4 Attachment C – Form 1

FLOOD EMERGENCY RESPONSE PLANNING FOR DEVELOPMENT IN PITTWATER POLICY
FORM NO. 1 – To be submitted with Development Application

Development Application for

_____
(Name of Applicant)

Address of site: 40 Maxwell street, Mona Vale

Declaration made by hydraulic engineer or engineer specialising in flooding/flood emergency response as part of a Flood Risk Emergency Assessment:

I, Ky Tran (Insert Name) on behalf of KD Stormwater Pty Ltd (Trading or Business/ Company Name)

on this the 25th March 2019 (Date) certify that I am a hydraulic engineer or engineer specialising in flooding/flood emergency response and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least $2million.

Flood Risk Emergency Assessment Details:

Report Title: Flood Study

Report Date: March 2019

Author: Ky Tran

Author's Company/Organisation: KD stormwater Pty Ltd

I: Ky Tran (Insert Name)

Please tick appropriate box (more than one box can be marked)

☑ have prepared the Flood Risk Emergency Assessment referenced on Form 1 in accordance with Council's guidelines and the Flood Emergency Response Planning for Development in Pittwater Policy.

☑ am willing to technically verify that the detailed Flood Risk Emergency Assessment referenced on Form 1 has been prepared in accordance with Council's guidelines and the Flood Emergency Response Planning for Development in Pittwater Policy.

☐ have examined the site and the proposed development in detail and have carried out a risk assessment (which has been attached to this form), and can confirm that:

- ☐ The addition/dwelling/building is located outside of the extents for Flood Life Hazard Categories H3-H4, H5 and H6 and a Flood Risk Emergency Assessment in not required.

☐ confirm that the results of the risk assessment for the proposed development are in compliance with the Flood Risk Management Policy for Development in Pittwater and a detailed risk assessment is not required for the subject site.

☐ have examined the site and the proposed development/alteration/addition in detail and I am of the opinion (after carrying out a risk assessment) that the Development Application does not require a Flood Risk Emergency Assessment and I have attached the risk assessment to this form.

☐ have reviewed (provide details of Report) the Flood Risk Emergency Assessment previously prepared for this property and can confirm it is up to date and is still current.

Documentation which relate to or are relied upon in report preparation:

☑ I am aware that the Flood Risk Emergency Assessment referenced on Form 1, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Flood Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable or Tolerable Risk" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Hydraulic engineer or engineer specialising in flooding/flood emergency response details:

Signature .....

Name ..... Ky Tran .....

Chartered Professional Status..... CPEng .....

Membership No. ..... 3109482 .....

Company..... KD stormwater Pty Ltd .....

Number of years specialising in flooding/emergency response..... 10 years .....

FLOOD STUDY

No. 40 MAXWELL STREET, MONA VALE, NSW

Prepared by : Ky Tran

(BSc,MEngSc,MIEAust,CPEng,NER (No.3109482)

Contact 0432 211 421

March 2019

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1. Introduction and background

The proposed development involves alterations & additions to an existing dwelling and construction of a secondary dwelling. Flood information letter dated 13/12/2018, issued by Northern Beaches Council indicates the site is affected flooding. Therefore a floodstudy is prepared to address flood impact assessment and flood risk management for the proposed development. The site locality is shown in Figure 1.

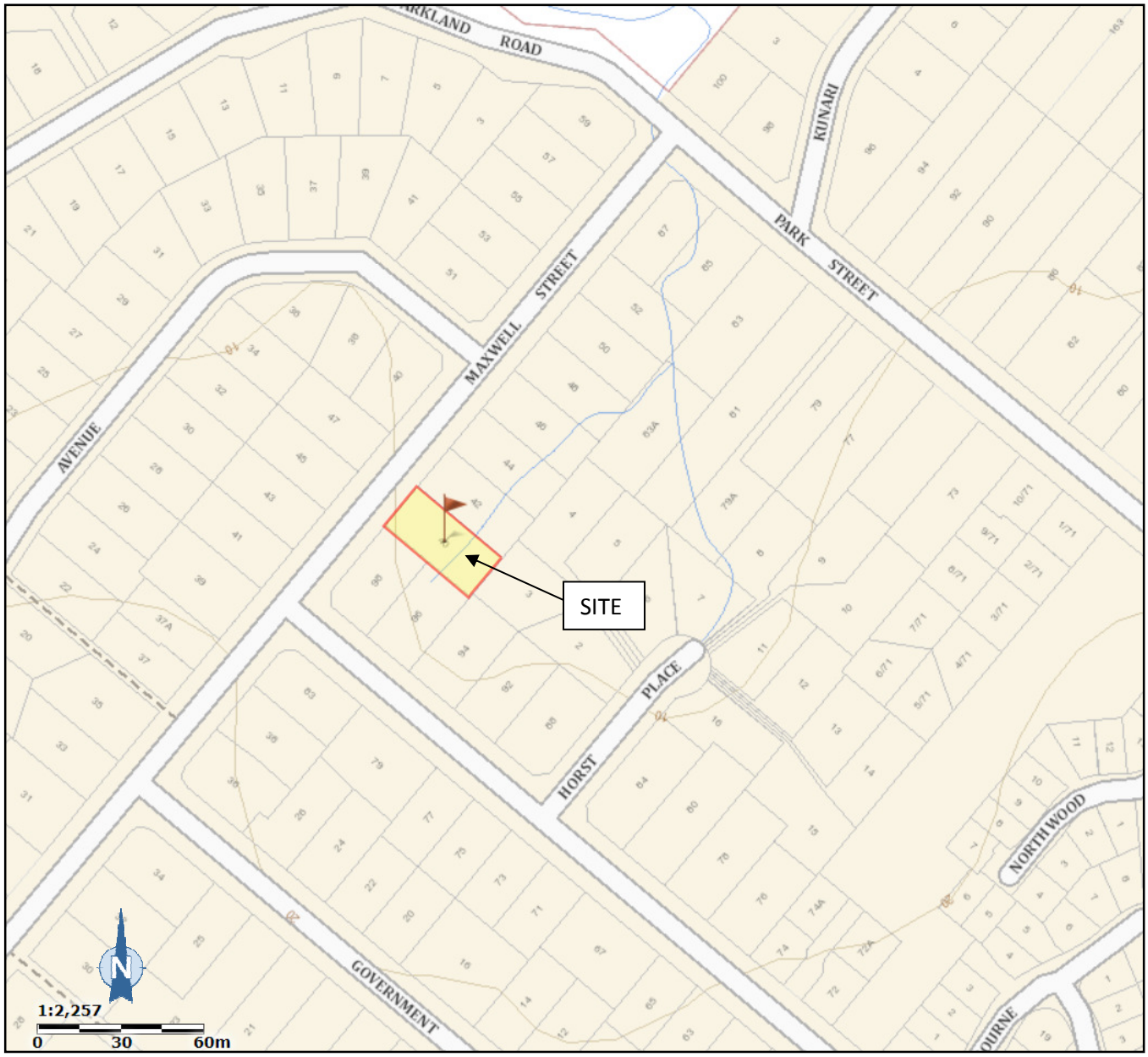


Figure 1 Site locality *(Source: Spatial Information Exchange)*

2. Data available

Data available for the flood study include:

- Flood maps and flood levels , dated 14 June 2016, supplied by Council.
- Proposed architectural drawings, project No 2018080, dated 11.03.2019, prepared by Blue Sky Building Designs.
- Site survey , dated 09/11/2018, prepared by Waterview Surveying services.
- Cadastre and topographical data from Land & Property Information (LPI) department in 2018.
- Aerial photos from Spatial Information Exchange (SIX) website in March 2019.

3. Existing flood conditions

The 1% Annual Exceedance Probability (AEP) flood extent map, flood hazard map, flood hydraulic category extent map and flood life hazard map are respectively presented from Figure 2 to Figure 5.

