Job Number: 200114
Date: 26 September 2024

GRC Hydro
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Raad Property Acquisition No 10 Pty Ltd
Attn: Raymond Raad
2 Gregory Place
Parramatta NSW 2150

Dear Mr Raymond Raad,

Re: Response to flood-related questions - 2 Bachell Avenue, Lidcombe

Introduction

GRC Hydro prepared a flood impact assessment to accompany a Development Application for 2 Bachell Avenue, Lidcombe (the subject site). This assessment was issued on 31/05/2023. Cumberland City Council (Council) issued a Request Further Information (RFI) Letter (Date: 30/07/2024) regarding the above DA. A meeting was held on 16/08/2024 with council engineering officers and town planner. Minutes of the meeting were provided to all attendees via emails on 17/08/2024.

This memo will address Council's RFI's requests in relation to flooding.

Flood Results

Referring to the previous Flood Impact Assessment report, results from the TUFLOW model developed by GRC Hydro match Council's results. Thus, the assessment has been undertaken using GRC Hydro's model. The results of Existing and Proposed Development are presented in:

- Figure 01 - 5% AEP Peak flood depths and levels – Existing
- Figure 02 - 5% AEP Flood Hazard – Existing
- Figure 03 - 1% AEP Peak flood depths and levels – Existing
- Figure 04 - 1% AEP Flood Hazard – Existing
- Figure 05 - PMF Peak flood depths and levels – Existing
- Figure 06 - PMF Flood Hazard – Existing
- Figure 07 - 5% AEP Peak flood depths and levels – Proposed
- Figure 08 - 5% AEP Flood Hazard – Proposed
- Figure 09 - 1% AEP Peak flood depths and levels – Proposed
- Figure 10 - 1% AEP Flood Hazard – Proposed
- Figure 11 - PMF Peak flood depths and levels – Proposed

- Figure 12 - PMF Flood Hazard – Proposed
- Figure 13 – 1% AEP Peak Flood Level Impact – Proposed

Responses to Council's Request

Council's flood-related RFI requests regarding the proposed development are listed below. GRC's response to each request to each concern is highlighted in blue.

The Council's Flood information letter and flood map indicates that the site in affected by 1%AEP flooding events. As the land profile slopes from south-west towards the Northeastern direction, the flood level during 1% AEP ranges from 12.4 mAHD at the Northern end/corner to 15.5 mAHD towards the South Western end. The habitable area floor level must be 500mm above the associated 1% AEP flood level. The overlay of the flood map on the architectural plan of ground floor indicates the 1% AEP flood level at:

- *The open area on the southside and the accesses door of DG01 is over 15.5 mAHD*
- *The vehicular crossing opposite the proposed roundabout on Rawson Street is approx. 14.6 mAHD.*
- *The Main access gate to the lobby (between CG.06and CG.07) at approx. 13.8 mAHD,*
- *The Access gate to the lobby between CGT.01 and AG.01 at approx. 12.8 mAHD.*
- *In addition, the flood levels associated for the commercial units AG.02, AG01 ~ DG.01 increases accordingly from the north towards the south.*

Each of the access gate/door must be protected from the flood. The floor level must be at least 500mm above the associated 1% AEP flood level. The architectural floor plan does not demonstrate how these accesses are protected from the flood.

GRC response:

Flood levels in 1% AEP (1 in 100 years), Probable Maximum Flood (PMF) flood events, and proposed Finished Floor Level (FFL) are shown for key entrances in Table 1 and Image 1 below. Floor Levels at locations A, B, C and D are above the FPLs, meeting Council's requirements.

