Broadcrest
Engineering and Environmental consultants

Flood Risk Review

Proposed Residential Alts & Ads

ISSUED BY:	*Broadcrest Consulting Pty Ltd*	26 June 2023
TO:	*D. Kershaw C/O: Blue Sky Building Design*	
APPLICATION NO.:	-	
ADDRESS:	*139 George St, Avalon Beach NSW*	
TO BE SUPPLIED TO:	*Northern Beaches Council*	
RE:	*Flood Risk of proposal & compliance to LGA controls*	
BROADCREST REF:	*1813-FR-A-02*	

Broadcrest Consulting Pty Ltd have been engaged to provide the review of the proposed residential alterations & additions at *139 George St, Avalon Beach NSW* (hereafter 'the site') with compliance to LGA flood controls and comment on the flood risk of the development. The review herein is based upon the following underlying documentation:

- Blue Sky Building Designs (dated 29/05/23), Architecturals No. AVA.2021012,
- Pittwater 21 DCP, Section B3.11 & B3.12
- Pittwater LEP2014, 7.4 Clause 3, and
- NBC (21/03/22) Flood Information Report - Comprehensive 28112E (D22/4246), as extracted from the *Avalon to Palm Beach Floodplain Risk Management Study & Plan, 2017*

1. Flood Information

Latest flood information available for the local catchment is present within the 2017 study noted above, for which the site-specific extract has been provided per NBC Appendix A.

The study results indicate the site is located within a 'Low Flood Risk' precinct for which the dwelling was not identified to be inundated by the 1% AEP, to be outside any 1% AEP hydraulic categories, and to not garner a prescribed 1% AEP Flood Planning Level (FPL).

The site is projected to be affected by the Probably Maximum Flood (PMF) event variably within the lot from 15.28m AHD to 9.55m AHD with a depth range of 0.3m to 0.16m from south to north respectively. PMF velocity ranges from 0.94 m/s to 0.39m/s respectively for which the site is categories as a PMF 'Flood Fringe' of low H1 hazard category. Under PMF conditions it is anticipated the 1st floor and above will be flood free at greater than the

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FGL+0.3m (15.53m AHD, 16.79m AHD); with minor inundation of the ground floor workshop, garage, and games room (11.7m AHD, and 14.10m AHD).

Projected Climate Change 1%AEP intensification indicates inundation at the dwelling of 10.93m AHD to a depth of 0.19m. Under such an event the ground floor and above will achieve an FPL greater than the CC adjusted 1%AEP + 0.5m freeboard (11.430m AHD).

2. Flood Controls

Flood controls for the development are understood to be governed per the following LGA criteria:

- Pittwater 21 DCP, B3.11 Flood Prone Land
- Pittwater 21 DCP, B3.12 Climate Change (Sea Level Rise and Increased Rainfall Volume)
- Pittwater LEP2014, 7.4 Floodplain Risk Management, clause 3

Given the development is not an intensification of land-use, nor a sensitive use case, LEP & DCP controls apply an FPL of 1%AEP + freeboard. Detail of the LEP and DCP controls and criteria are presented below.

Pittwater 21 DCP, B3.11 Flood Prone Land

B3.11 DCP controls are applied per Flood Risk precinct mapping of a given site for which a control matrix is applied based upon the risk profile. NBC mapped flood precinct for the site is presented in Figure 1, for which a 'Low Risk Precinct' condition is identified (see Figure 2). Based upon the continued 'Residential' use case for the site and the low risk profile, no B3.11 controls were identified to be applicable for the development.

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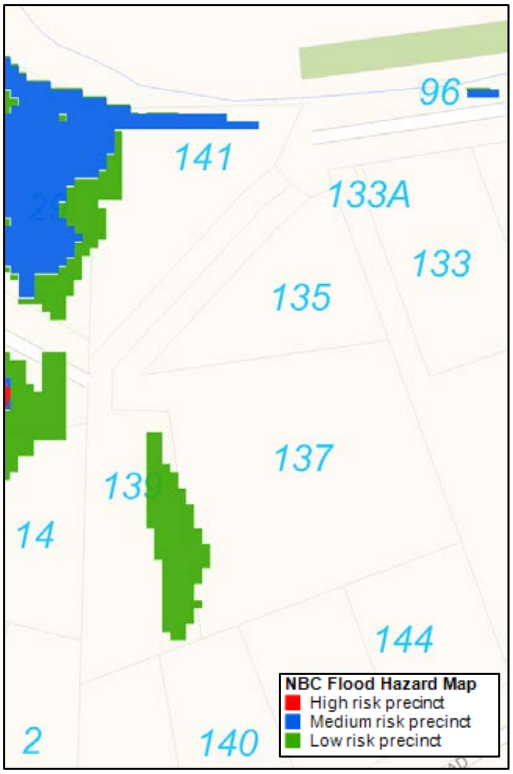