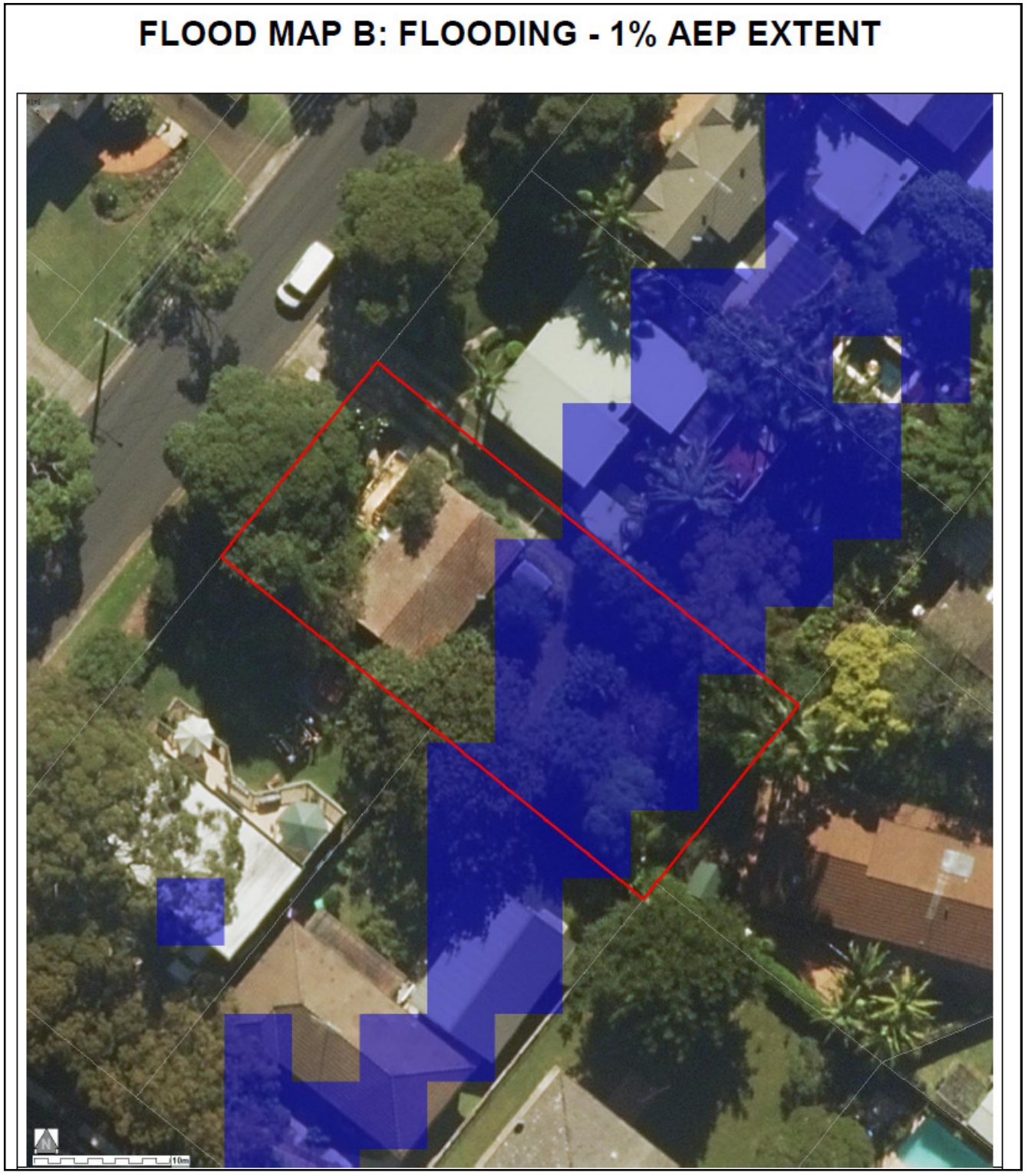


Figure 2 1% AEP Flood extent *(source: Northern Beaches Council)*

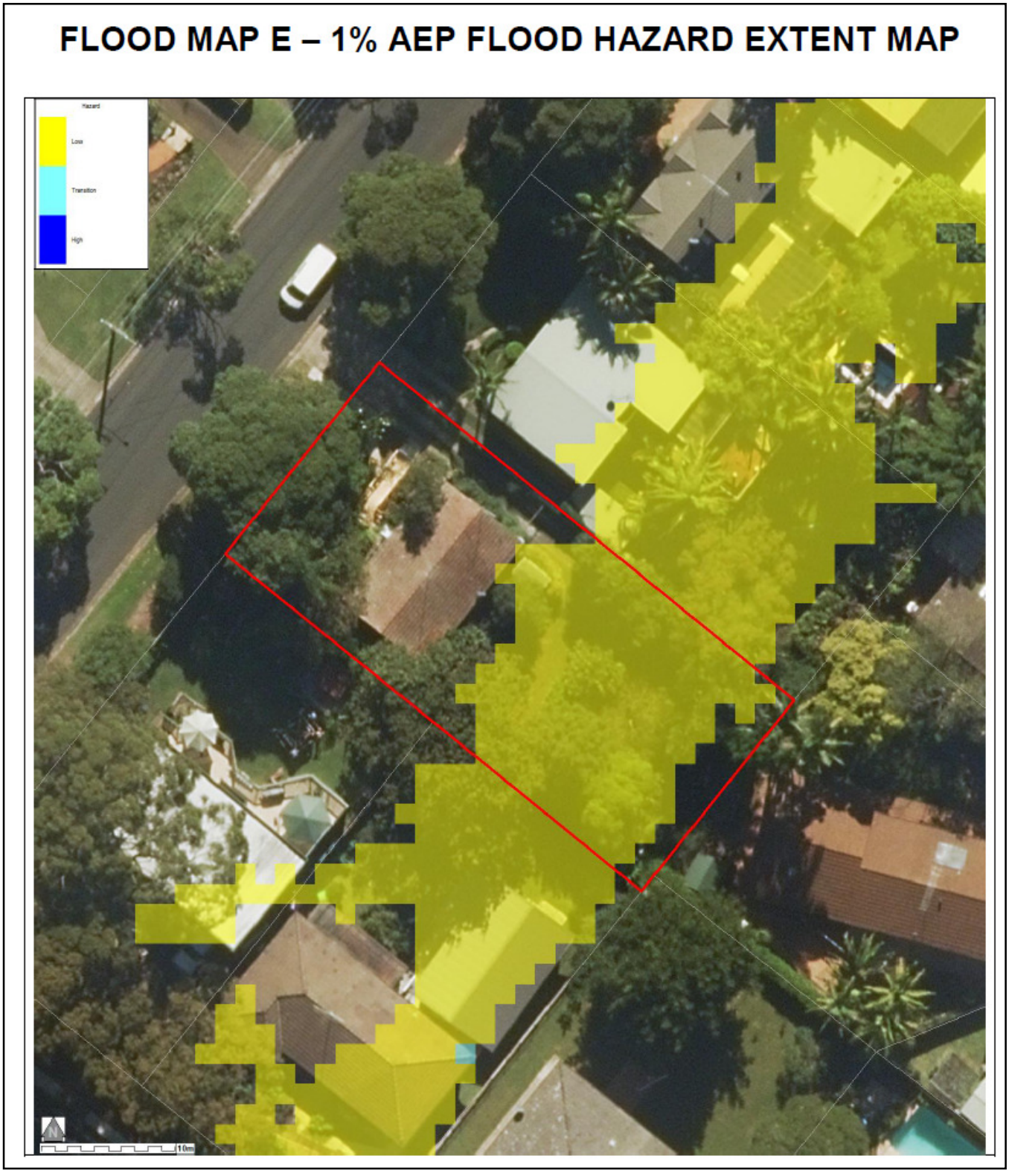


Figure 3 1% AEP Flood hazard map *(source: Northern Beaches Council)*

FLOOD MAP F – 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP

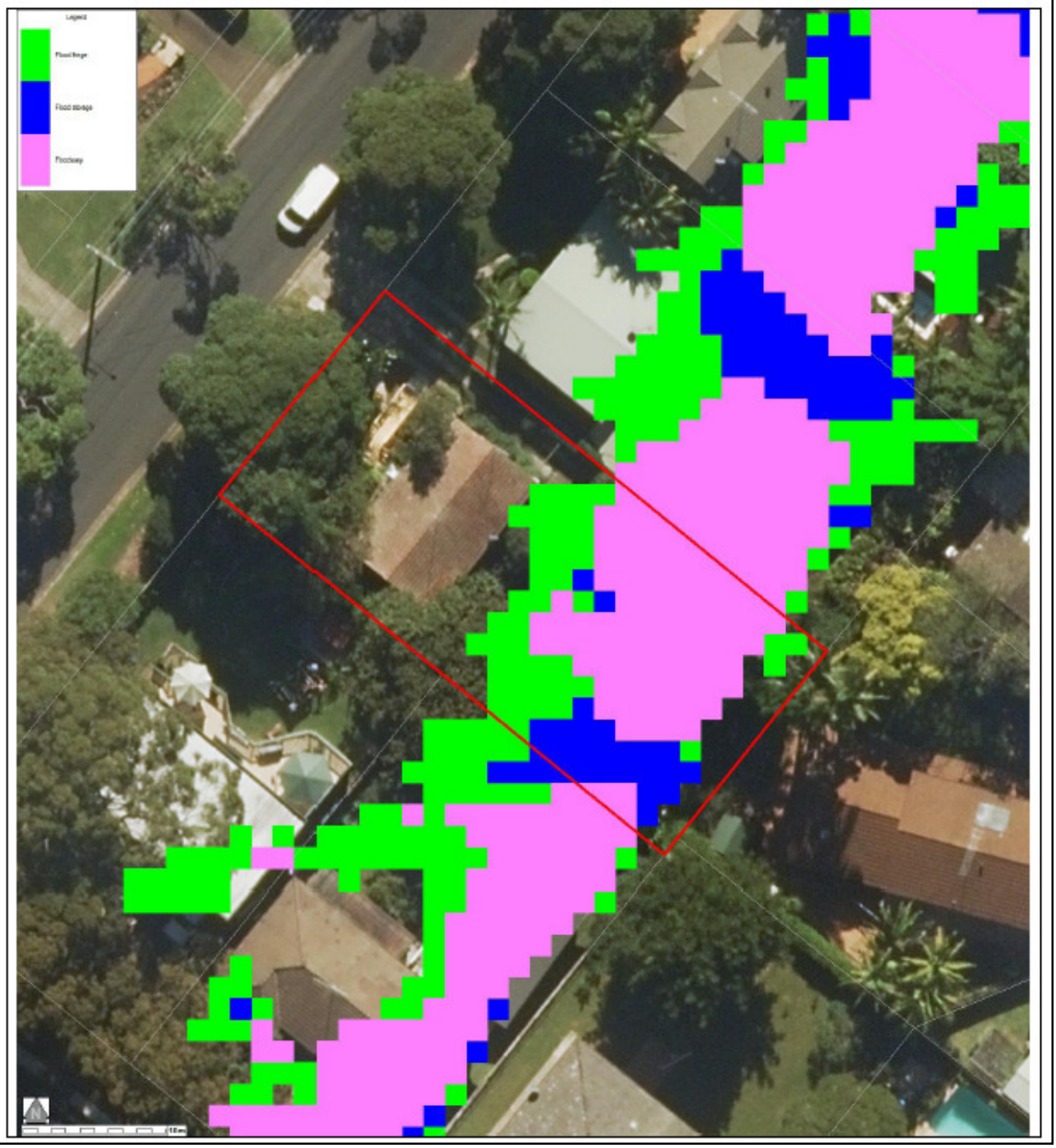


Figure 4 1% AEP Flood hydraulic category extent *(source: Northern Beaches Council)*

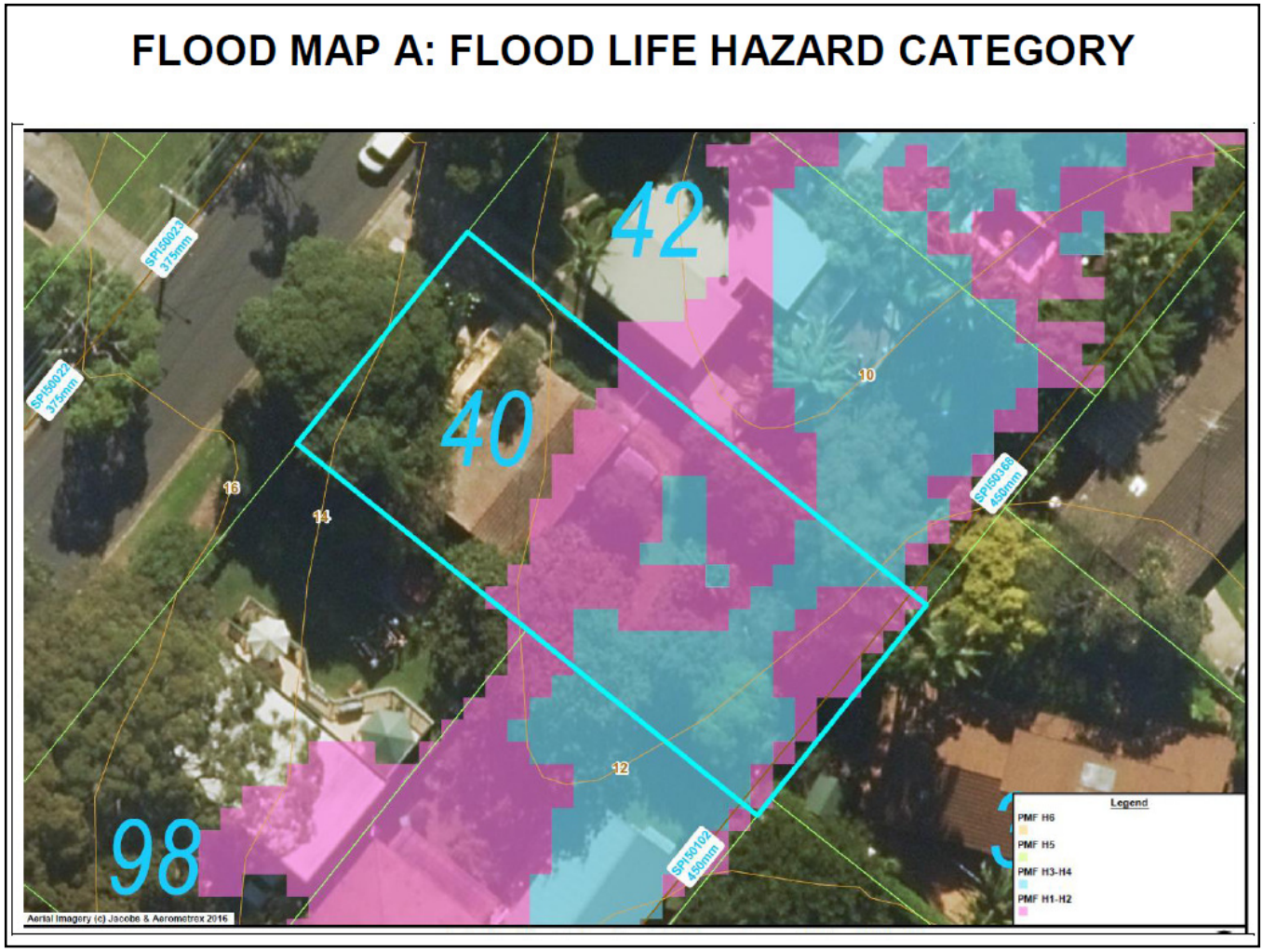


Figure 5 Flood life hazard *(source: Northern Beaches Council)*

Flood information from Figure 3 and Figure 5 indicates that within the site the flood hazard is low and the risk to life is tolerable (H3 to H5).

