

FLOOD RISK REPORT

FOR PROPOSED ADDITIONS AT



1058 BARRENJOEY ROAD PALM BEACH

JOB NO: 2021097

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1 – Introduction

Approved Consulting Engineers has completed a review of the proposed development at 1058 Barrenjoey Road, Palm Beach and determined that the site is located within 1% AEP flood extent as predicted by the *'Avalon To Palm Beach Floodplain Risk Management Study and Plan'* (2017). The proposed architectural plans prepared by 'Rapid Plans' (RP1120DAR) detail internal alterations, the proposed demolition of an existing shed, a new pool and associated timber decking surrounds.

This report has been prepared in accordance with section B3.11 of 'Northern Beaches - Pittwater 21 Development Control Plan.'

1.0 - Flood Information Summary

Background Information	
Council	Northern Beaches (Region 1)
Flood Information Report Date	23/12/2020
Flood Study Reference	Avalon to Palm Beach Floodplain Risk Management Study and Plan (2017)
Flood Behaviour	Mainstream Flooding and Overland Flow
1% AEP Flood Information	
Flood Level	3.88m AHD (maximum)
Flood Depth	0.54m (maximum)
Velocity	0.38 m/s (maximum)
PMF Flood Information	
Flood Level	5.63m AHD (maximum)
Flood Depth	0.69m (maximum)
Velocity	0.56 m/s

2 - Flood Risk Report

Flood Planning Summary	
Flood Risk Precinct	Medium Risk Precinct
Flood Emergency Response Strategy (Onsite Response)	Shelter In Place <i>(refer section 3 for recommendation)</i>
Flood Planning Level (FPL)	3.90m (main dwelling) 3.91m AHD (granny flat)
Existing Dwelling Floor Level	3.77 m AHD (main dwelling) 3.74m (granny flat) 6.72m (first floor)
Degree of Inundation	95% (1% AEP event)
Flood Storage	No Reduction <i>(refer section 2.1)</i>
Flood Levels	NA – residential dwelling
Recommendations For Structural Design	<i>Refer section 2.2</i>
Recommended Construction Materials	<i>Refer section 2.3</i>
Ground Floor Requirements	NA
Stormwater Management	<i>Refer section 2.5</i>
Waterproofing	Above FPL <i>(refer section 2.6)</i>
Flood Life Hazard Category	H3
Hazardous Materials Storage	Above FPL <i>(refer section 2.7)</i>

2.1 - Flood storage

We recommend the following:

- Following the demolition of the shed and associated landscaping works, we recommend the finished surface level be provided at an average level of RL 3.22m AHD. This will result in an increase in flood storage of approximately 5.3m^3 ($16.2\text{m}^2 \times 0.33\text{m}$ depth). Note: Corresponding 1% AEP flood level – Point ID: No.5 = 0.33m depth
- The proposed pool at RL 3.68m AHD will result in a flood storage reduction of approximately 4.2m^3 ($9.6\text{m}^2 \times 0.44\text{m}$ depth). Note: Corresponding 1% AEP flood level – Point ID: No.6 = 0.44m depth.
- All proposed additions (including decks) are to provide an open subfloor.
- If the above recommendations are incorporated into the proposed development, the resulting net flood storage available across the site will increase by 1.1m^3 and, as such will ensure no net reduction in flood storage, in accordance with the requirements of the DCP.

2.2 – Structural Requirements

- Perimeter and pool fencing must be designed to be open and to withstand flood forces up to the 1% AEP Flood event (including debris impact).
- The proposed works are to be certified by a structural engineer as adequate to withstand forces from flood waters and debris impact up to the FPL.

2.3 - Recommended Construction Materials

- The proposed development must be constructed as a flood compatible building, and wet flood proofed below the FPL.
- Below the FPL standard lining materials, such as timber and plasterboard may be used in accordance with section 3.10.3 of the NCC, ABCB handbook 'Construction of

Buildings in Flood Hazard Areas and 'Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building In Flood Prone Areas – Hawkesbury-Nepean Floodplain Management Steering Committee (2006)'.

- Standard Building Materials (concrete, steel, timber and/or brickwork) are to be used above and below the FPL.

2.4 – Floor Level requirements

- The proposed floor level of the main dwelling addition (sunroom) is at RL 3.72m AHD. This is below the FPL (note: corresponding FPL Point ID: No.4 = 3.90m). The total floor area is 27m² and is located above the 1% AEP flood level.
- The proposed floor level of the granny flat addition is at RL 3.74m AHD. This is below the FPL (note: corresponding FPL Point ID: No.4 = 3.91m). The total floor area is 3m² and is located above the 1% AEP flood level.
- Since the total surface area of the above is 30m², this complies with part C4 of section B3.11 of the DCP and no floor level adjustment is recommended.

2.5 - Stormwater Management

- To be incorporated as per council requirements and AS3500.3.

2.6 - Waterproofing methods

- All electrical equipment is to be fitted with circuit breakers.
- All conduits below the FPL are to be free draining, with 1% (minimum) fall.
- Switchboard and main circuit unit to be fitted above the FPL.
- Other valuable materials or possessions are to be stored above the FPL.
- Owner and occupant are to acknowledge that a reasonable extent of damage to fittings below the FPL (3.91m) is to be expected during the flood events.

2.7 - Hazardous Material Storage

- The owner and occupant are to acknowledge that all hazardous materials are to be stored at or above 3.91m AHD.

3 – Emergency Response Plan

- The existing first floor level is above the PMF so shelter in place is recommended.
- In a flooding event, occupants are to proceed on foot to the first floor (RL 6.72m AHD). This should be completed within the first 5 minutes of the rainfall event (heavy rainfall, inundation of the southern or western boundary of the site, or inundation of the kerb and gutter in Barrenjoey road indicate a potential flood event).
- The client is to refer to the local Northern Beaches flood warning website for updates: <http://new.mhl.nsw.gov.au/users/NBFloodWarning/>
- A list of emergency contacts is to be provided that includes but not limited to; emergency services (000), the State Emergency Service (132 500), local Council, the local Police, ambulance and fire and rescue numbers and the Bureau of Meteorology.
- A copy of this Flood Risk Report and the *Flood Emergency Response Plan* is to be kept on the premises at all times. The owner/occupant is to be fully aware of these documents and requirements in potential flooding event.