Figure 1. –NBC Online Flood Risk Mapping for 139 George St

		Low Flood Risk Precinct				
		Vulnerable & Critical Use	Residential Use	Business & Industrial Use	Recreational & Environmental Use	Subdivision & Civil Works
B	Building Components & Structural	B1 B2 B3				
C	Floor Levels	C2 C3				C5
D	Car Parking	D2 D7				
E	Emergency Response	E1 E2				E3

Figure 2. –Pittwater 21DCP B3.11 Low Risk Flood control Matrix

Pittwater 21 DCP, B3.12 Climate Change (Sea Level Rise and Increased Rainfall Volume)

B3.12 notes control application in relation to online coastal hazard mapping and estuarine hazard mapping. In relation to this site, the lot was not identified within the 'Pittwater Coastal Risk Planning Map' and was identified as subject to 'Wave Action and Tidal Inundation' within the Pittwater 'Estuarine Hazard Map'. As the proposed development does not constitute any

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of the development cases listed as 'intensification of development', it is understood that an Estuarine Risk Management Report is not warranted per B3.12 of the DCP.

Pittwater LEP2014, 7.4 Floodplain Risk Management, clause 3

(3) Development consent must not be granted to development for the following purposes on land to which this clause applies unless the consent authority is satisfied that the development will not, in flood events exceeding the flood planning level, affect the safe occupation of, and evacuation from, the land— (proceeds to list sensitive land-uses)

The proposed land-use is single dwelling residential and not listed within the affected development types, therefore the above clause does not apply.

3. Findings and Recommendations

The flood affectation has been identified for the 1%AEP, CC adjusted 1% AEP, and PMF from within the latest study data. The development was found to not attracted flood specific controls of the LEP & DCP based upon the continued single-dwelling residential land use and situation within a Low Risk 1% AEP flood precinct.

Based upon the proposed configuration (as detailed in Architecturals dated 29/05/23) the 1st and 2nd floor are anticipated to remain flood free for all inundations projected by the 2017 study. Ground floor inundation is anticipated for the PMF event only, with the space remaining flood free for the 1% AEP and CC adjusted 1% AEP per the 2017 study results.

The proposed dwelling configuration per Architecturals dated 29/05/23 was identified to be in compliance with the LEP and DCP controls with no modifications warranted.

On behalf of Broadcrest Consulting,

Logan Starkey
Civil Engineer
B. Eng (Adv.) (Civil) (Hons.)

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Appendix A: NBC FLOOD INFORMATION REPORT

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FLOOD INFORMATION REPORT – COMPREHENSIVE

Property: 139 George Street AVALON BEACH NSW 2107
Lot DP: Lot 4 DP 204164
Issue Date: 21/03/2022
Flood Study Reference: Avalon to Palm Beach Floodplain Risk Management Study & Plan, 2017

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]: N/A m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level [2, 3]: N/A mAHD

1% AEP Maximum Depth from natural ground level[3]: N/A m

1% AEP Maximum Velocity: N/A m/s

1% AEP Hydraulic Categorisation: N/A **See Flood Map D**

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level [4]: 15.28 m AHD

PMF Maximum Depth from natural ground level: 0.29 m

PMF Maximum Velocity: 0.94 m/s

PMF Hydraulic Categorisation: N/A **See Flood Map E**

Flooding with Climate Change (See Flood Map F)