The existing flood levels at the site supplied by Council are shown in Figure 6 and Table 1.

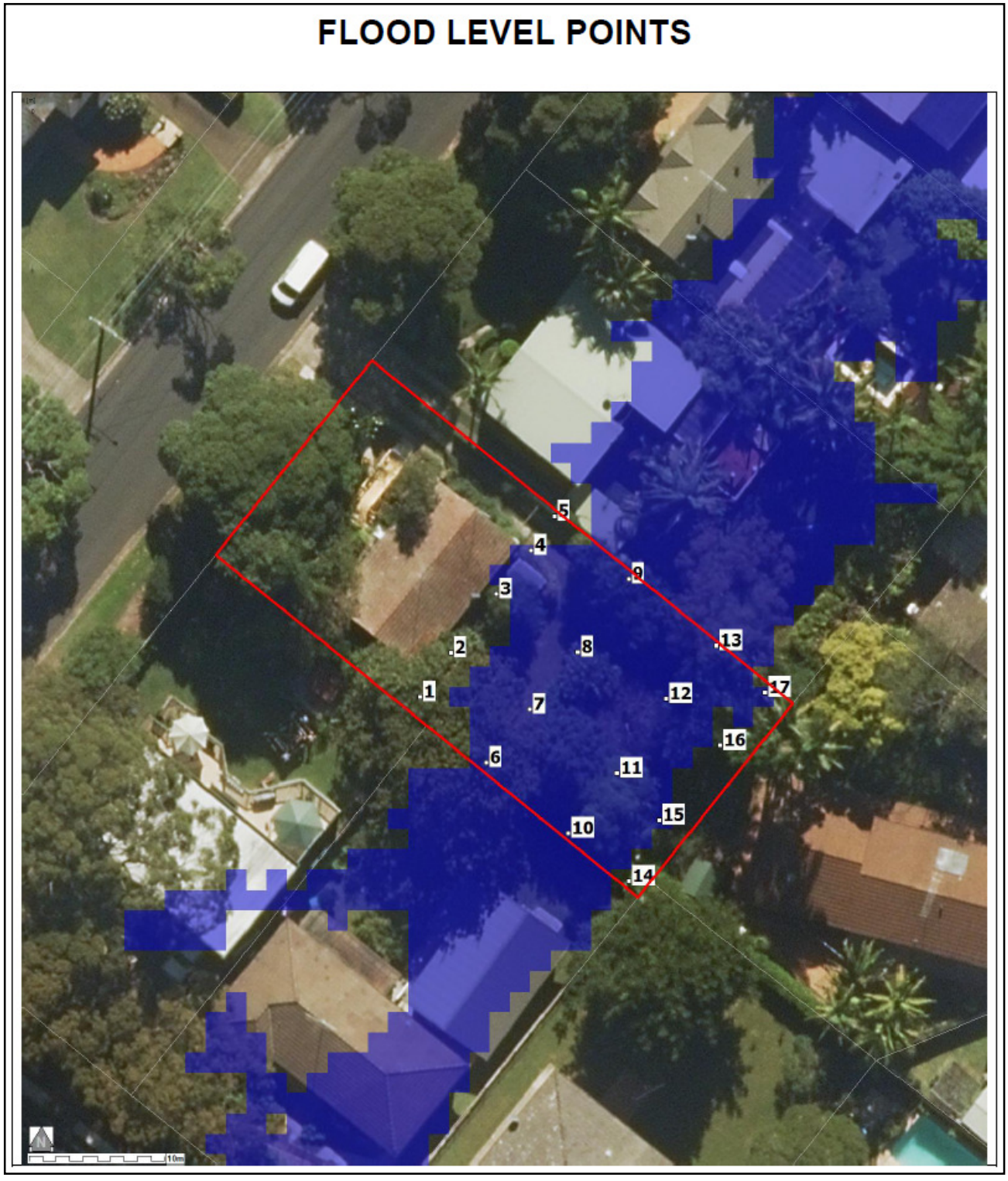


Figure 6 Location of flood levels

Table 1 Flood levels at locations shown in Figure 6

ID	5% AEP Max WL (m AHD)	5% AEP Max Depth (m)	1% AEP Max WL (m AHD)	1% AEP Max Depth (m)	1% AEP Max Velocity (m/s)	Flood Planning Level (m)	PMF Max WL (m AHD)	PMF Max Depth (m)	PMF Max Velocity (m/s)
1	N/A	N/A	N/A	N/A	N/A	11.83	11.67	0.21	0.53
2	N/A	N/A	N/A	N/A	N/A	11.55	11.35	0.24	0.60
3	N/A	N/A	N/A	N/A	N/A	11.16	10.92	0.41	0.62
4	N/A	N/A	10.46	0.16	0.32	10.94	10.71	0.41	0.68
5	N/A	N/A	N/A	N/A	N/A	10.65	10.44	0.28	0.78
6	N/A	N/A	11.46	0.24	0.43	11.96	11.76	0.54	0.81
7	N/A	N/A	11.24	0.19	0.46	11.72	11.49	0.44	0.83
8	N/A	N/A	10.75	0.33	0.48	11.26	11.01	0.59	0.83
9	N/A	N/A	10.21	0.23	0.60	10.69	10.43	0.45	0.96
10	N/A	N/A	11.52	0.32	0.52	12.05	11.84	0.64	0.81
11	N/A	N/A	11.35	0.58	0.55	11.81	11.61	0.84	0.88
12	N/A	N/A	10.71	0.30	0.87	11.20	10.92	0.52	1.10
13	N/A	N/A	10.05	0.30	0.63	10.57	10.31	0.56	0.94
14	N/A	N/A	N/A	N/A	N/A	12.08	11.87	0.52	0.61
15	N/A	N/A	11.44	0.31	0.25	11.86	11.69	0.56	0.48
16	N/A	N/A	N/A	N/A	N/A	11.11	10.84	0.31	0.78
17	N/A	N/A	10.33	0.24	0.38	10.80	10.55	0.46	0.48

WL – Water Level
PMF – Probable Maximum Flood
N/A = no peak water level/depth/velocity available in flood event

4. Proposed development

The proposal involves extension to ground floor, additional first floor to the existing dwelling and a detached secondary dwelling. The proposed development layout is presented in Figure7.

Figure 7 Proposed development layout.

The proposed layout is overlaid on the Council's flood map to identify 1% AEP flood levels. The overlay is shown in Figure 8.

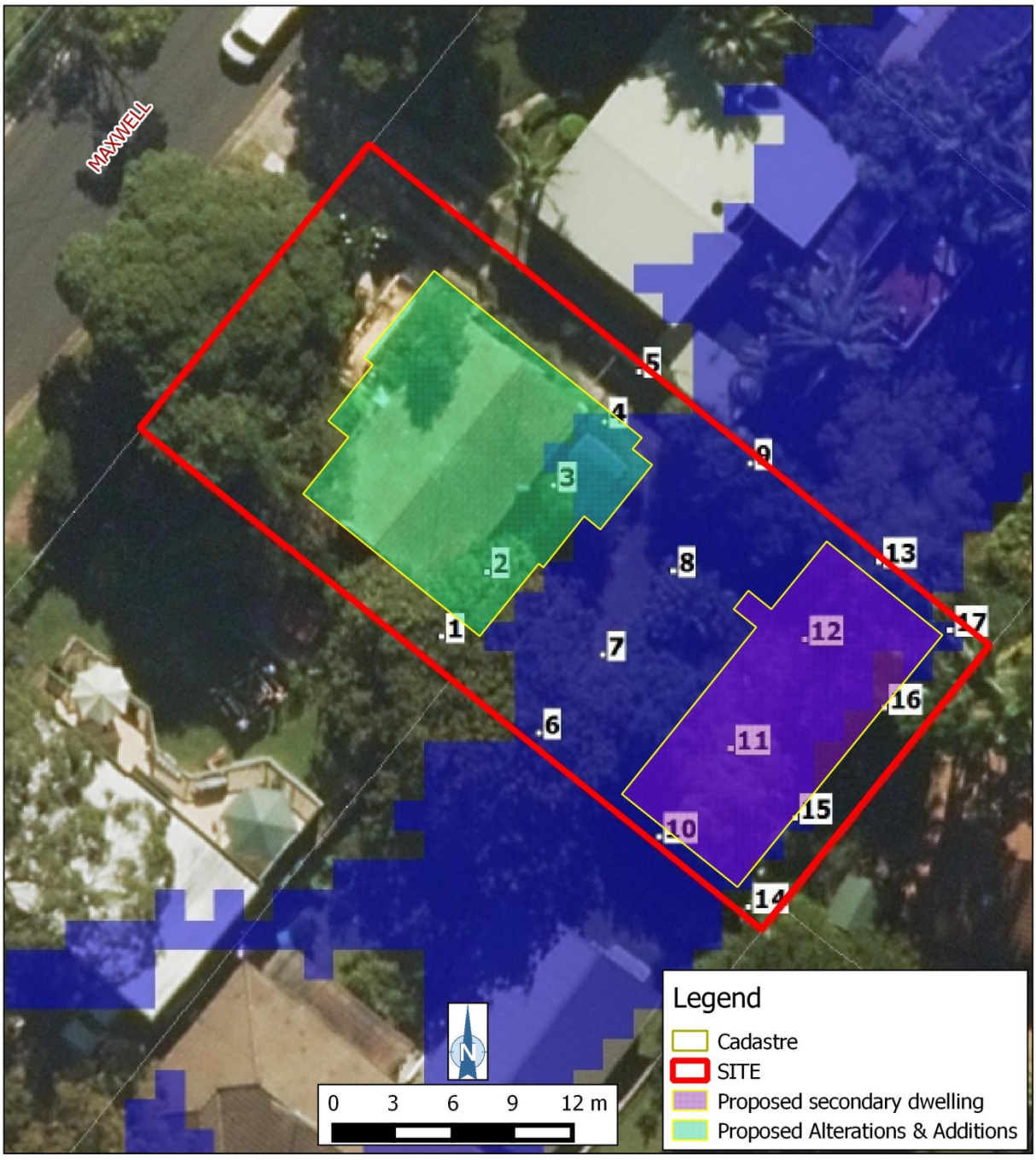


Figure 8 Flood map overlay

Figure 8 and Table1 indicate upstream 1% AEP flood levels are 11.46 mAHD (point 6) and 11.52 mAHD (point 10) for the proposed additions and secondary dwelling respectively. The flood map overlay also shows the development encroaches the 1% AEP flood extent.

Overlay of the proposed layout and flood hydraulic category map is presented in Figure 9.