We have provided the above report in accordance with the flood information provided by council and have assessed the site and proposed development in accordance with Section B3.11 of the Pittwater 21 DCP. If further clarification is required, please contact 'Approved Consulting Engineers Pty Ltd.'



Cameron Haack
Director BE (Civil) MIE Aust NER RPEQ (24684)
Approved Consulting Engineers P/L

APPENDIX A – COUNCIL FLOOD INFORMATION (INCLUDING FORM A/A1)

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 1058 Barrenjoey Road PALM BEACH NSW 2108

Lot DP: Lot 4C DP 13374

Issue Date: 23/12/2020

Flood Study Reference: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory

Flood Information for lot 1:

Flood Risk Precinct – See Map A

Flood Planning Area – See Map A

Maximum Flood Planning Level (FPL) ^{2, 3, 4}: 4.38 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: 3.88 m AHD

1% AEP Maximum Depth from natural ground level³: 0.54 m

1% AEP Maximum Velocity: 0.38 m/s

1% AEP Provisional Flood Hazard: Low See Flood Map D

1% AEP Hydraulic Categorisation: Flood storage See Flood Map E

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level ⁴: 5.63 m AHD

PMF Maximum Depth from natural ground level: 0.69 m

PMF Maximum Velocity: 0.56 m/s

PMF Flood Hazard: Low See Flood Map F

PMF Hydraulic Categorisation: Floodway See Flood Map G

Flooding with Climate Change (See Flood Map H)

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

1% AEP Maximum Water Level with Climate change³: 3.94 m AHD

1% AEP Maximum Depth with Climate Change³: 0.58 m

1% AEP Maximum Velocity with Climate Change³: N/A m/s

Flood Life Hazard Category – See Map I

Indicative Ground Surface Spot Heights – See Map J

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. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

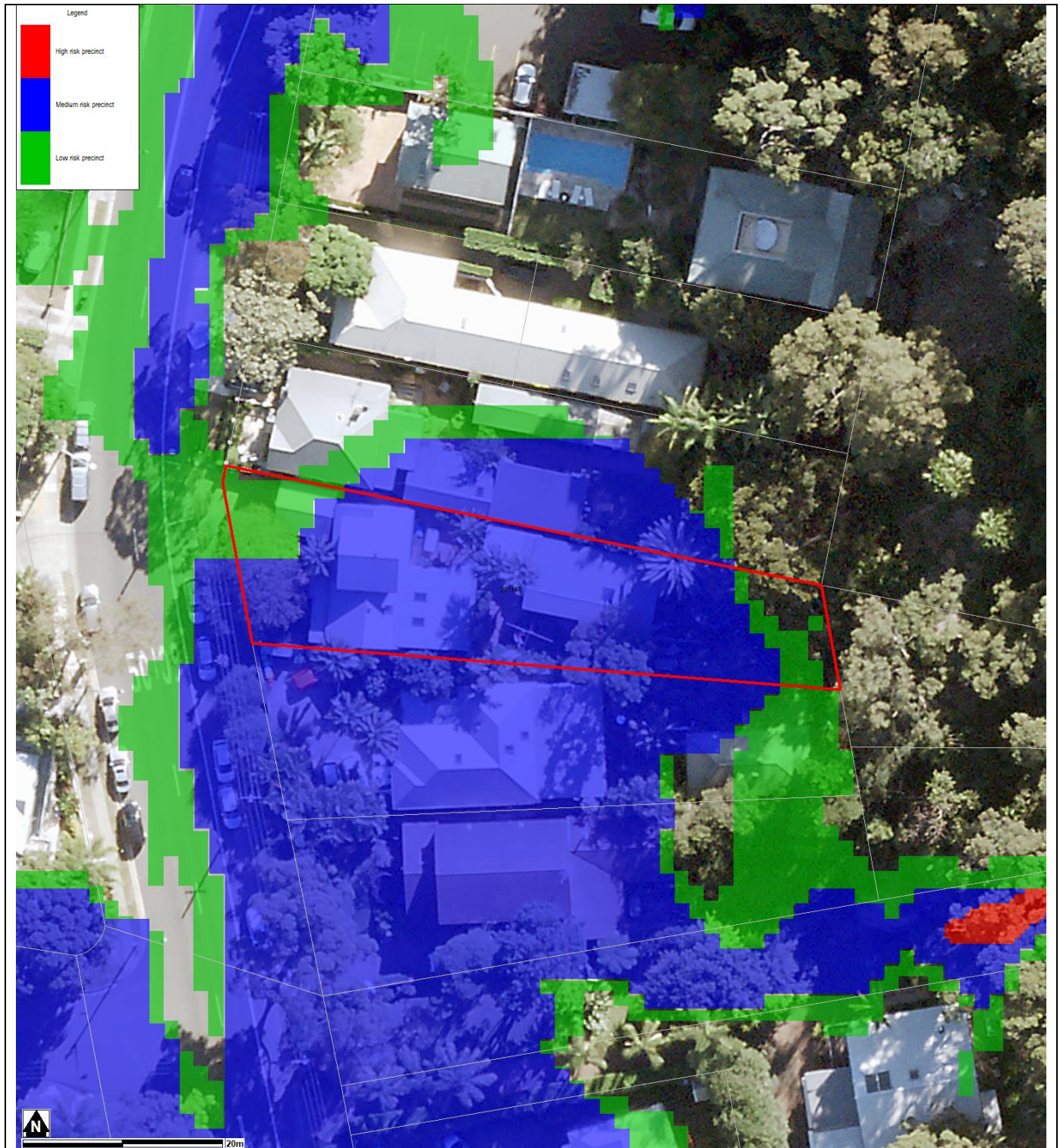
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

⁴ Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or FPL.

