ZAIT
Engineering Solutions Pty Ltd

FLOOD ASSESSMENT REPORT

Address:	15-17 Mona St, Mona Vale
Prepared for:	Sydney Water
Date:	19 October, 2020
Report Number:	20-2569

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1. INTRODUCTION

A subdivision application is to be lodged with Northern Beaches Council for a proposed four (4) lot subdivision at No.15-17 Mona St, Mona Vale. Council flood maps have indicated that the site is flood affected and a Flood Assessment Report is required to investigate the flood affectation and propose advice and recommendations for the development.

Site is affected by flooding as stated in the Flood Advice Letters from Northern Beaches dated 16/03/2020. Council's flood study in which demonstrates the site flood affectation is *McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV*.

Zait Engineering Solutions have been commissioned to assess the flood characteristics of the site and to provide a Flood Assessment Report demonstrating compliance with Northern Beaches Council's Development Control Plan and the NSW Government Department of Planning's 'Floodplain Development Manual' for the purpose of the residential subdivision.

2. SITE ANALYSIS

The site is located within Northern Beaches Council and is identified as Lot 1 on DP 89128 and Lot 1 744458 for Nos.15 & 17 respectively. The site is located on the Eastern side of Mona St and Southern side of Bassett St. The site has a total area of approximately 8225.8m^2. The site is bounded by existing residential allotments to the South and South-West, by Mona St along the Northern-western boundary, and a concrete drainage channel and Bassett St along the Eastern boundary (See Figure 1 – Site location).

The proposed development consists of the removal of existing site trees, and the creation of four new allotments within the front half of the site. The rear of the site is proposed to be accommodated by and a communal pathway and large public open space. The proposed lots will each have a size of approximately 715m2 with proposed future dwelling footprints of approximately 180m2 (See Figures 3 - Site Plan).

The site is deemed as a Flood Planning Area and is located within a Floodway and a Flood Storage Area. Majority of the site is within the 100YR Flood extent as flood water enters the property from both street frontages and the channel.

3. FLOOD ASSESSMENT AND RECOMMENDATIONS

The flood information from council as extracted from *McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV*, demonstrate that the subject site is subject to potential stormwater overland flow during the 100YR ARI flood event.

As per the flood information, the 100YR ARI Flood level in the vicinity of the proposal is approximately RL1.86mAHD – Refer to Flood Levels Points mapping. With this, the Flood Planning Level (FPL) for the prosed four subdivided lot is to be set at RL 2.36mAHD. This level includes 500mm Freeboard.

The 100 Year ARI Flood extent has been plotted as per the information provided and a current survey on site and are shown in Figure 3. The flood maps extracted from council's flood Study can be seen in the appendices of this report.

It can be seen that the northern & eastern setbacks of the site are inundated with flood water during the 100YR ARI. The 100YR Flood Depths vary across the site, ranging from approximately 0-0.6m. The hydraulic hazard category for the areas of the site proposed in the subdivision are determined to be Low Hazard. The Flood Risk categorisation for the areas proposed for subdivision are determined to be Medium Risk Flood Precincts.

3.1 FINISHED FLOOR LEVELS

As per Councils DCP for flood affected sites, all habitable floor levels are to have a 500mm freeboard above the 100 Year ARI flood level.

For the subject site, the 100 Year ARI Flood level is set at 33.30mAHD and hence the minimum finished floor level of all habitable spaces as proposed on the subdivision plans are to be **min. FFL2.36mAHD**.

3.2 BUILDING COMPONENTS AND STRUCTURAL SOUNDNESS

The lowest natural ground level in the vicinity of the future proposed dwellings is approximately RL1.51. With a required habitable finished floor level of min.2.36mAHD, the ground floor of the proposed dwelling will be a maximum of 0.85m from the surface.
The proposed dwelling footprints encroach the flood extent and is to be constructed as a suspended structure as to not increase inundation levels**.**

Due to this, the dwelling must be constructed on **piers** to the structural engineer's details**.**

All materials proposed in the construction of the dwelling below the 100YR ARI are to be flood compatible material with supporting brick piers/steel columns.

This form of construction will ensure structural soundness and the ability to withstand all forces of flowing waters, including debris and buoyancy. All building components below the 100YR ARI plus freeboard (i.e the Flood Planning Level) are to be flood compatible materials as described above. All power points are to be at least 500mm above the 1:100 flood levels (2.36mAHD).

3.3 BOUNDARY FENCING

Any new boundary fences are to be flood fences so as to allow water to pass and not cause a blockage. Boundary fences should have a minimum gap of 100mm from Natural Ground Level in order to allow flood waters to pass (See Figure 4 – Flood Fence Detail). These details are to be reflected on the architectural plans.

3.4 VOLUME

The total site area is approximately 8295.5m2. The total site area inundated during the 100YR storm is calculated to be approximately 6451.15m2. With an average flood depth across the two sites interpolated to be 0.48m, the volume of the existing flood storage on the site is calculated to be approximately 3096.55m^3. The proposed future dwellings as shown on the subdivision plans are located primarily within the 100YR flood extent; however, with finished floor levels at 2.36mAHD and the proposed ground floor to be suspended on piers, it is expected the dwellings to be above the TWL. Therefore, it can be expected that a net zero flood storage loss is to occur for the site during the 100YR storm.

The post-developed flood storage volume for the site has been calculated to equal that of the pre-developed flood storage volume, hence the proposal can be accommodated on site without causing nuisance or an increase in flood inundation to neighbouring properties.

3.5 VELOCITY

The flood information from council as extracted from *McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV*, demonstrates a 1% AEP Maximum Flood Velocity of 0.39m/s and 1.90m/s on No.15 & 17 respectively. It can be assumed that the maximum velocity as calculated for No.17 is the flood velocity accommodated within the existing channel. With a conservative approach, the area proposed for the four (4) lot subdivision is within a Low Flood hazard (calculated as the product of Depth x Velocity), and the maximum flood velocity to be adopted for this assessment for the overland flow is 0.39m/s.

The proposed future dwellings as shown on the subdivision plans are to be constructed as a suspended structure, bearing on piers at 1.8m c/c. When interpreting the velocity of flood water traversing across the area of inundation, the spacing of the piers allow for free flow. Due to this configuration, the velocity of flood water through the site is calculated to equate that of the pre-developed state and will not cause nuisance or an increase in flood inundation to neighbouring properties. The implementation of flood fencing for all new fencing will also allow the velocity of water to equal to the existing flow rate.

3.6 IMPACT ON ADJACENT LANDS

As per the Flood Extent shown in Figure 4, it can be seen that the proposed area for subdivision is affected by the 1 in 100YR Flood. The site will be inundated with approximately 0-0.6m of flood water. The proposal consists of a four (4) lot subdivision and future proposed single residential dwellings on each lot. With the proposed future dwellings designed to be

constructed as suspended structures above the TWL, the flood velocity and flood storage volume of the site is expected to be maintained as existing. This will therefore not increase the inundation level on the neighbouring properties.

4. EVACUATION

It is recommended that evacuation procedures shall be carried out pending instructions from authorities i.e. State Emergency Services.
For Storms up to the 1% AEP, all occupants are to remain within the existing dwelling and proposed dwelling, due to the proposed elevated level, and the short length of time of concentration. However, if previous warning is given, evacuation to Mona St is safer. Occupants of the dwelling are to evacuate to the front of site and travel in a **North-East** direction along Mona St. This is the shortest and safest travel distance to evacuate. Evacuation during flooding may be quite dangerous and would NOT be recommended and should only take place prior to the water level reaching a level of 0.3m above the NGL at the front boundary.

In the event of a probable maximum flood, early evacuation is paramount. All residents to seek refuge on higher grounds and as directed by authorities. A **Flood Emergency Response Plan** has been included at the end of this report.

5. CONCLUSION

We certify that the proposed four (4) Lot Subdivision as presented in the architectural plans by *RJK Architects dated 15/10/20* will meet the requirements of Department of Planning's 'Floodplain Development Manual' and Northern Beaches Council's DCP.

The area of the site proposed for subdivision is categorised as Low Flood Hazard and Medium Flood Risk. This is therefore suitable for a residential lot subdivision provided that all procedures and recommendations presented in this report are implemented.

Should you require any further explanations, please do not hesitate to contact our office.