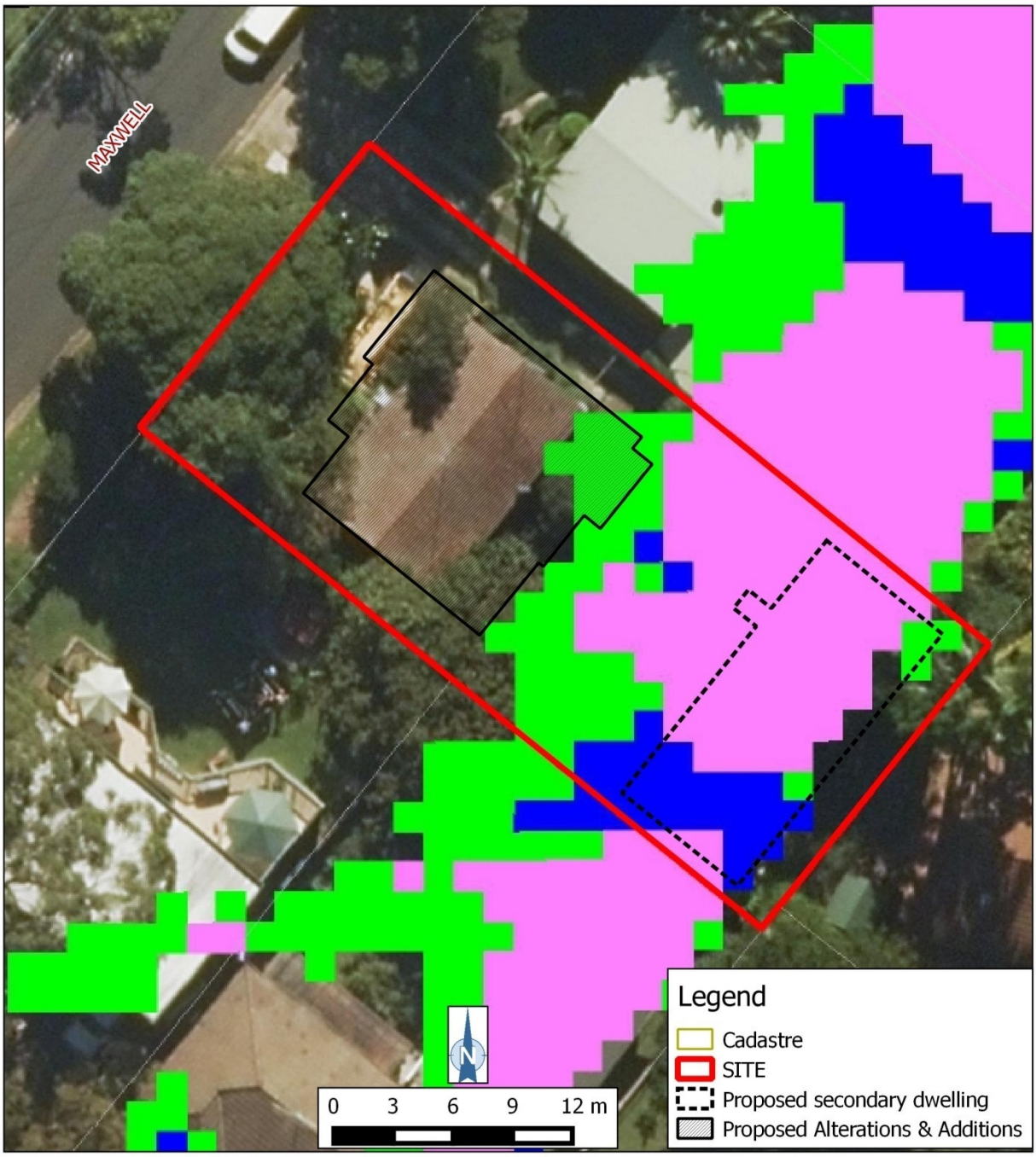


Figure 9 Overlay of proposed layout and flood category map

As seen from Figure 9 whilst the proposed extension is slightly encroach the flood fringe the proposed secondary dwelling is located in both flood way and flood storage area.

5. Flood mitigation and flood impact assessment

Suspended floor structure is proposed for the development as a flood mitigation measure. The opening in the subfloor will span between underpinning columns and be minimum 100mm above the 100-year flood level , enabling overland flow passage without obstruction. The proposed suspended floor for the addition area and secondary dwelling are displayed in Figure 10 and Figure 11.

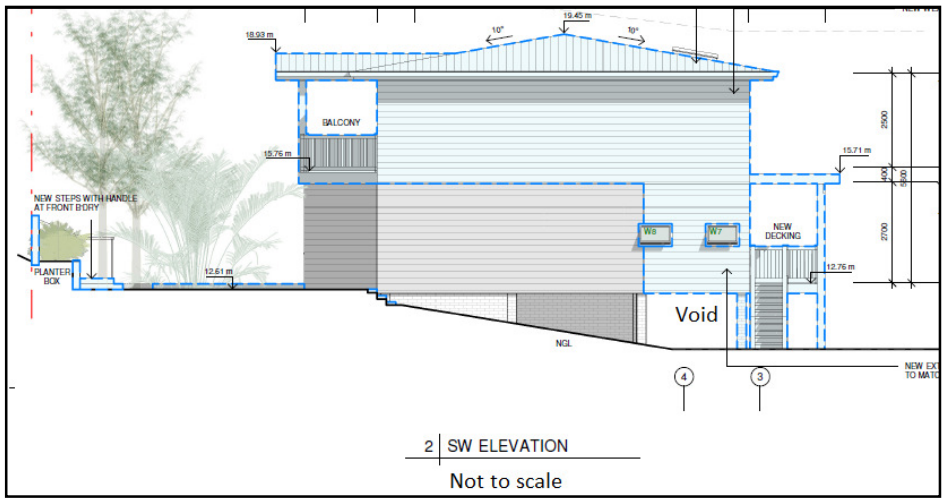


Figure 10 Proposed extension - Southwest Elevation

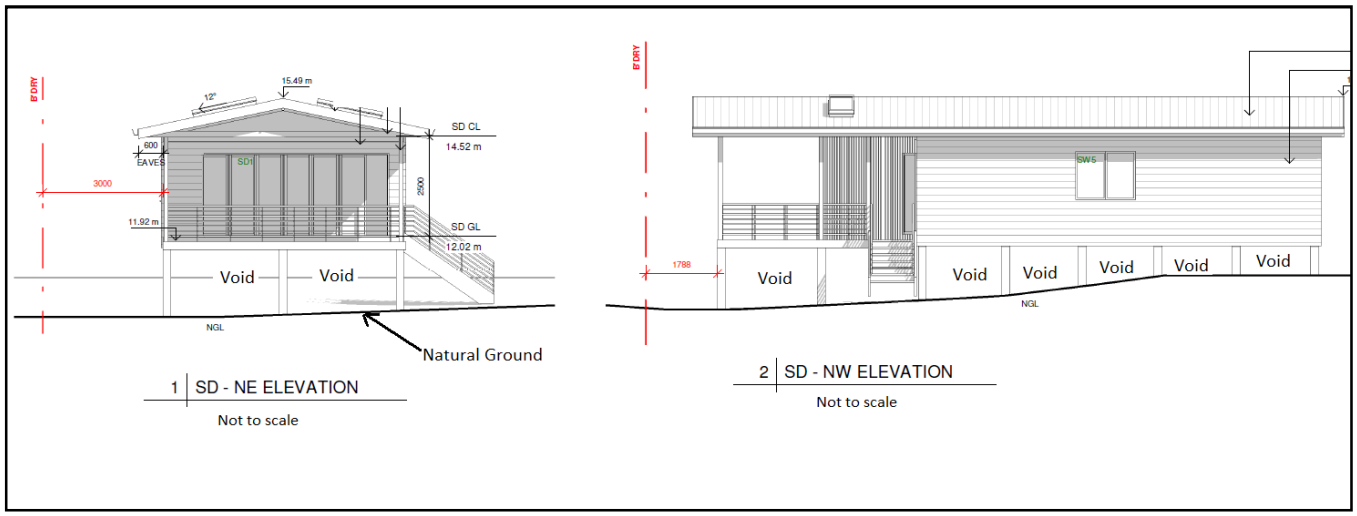


Figure 11 Proposed secondary dwelling- Northeast and Northwest Elevations

As shown in Figure 10 and Figure 11 the proposed suspended floor ensures the development does not cause detrimental impacts to the existing flood conditions.

6. Flood Risk mangement

The flood risk management is adopted from *clause 3.5 of the State Environmental Planning Policy (Exempt and Complying Codes) 2008.*

The above analysis and implementation of suspended floor ensure the proposed development is not any of the following

- *a flood storage,*
- *a floodway area,*
- *a flow path,*
- *a high hazard area,*
- *a high risk area.*

Based on Figure 8 and Table 1, the minimum Finished Floor Level (FFL) shall be set at 11.96 mAHD for the extension area and 12.02 mAHD for the secondary dwelling.

Unless supporting structures of the proposed development are of reinforced concrete or solid brick, a qualified structure engineer is to certify that the proposed development will

- *be able to withstand the forces of floodwater, debris and buoyancy up to 1% AEP level plus 0.5m, and*
- *have the part of the development at or below the 1% AEP level plus 0.5m constructed of flood compatible material.*

7. Flood evacuation

The top PMF level at the site is 11.87 mAHD which is below the FFL of both main dwelling 12.76 mAHD and the secondary dwelling 12.02 mAHD. Therefore development has complied with the in-place-shelter flood requirements.

8. Conclusions

The available flood information indicates the development is not subject to high flood hazard. Site analysis shows that suspended floor used as the flood mitigation measure will eliminate adverse impacts to the existing flood conditions. The flood risk management including FFLs and flood evacuation has been adequately addressed.

NORTHERN BEACHES COUNCIL

FLOOD INFORMATION REQUEST – MULTI-PURPOSE

Property: 40 Maxwell Street Mona Vale
Lot DP: 9//216532
Issue Date: 13/12/2018
Flood Study Reference: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level[3]: 11.52 mAHD

1% AEP Maximum Peak Depth from natural ground level[3]: 0.58 m

1% AEP Maximum Velocity: 0.87 m/s

1% AEP Provisional Flood Hazard: Low **See Flood Map E**

1% AEP Hydraulic Categorisation: Floodway **See Flood Map F**

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL)[1,2, 3 &4]: 12.02 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 11.87m AHD

PMF Maximum Depth from natural ground level: 0.77 m

PMF Maximum Velocity: 1.10 m/s

PMF Flood Hazard: High **See Flood Map G**

PMF Hydraulic Categorisation: Floodway **See Flood Map H**

Flood Risk Precinct – See Map K

Flooding with Climate Change (See Flood Map I)

The following is for the 30% Rainfall intensity increase and 0.9m Sea Level Rise Scenario:

1% AEP Maximum Water Level with Climate change[1&3]: 11.53 m AHD

1% AEP Maximum Depth with Climate Change[3]: 0.61 m

1% AEP Maximum Velocity with Climate Change[3]: 0.80 m/s

PMF Maximum Water Level from natural ground level with SLR[3]: 11.90 m

PMF Maximum Depth from natural ground level with SLR[3]: 0.98 m

[1]The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.
[2]Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/ flood planning levels across the site.
[3]Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.
[4]Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