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.

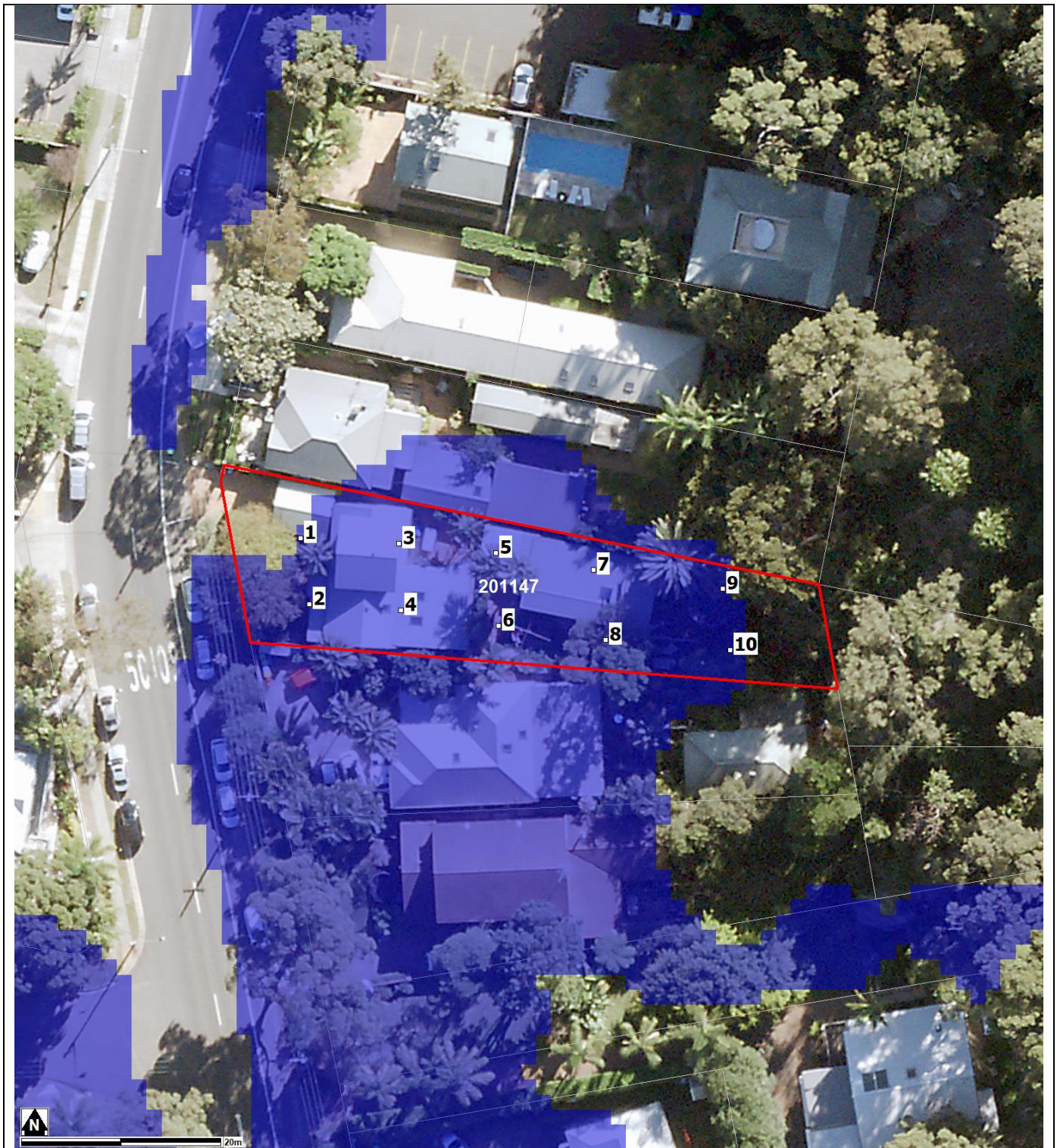
FLOOD MAP A: FLOOD RISK PRECINCT MAP



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 or H6 Life Hazard Classification).
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

FLOOD LEVEL POINTS



Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) 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	3.40	0.15	0.06	3.90	3.54	0.29	0.09
2	3.37	0.20	3.40	0.23	0.08	3.90	3.54	0.37	0.14
3	3.37	0.15	3.40	0.18	0.06	3.90	3.54	0.33	0.12
4	3.37	0.30	3.40	0.33	0.10	3.90	3.54	0.47	0.20
5	3.38	0.30	3.41	0.33	0.07	3.91	3.55	0.47	0.16
6	3.37	0.41	3.41	0.44	0.13	3.91	3.55	0.59	0.24
7	3.38	0.46	3.41	0.49	0.10	3.91	3.55	0.63	0.22
8	3.38	0.48	3.41	0.51	0.13	3.91	3.55	0.66	0.26
9	3.75	0.19	3.76	0.20	0.15	4.26	3.84	0.28	0.32
10	3.43	0.24	3.45	0.27	0.21	3.95	3.58	0.40	0.37

WL – Water Level

PMF – Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than 0.3m²/s, a freeboard of 0.3m may be able to be justified.