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

1% AEP Maximum Water Level with Climate change [3]: 13.42 m AHD

1% AEP Maximum Depth with Climate Change[3]: 0.41 m

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

Flood Life Hazard Category – See Map G

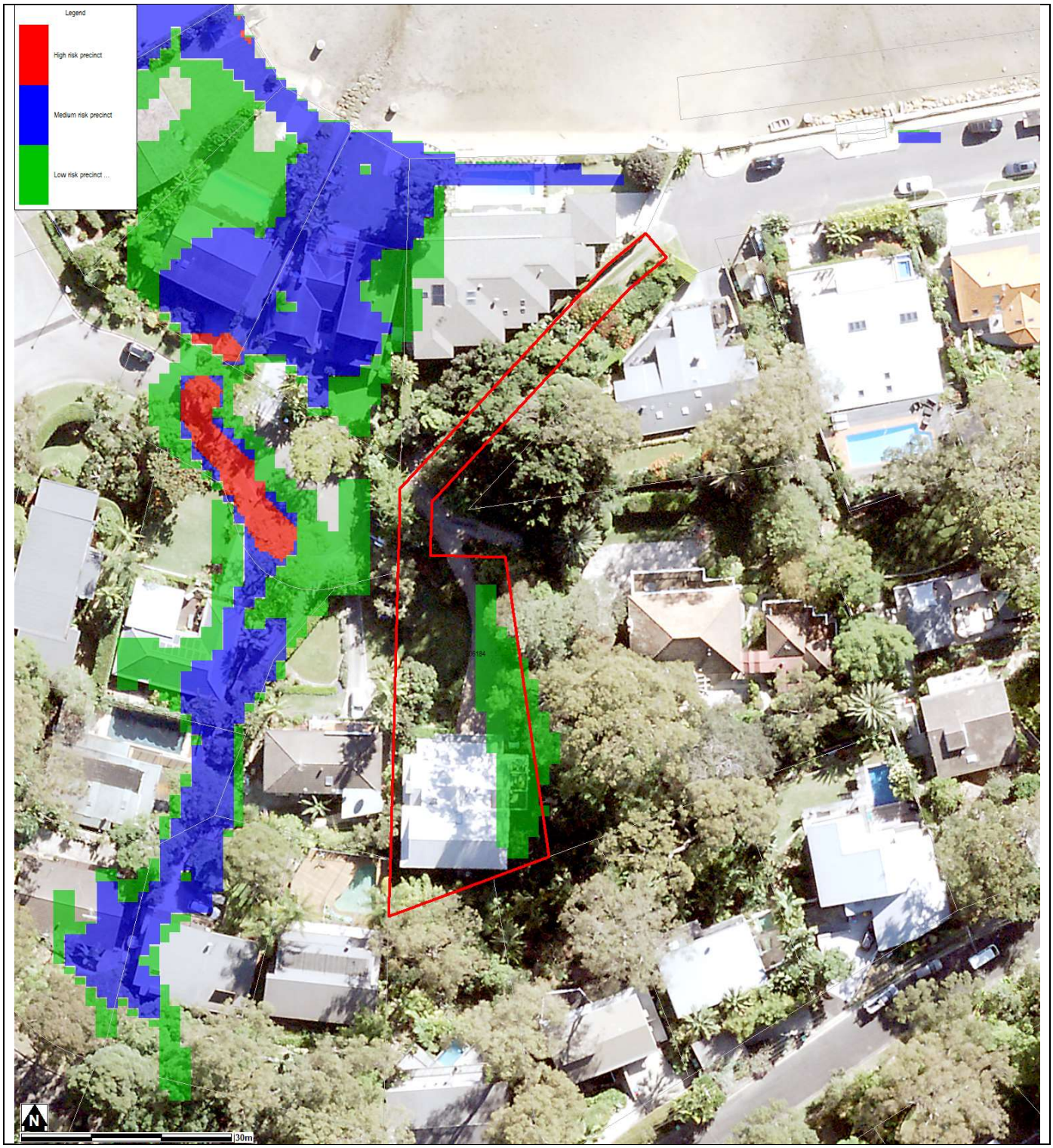
Indicative Ground Surface Spot Heights – See Map H

[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:) 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	N/A	9.55	0.16	0.39
2	N/A	N/A	N/A	N/A	N/A	N/A	11.00	0.25	0.71