Signed 

David Zaiter
MIEAust CPEng NER RPEQ
Member No. 3804362
Director
Zait Engineering Solutions PTY LTD

Figure 1 - Site Locality Plan (Source: SIX Maps website accessed 15/10/19)

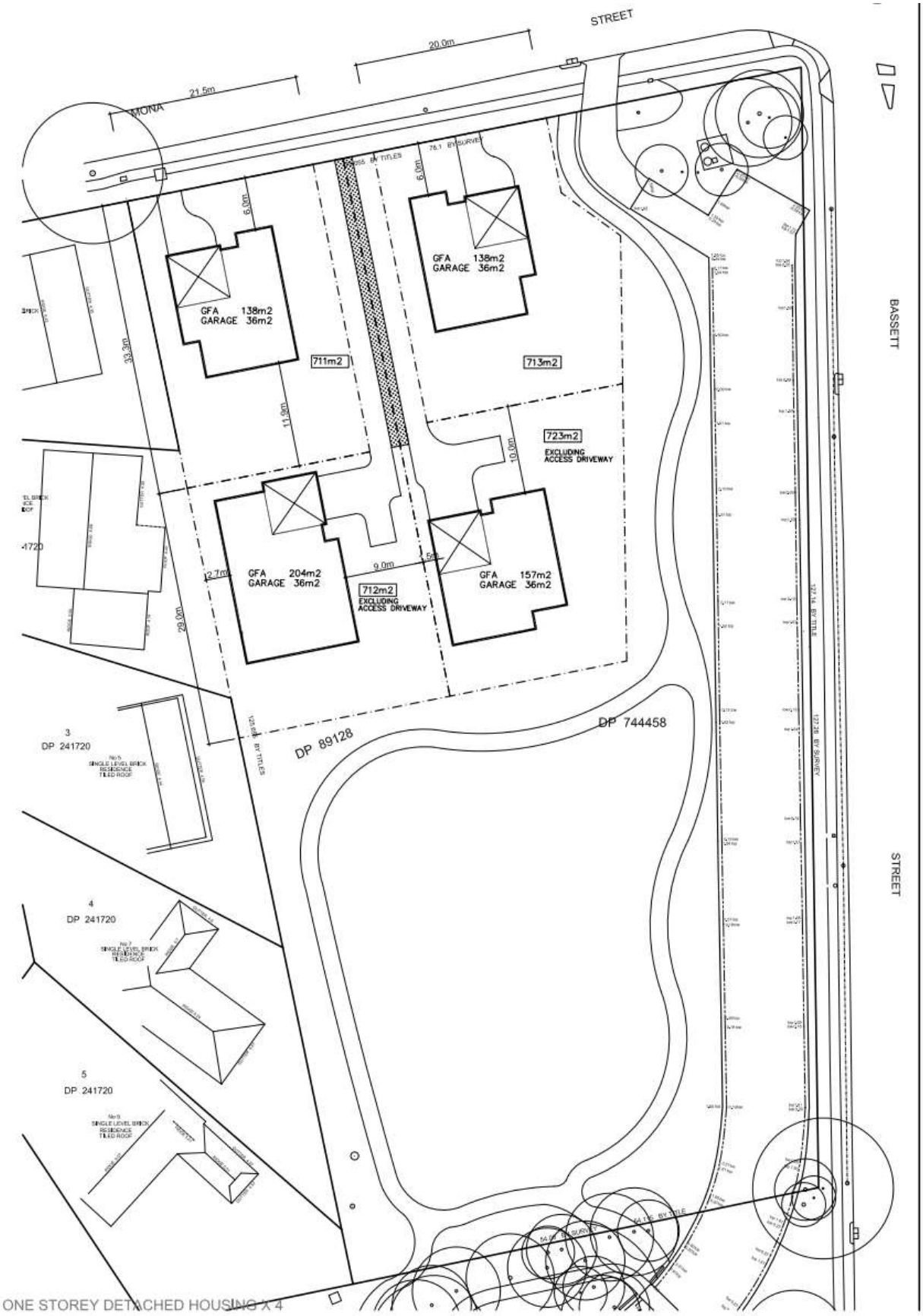

Figure 2 - Proposed Subdivision Plan (Source: RJK Architects dated 15/10/20)

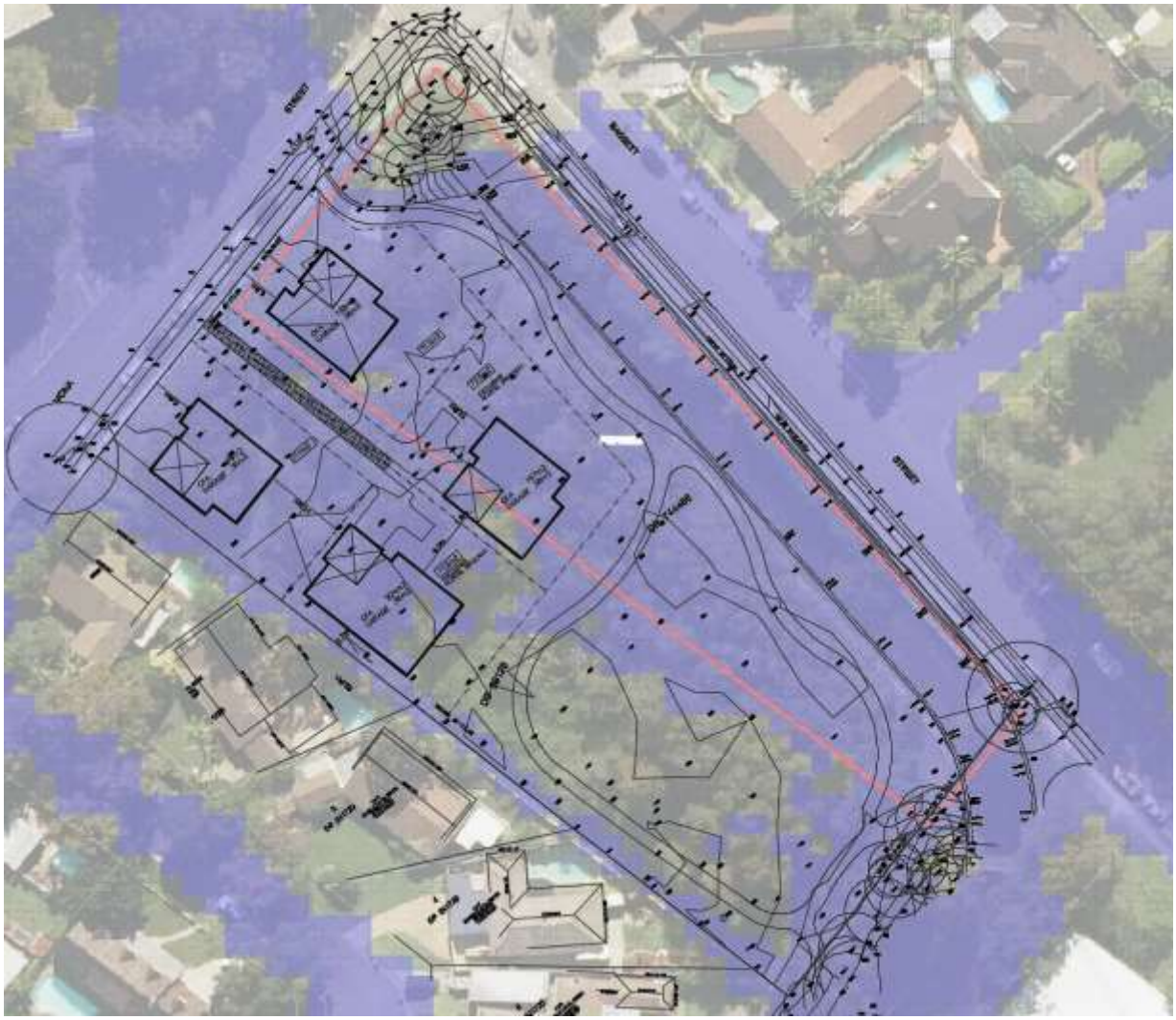

Figure 3 – 100YR Flood Extent Plan (Source: Zait Engineering dated 15/10/20)

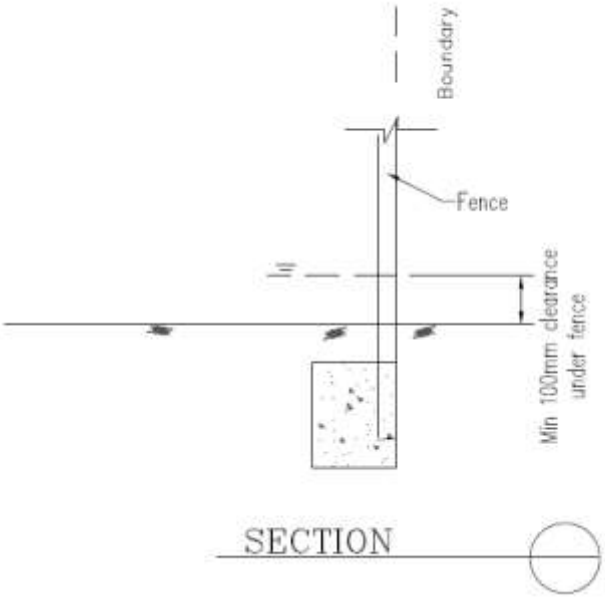

Figure 4 - Flood Fencing Detail

Re: Flood Emergency Response Plan for the Proposed development at No.15-17 Mona St, Mona Vale

A laminated copy of this Flood Emergency Response Plan should be permanently attached (glued) on an internal cupboard door and to the inside of the electrical meter box at No.15-17 Mona St, Mona Vale.