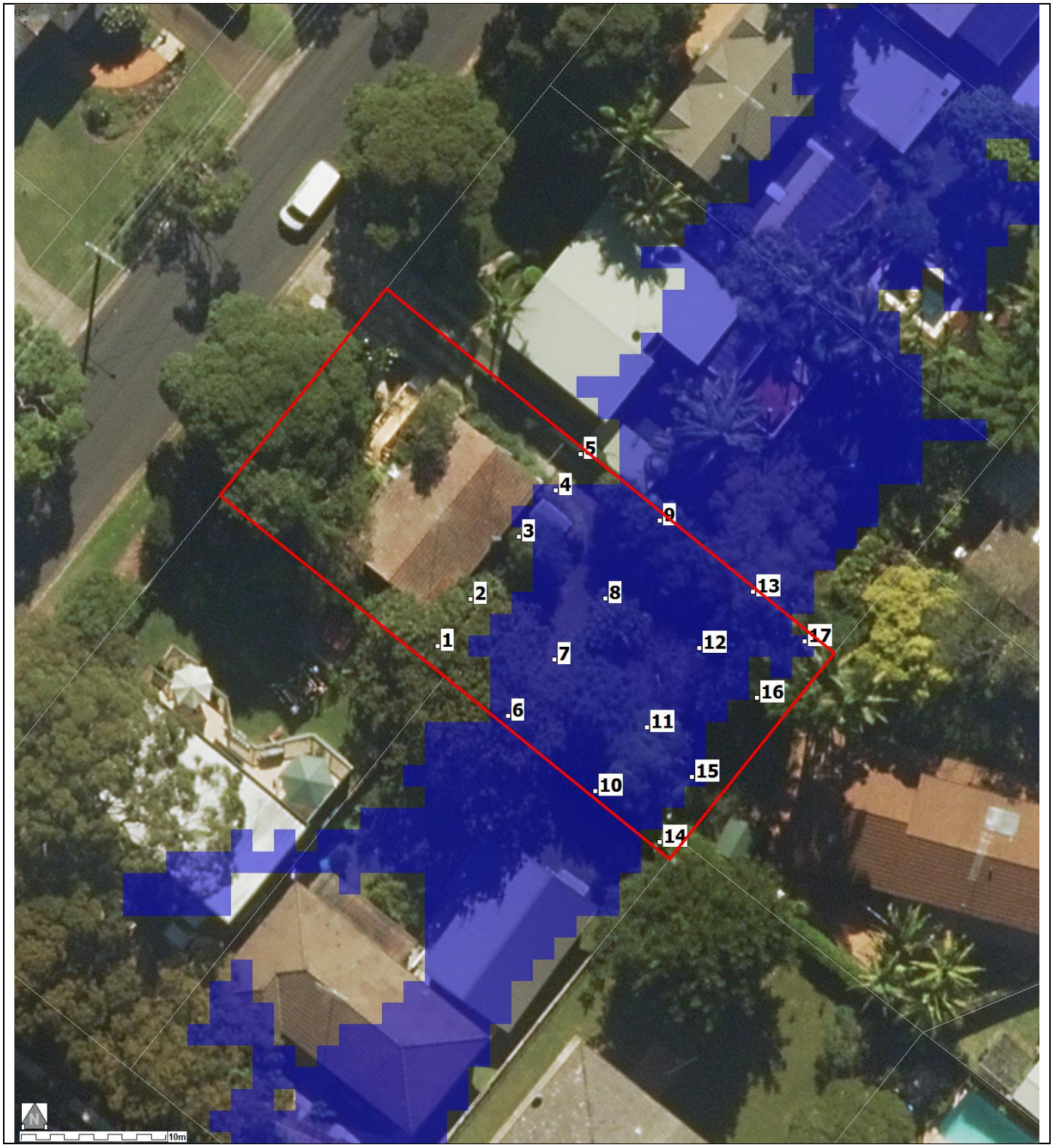
- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY

Notes:

- Refer to 'Flood Emergency Response Planning for Development in Pittwater Policy for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.25.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD LEVEL POINTS



Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only.

Flood Levels

ID	5% AEP Max WL (m AHD)	5% AEP Max Depth (m)	1% AEP Max WL (m AHD)	1% AEP Max Depth (m)	1% AEP Max Velocity (m/s)	Flood Planning Level (m)	PMF Max WL (m AHD)	PMF Max Depth (m)	PMF Max Velocity (m/s)
1	N/A	N/A	N/A	N/A	N/A	11.83	11.67	0.21	0.53
2	N/A	N/A	N/A	N/A	N/A	11.55	11.35	0.24	0.60
3	N/A	N/A	N/A	N/A	N/A	11.16	10.92	0.41	0.62
4	N/A	N/A	10.46	0.16	0.32	10.94	10.71	0.41	0.68
5	N/A	N/A	N/A	N/A	N/A	10.65	10.44	0.28	0.78
6	N/A	N/A	11.46	0.24	0.43	11.96	11.76	0.54	0.81
7	N/A	N/A	11.24	0.19	0.46	11.72	11.49	0.44	0.83
8	N/A	N/A	10.75	0.33	0.48	11.26	11.01	0.59	0.83
9	N/A	N/A	10.21	0.23	0.60	10.69	10.43	0.45	0.96
10	N/A	N/A	11.52	0.32	0.52	12.05	11.84	0.64	0.81
11	N/A	N/A	11.35	0.58	0.55	11.81	11.61	0.84	0.88
12	N/A	N/A	10.71	0.30	0.87	11.20	10.92	0.52	1.10
13	N/A	N/A	10.05	0.30	0.63	10.57	10.31	0.56	0.94
14	N/A	N/A	N/A	N/A	N/A	12.08	11.87	0.52	0.61
15	N/A	N/A	11.44	0.31	0.25	11.86	11.69	0.56	0.48
16	N/A	N/A	N/A	N/A	N/A	11.11	10.84	0.31	0.78
17	N/A	N/A	10.33	0.24	0.38	10.80	10.55	0.46	0.48

WL – Water Level
PMF – Probable Maximum Flood
N/A = no peak water level/depth/velocity available in flood event

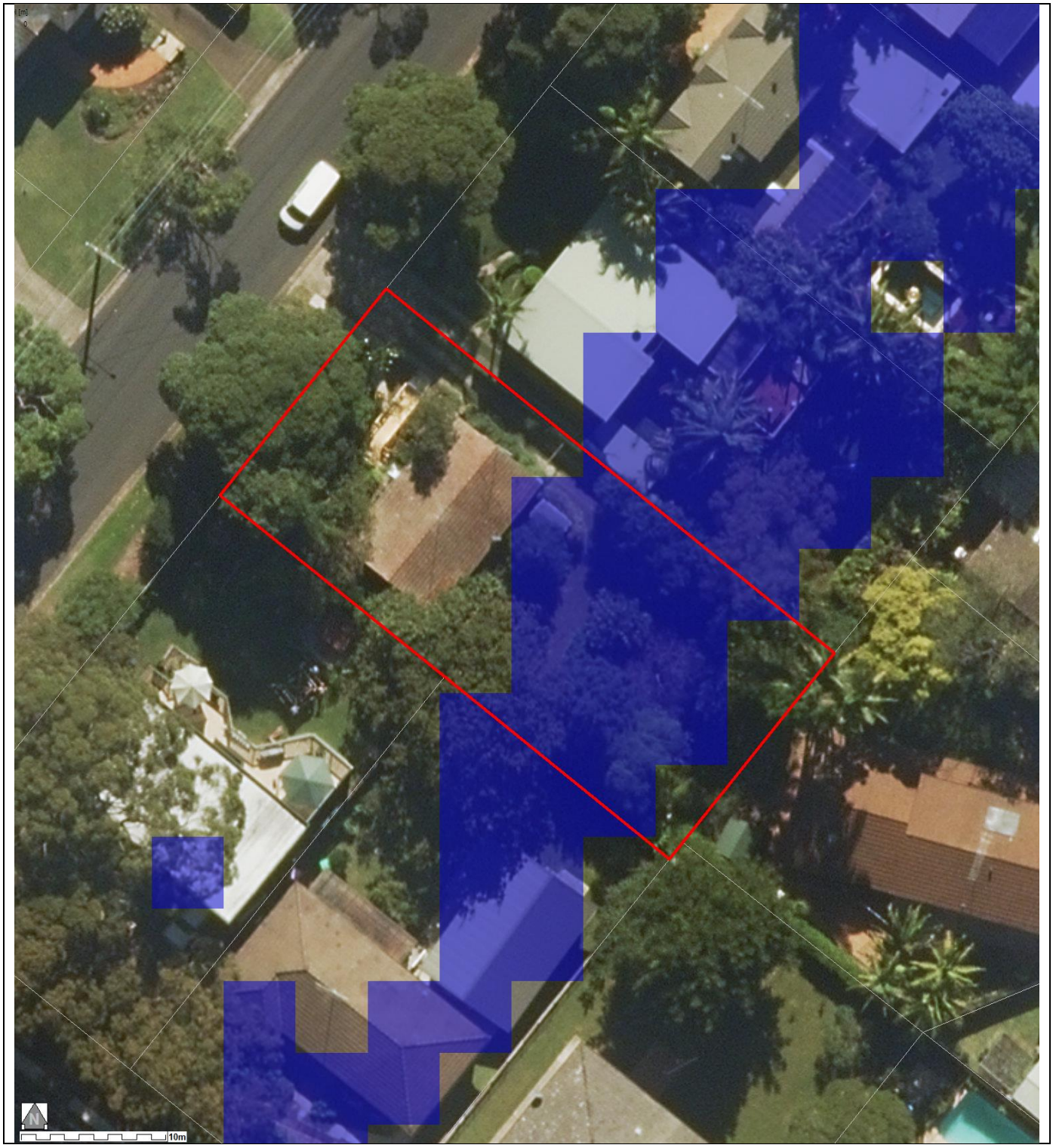
Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)

ID	CC 1% AEP Max WL (m AHD)	CC1 % AEP Max Depth (m)
1	N/A	N/A
2	N/A	N/A
3	10.58	0.20
4	10.42	0.16
5	N/A	N/A
6	11.52	0.32
7	11.09	0.20
8	10.78	0.34
9	10.23	0.25
10	11.48	0.46
11	11.37	0.61
12	10.72	0.33
13	10.26	0.31
14	11.53	0.33
15	11.47	0.28
16	10.78	0.18
17	10.28	0.24

A variable Flood Planning Level might apply - 0.5m above 1% AEP max water level (for Mainstream flooding) or 0.5m above the 1% AEP max water level flow path extent with depth greater than 0.3m and 0.3m above the 1% AEP max water level flow path with depth 0.3m and less (for overland flow)

WL – Water Level
PMF – Probable Maximum Flood
N/A = no peak water level/depth/velocity available in flood event.