Image 1 - 1% AEP Proposed Flood Map with Ground Flood Layout Overlaid

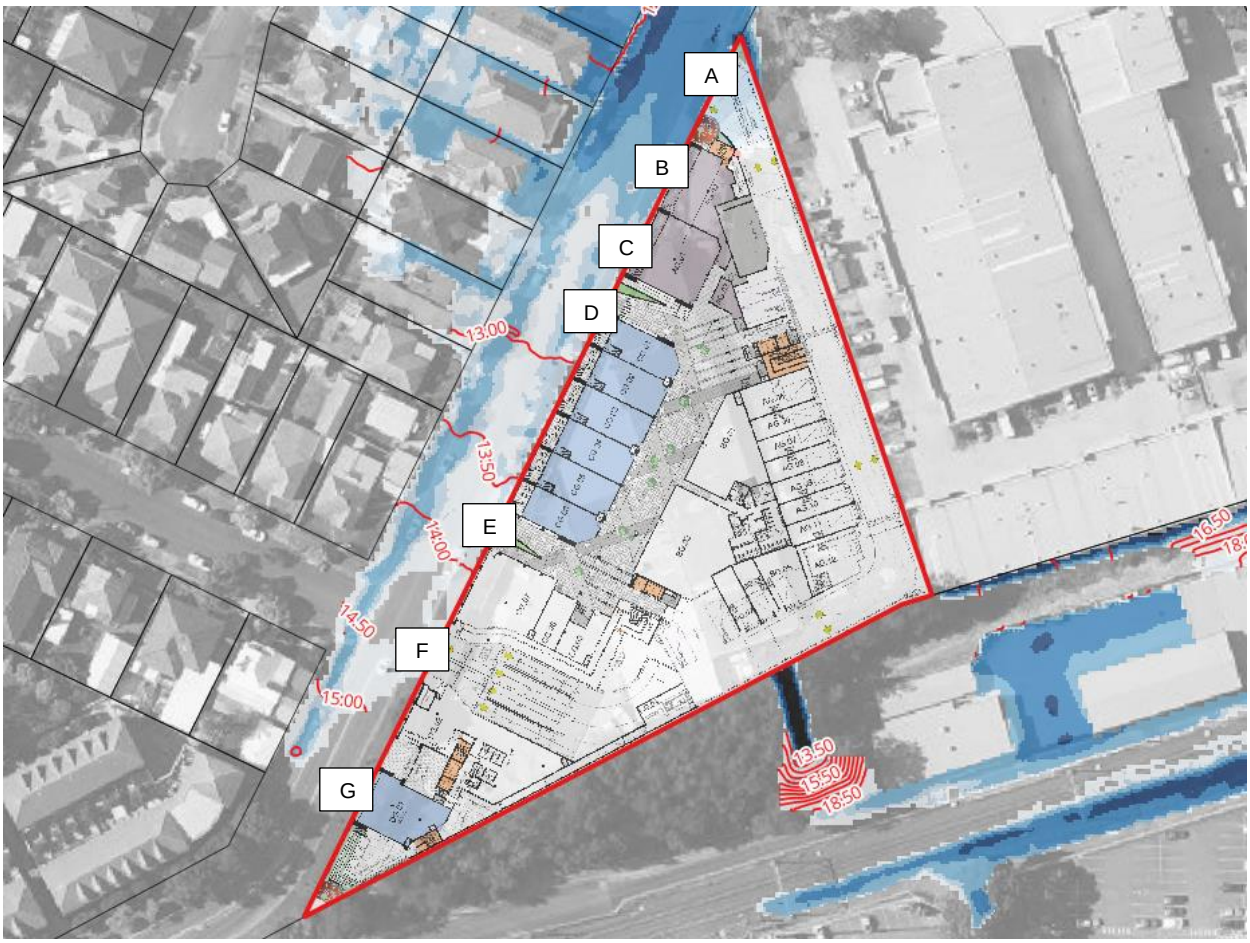


Table 1 - Flood Levels and FFL

ID	1% AEP flood level (mAHD)	PMF Flood Level (mAHD)	Finished Floor Level (mAHD)	Flood Planning Level (mAHD)
A	12.52	12.93	13.70	13.02
B	12.56	13.12	13.70	13.06
C	12.63	13.12	13.70	13.13
D	12.87	13.12	13.70	13.37
E*	13.57 (depth 0.01 m)	13.72	13.70	Not applicable
F*	14.42 (depth 0.01 m)	14.48	14.55	Not applicable
G*	Not Flooded	Not Flooded	13.70	Not applicable

ID locations are referred to image 1. *-indicates not flooded.

Entrances E, F &G are situated along a sloping section of Bachell Avenue. This stretch of Bachell Avenue experiences flood depths that don't differ greatly between the 1% AEP and PMF design events as the shallow flow in these two events is able to continue flowing downstream. Depths at D and E are negligible and do not constitute flooding (that is, a depth of 10 mm is not flooding).

A 500mm freeboard above the 1% AEP flood level is suggested by Council to retain flood protection during flood events rarer than a 1% AEP. At these locations however, the maximum predicted flood level possible

(the PMF level) is only 0.15 m higher than 1% AEP level. GRC are of the view that locations E and F aren't flooded and as such FPL doesn't apply. We have however presented results as per Table 1.

- With the topographic sag point at the proposed driveway entrance on Bachell Avenue (Location A), the majority of the flooding on Bachell Avenue will be collected at the sag point and drains to the northwestern channel downstream. Therefore, flooding on Bachell Avenue south of Point C in Image 1 is considered to be minimal with less than 0.1m flood depth.

On this Basis, GRC suggests that the proposed Ground Floor Levels at the entrances are compliant with Council policy.

In regards to the vehicular crossing and access driveway, the driveway shall incorporate a crest across the driveway with the crest level 500mm higher than the associated flood level during 1% AEP storm event.

GRC response:

As shown in Location A in Table 1 above. The crest level (13.7 mAHD) at the driveway is higher than the Flood Planning Level of (13.02 mAHD) and therefore compliant with Council Policy.

The submitted flood study report is not satisfactory in regard to the risk assessment and risk management measures.

GRC response:

Proposed Flood Hazard maps are shown in Figures 8, 10 and 12. The majority of the site is flood-free in 1% AEP and peaks at H2 in a 1% AEP event at the driveway entrance. As such the site is exposed to very low hazard if at all for all but the rarest events.

The proposed free board of 150mm is against Council advised 500mm and not supported.

GRC response:

As explained in the first comment raised.

The blockage of 50% must apply. The study does not account for the blockage.

GRC response:

GRC has undertaken 50% blockage assessment at the inlet and outlet of the proposed culvert. Our modelling reflects the culvert (2.4 x 2.1 m) and does not include the short reach where the double width entrance (4.8 x 2.1 m) transitions to the structure width. As such, our design run implicitly incorporates 50% blockage of the entrance. The impact of the 50% blockage inlet is shown in Figure 13, which shows no adverse impact on adjacent properties.

The outlet blockage scenario is the same as the inlet blockage scenario as there is no "opening" at the downstream outlet. So, a 50% blockage downstream would be expected to result in the same impacts (but less) than the blockage of the inlet.

It is noteworthy that the design of the opening specified is an oversized opening relative to what was previously there.

The study report does not elaborate the flooding impact of the proposed development to the surrounding neighbourhood.

GRC response:

A flood impact assessment and map were provided in the previous report. The impact of 50% blockage inlet figure is also provided in Figure 13, which shows that the proposed development has no adverse impact on the adjacent properties. So, with an oversized opening where doubled the width at the structure entrance, the impact would be expected to result in the same impact but less than the blockage of the inlet.

The study must analyse the scenario for 5% AEP and PMF events as well for better understanding of the site situation and clarity.

GRC response:

The 5% AEP and PMF flood events have been analysed for the proposed scenario, and flood maps are shown in Figure 07 (5% AEP) and Figure 11 (PMF).

In a 5% AEP deign flood event, the subject site is predicted to only flood at the entrance of the driveway (Location A) with a flood level of 12.40 mAHD. This is only 0.1m lower than the 1% AEP flood level at the same location. In the PMF event, the site is liable to flooding with flood levels between 13.2 and 15.2 mAHD,

Electronic Copy of all models used for the existing condition and the proposed development in the study shall be submitted.

GRC response:

This modelling has been submitted along with this report.

Conclusion

GRC Hydro has assessed the proposed works in 5% AEP, 1% AEP and PMF design events at the subject site.

GRC understands Council requests a FPL that incorporates a 500mm freeboard above the 1% AEP Flood level. All of the entrance locations identified in Image 1 satisfy this criteria except for locations E and F, although arguably these locations are not flood liable in the 1% AEP event with trivial depths only. Locations E and F are situated on a section of Bachell Avenue that freely allows shallow flow to continue downstream