Council has advised that this property is subject to flooding in a 1 % AEP (1 in 100year ARI) storm event. The Probable Maximum Flood (PMF) is the highest flood level that is ever likely to occur, however it is extremely rare. Council has no information regarding tsunamis in the area.
Habitable living areas are designed to be a minimum of 0.5m above the 1 % AEP Flood Level and staying within the building will provide protection for a wide range of floods.

Emergency Procedure

1. Floods in the area are considered as "flash floods" and no warning system is available.
Storms leading to major flooding are typically 2 hours long, however shorter storms as little as a % hour long can produce significant flooding. Once the storm passes floodwaters usually disappear rapidly.
2. During floods many local and major streets and roads will be cut by floodwaters.
Travelling through floodwaters on foot, or in a vehicle can be very dangerous as the water may be polluted, obstructions can be hidden under the floodwaters, or you could be swept away. We recommend staying within the building as much as practical as this is the safest option. If you need to leave the building do so early in the flood event, before the flood level reaches 300mm above NGL at the boundary.
3. Study this response plan and learn the safe travel routes that show the paths that are less likely to be cut by floodwaters. Keep in mind that neighbouring streets may be worse affected by the flooding. Should you wish to evacuate, contact the SES or Police for information such as which streets are flooded and which route to take to your nearest evacuation centre.
4. As the flood level approaches the garage floor level (but only if safe to do so) relocate any items that may be damaged by water, or poisons, or wastes to as high a level as possible.
5. As the flood level approaches the habitable floor level:
   i) gather medicines, special requirements for babies or the elderly, mobile phones, first aid kit, special papers and any valuables into one location,
   ii) put on strong shoes, raise any items within the building that may be damaged by water (e.g. photo albums) to as high a level as possible, with electrical items on top. Turn off and disconnect any large electrical items such as a TV that cannot be raised.
   iii) place towels across the bottom and lower sides of external doors to slow down the entry of water through the door.
6. In the very rare event that floodwaters may enter the building collect items from 5.i) above and move to an upper level if possible, or if in a single level building provide a chair in the kitchen to enable access to the kitchen bench preferably adjacent to the window. Ensure window is not locked or key readily available. Do not evacuate the building unless instructed to do so by the SES or the Police. Remember floodwaters are much deeper and flow much faster outside.
7. In the case of a medical emergency ring 000 as normal, but explain about the flooding.
8. A laminated copy of this flood plan should be permanently attached (glued) on an inside cupboard door in the kitchen and laundry and to the inside of the electrical meter box.
9. This flood management plan should be reviewed every 5 years, particularly with the potential sea level rise due to Climate Change.

COUNCIL ISSUED FLOOD INFORMATION

PROPERTIES:	No. 15 & No. 17 Mona St, Mona Vale
DATED ISSUED:	16/03/2020
FLOOD STUDY REFERENCE:	*McCarrs Creek, Mona Vale and Bayview Flood Study Review 2017, Royal HaskoningDHV*

northern beaches council

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 15 Mona St Mona Vale
Lot DP: 1//89128
Issue Date: 16/03/2020
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]: 2.02 mAHD

1% AEP Maximum Peak Depth from natural ground level[3]: 0.60 m

1% AEP Maximum Velocity: 0.39 m/s

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

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

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL) [1, 2, 3 & 4]: 2.51 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 3.18 m AHD

PMF Maximum Depth from natural ground level: 1.77 m

PMF Maximum Velocity: 0.62 m/s

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

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

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]: 2.14 m AHD

1% AEP Maximum Depth with Climate Change[3]: 0.79 m

1% AEP Maximum Velocity with Climate Change[3]: 0.75 m/s

Flood Risk Precinct – See Map J

Indicative Ground Surface Spot Heights – See Map K

[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.

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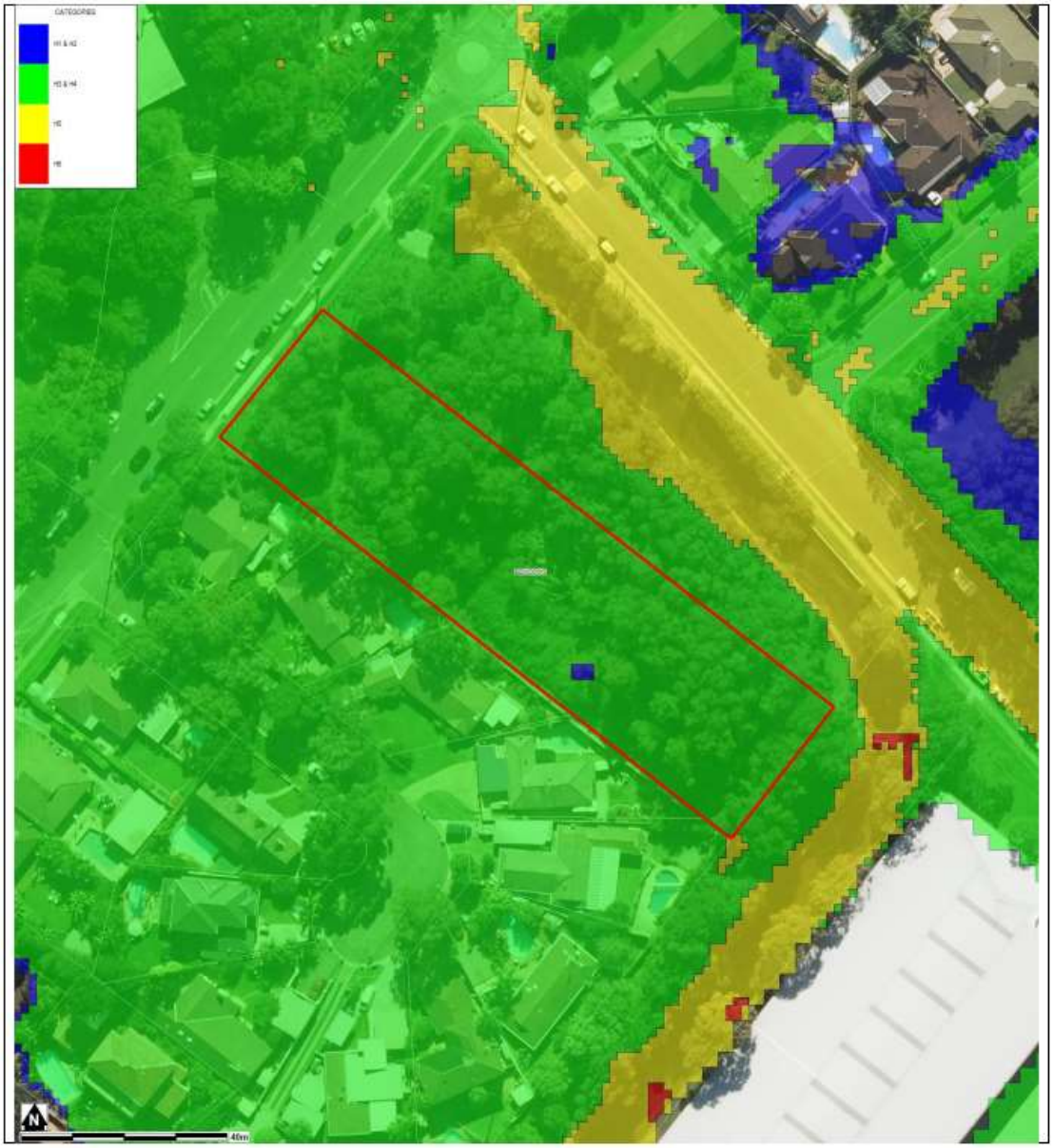
FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



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 B3.13.
- 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.

