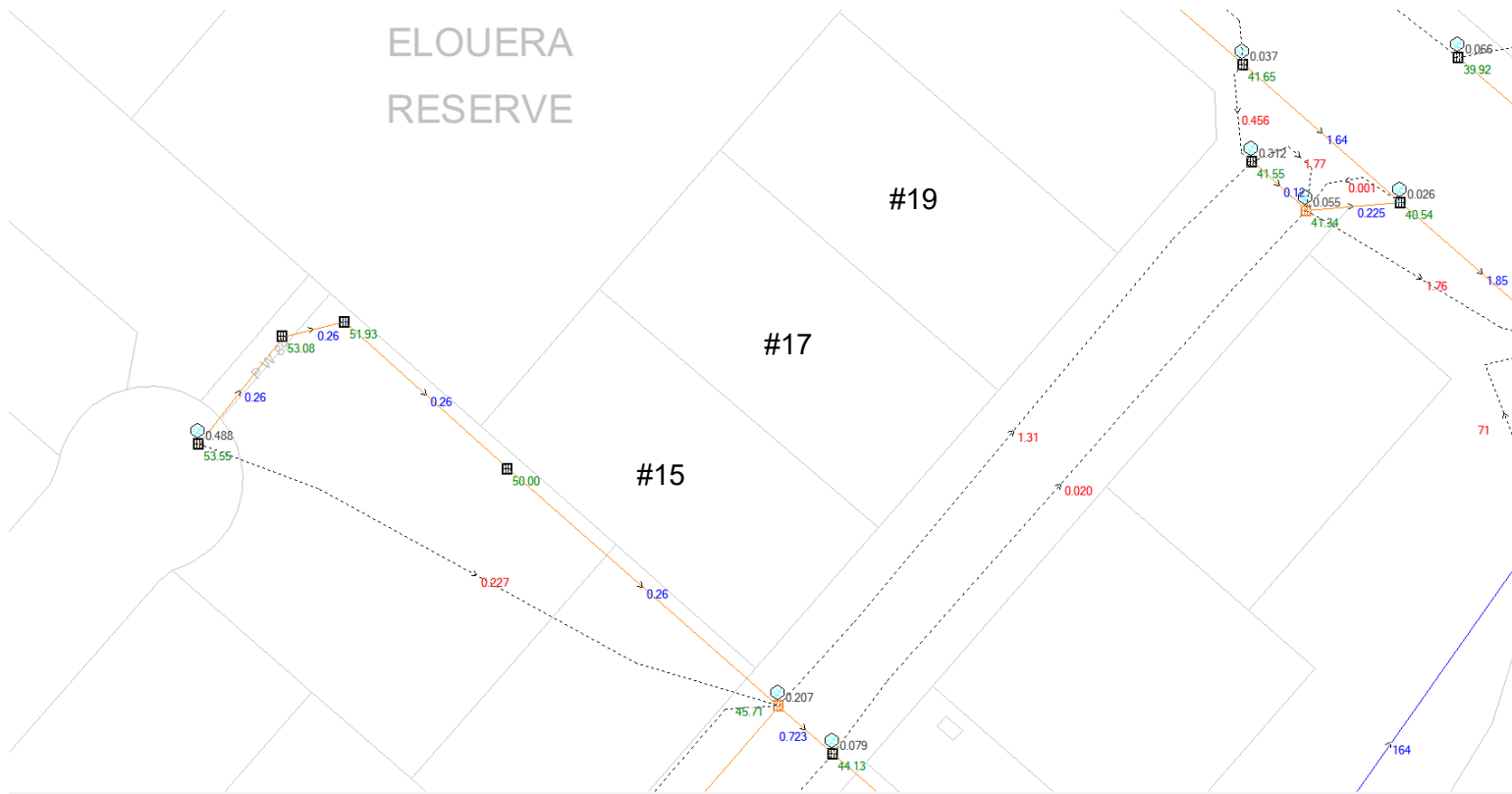
Flood Extent (100 Year ARI Event)