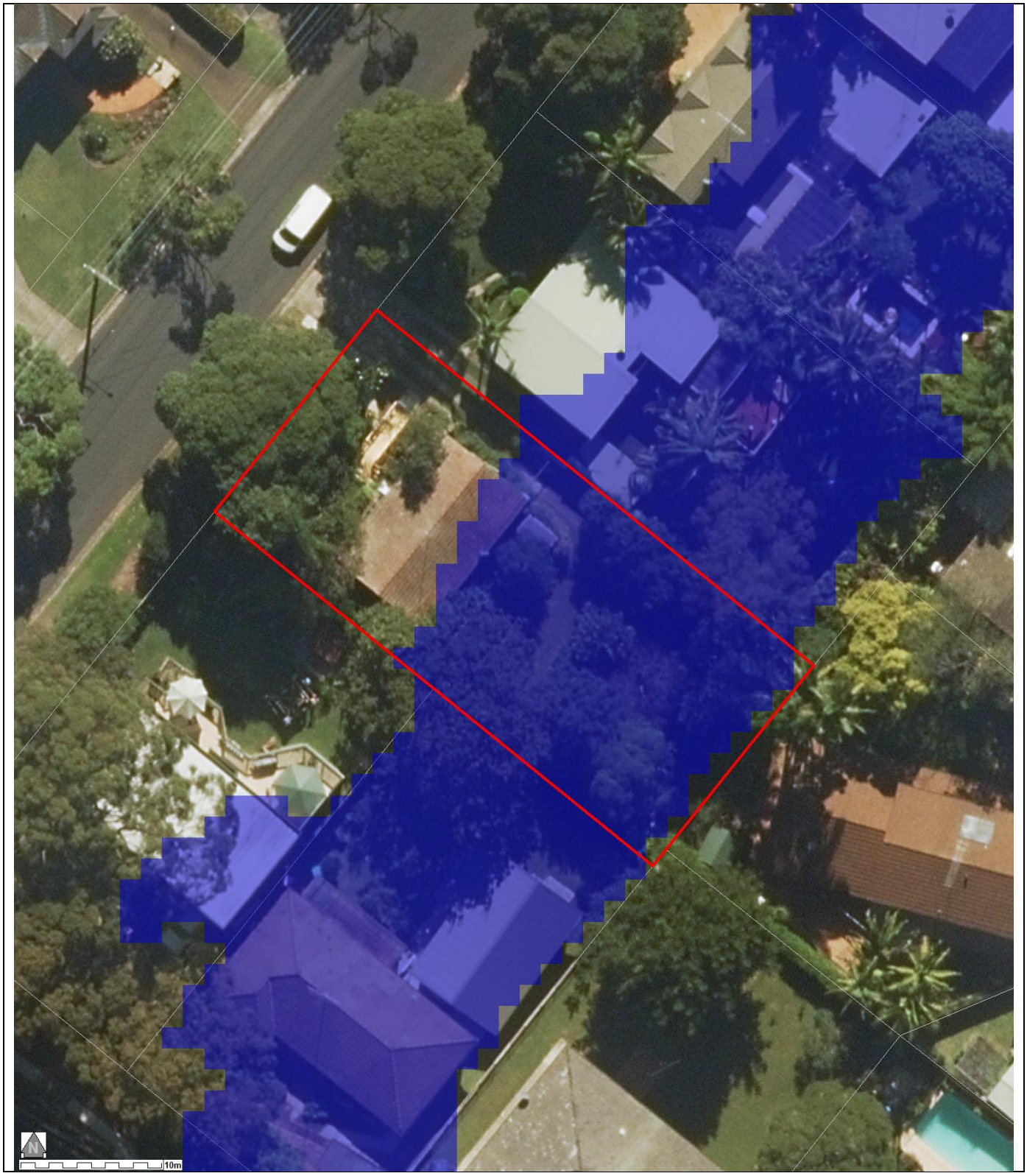
FLOOD MAP B: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source Near Map 2014) are indicative only.

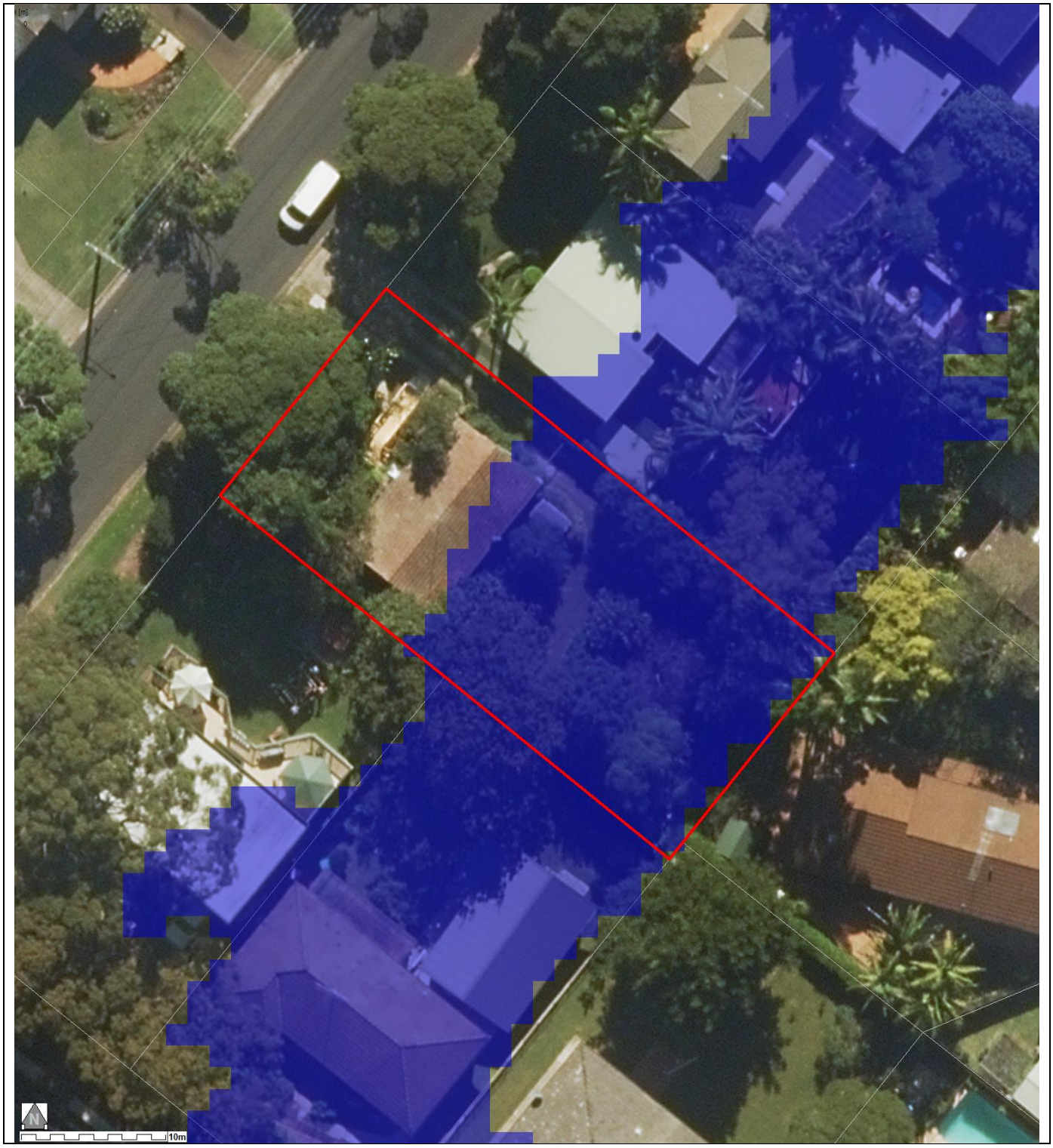
FLOOD MAP C: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source Near Map 2014) are indicative only.

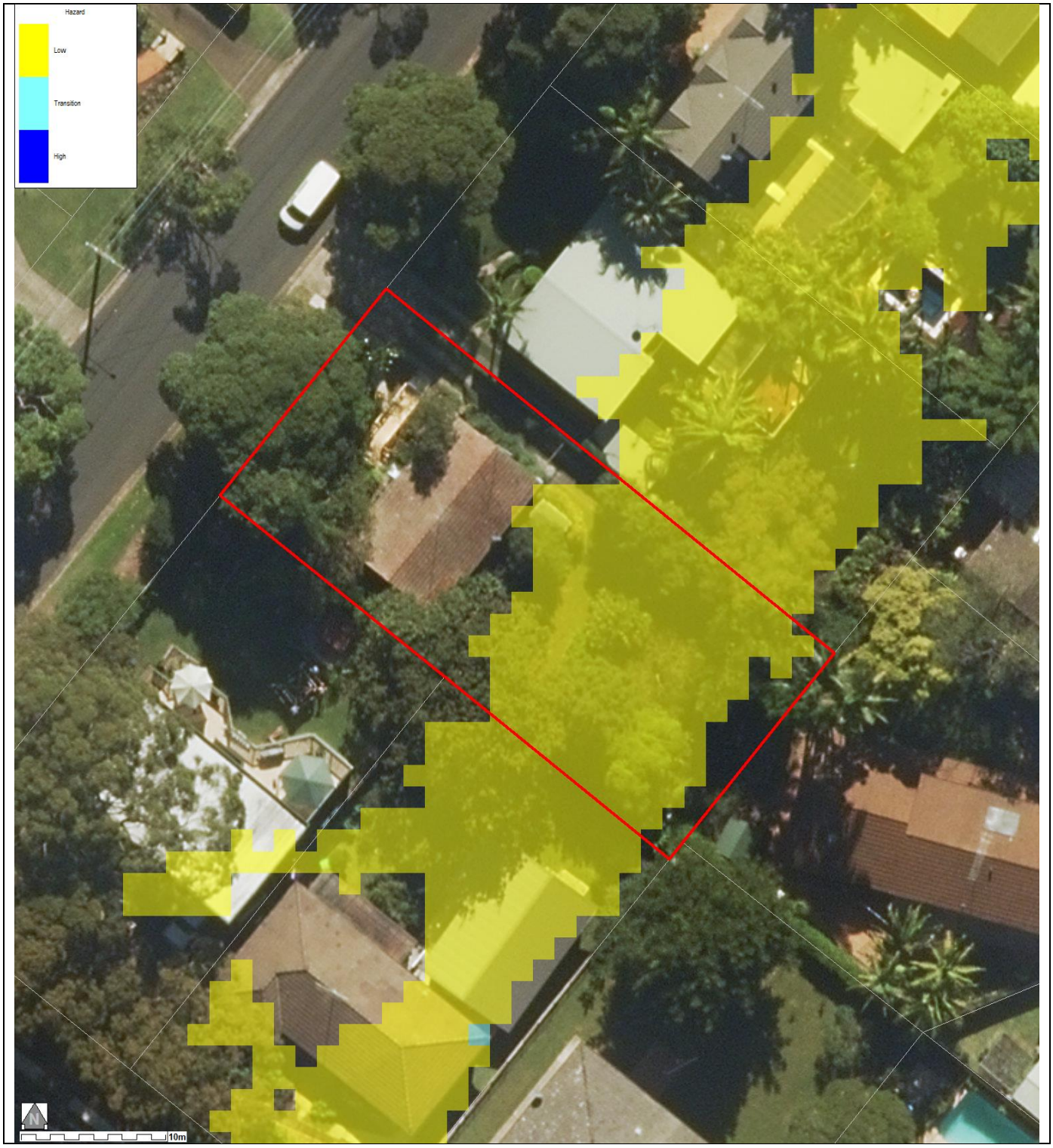
FLOOD MAP D - PMF EXTENT MAP



Notes:

- extent represents the Probable Maximum Flood (PMF) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