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	3.44	0.18
2	3.43	0.26
3	3.44	0.22
4	3.43	0.36
5	3.44	0.36
6	3.44	0.48
7	3.44	0.52
8	3.44	0.55
9	3.78	0.22
10	3.48	0.30

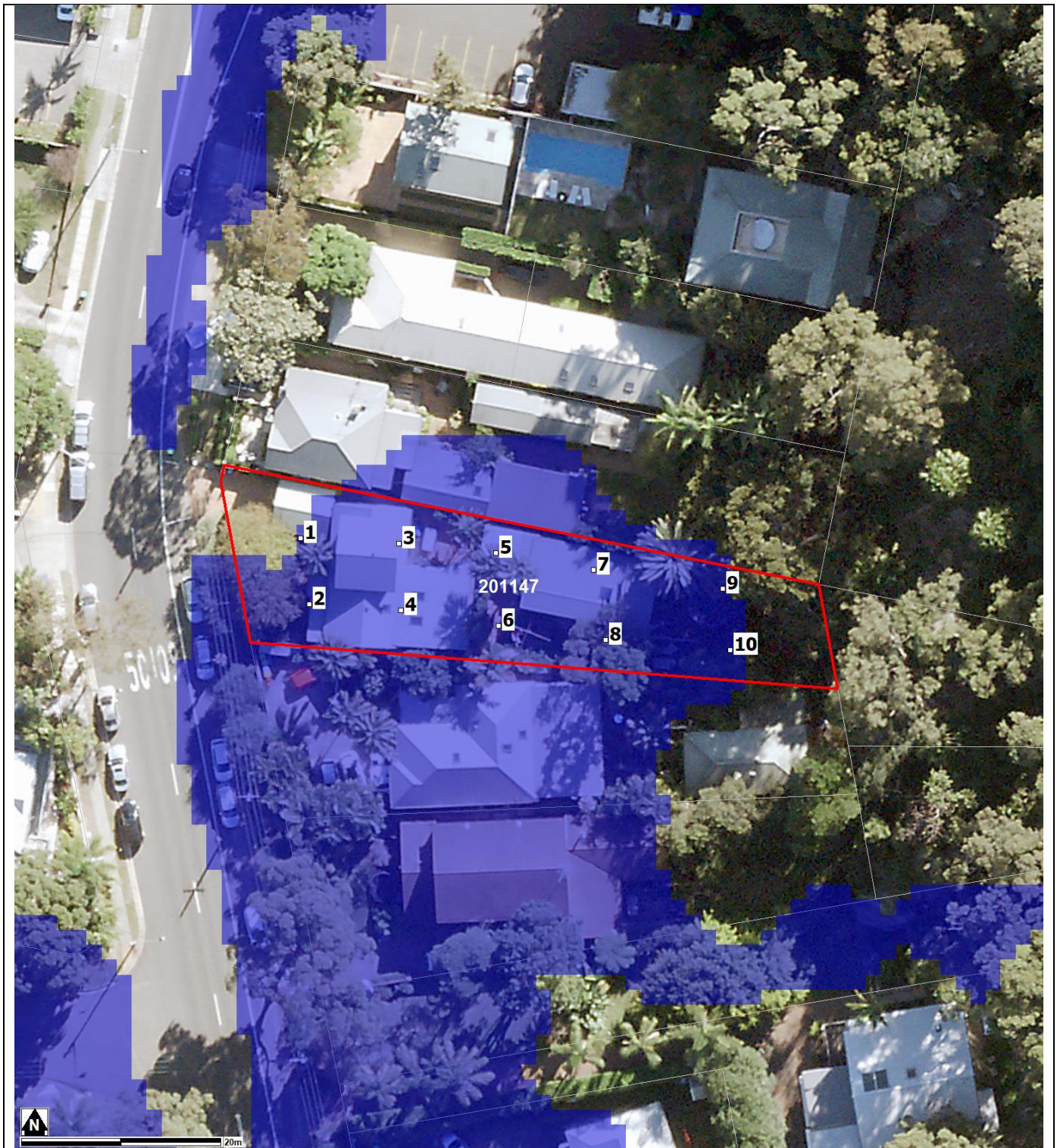
WL – Water Level

PMF – Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event.

If the CC 1% AEP level is less than the 1% AEP level, this is possibly because the 1% AEP level used for planning includes a 5% AEP ocean surge. In this case, the 1% AEP value should be used.