Flood Extent (Probable Maximum Flood)



DRAINS Model Peak Flow Rates for the 100 year ARI (Average Recurrence Interval)



Laurence Gitzel
Level 1, 215 – 217 Pacific Highway
CHARLESTOWN NSW 2290

15 December 2025

Our ref: D25/174200

Dear Mr. Gitzel

RE: Request for Flood Information – No. 19 Cottonwood Crescent, Macquarie Park

Reference is made to your application received on 24th of November 2025 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

The DRAINS model 100 Year ARI (Average Recurrence Interval) peak overland flow rate near the site is approximately 0.26 m³/s (1.31 m³/s pipe flow). For more detailed information, refer to DRAINS model extract at the end of this report.

This information is derived from models established as part of the Macquarie Park Flood Study Report and Floodplain Risk Management Study and Plan.

Council's database indicates the presence of a Ø375mm drainage pipe within the site.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

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Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,



Leila Faghihi
SENIOR ENGINEER STORMWATER AND FLOODPLAIN MANAGEMENT

FLOOD INFORMATION REQUEST

Property Address: No. 19 Cottonwood Crescent, Macquarie Park
Issue Date: 15 December 2025
Flood Study Reference: Macquarie Park Flood Study Report (2025)
Flood Model Reference: TUFLOW Model (2025)

Flood Level Location Map

x



Flood Level Data Table

Location	100 Year ARI Flood Event (m AHD)	Probable Maximum Flood (m AHD)
A	nil	nil
B	nil	nil
C	nil	nil
D	nil	nil
E	nil	nil
F	nil	nil
G	nil	nil
H	nil	nil
I	nil	44.309
J	nil	44.351