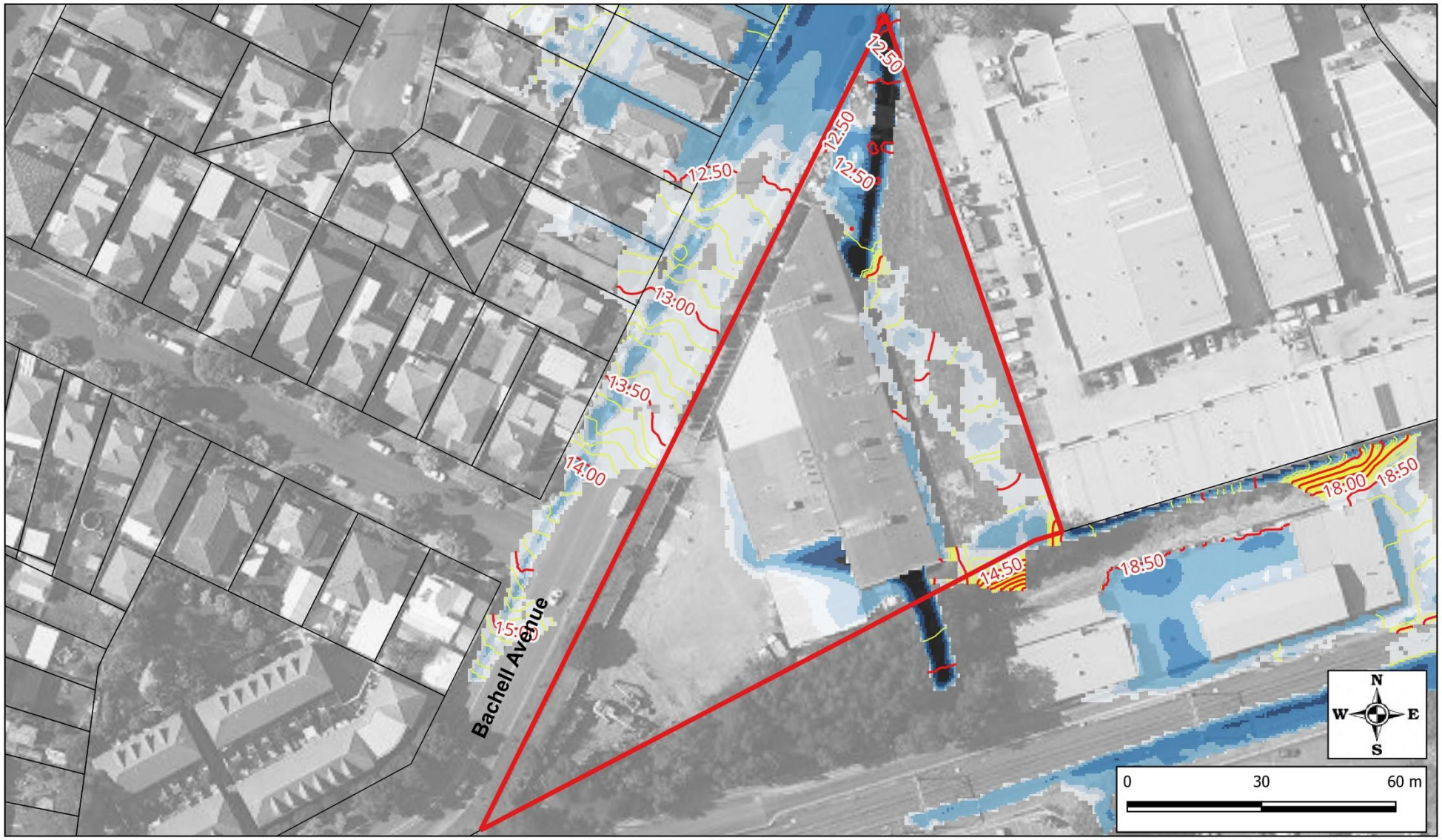
and the PMF only exhibits minor increases in flood level above the 1% AEP design event. This is then merely stormwater flow in the gutter and not flooding proper.

An impact assessment has been undertaken, showing no adverse impacts on adjacent properties. Additionally, the inlet and outlet 50% blockage of the proposed culvert have been assessed in 1% AEP, and it shows that no adverse impacts as well.