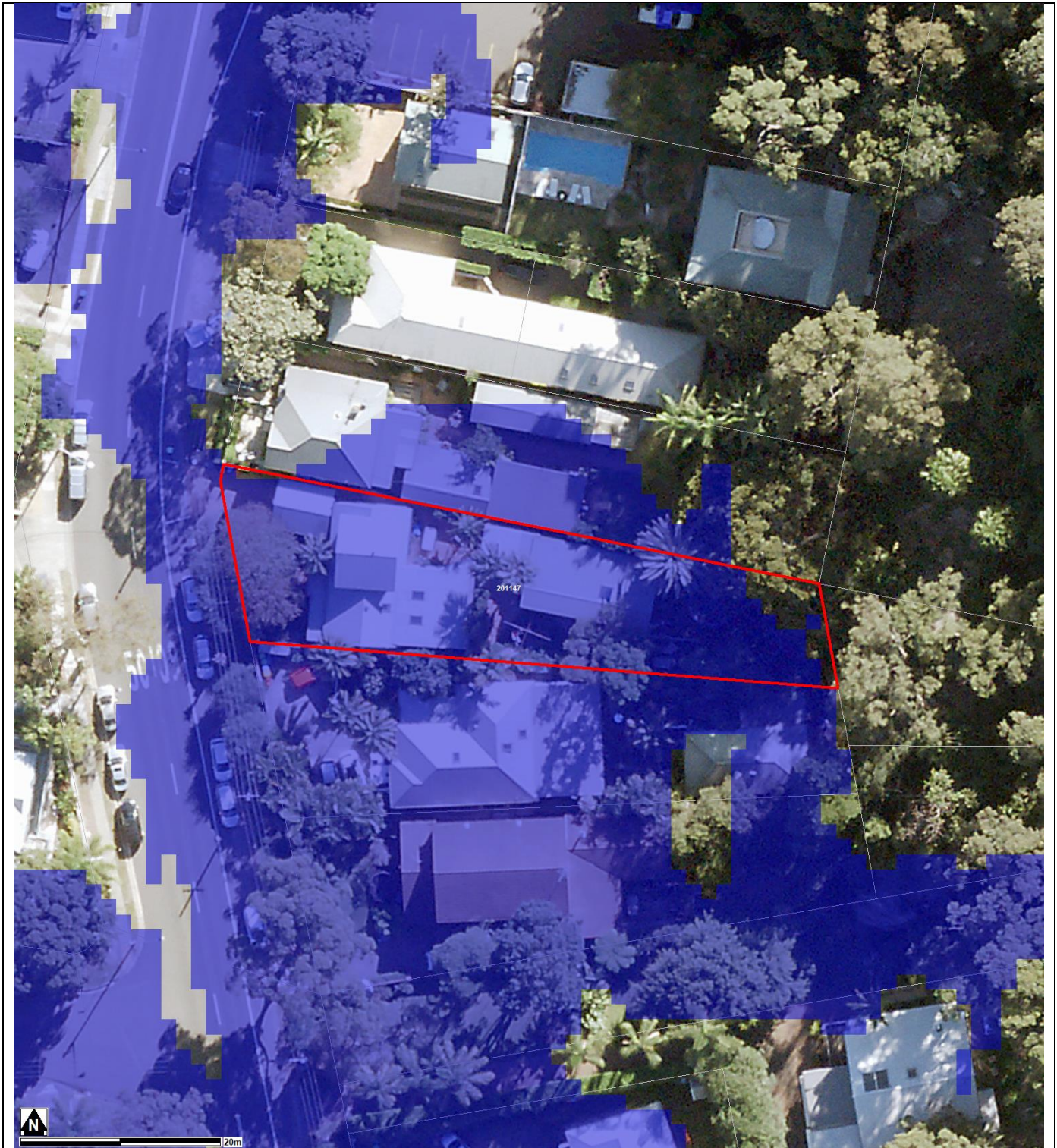
FLOOD MAP B: FLOODING - 1% AEP EXTENT



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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: Near Map 2014) are indicative only.

FLOOD MAP C: 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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

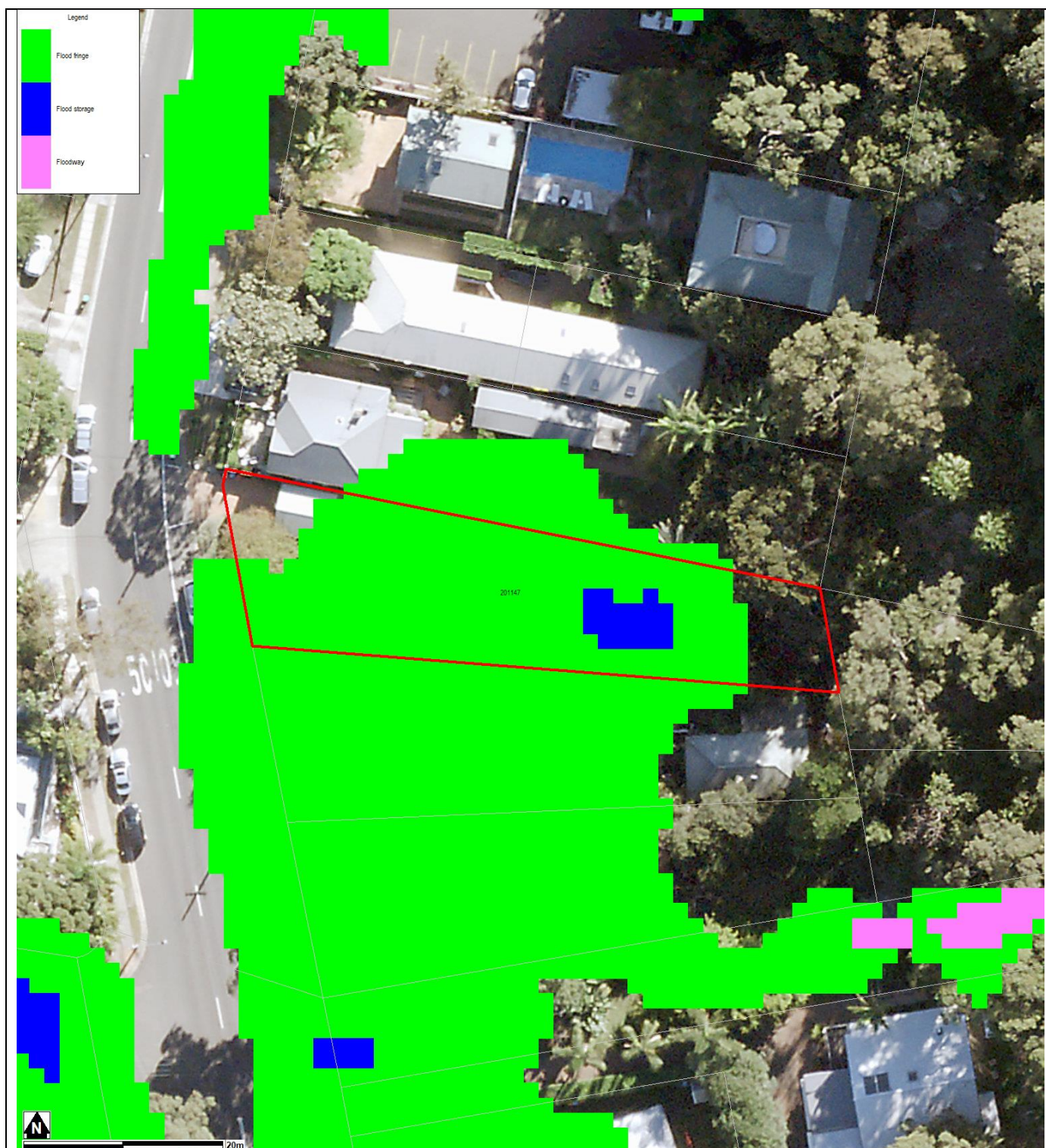
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP E: 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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