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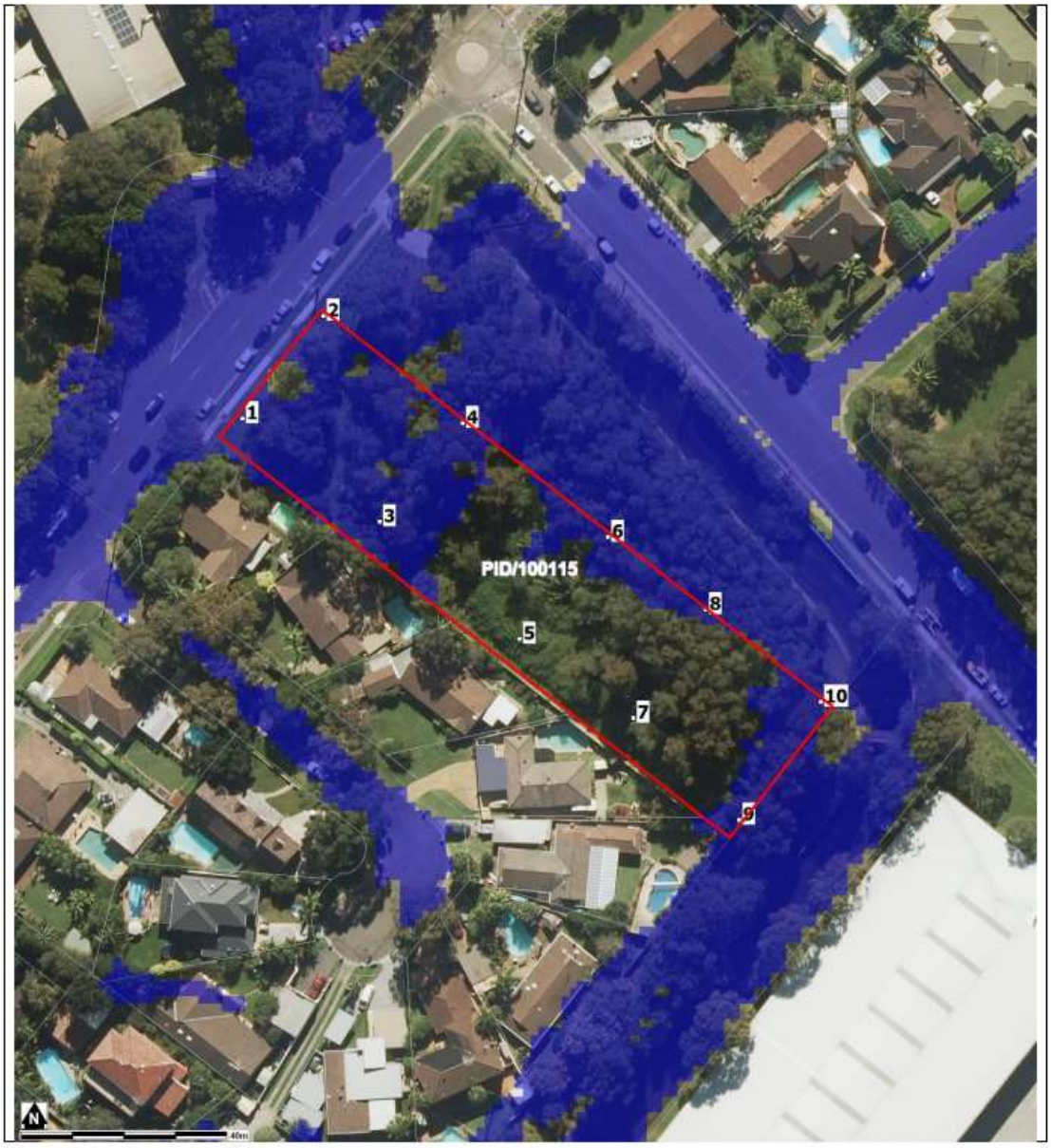
FLOOD LEVEL POINTS



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.

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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	1.86	0.32	0.06	2.36	3.15	1.62	0.34
2	N/A	N/A	1.86	0.22	0.06	2.36	3.15	1.52	0.35
3	N/A	N/A	1.86	0.24	0.05	2.36	3.16	1.54	0.25
4	N/A	N/A	1.86	0.23	0.15	2.36	3.16	1.53	0.34
5	N/A	N/A	N/A	N/A	N/A	2.38	3.17	1.08	0.15
6	N/A	N/A	1.89	0.39	0.06	2.38	3.17	1.67	0.20
7	N/A	N/A	N/A	N/A	N/A	2.46	3.17	1.02	0.15
8	N/A	N/A	1.89	0.29	0.07	2.39	3.17	1.57	0.19
9	N/A	N/A	2.00	0.53	0.17	2.50	3.18	1.70	0.29
10	N/A	N/A	1.92	0.50	0.36	2.43	3.18	1.75	0.37

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	1.95	0.42
2	1.95	0.33
3	1.95	0.33
4	1.95	0.31
5	N/A	N/A
6	1.97	0.54
7	N/A	N/A
8	1.97	0.37
9	2.08	0.49
10	2.01	0.61

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.

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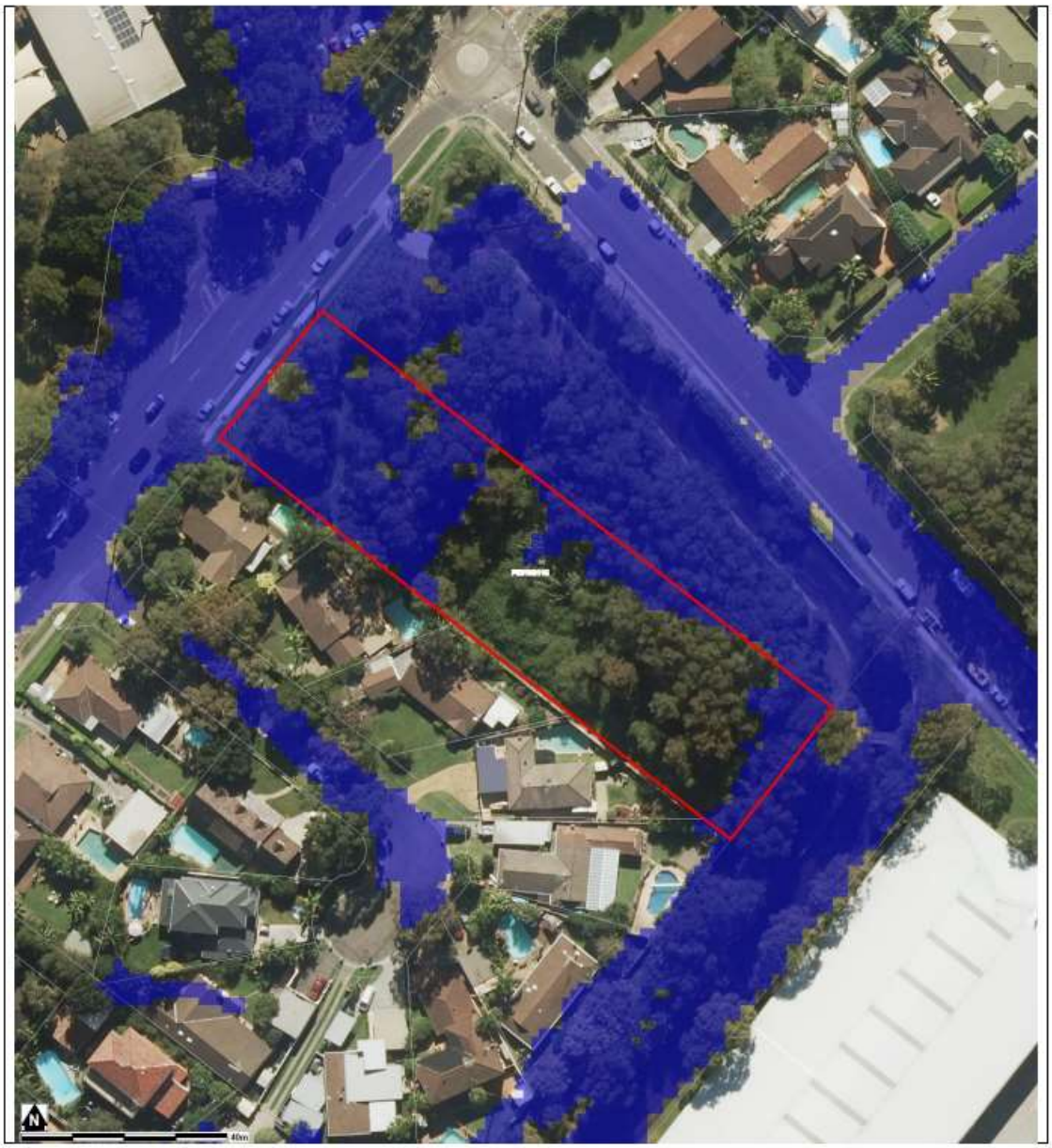
FLOOD MAP B: FLOODING - 1% AEP EXTENT



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.