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	10.93	0.19

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

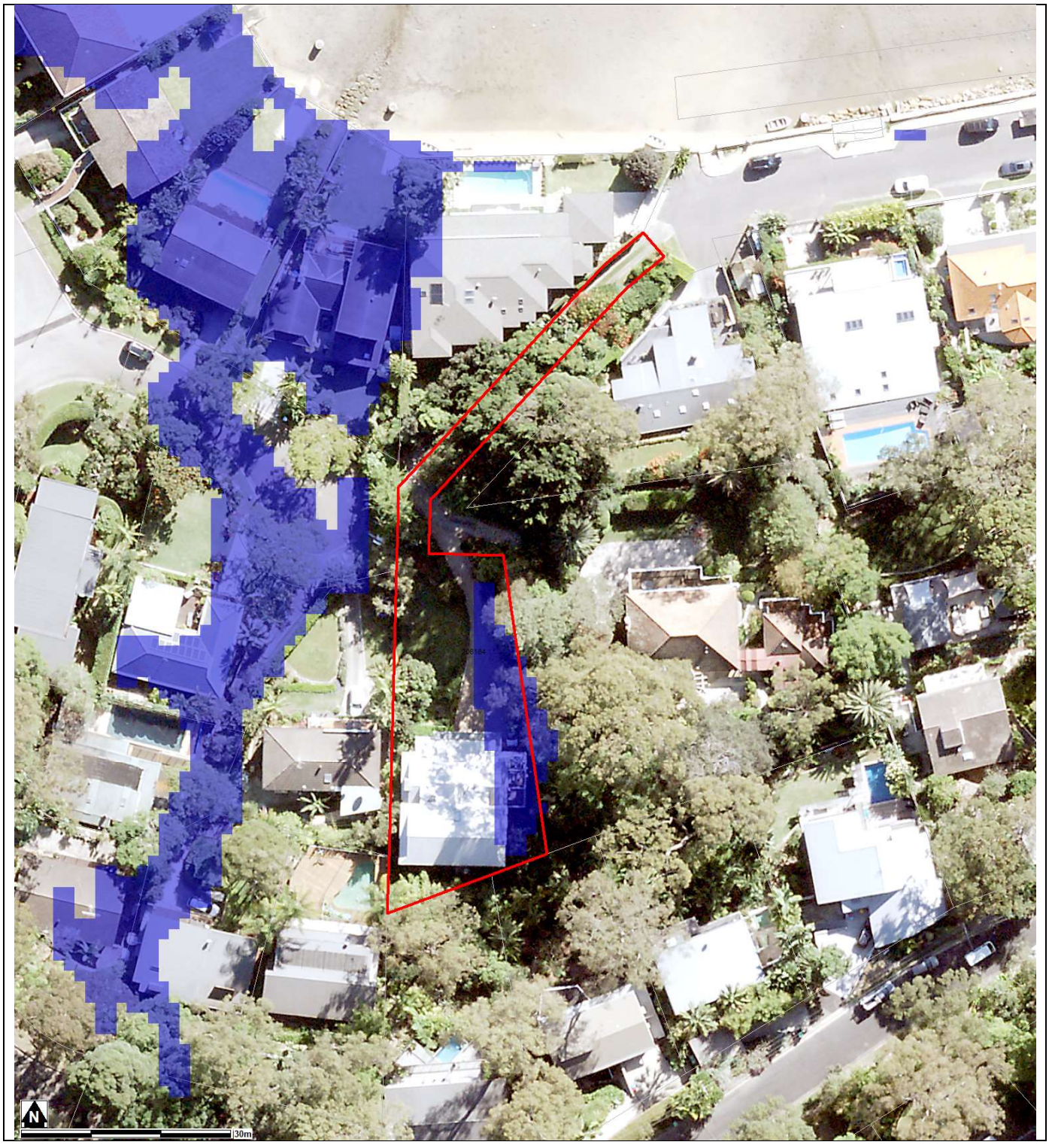
A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than $0.3m^2/s$, a freeboard of 0.3m may be able to be justified.

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:) and aerial photography (Source Near Map 2014) are indicative only.