Yours Sincerely

Steve Gray
GRC Hydro

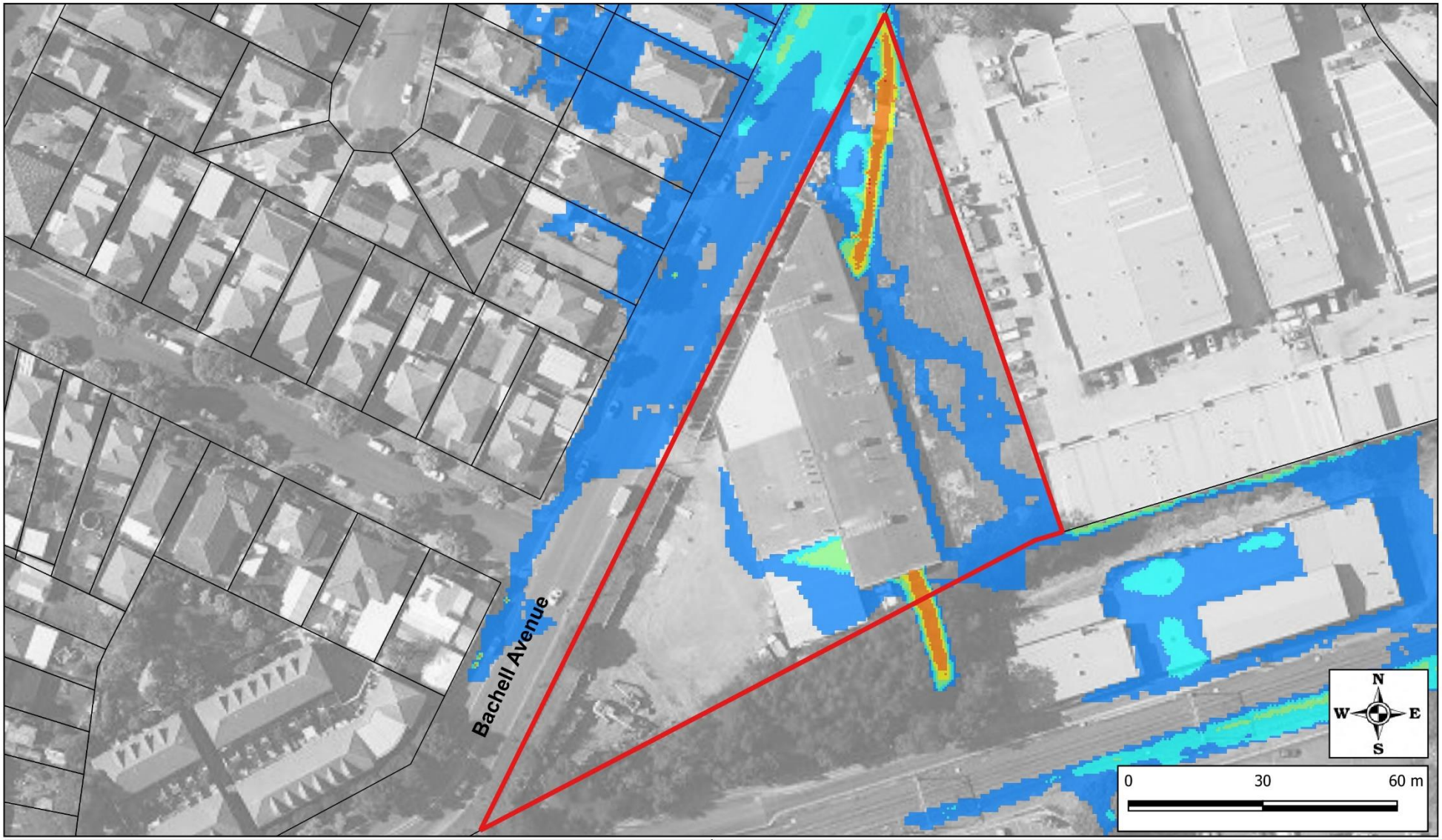
Figures



Flood Depths (m)
0.00 - 0.05
0.05 - 0.10
0.10 - 0.30
0.30 - 0.50
0.50 - 1.00
> 1.00
Subject Site
Cadastral Boundaries
Minor Flood Level Contours (Spacing = 0.1 m)
Major Flood Level Contours (Spacing = 0.5 m)

TITLE: **5% AEP Peak flood depths and levels - Existing**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **01**

grc HYDRO

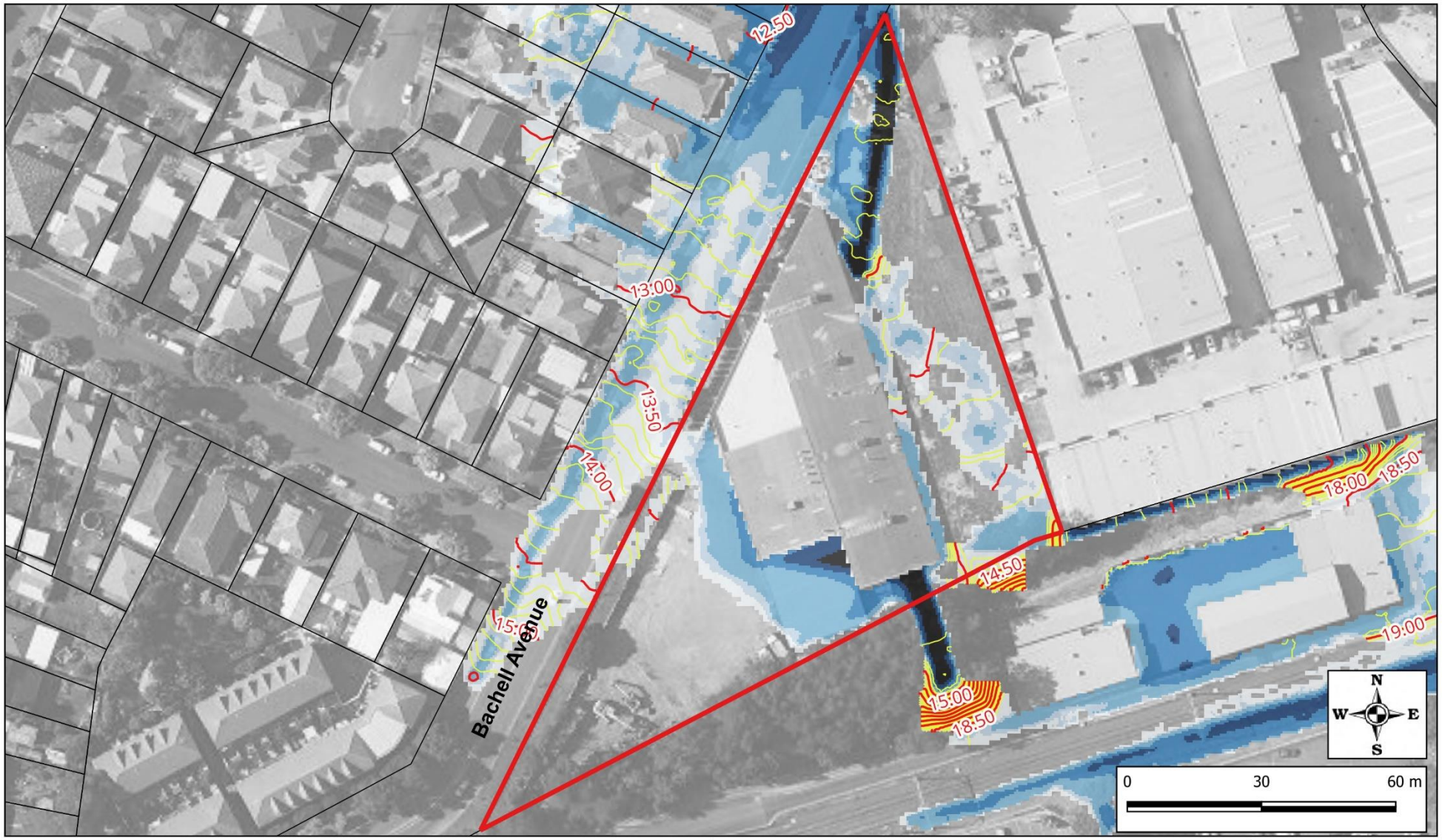


Subject Site
Cadastral Boundaries

Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **5% AEP Flood Hazard - Existing**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **02**