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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.

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northern beaches council

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 17 Mona St, Mona Vale
Lot DP: 1//744458
Issue Date: 17/03/2020
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]: 2.02 mAHD

1% AEP Maximum Peak Depth from natural ground level[3]: 1.94 m

1% AEP Maximum Velocity: 1.90 m/s

1% AEP Provisional Flood Hazard: High **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]: 2.52 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 3.20 m AHD

PMF Maximum Depth from natural ground level: 3.24 m

PMF Maximum Velocity: 1.83 m/s

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

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

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]: 2.03 m AHD

1% AEP Maximum Depth with Climate Change[3]: 2.02 m

1% AEP Maximum Velocity with Climate Change[3]: 1.89 m/s

Flood Risk Precinct – See Map J

Indicative Ground Surface Spot Heights – See Map K

[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.

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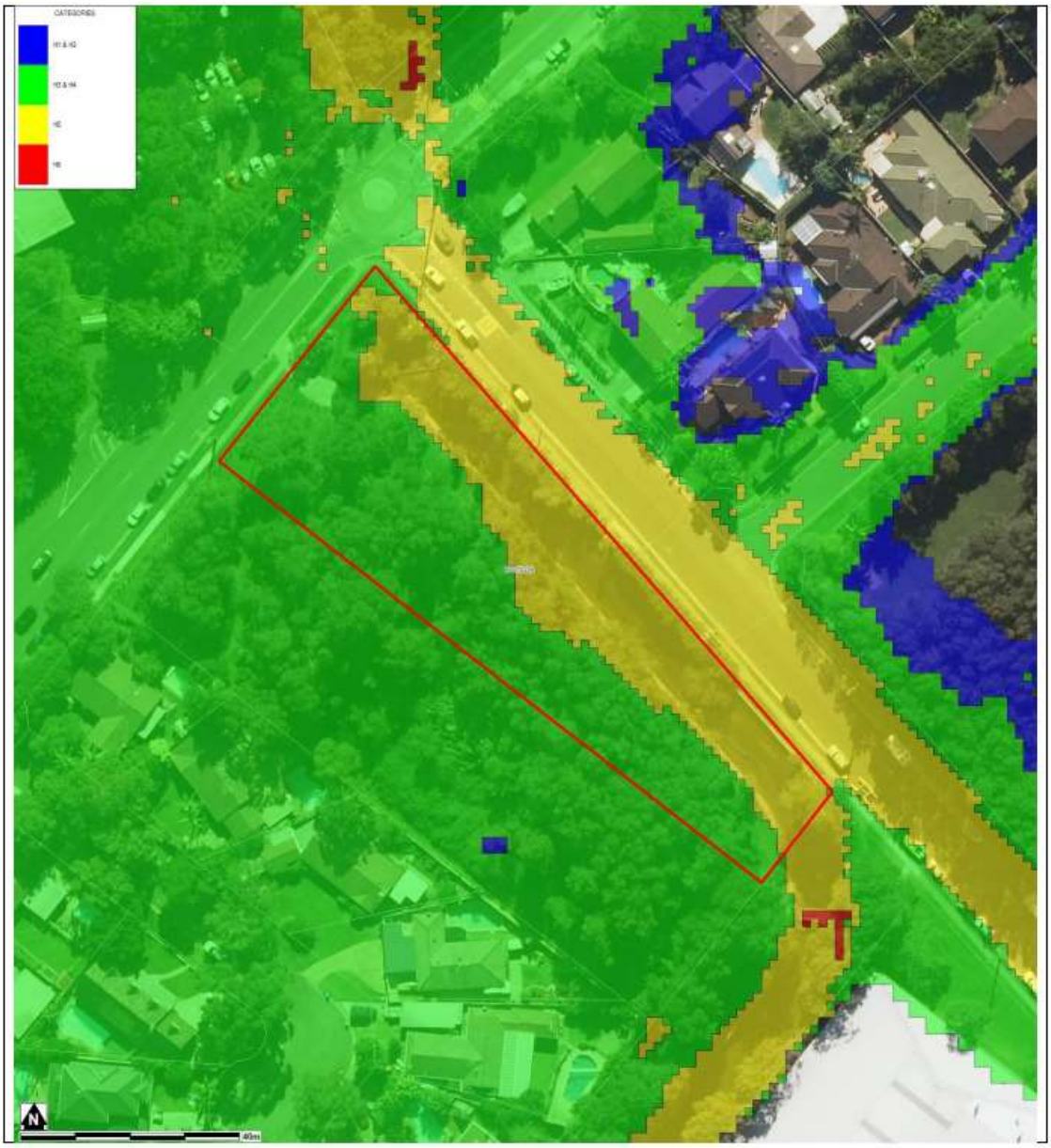
FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



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 B3.13.
- 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.

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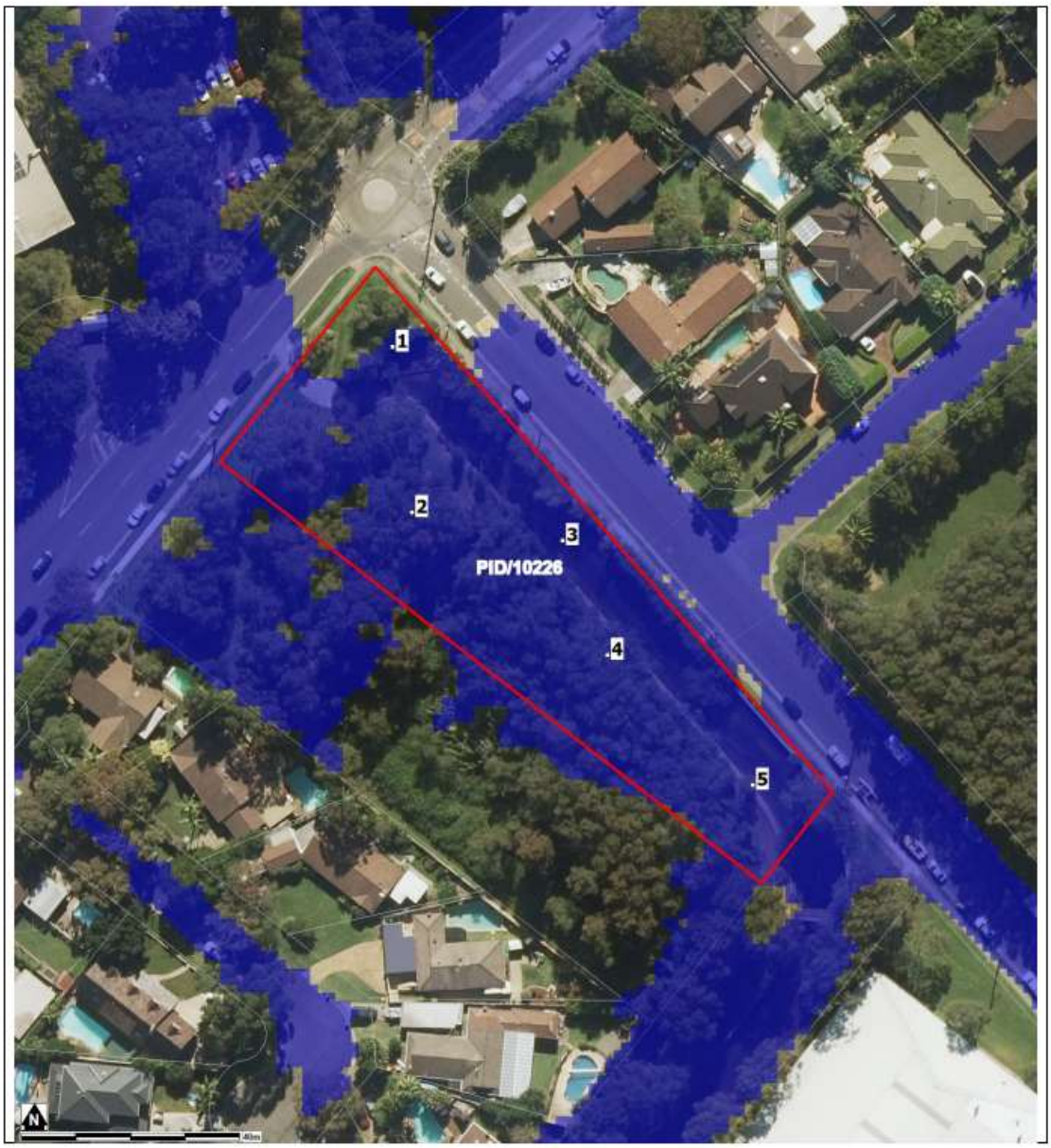
FLOOD LEVEL POINTS



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.