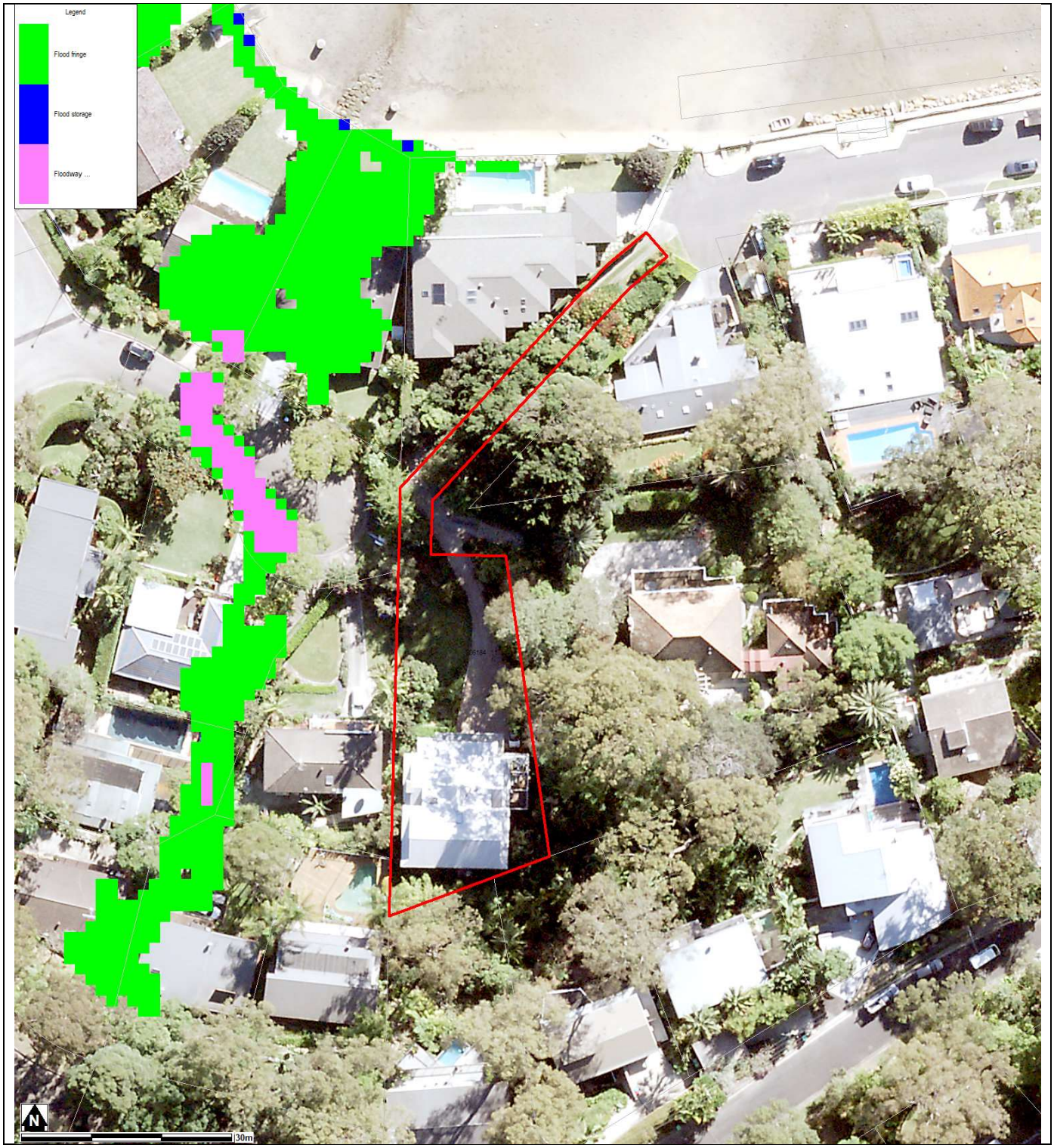
FLOOD MAP C: PMF EXTENT MAP



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:) and aerial photography (Source: NearMap 2014) are indicative only

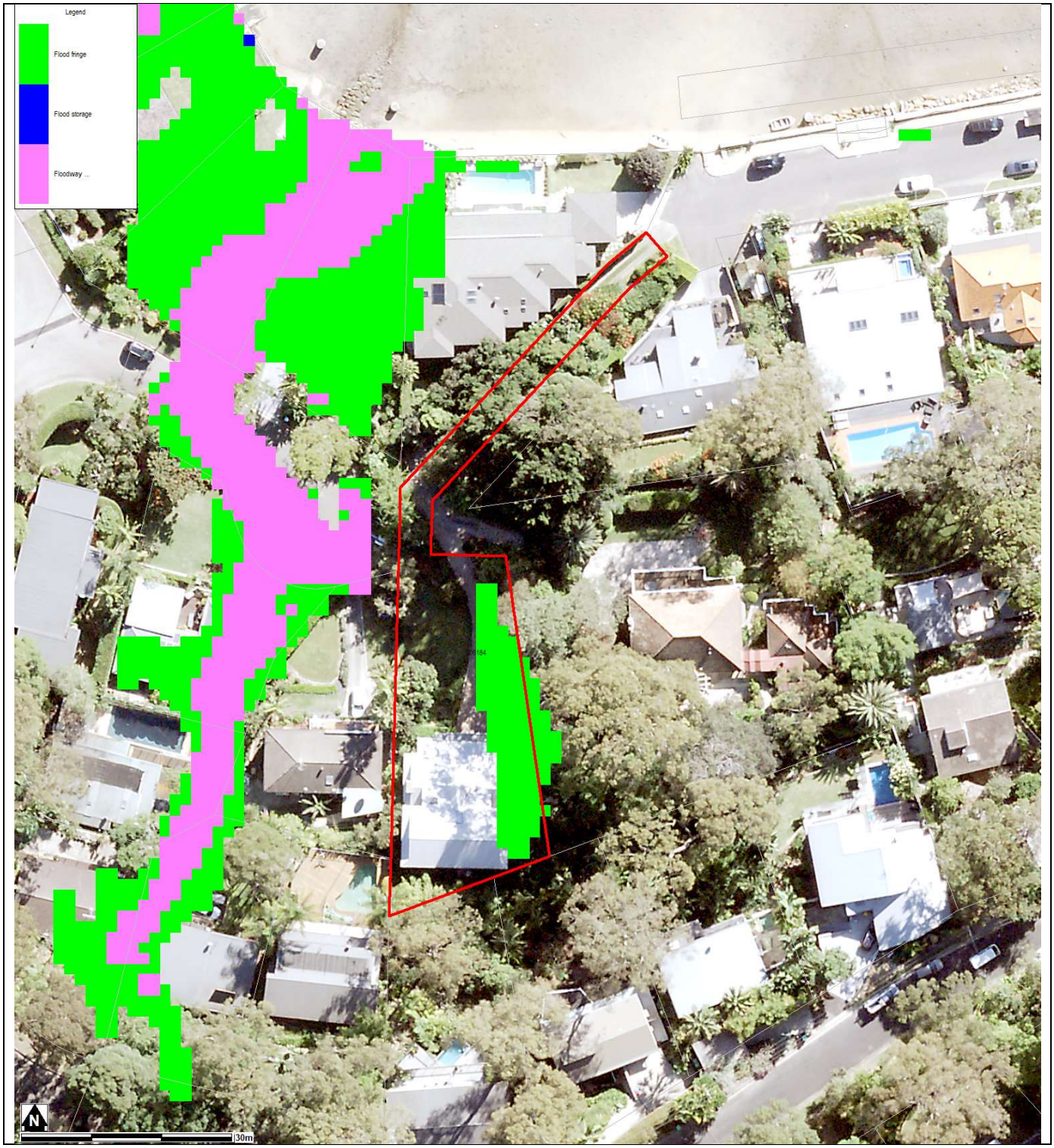
FLOOD MAP D: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