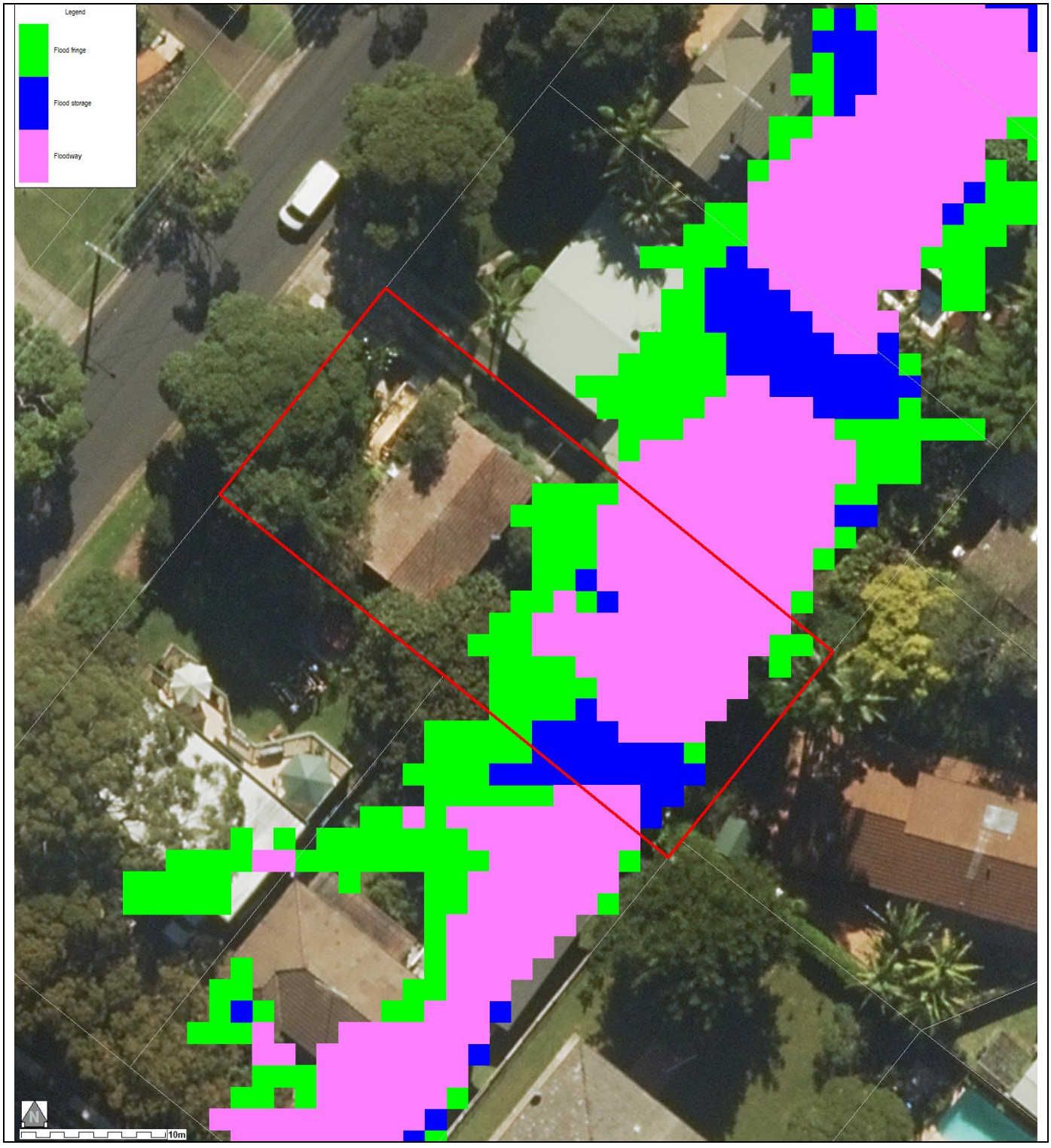
FLOOD MAP E – 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

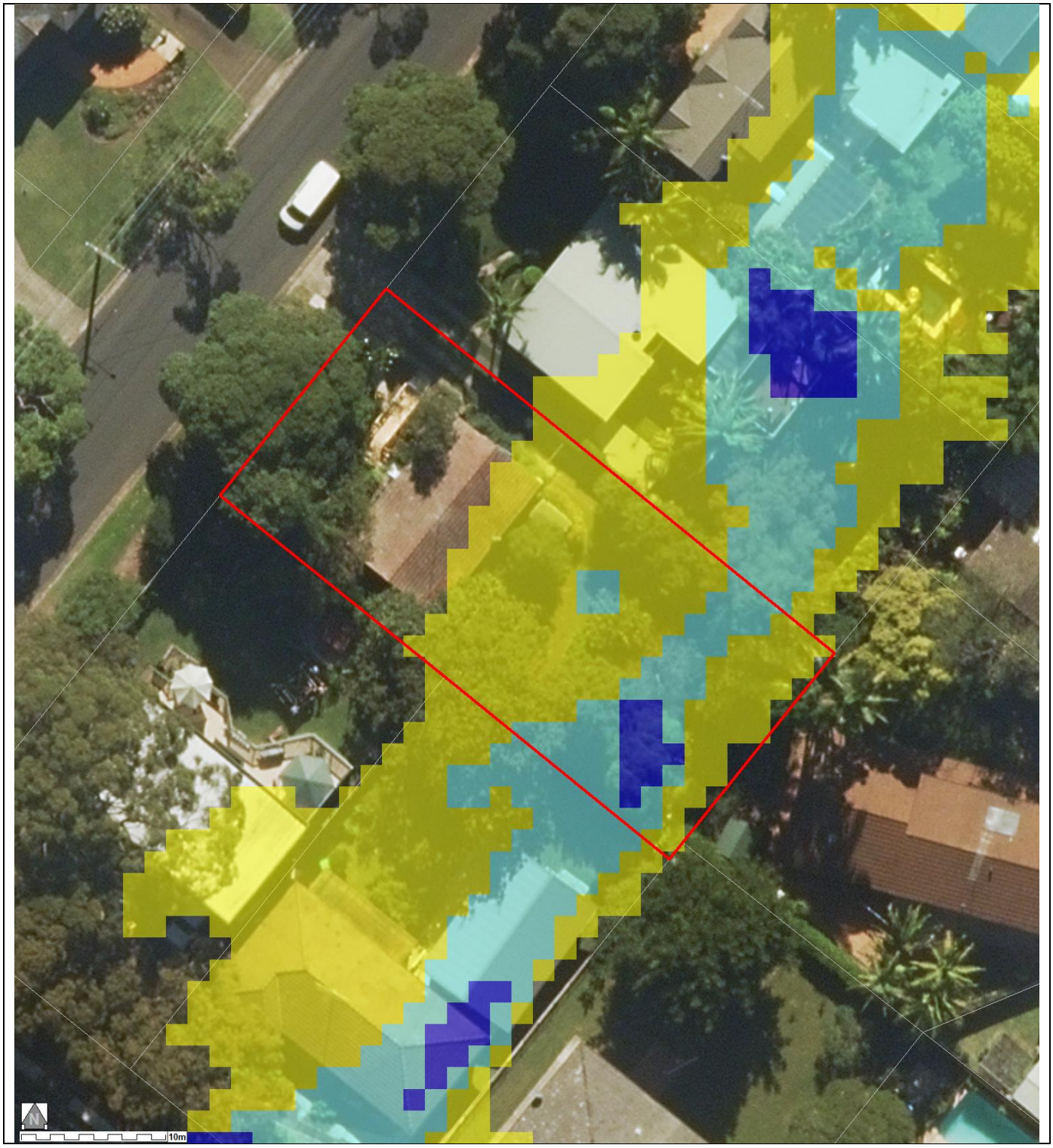
FLOOD MAP F – 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

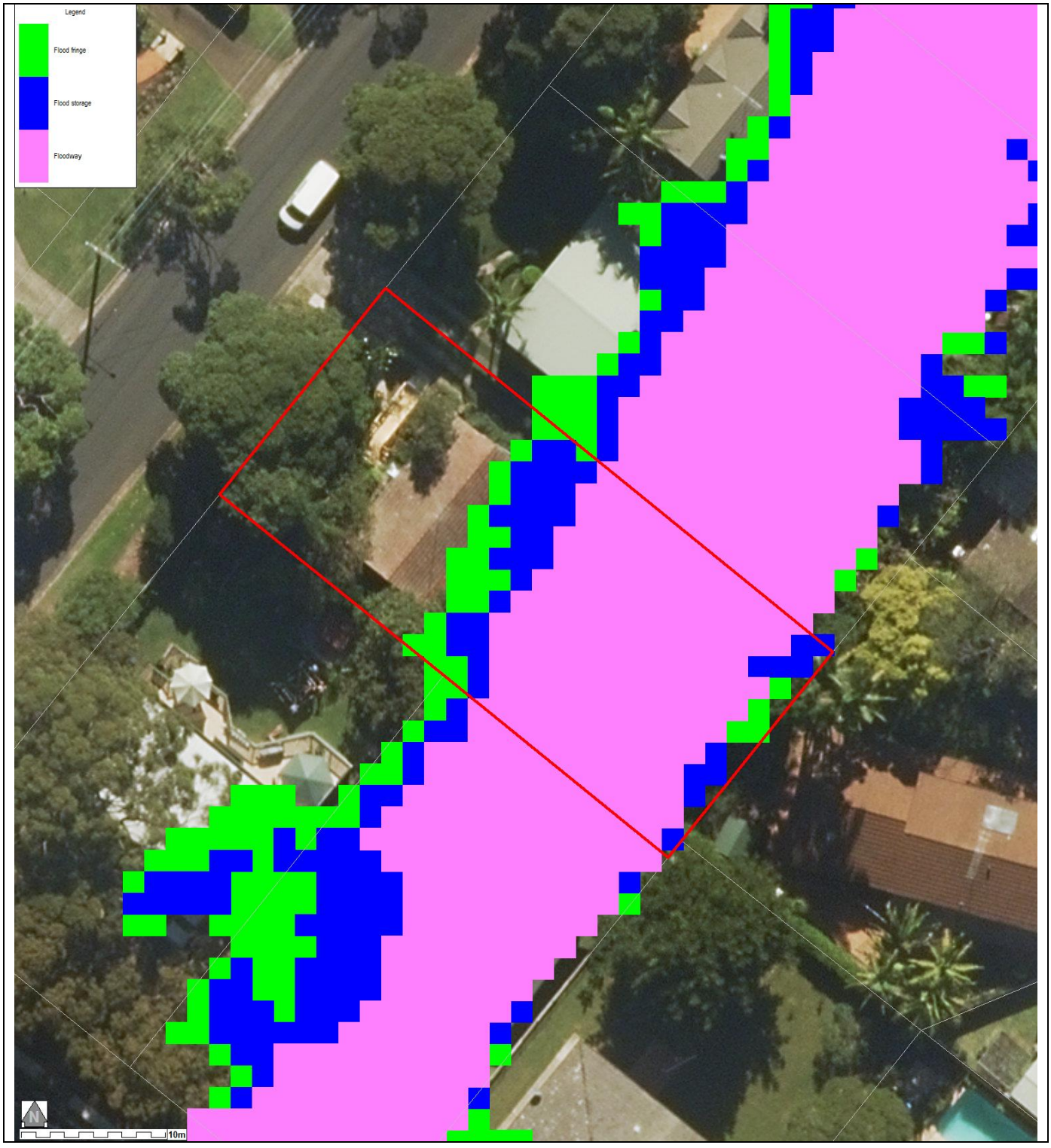
FLOOD MAP G – PMF FLOOD HAZARD EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