grc HYDRO



Flood Depths (m)
- 0.00 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00

Subject Site

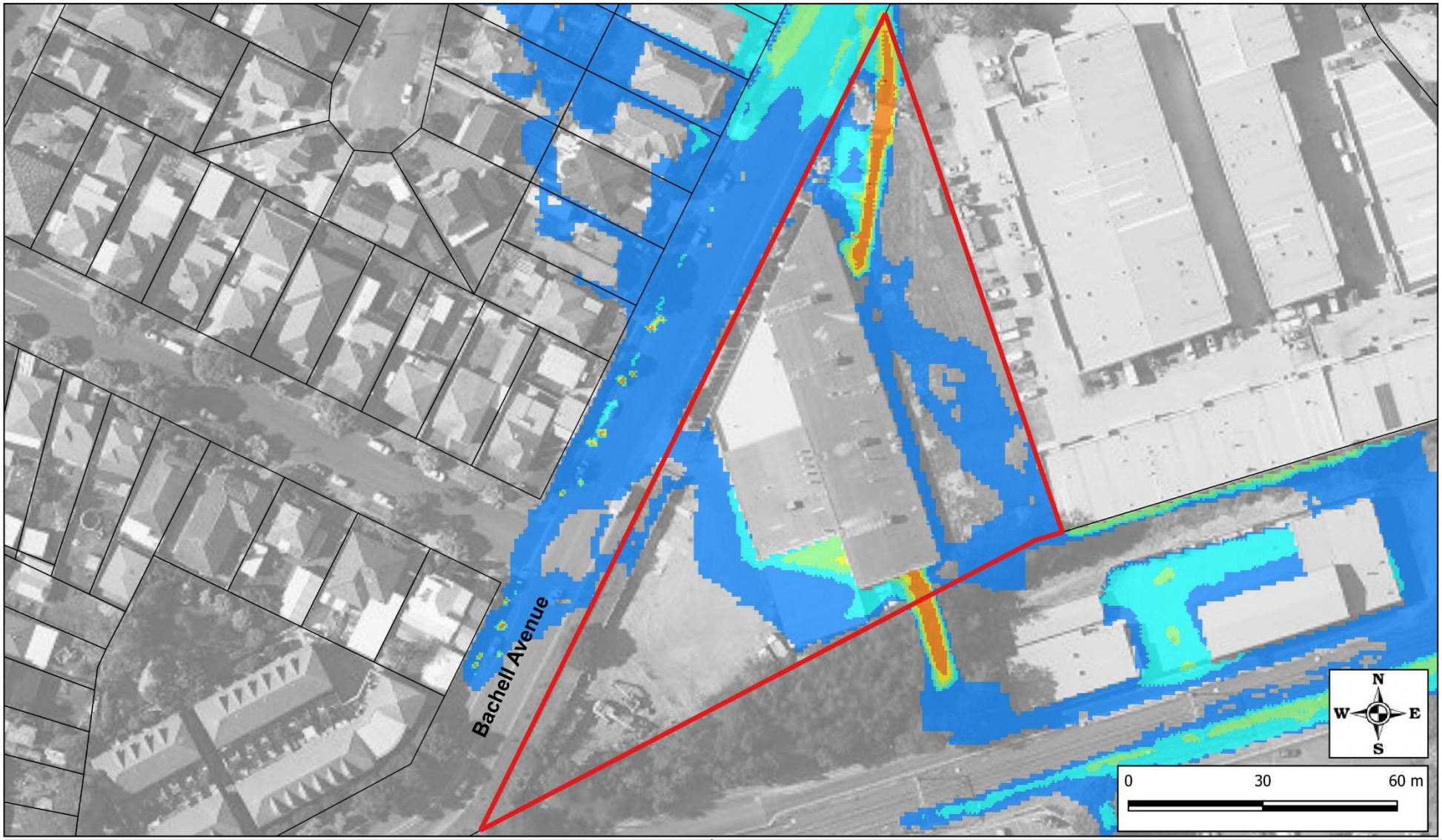
Cadastral Boundaries

Minor Flood Level Contours (Spacing = 0.1 m)

Major Flood Level Contours (Spacing = 0.5 m)

TITLE: **1% AEP Peak flood depths and levels - Existing**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **03**

grc HYDRO

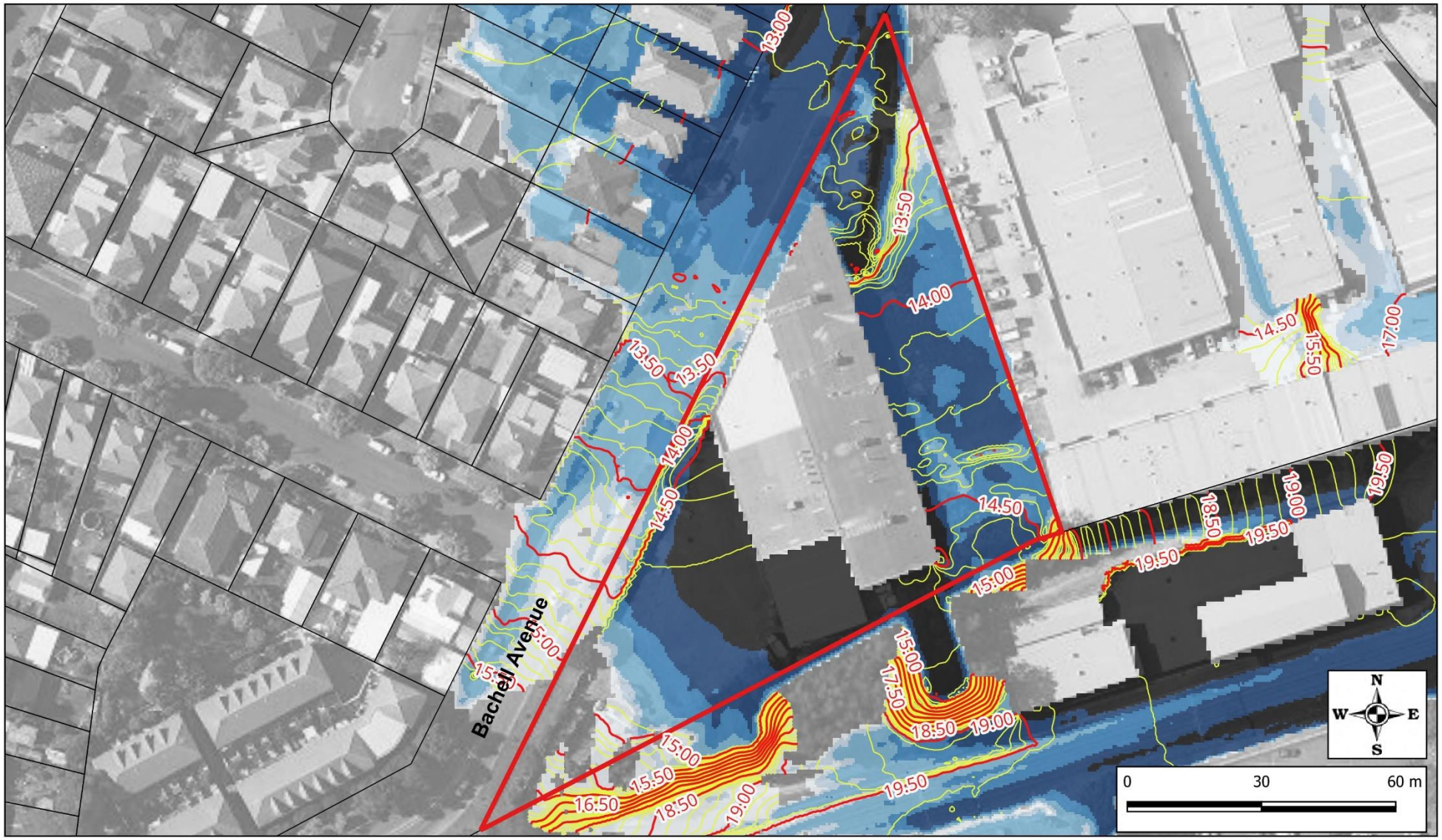


Subject Site
Cadastral Boundaries

Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **1% AEP Flood Hazard - Existing**			
PROJECT: **2 Bachell Avenue, Lidcombe**			
PROJECT No. **200114**			
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **04**	