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:) and aerial photography (Source: NearMap 2014) are indicative only

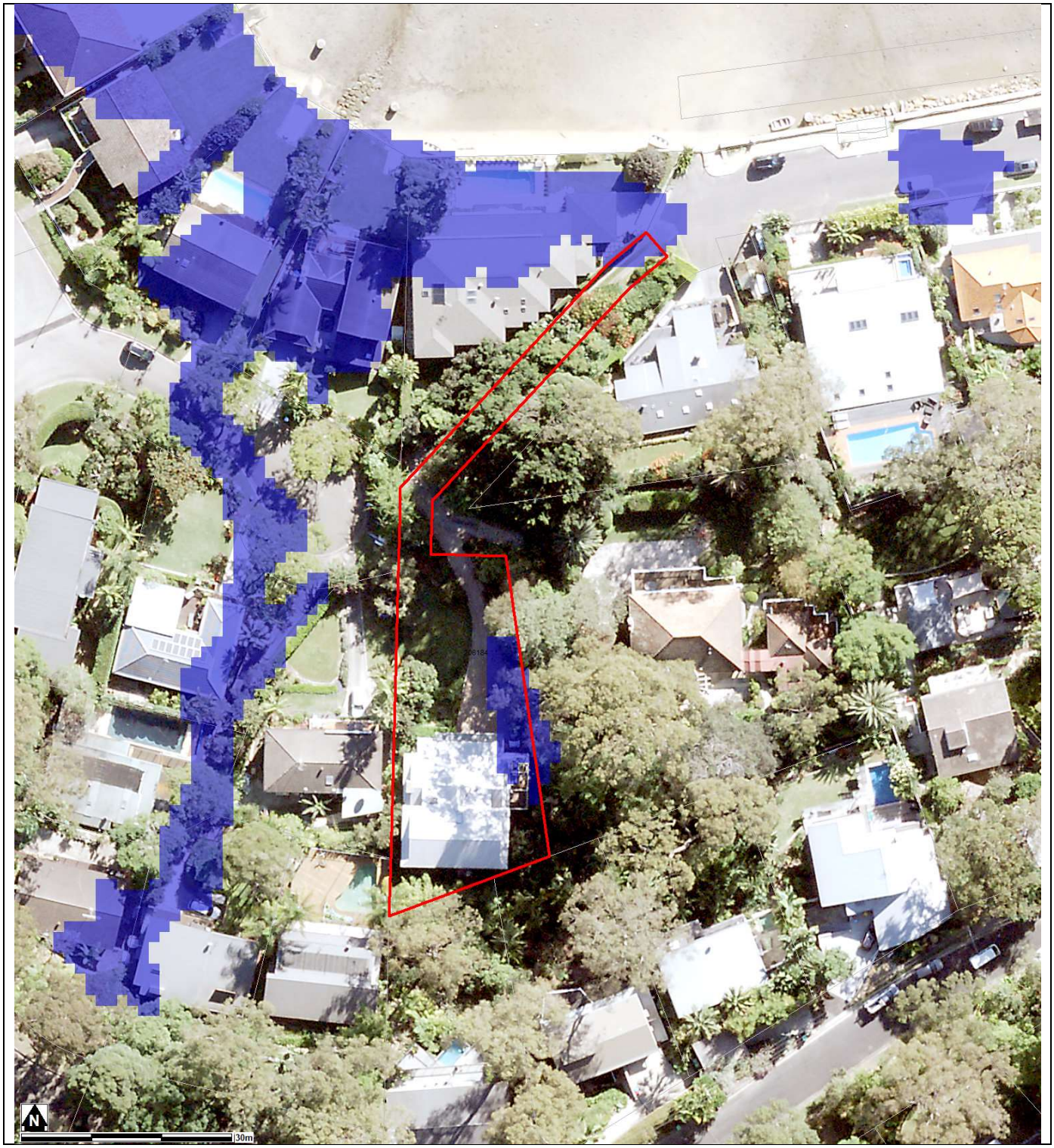
FLOOD MAP E: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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:) and aerial photography (Source: NearMap 2014) are indicative only