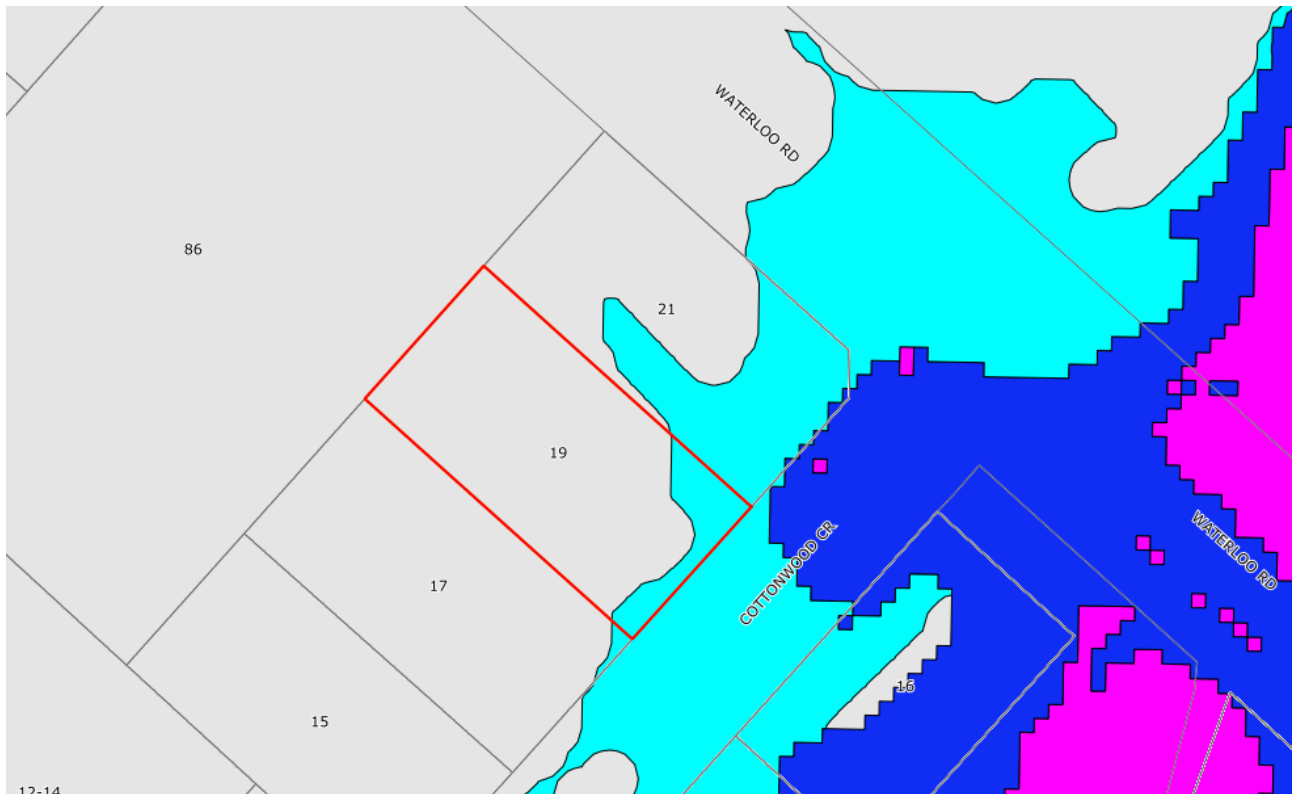


K	nil	44.324
L	nil	44.289
M	nil	44.309
N	41.949	44.259
O	41.949	44.274
P	41.949	44.296

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Aerial Laser Survey (ALS) data which is considered as approximate.
- This flood level information is for existing site conditions only.
- Concept plans are required for all new development proposals.
- The floor levels of the proposed habitable floor area should be set with a freeboard of 300 mm (Overland Flow and Low Risk) and 500 mm (Medium Risk and High Risk) to the 100 year ARI flood level. A freeboard of 150 mm (Overland Flow and Low Risk) and 300 mm (Medium Risk and High Risk) is applicable for non-habitable floor areas. Refer City of Ryde Development Control Plan 2014.
- A site specific flood study / risk assessment may be required for any future development.
- Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2023 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