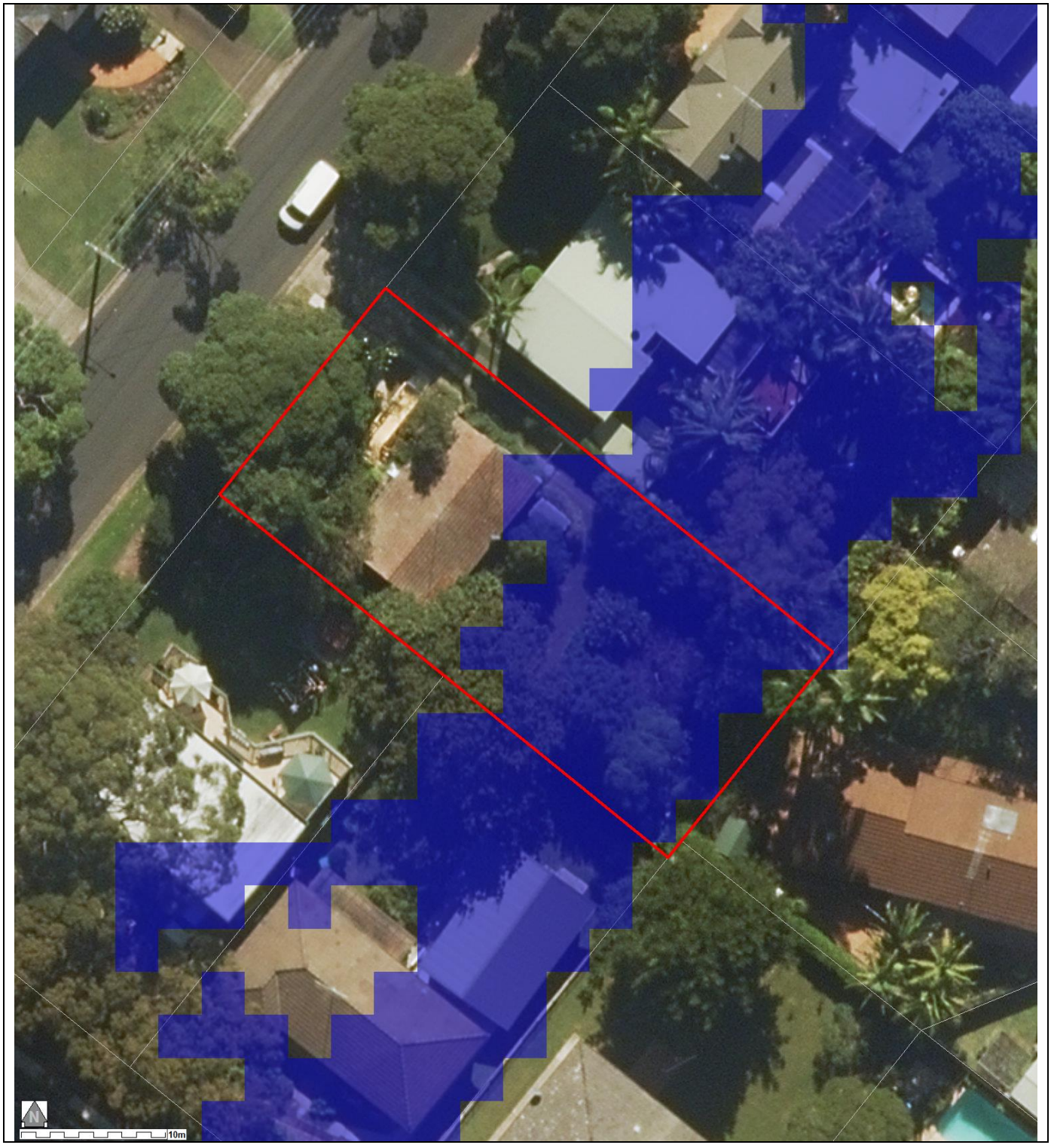
FLOOD MAP H – PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

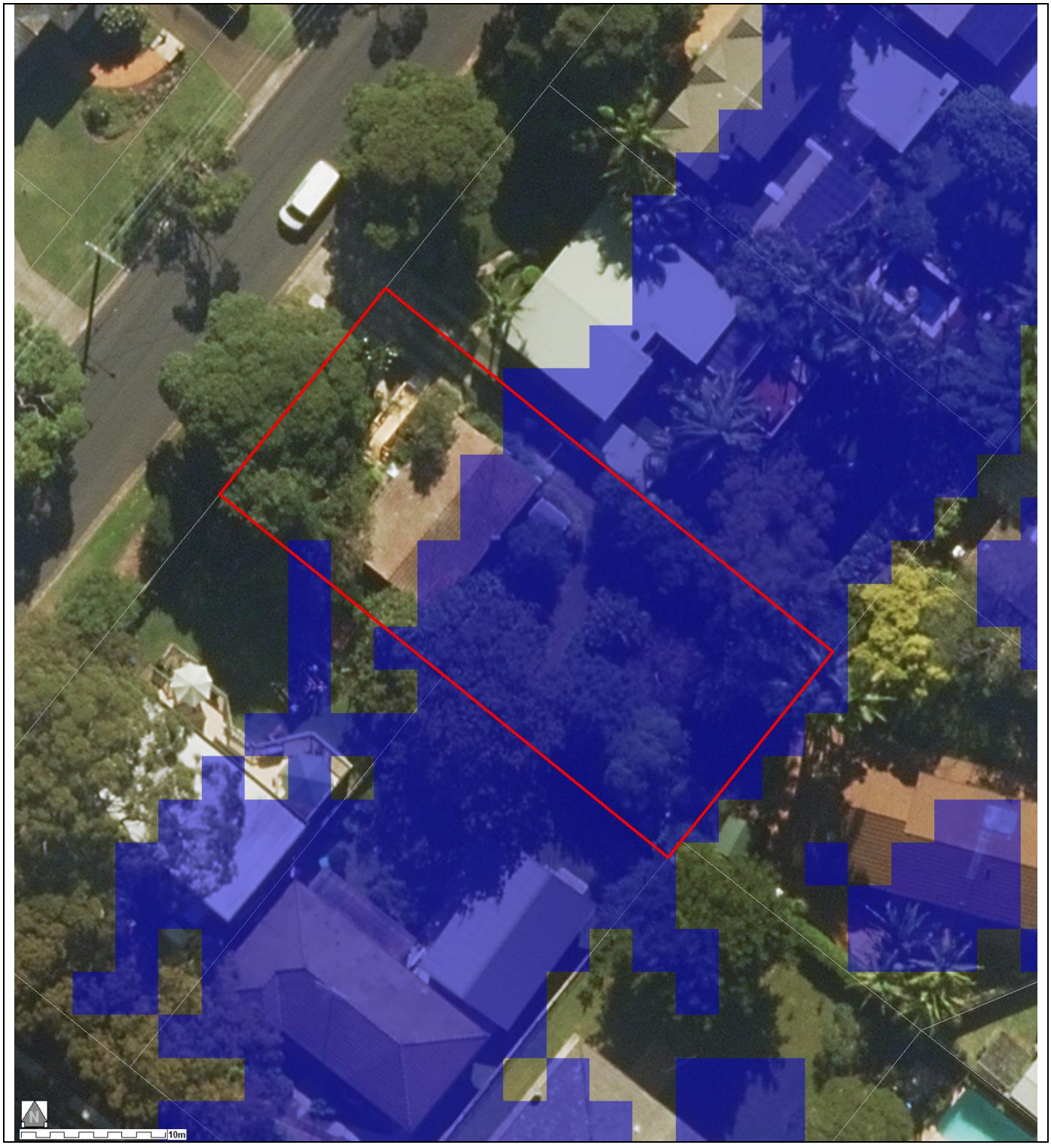
FLOOD MAP I: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



Note Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- includes 30% rainfall intensity and 0.9m Sea Level Rise climate change scenario
- Flood events exceeding the 1% AEP can occur on this site.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

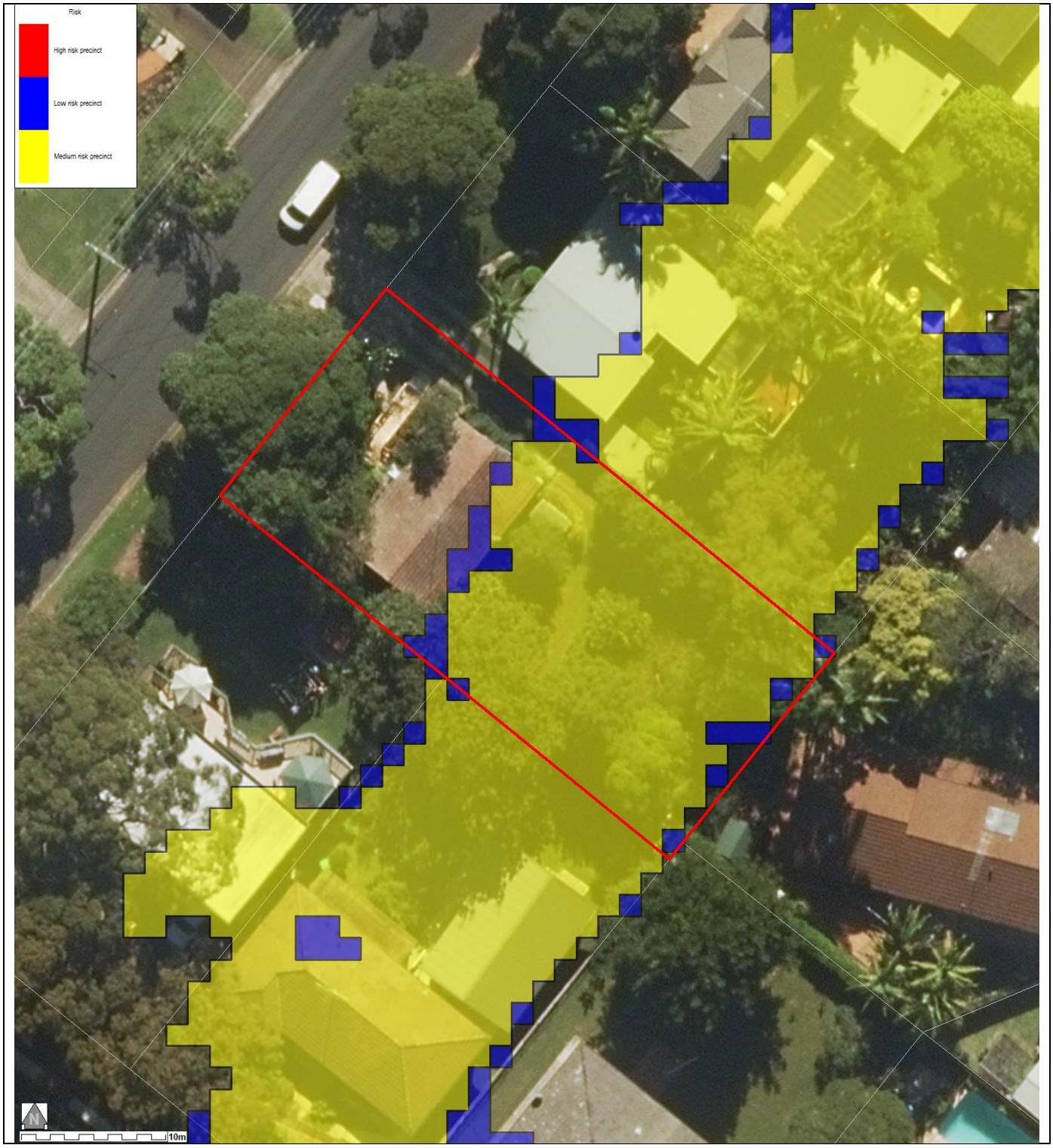
FLOOD MAP J: FLOODING – PMF EXTENT PLUS SEA LEVEL RISE



Note Notes:

- extent represents the PMF flood event
- includes 0.9m Sea Level Rise climate change scenario
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP K – FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 and or H6 Life Hazard Classification).
- Does not include climate change