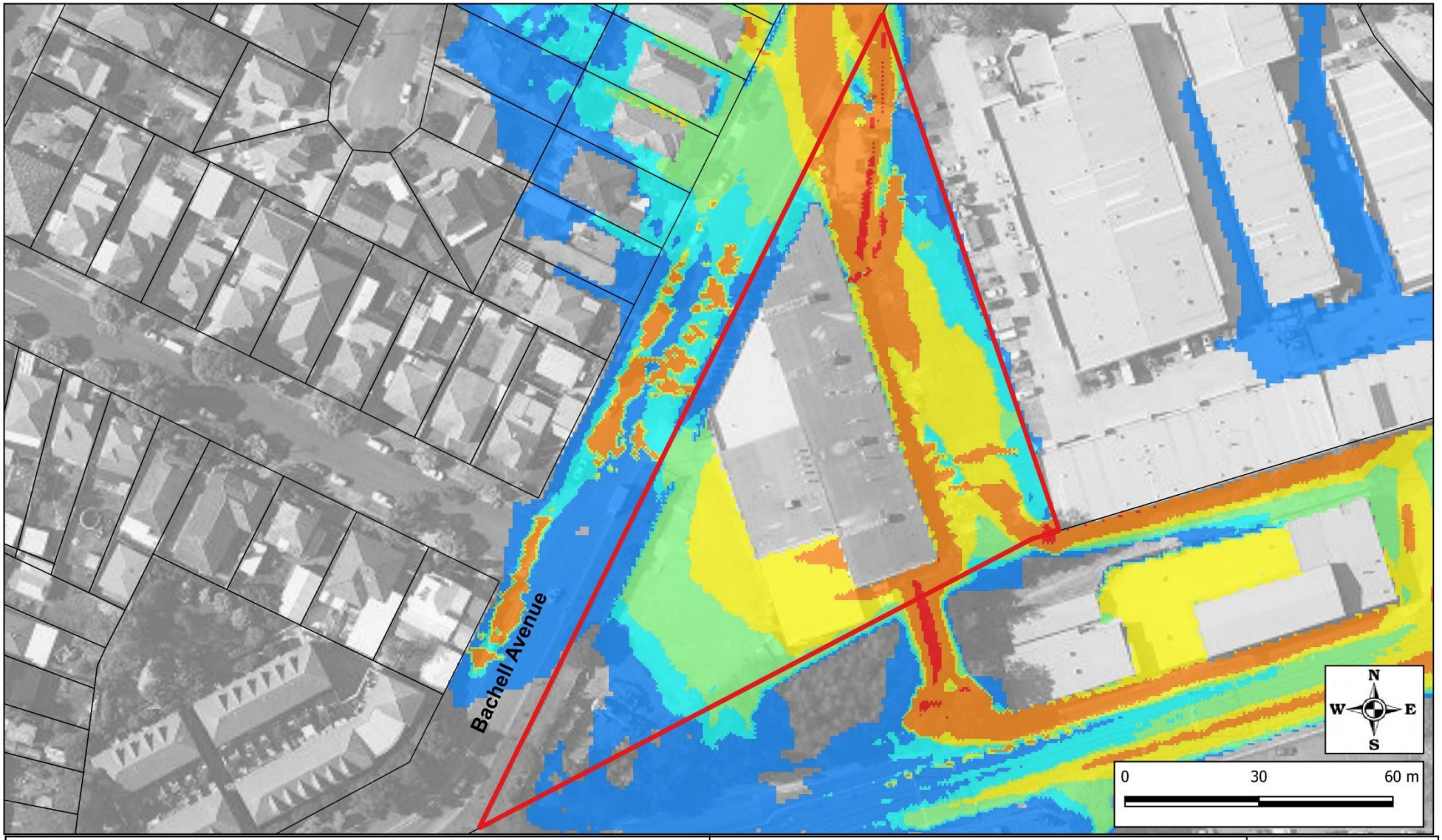
grc HYDRO



Flood Depths (m)
- 0.00 - 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- > 1.00
- Subject Site
- Cadastral Boundaries
- Minor Flood Level Contours (Spacing = 0.1 m)
- Major Flood Level Contours (Spacing = 0.5 m)

TITLE: **PMF Peak flood depths and levels - Existing**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **05**

grc HYDRO



Subject Site
Cadastral Boundaries

Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **PMF Flood Hazard - Existing**			
PROJECT: **2 Bachell Avenue, Lidcombe**			
PROJECT No. **200114**			
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **06**	

grc HYDRO

Flood Depths (m)
0.00 - 0.05
0.05 - 0.10
0.10 - 0.30
0.30 - 0.50
0.50 - 1.00
> 1.00
Subject Site
Proposed Buildings
Cadastral Boundaries
Proposed Inlets
Minor Flood Level Contours (Spacing = 0.1 m)
Major Flood Level Contours (Spacing = 0.5 m)
Proposed Culvert

TITLE: **5% AEP Peak flood depths and levels - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **07**

grc HYDRO

Proposed Buildings
Subject Site
Cadastral Boundaries
Proposed Inlets
Proposed Culvert
Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **5% AEP Flood Hazard - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **08**

grc HYDRO

Flood Depths (m)
0.00 - 0.05
0.05 - 0.10
0.10 - 0.30
0.30 - 0.50
0.50 - 1.00
> 1.00
Subject Site
Proposed Buildings
Minor Flood Level Contours (Spacing = 0.1 m)
Major Flood Level Contours (Spacing = 0.5 m)
Cadastral Boundaries
Proposed Culvert
Proposed Inlets