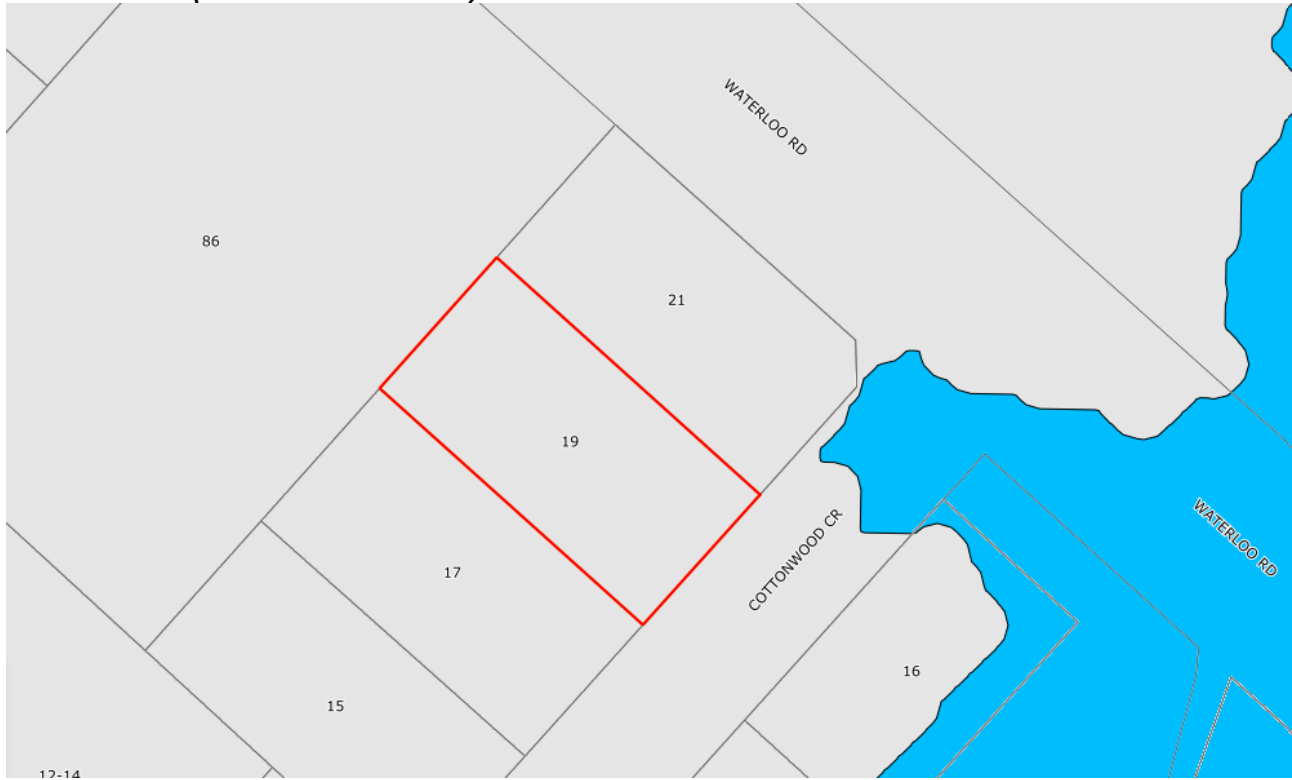
Flood Risk Map



Flood Risk Precincts



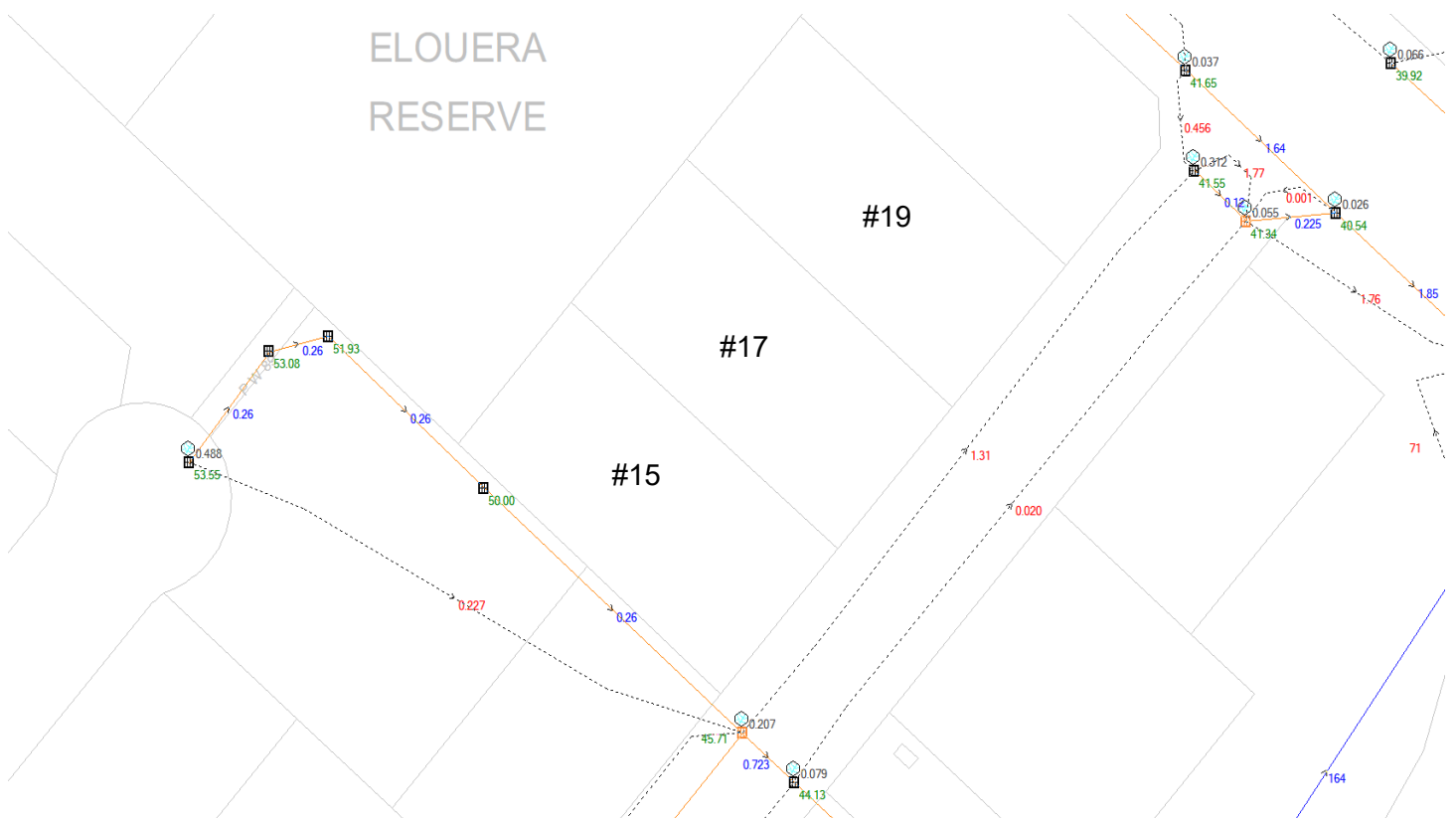
Flood Extent (100 Year ARI Event)