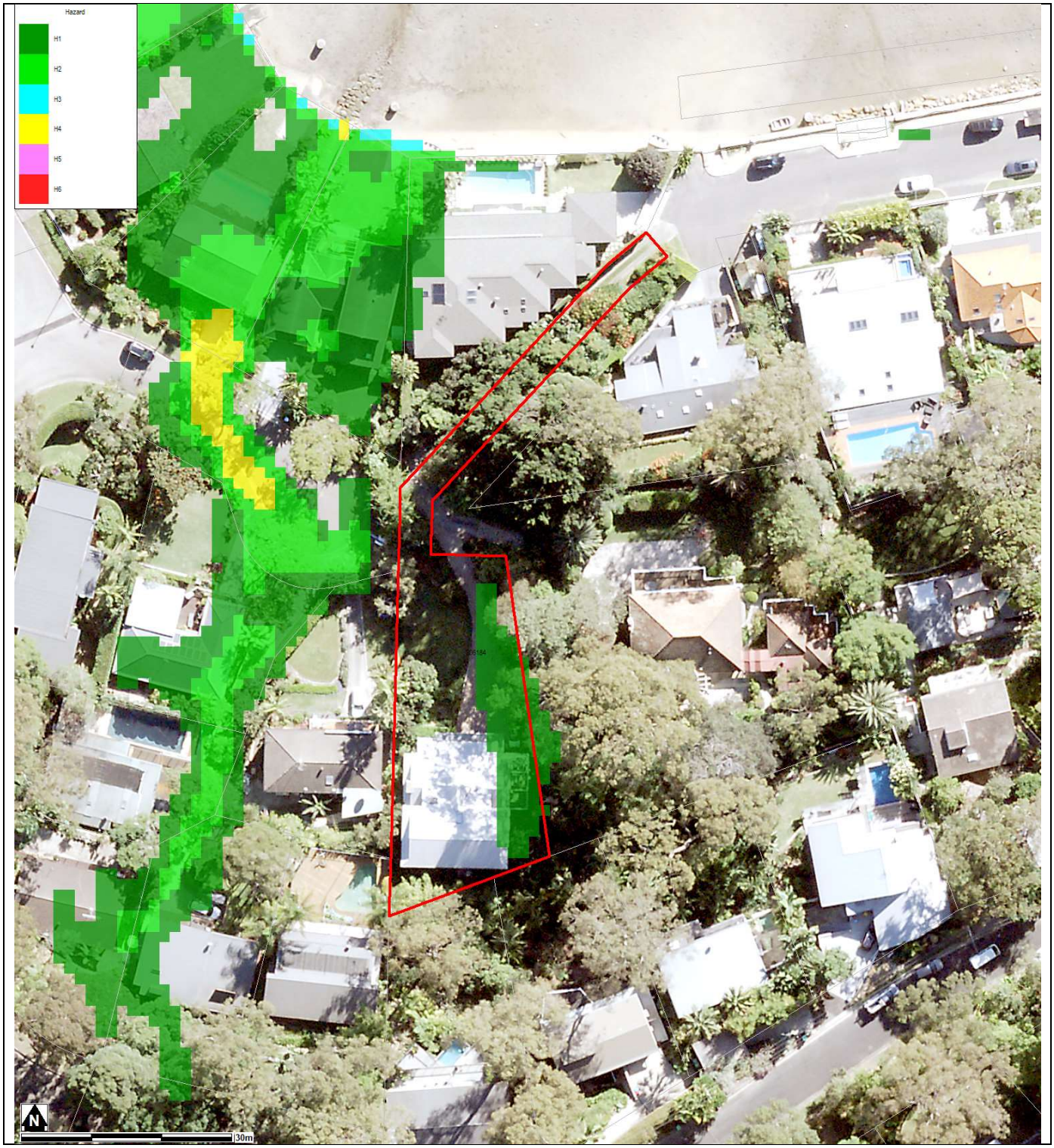
FLOOD MAP F: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