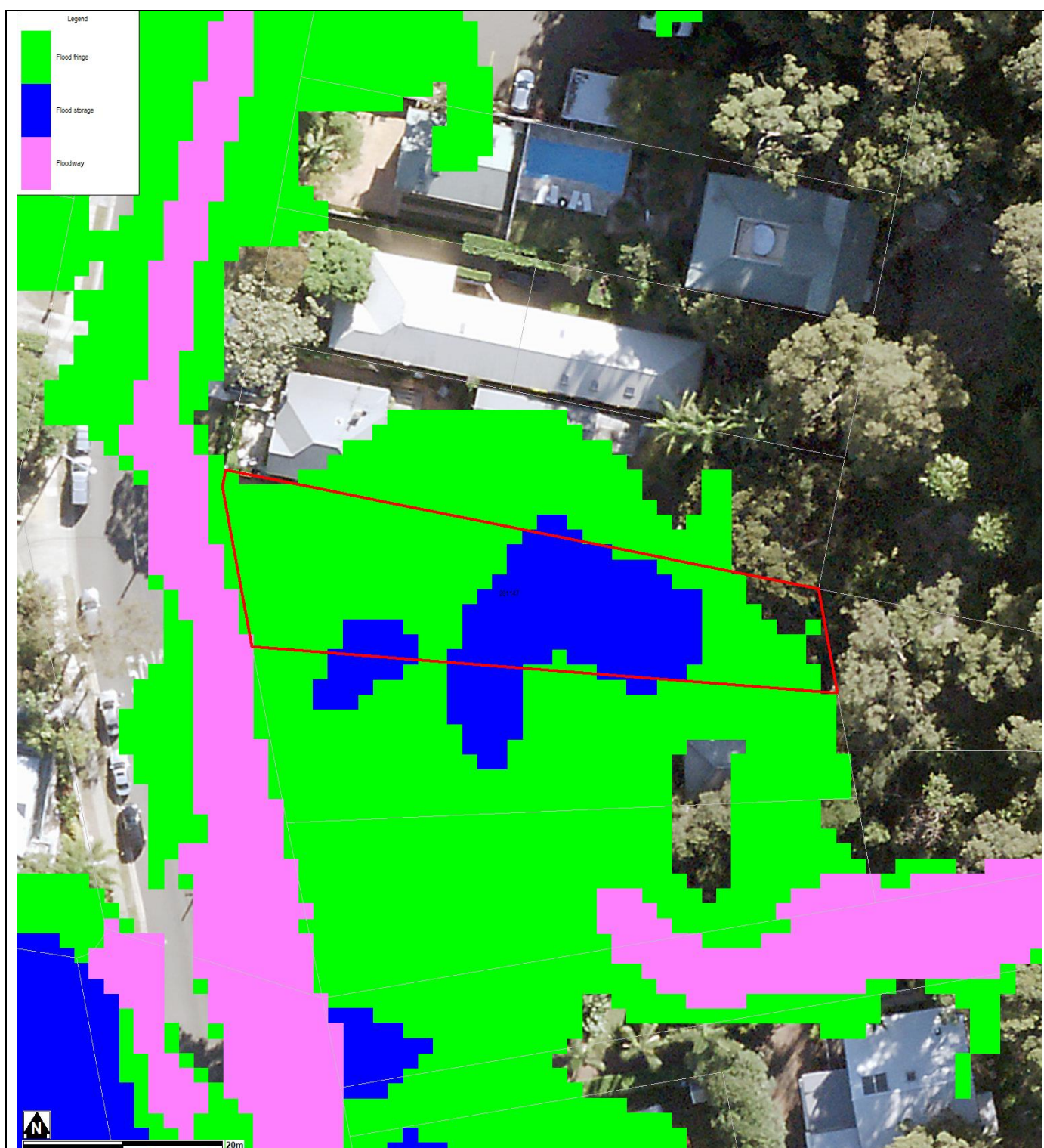
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

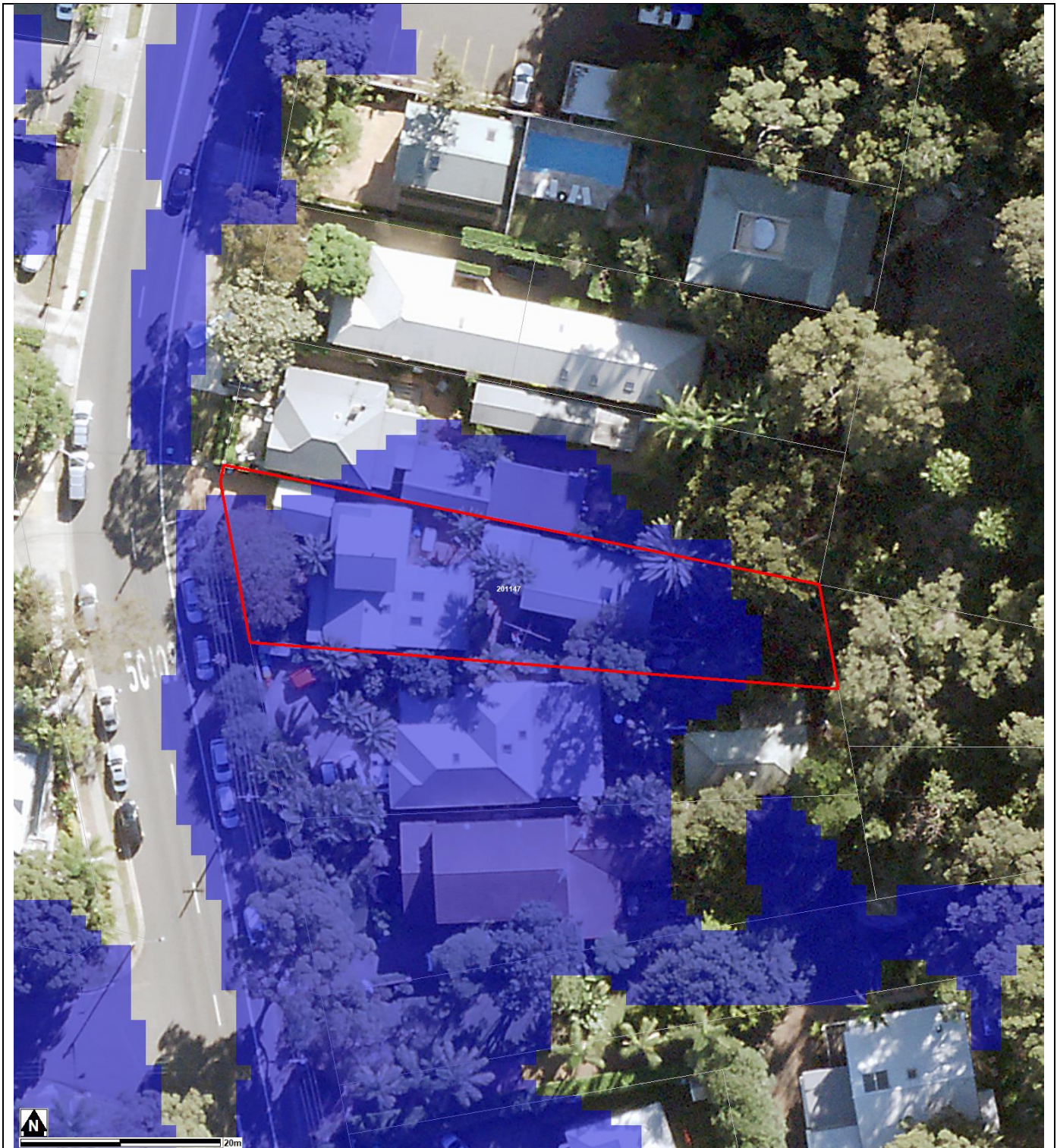
FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