Flood Extent (Probable Maximum Flood)



DRAINS Model Peak Flow Rates for the 100 year ARI (Average Recurrence Interval)



Laurence Gitzel
Level 1, 215 -217 Pacific Highway
CHARLESTOWN NSW 2290

15 December 2025

Our ref: D25/174201

Dear Mr. Gitzel

RE: Request for Flood Information – No. 21 Cottonwood Crescent, Macquarie Park

Reference is made to your application received on 24th of November 2025 seeking flood level information pertaining to the above-mentioned address.

Please find attached flood level data sheet providing flood levels for the 100 year ARI (Average Recurrence Interval) flood event and the PMF (Probable Maximum Flood) event.

The DRAINS model 100 Year ARI (Average Recurrence Interval) peak overland flow rate near the site is approximately 0.456 m³/s (1.64 m³/s pipe flow). For more detailed information, refer to DRAINS model extract at the end of this report.

This information is derived from models established as part of the Macquarie Park Flood Study Report and Floodplain Risk Management Study and Plan.

Council's database indicates the presence of a Ø600mm drainage pipe within the site.

Please be advised that flood models are approximate. Care and expertise is required in the interpretation of these flood levels. In addition, this flood information does not take into account any local overland flow issues.

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Should you require any further information, please feel free to contact me on (02) 9952 8222.

Yours sincerely,



Leila Faghihi
SENIOR ENGINEER STORMWATER AND FLOODPLAIN MANAGEMENT

FLOOD INFORMATION REQUEST

Property Address: No. 21 Cottonwood Crescent, Macquarie Park

Issue Date: 15 December 2025

Flood Study Reference: Macquarie Park Flood Study Report (2025)

Flood Model Reference: TUFLOW Model (2025)