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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	1.88	1.07	0.18	2.38	3.18	2.38	0.62
2	N/A	N/A	1.86	0.26	0.14	2.36	3.16	1.56	0.34
3	N/A	N/A	1.88	1.91	0.77	2.38	3.17	3.20	0.99
4	N/A	N/A	1.89	0.89	0.41	2.38	3.17	2.17	0.43
5	N/A	N/A	1.89	1.79	1.19	2.39	3.18	3.07	0.91

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

Issue Date: 17/03/2020

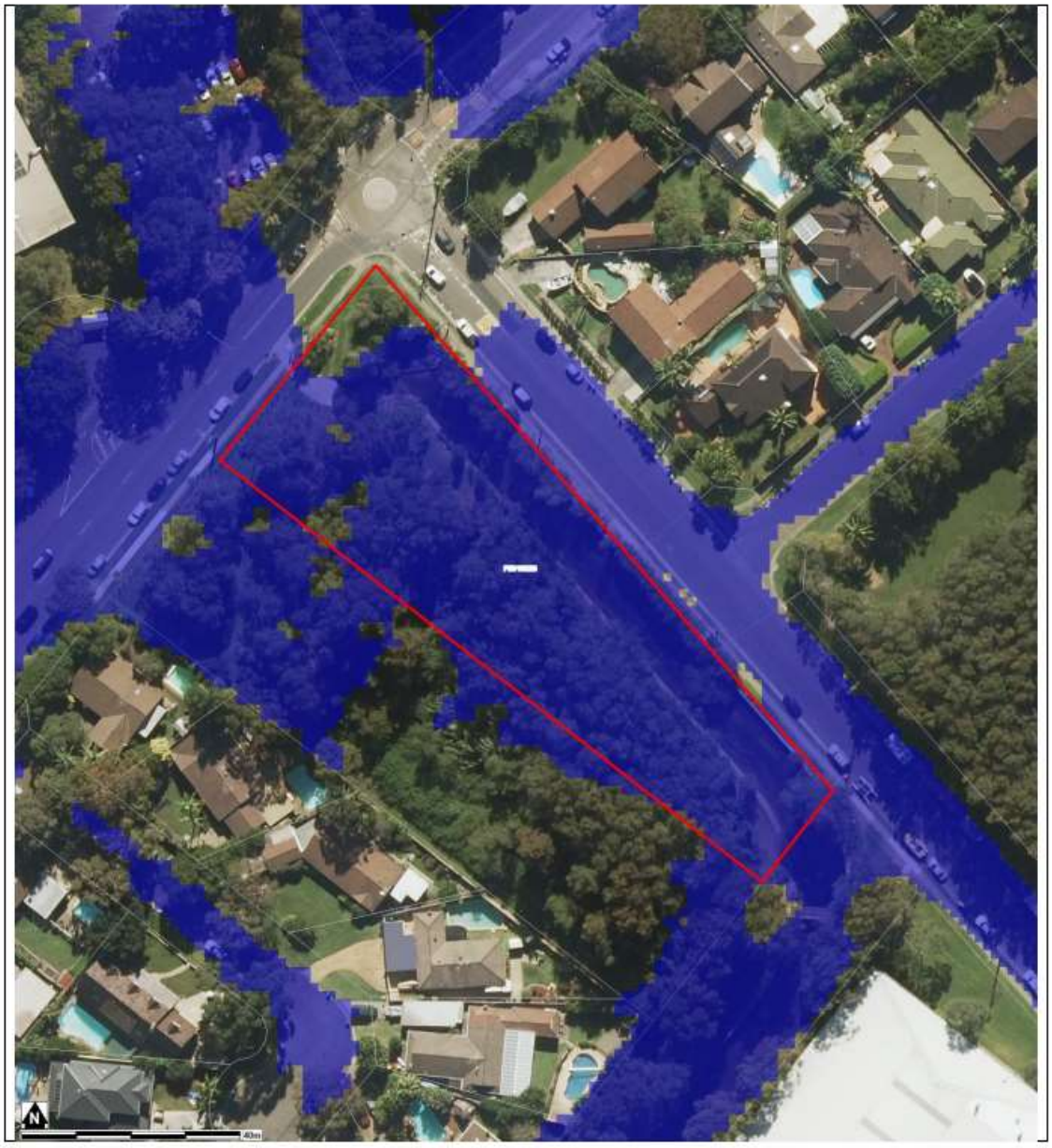
Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)

ID	CC 1% AEP Max WL (m AHD)	CC1 % AEP Max Depth (m)
1	1.97	0.71
2	1.95	0.33
3	1.97	2.00
4	1.97	0.96
5	1.97	1.87

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.

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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.

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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

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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

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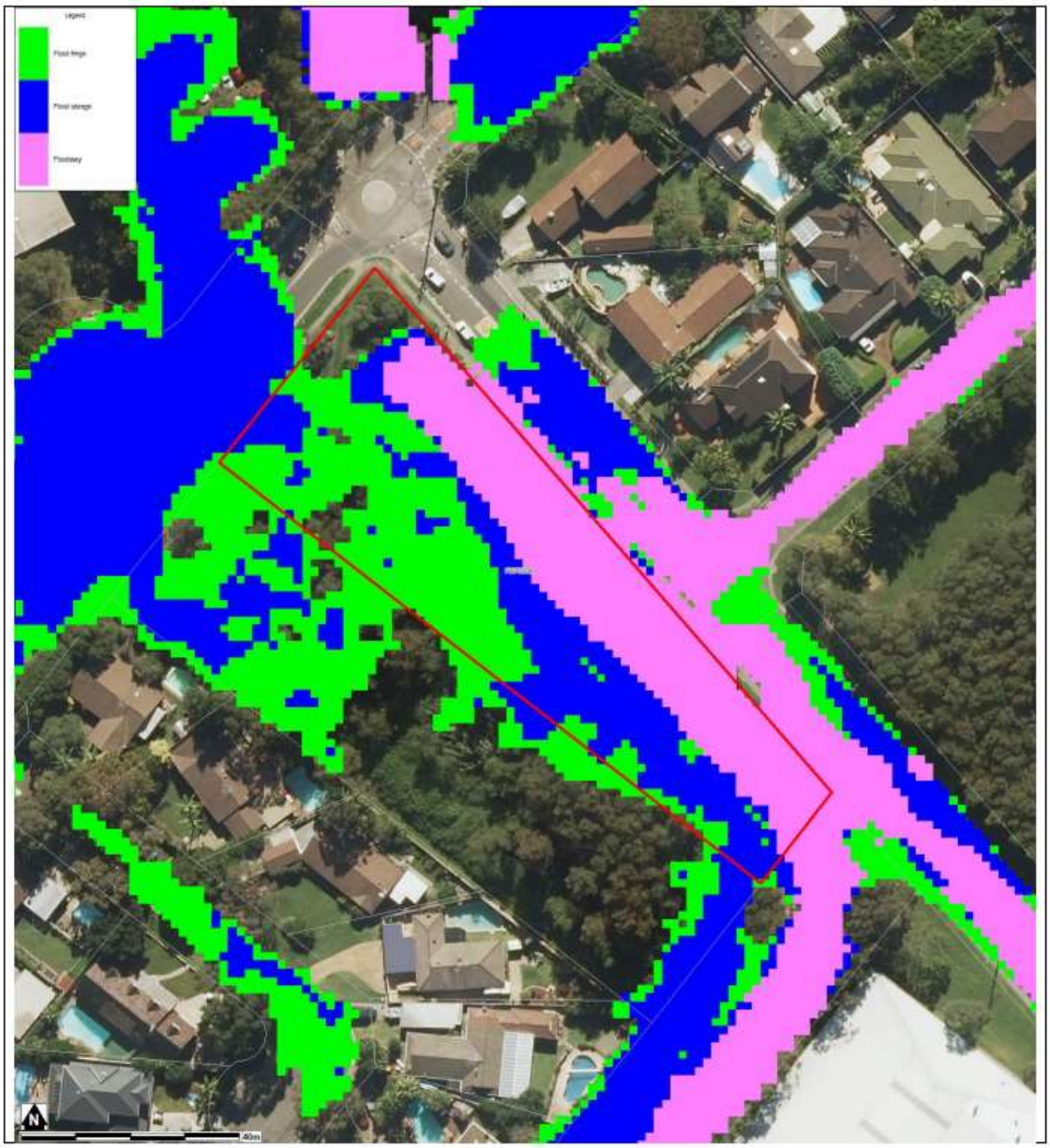
FLOOD MAP F: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