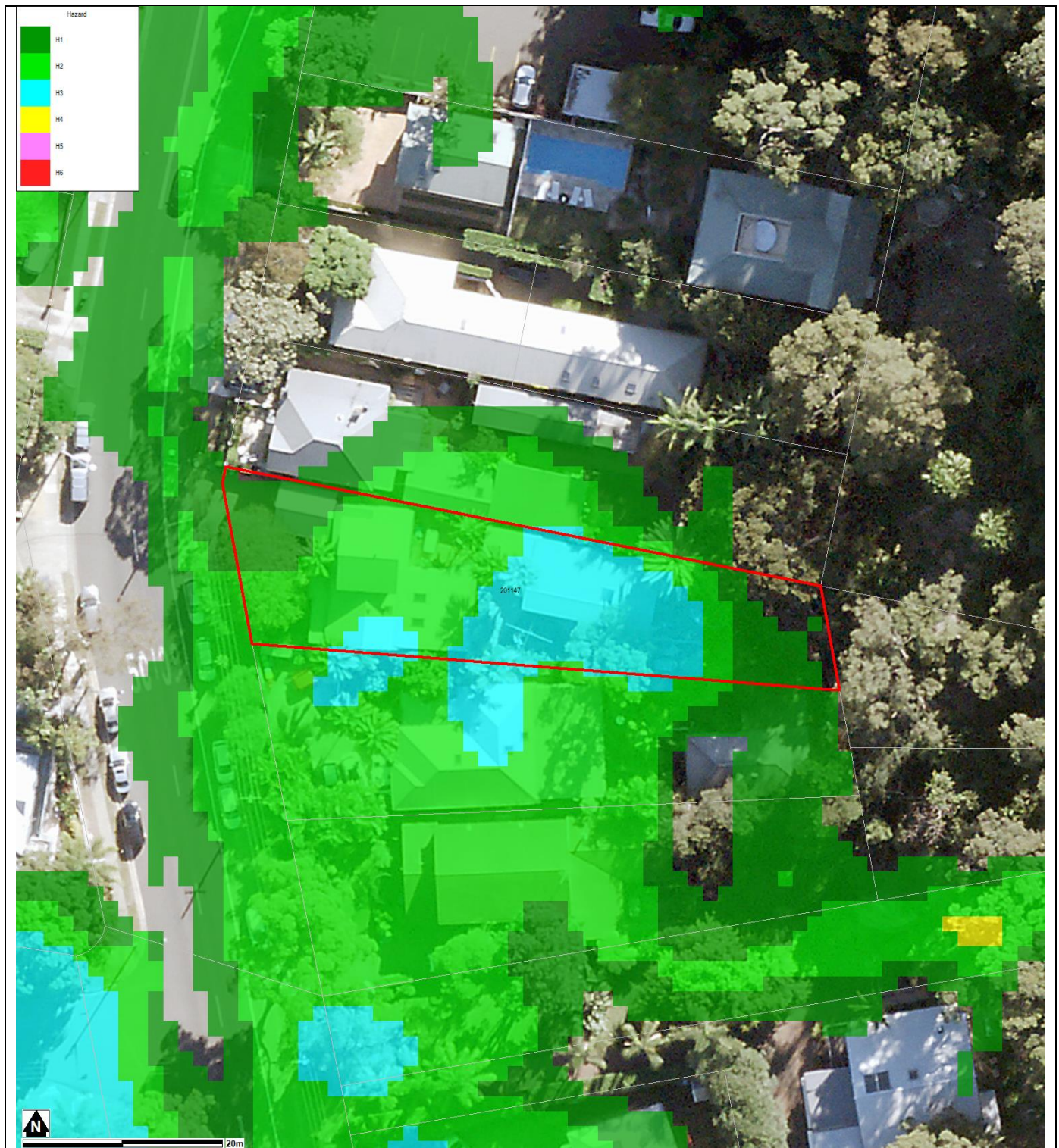
FLOOD MAP H: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



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: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP I: FLOOD LIFE HAZARD CATEGORY



Notes:

- For additional information on Flood Life Hazard Categories, refer to the 'Flood Emergency Response Planning for Development in Pittwater Policy'.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, Manly Hydraulics Laboratory) and aerial photography (Source: Near Map 2014) are indicative only.