Flood Level Location Map

x



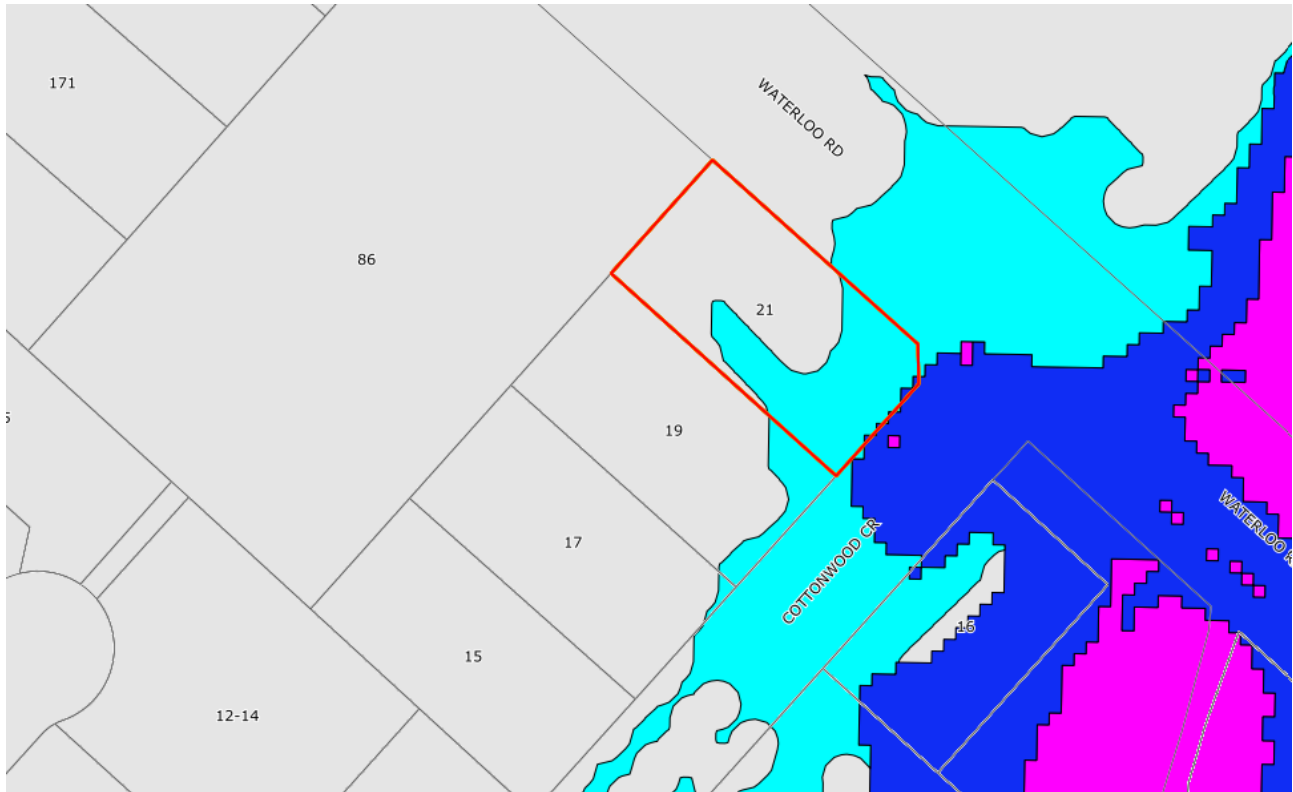
Flood Level Data Table

Location	100 Year ARI Flood Event (m AHD)	Probable Maximum Flood (m AHD)
A	nil	nil
B	nil	nil
C	nil	nil
D	nil	nil
E	nil	nil
F	nil	nil
G	nil	44.319
H	nil	nil
I	nil	nil
J	nil	44.317
K	nil	nil
L	nil	44.3
M	nil	44.301
N	nil	44.296
O	nil	44.298
P	nil	44.289
Q	nil	44.27
R	nil	44.287
S	41.949	44.259
T	41.949	44.265
U	41.949	44.29

Notes:

- All levels are based on Australian Height Datum (AHD).
- Flood levels are indicative only.
- The flood levels were derived using Aerial Laser Survey (ALS) data which is considered as approximate.
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- A site specific flood study / risk assessment may be required for any future development.
- Engage a suitably qualified engineer to assist you in this matter. Any study or assessment shall be in accordance with the NSW Government's Floodplain Development Manual 2023 and the City of Ryde Development Control Plan 2014.
- Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding.