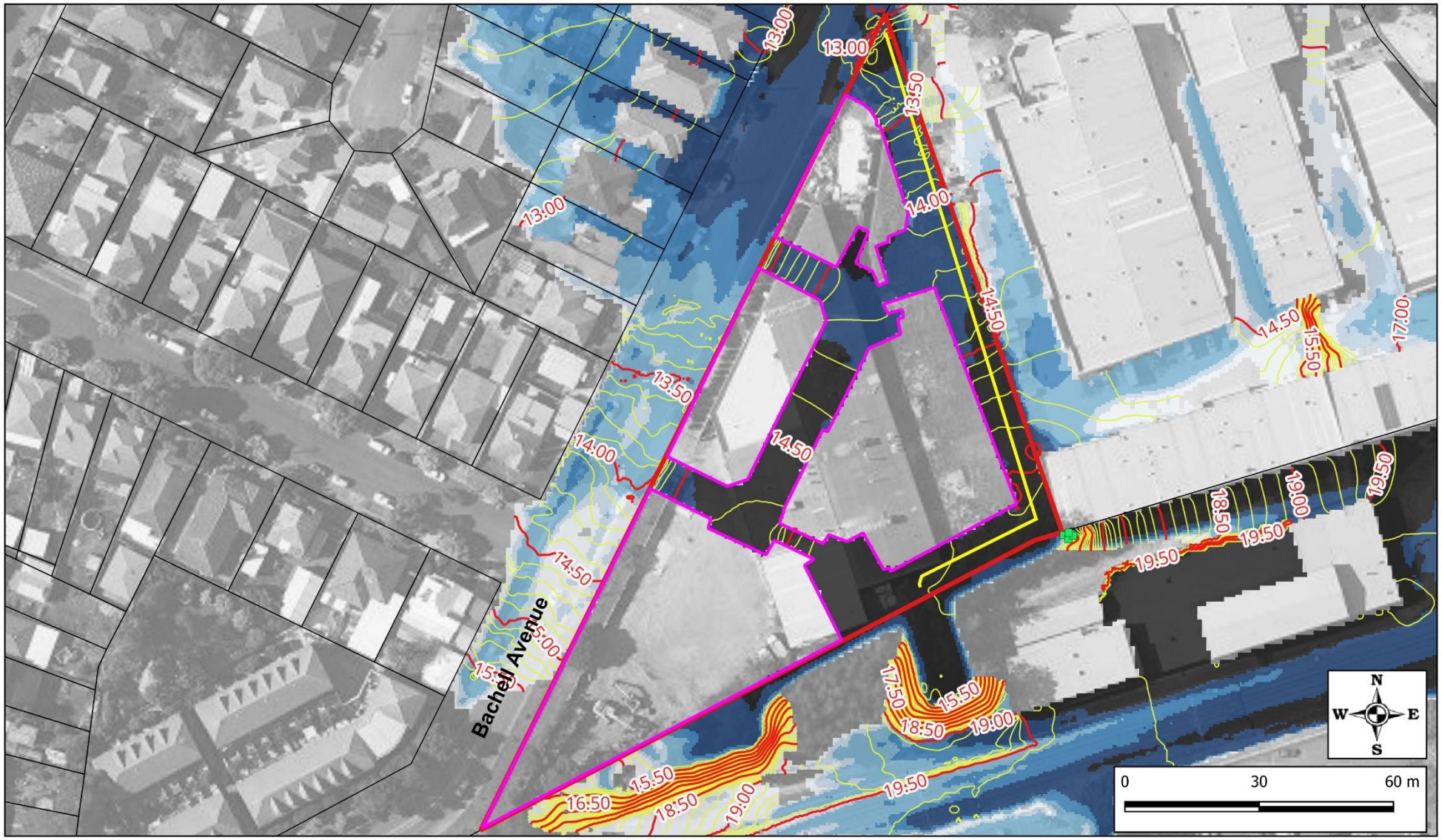
TITLE: **1% AEP Peak flood depths and levels - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **09**

grc HYDRO

Proposed Buildings
Subject Site
Cadastral Boundaries
Proposed Inlets
Proposed Culvert
Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **1% AEP Flood Hazard - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **10**