MAP J: INDICATIVE GROUND SURFACE SPOT HEIGHTS



Notes:

- The surface spot heights shown on this map were derived from Airborne Laser Survey and are indicative only.
- Accuracy is generally within $\pm 0.2\text{m}$ vertically and $\pm 0.15\text{m}$ horizontally, and Northern Beaches Council does not warrant that the data does not contain errors.
- If accuracy is required, then survey should be undertaken by a registered surveyor.

GUIDELINES for Preparing a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on preparing a Flood Management Report. The purpose of a Flood Management Report is to help applicants measure and manage the flood risk to life and property on their site.

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land, for Council to consider the potential flood impacts and controls. For Residential or Commercial development, it is required for development on land identified within the Medium or High Flood Risk Precinct. For Vulnerable or Critical development, it is required if it is within any Flood Risk Precinct.

Note that the flood extents shown on the mapping are indicative only. It is recommended that flood levels are compared to registered ground survey to more accurately determine the flood extent.

There are some circumstances where a Flood Management Report undertaken by a professional engineer may not be required. However, the relevant parts of the DCP and LEP would still need to be addressed, so as to demonstrate compliance. Examples where this may apply include:

- If all proposed works are located outside the relevant Flood Risk Precinct extent
- First floor addition only, where the floor level is above the Probable Maximum Flood level
- Internal works only, where habitable floor areas below the Flood Planning Level are not being increased

Note that development on flood prone land will still be assessed for compliance with the relevant DCP and LEP, and may still be subject to flood related development controls.

What is in a Flood Management Report?

The aim of a Flood Management Report is to demonstrate how a proposed development will comply with the flood related development controls outlined in the relevant LEP and DCP clauses. The report must detail the design, measures and controls needed to achieve compliance, following the steps outlined below.

A Flood Management Report should reflect the size, type and location of the development, proportionate to the scope of the works proposed, and considering its relationship to surrounding development. The report should also assess the flood risk to life and property.

Technical requirements of a Flood Management Report

The technical requirements of a Flood Management Report should include (where relevant):

1. Description of development

The description of development should identify:

- Outline of the proposed development, with plans if necessary for clarity
- Use of the building, hours of operation, proposed traffic usage or movement
- Type of use, ie, critical, vulnerable, subdivision, residential, business, industrial, recreational, environmental or concessional

2. Flood analysis

The flood analysis should include:

- Predicted 1 in 100 year flood level
- Flood Planning Level (FPL)
- Probable Maximum Flood (PMF) level
- Flood Risk Precinct, ie High, Medium or Low
- Flood Life Hazard Category (in former Pittwater Council area only)
- Mapping of relevant extents
- Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the impact these have on the proposed development

Note that if the property is affected by estuarine flooding or other coastal issues, these need to be addressed separately under the relevant DCP.

3. Assessment of impacts

The assessment of impacts should address the various elements of the relevant LEP and DCP. A simple compliance table should be provided, similar to the table one below.

	Compliance		
	Not Applicable	Yes	No
A Flood effects caused by Development		✓	
B Drainage Infrastructure & Creek Works	✓		
C Building Components & Structural		✓	
D Storage of Goods		✓	
E Flood Emergency Response		✓	
F Floor Levels		✓	
G Car Parking		✓	
H Fencing		✓	
I Pools		✓	

Further details of what is required for each of these categories can be found in the *Development Control Plan for Flood Prone Land*.

For any of these categories which are applicable, the assessment should demonstrate how the development complies, or if it doesn't, provide an explanation of why the development should still be considered.

Reporting requirements for a Flood Management Report

The Flood Management Report should include:

- Executive summary
- Location plan, at an appropriate scale, that includes geographical features, street names and identifies all waterways and Council stormwater pipes, pits and easements
- Plan of the proposed development site showing the extent of the predicted 100 year, any high hazard or floodway conditions and the PMF flood event
- Development recommendations and construction methodologies
- Calculation formulae (particularly for flood storage)
- Clear referencing using an accepted academic referencing system (eg. Harvard)
- Analysis of development against relevant State Environmental Planning Policies
- Analysis of development against relevant Local Environment Plan and Policies
- Conclusion detailing key points
- Standard Hydraulic Certification (Form A/A1)
- Qualifications of author
- Any flood advice provided by Council
- Any other details which may be relevant

NOTE: Qualifications of Author

Council requires that the Flood Management Report be prepared by a suitably qualified Engineer with experience in flood design / management who has, or is eligible for, membership to the Australian Institute of Engineers.

For further information please contact Stormwater and Floodplain Team on 1300 434 434 or via email at floodplain@northernbeaches.nsw.gov.au

Attachment A

NORTHERN BEACHES COUNCIL STANDARD HYDRAULIC CERTIFICATION FORM

FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: 1058 Barrenjoey Road, Palm Beach

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, Cameron Haack on behalf of Approved Consulting Engineers P/L
(Insert Name) (Trading or Business/ Company Name)

on this the 17/05/2021 certify that I am engineer or a
(Date)

professional consultant specialising in flooding 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 \$2 million.

Flood Management Report Details:

Report Title: Flood Risk Report - 2021097

Report Date: 17/05/2021

Author: Cameron Haack

Author's Company/Organisation: Approved Consulting Engineers P/L


I: Cameron Haack
(Insert Name)

Please tick all that are applicable (more than one box can be ticked)

☒ have obtained and included flood information from Council (must be less than 12 months old) **(This is mandatory)**

☒ have followed Council's Guidelines for Preparing a Flood Management Report

☐ have requested a variation to one or more of the flood related development controls. Details are provided in the *Flood Management Report*.

Signature 

Name Cameron Haack