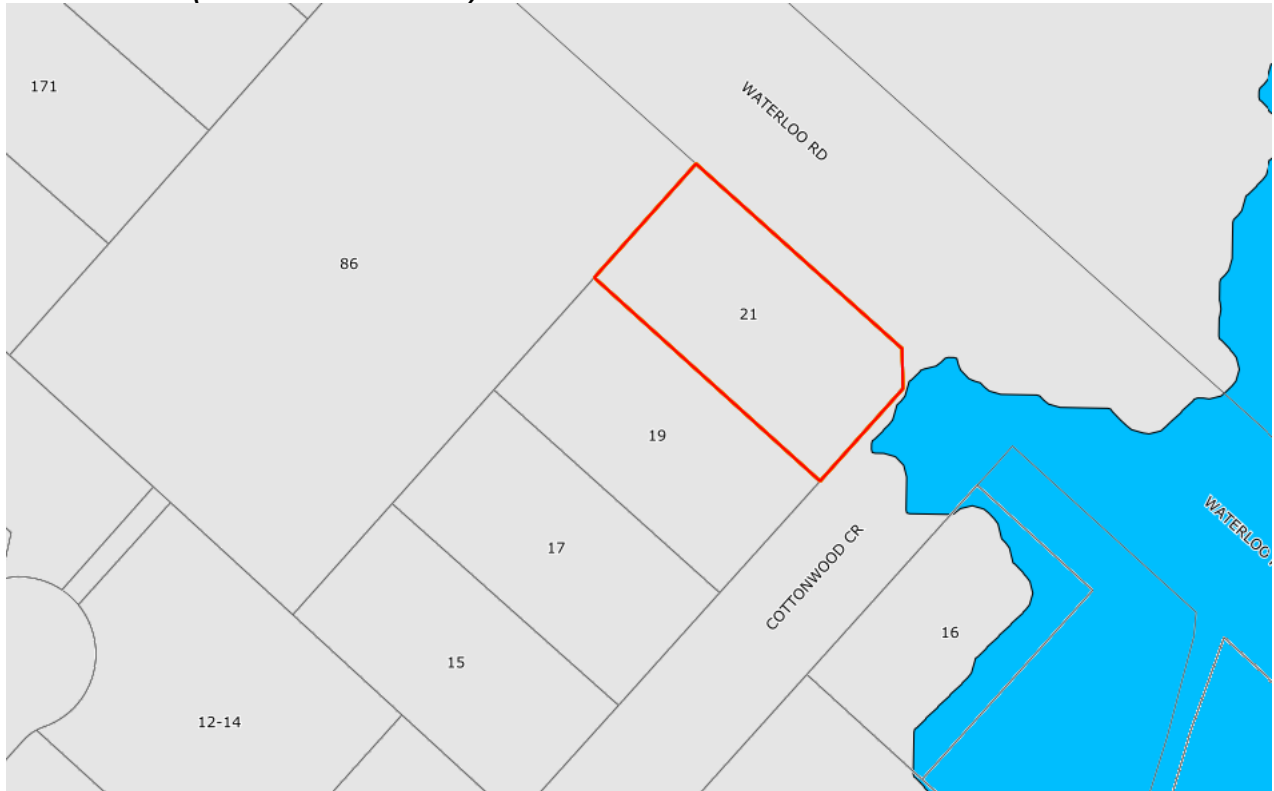
Flood Risk Map



Flood Risk Precincts



Flood Extent (100 Year ARI Event)



Flood Extent (Probable Maximum Flood)



DRAINS Model Peak Flow Rates for the 100 year ARI (Average Recurrence Interval)