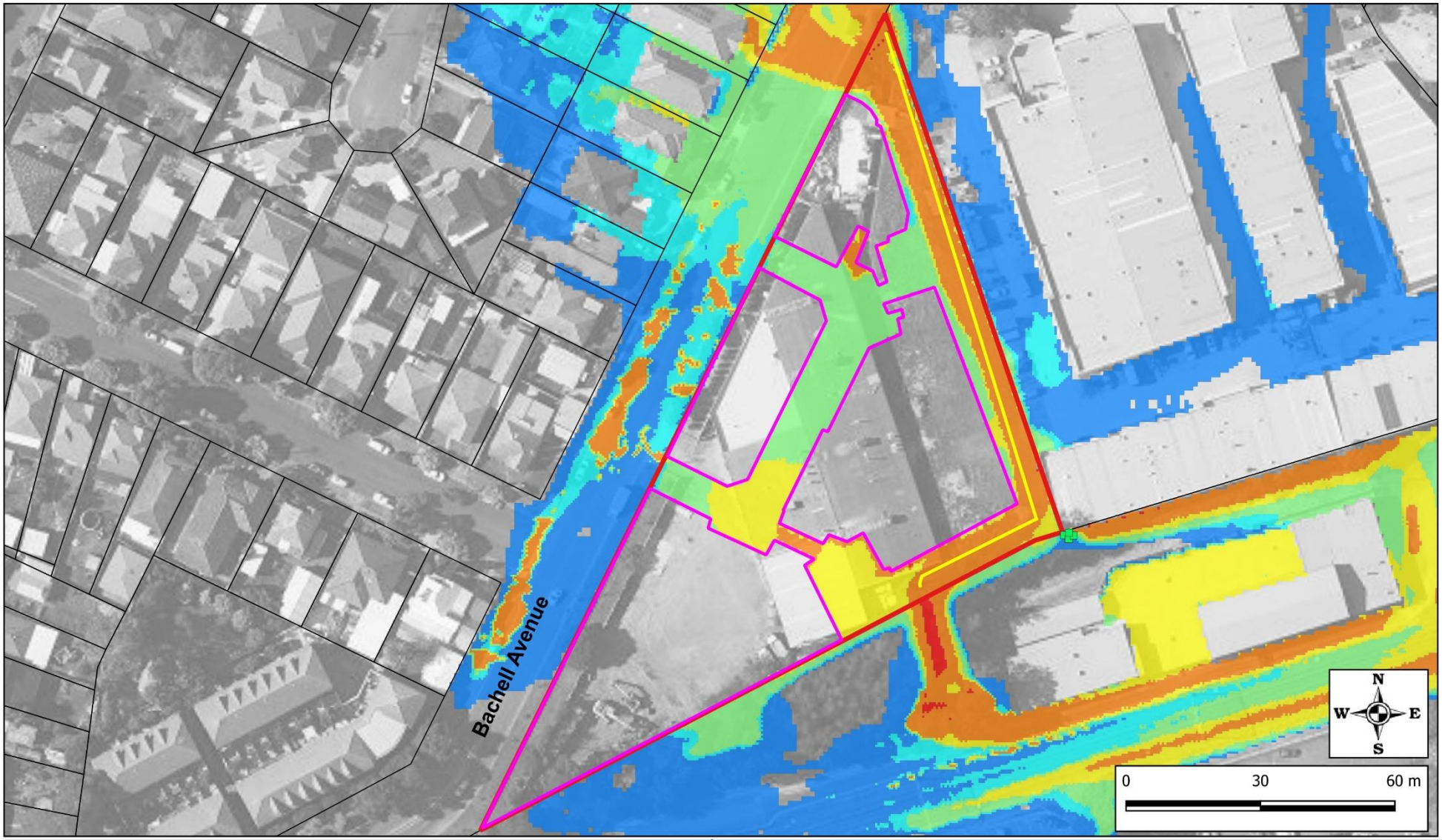
grc HYDRO



Flood Depths (m)
0.00 - 0.05
0.05 - 0.10
0.10 - 0.30
0.30 - 0.50
0.50 - 1.00
> 1.00
Subject Site
Proposed Buildings
Minor Flood Level Contours (Spacing = 0.1 m)
Major Flood Level Contours (Spacing = 0.5 m)
Cadastral Boundaries
Proposed Culvert
Proposed Inlets

TITLE: **PMF Peak flood depths and levels - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **11**

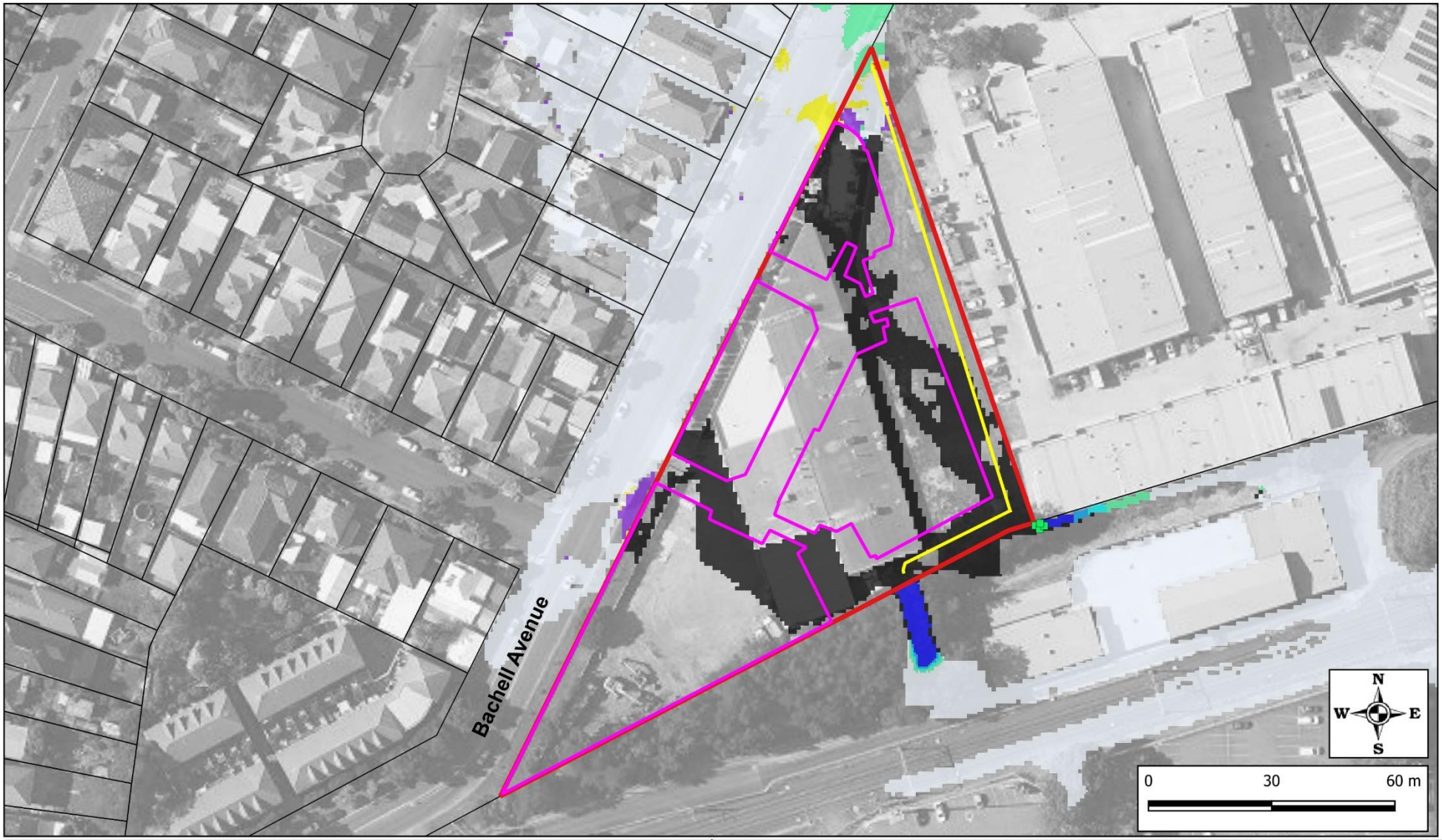
grc HYDRO



Proposed Buildings
Subject Site
Cadastral Boundaries
Proposed Inlets
Proposed Culvert
Flood Hazard
H1
H2
H3
H4
H5
H6

TITLE: **PMF Flood Hazard - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,100**	FIGURE No. **12**

grc HYDRO



Proposed Buildings
Subject Site
Cadastral Boundaries
Proposed Inlets
Proposed Culvert

Flood Impact

< -0.3	0.01 to 0.1
-0.3 to -0.2	0.1 to 0.2
-0.2 to -0.1	0.2 to 0.3
-0.1 to -0.01	> 0.3
No Impact	No Longer Flooded
	Newly Flooded

TITLE: **1% AEP Peak Flood Level Impact - Proposed**		
PROJECT: **2 Bachell Avenue, Lidcombe**		
PROJECT No. **200114**		
DATE: **09-2024**	SCALE: **1:1,200**	FIGURE No. **13**

grc HYDRO