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

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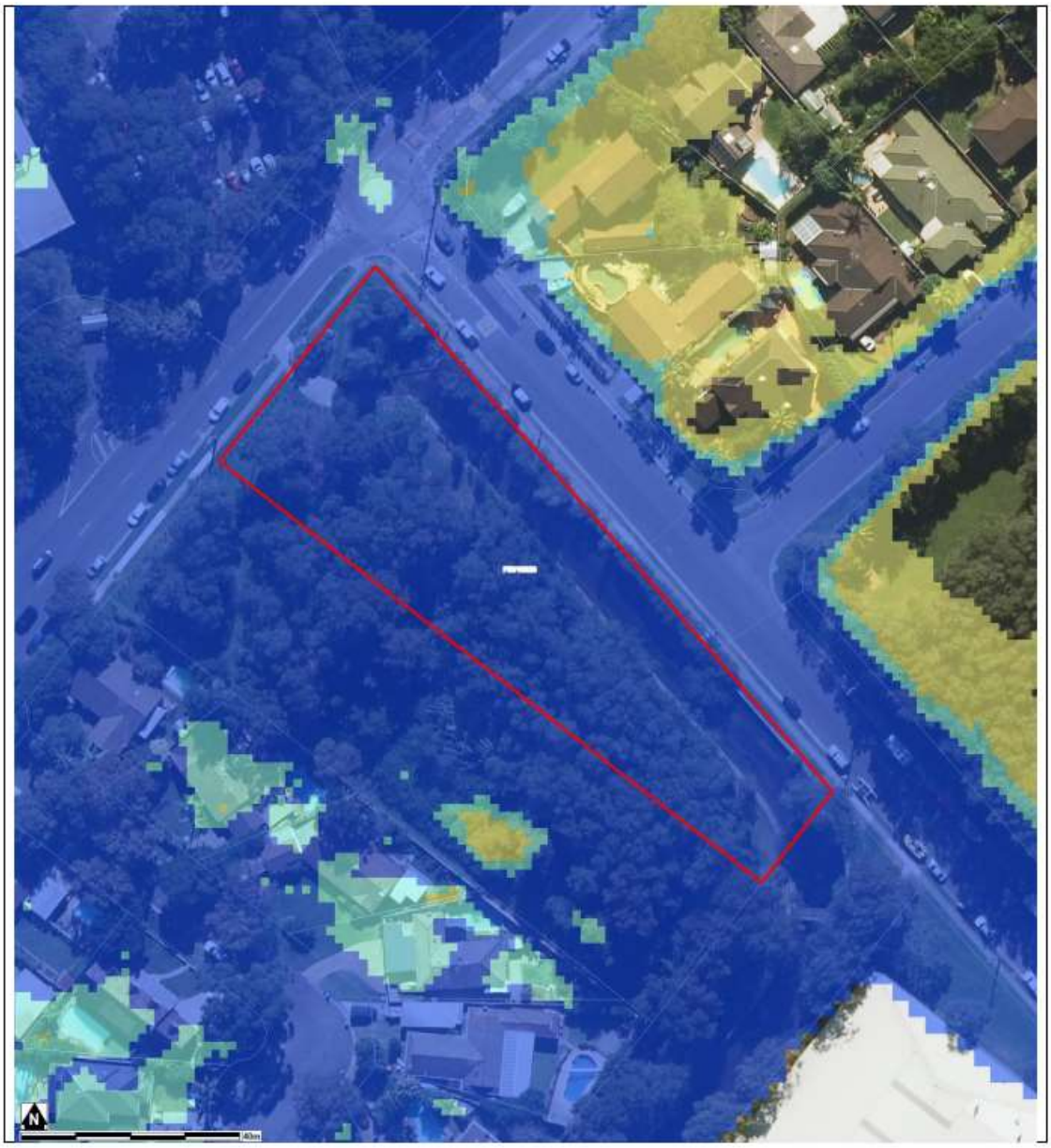
FLOOD MAP G: PMF FLOOD HAZARD EXTENT MAP



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

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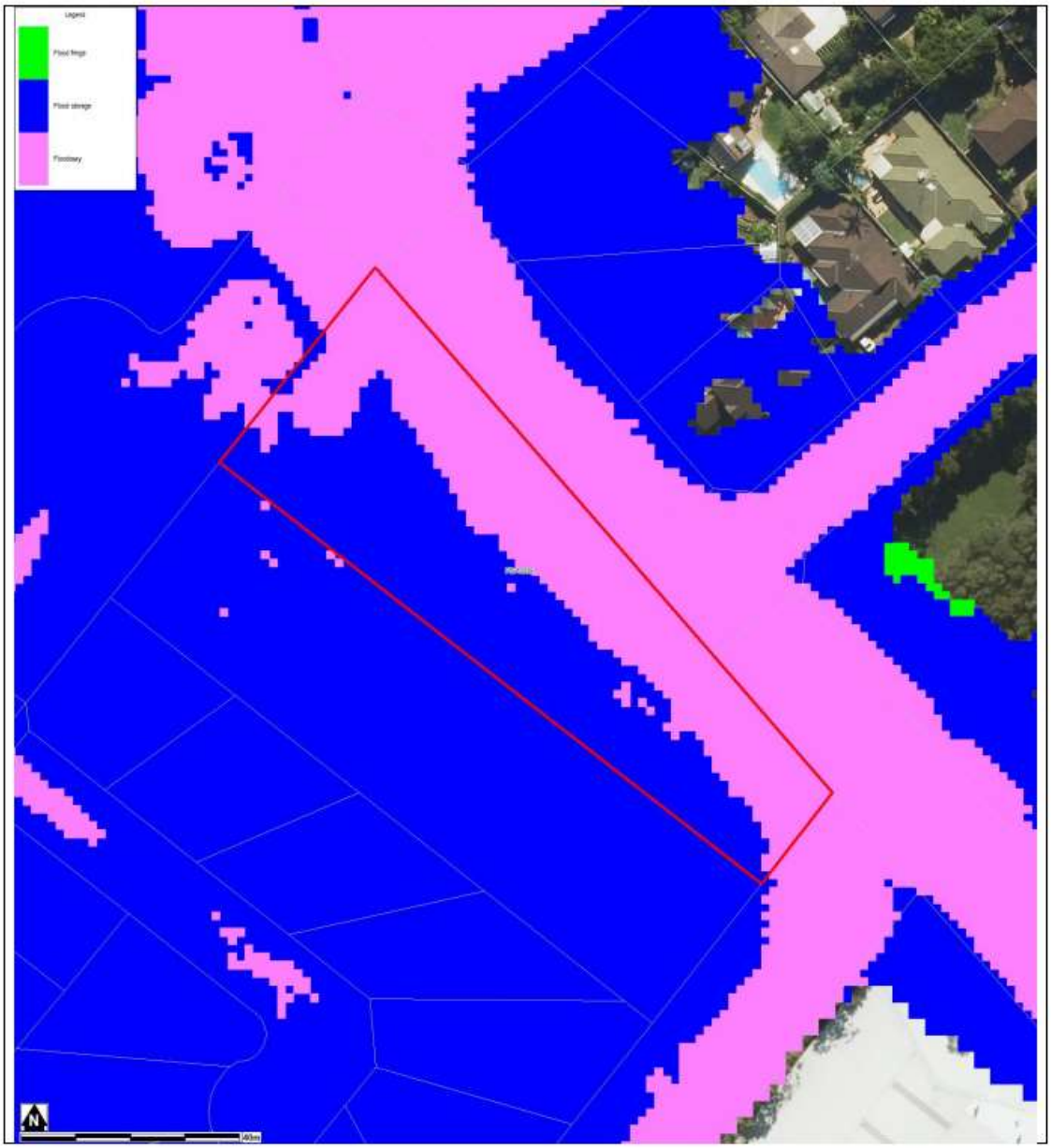
FLOOD MAP H: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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