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:) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP G: FLOOD LIFE HAZARD CATEGORY



Notes:

- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source:) and aerial photography (Source Near Map 2014) are indicative only.

MAP H: 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 ± 0.2m vertically and ± 0.15m 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.

Preparation of a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on how to determine what rules apply on flood prone land, and how to prepare a Flood Management Report. The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood related planning requirements.

Planning Requirements for Flood Prone Land

Development must comply with the requirements for developing flood prone land set out in the relevant Local Environment Plan (LEP) and Development Control Plan (DCP). There are separate LEPs and DCPs for each of the former Local Government Areas (LGAs), although preparation of a LGA-wide LEP and DCP is currently under way.

The clauses specific to flooding in the LEPs and DCPs are as follows:

LEP Clauses	DCP Clauses
Manly LEP (2013) – 6.3 Flood Planning	Manly DCP (2013) – 5.4.3 Flood Prone Land
Warringah LEP (2011) – 6.3 Flood Planning Warringah LEP (2000) – 47 Flood Affected Land *	Warringah DCP (2011) – E11 Flood Prone Land
Pittwater LEP (2014) – 7.3 Flood Planning Pittwater LEP (2014) – 7.4 Flood Risk Management	Pittwater 21 DCP (2014) – B3.11 Flood Prone Land Pittwater 21 DCP (2014) – B3.12 Climate Change

* The Warringah LEP (2000) is relevant only for the “deferred lands” which affects only a very small number of properties, mostly in the Oxford Falls area.

Development on flood prone land must also comply with Council’s Water Management for Development Policy, and if it is in the Warriewood Release Area, with the Warriewood Valley Water Management Specification. Guidelines for Flood Emergency Response Planning are available for addressing emergency response requirements in the DCP. These documents can be found on Council’s website on the Flooding page.

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

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land (with exceptions noted below), for Council to consider the potential flood impacts and applicable 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.

There are some circumstances where a formal 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 FPL 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 the purpose of a Flood Management Report?

The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood planning requirements, particularly the 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.

Preparation of a Flood Management Report

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

1. Description of development
   - 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, eg vulnerable, critical, residential, business, industrial, subdivision, etc

2. Flood analysis
   - 1% AEP flood level
   - Flood Planning Level (FPL)
   - Probable Maximum Flood (PMF) level
   - Flood Risk Precinct, ie High, Medium or Low
   - Flood Life Hazard Category
   - Mapping of relevant extents
   - Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the relevance to the proposed development

   If the property is affected by an Estuarine Planning Level (EPL) which is higher than the FPL, then the EPL should be used as the FPL. If the FPL is higher than the PMF level, then the FPL should still be used as the FPL, as it includes freeboard which the PMF does not.

3. Assessment of impacts
- Summary of compliance for each category of the DCP, as per the table below.

	Compliance		
	N/A	Yes	No
A) Flood effects caused by Development			
B) Building Components & Structural Soundness			
C) Floor Levels			
D) Car parking			
E) Emergency Response			
F) Fencing			
G) Storage of Goods			
H) Pools			

- Demonstration of how the development complies with any relevant flood planning requirements from the DCP, LEP, Water Management for Development Policy, and if it is in the Warriewood Valley Urban Land Release Area, with the Warriewood Valley Water Management Specification (2001)
- For any non-compliance, a justification for why the development should still be considered.
- Calculations of available flood storage if compensatory flood storage is proposed
- Plan of the proposed development site showing the predicted 1% AEP and PMF flood extents, as well as any high hazard or floodway affectation
- Development recommendations and construction methodologies
- 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 Institution of Engineers Australia
- Any flood advice provided by Council
- Any other details which may be relevant

Further information and guidelines for development are available on Council's website at:

https://www.northernbeaches.nsw.gov.au/planning-and-development/building-and-renovations/development-applications/guidelines-development-flood-prone-land

Council's Flood Team may be contacted on 1300 434 434 or at floodplain@northernbeaches.nsw.gov.au .