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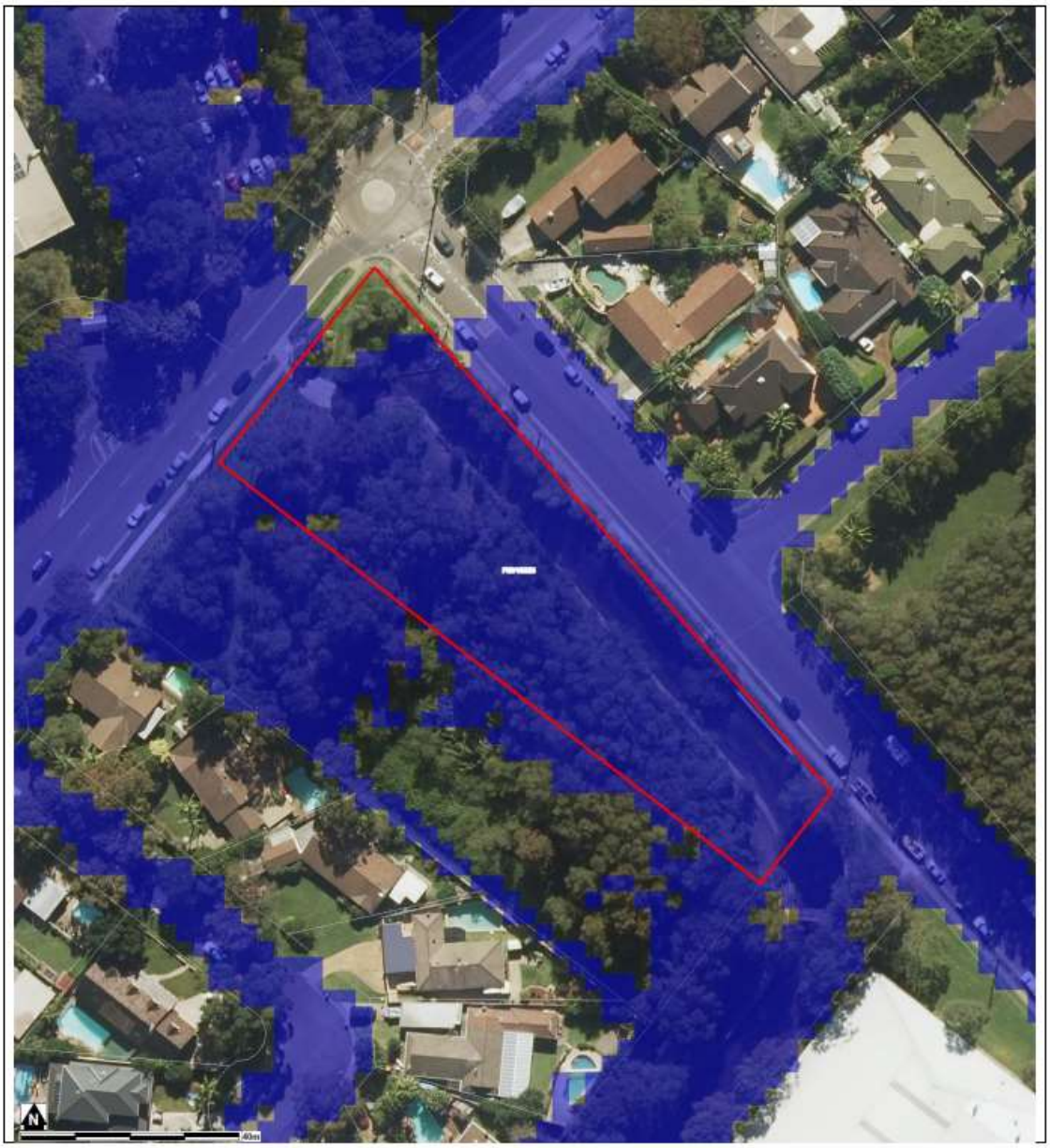
FLOOD MAP I: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



Note:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event including 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

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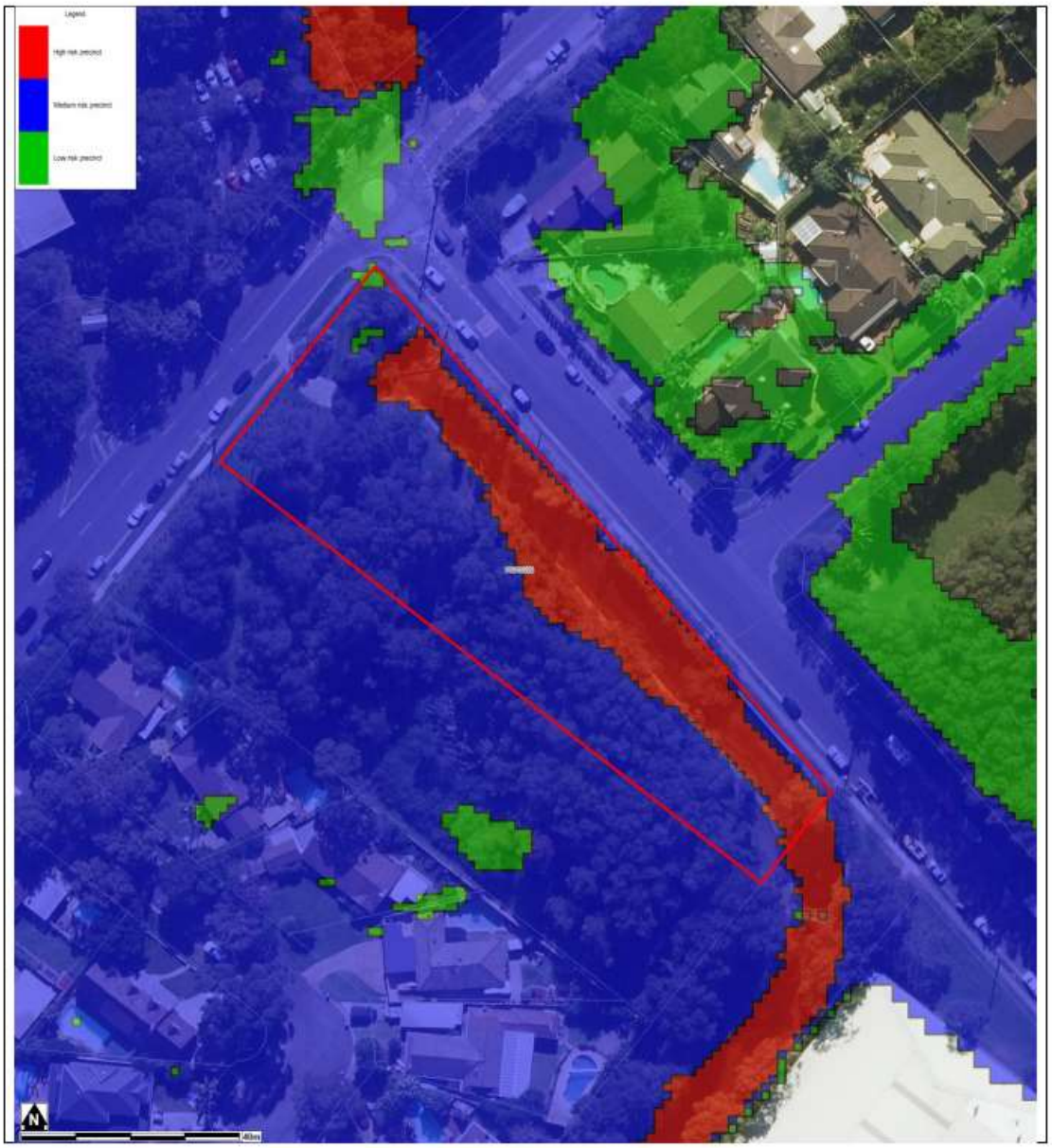
FLOOD MAP J: FLOOD RISK PRECINCT MAP



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

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