06 June 2019

Kathryn Parker
12 Bellevue Ave
Avalon Beach NSW 2107

c/o rachelhudsonarchitect@gmail.com

Project Reference: **J19067**
Project Location: **12 Bellevue Ave, Avalon Beach**
Project Details: **Proposed Alterations and Additions**

Flood evaluation for the proposed development at 12 Bellevue Ave, Avalon Beach (DA)

Dear Kathryn

1.0 Executive Summary

GZ Engineers was engaged to assess the proposed alterations and additions to the existing dwelling at 12 Bellevue Ave in reference to potential risks and impacts connected with flooding. Architectural plans and a detailed survey were used in conjunction with Council supplied flood information to assess the proposed development against the relevant flood controls found in Northern Beaches Council (Pittwater) Development Control Plan (21DCP).

The development site, known as 12 Bellevue Ave (Lot 40, DP11462), is a 1073 m^2 rectangular shaped block located in Avalon Beach, New South Wales. The property is situated in the upper reaches of the Careel Bay Creek catchment and drains to Council's stormwater system in Bellevue Ave.

The development proposes alterations to the existing primary and secondary dwellings on site and construction of an outdoor deck area linking the two.

Council's flood data predicts that during the 1% annual exceedance period (AEP) rain event the site will be inundated with floodwaters traversing the property in a north-east direction toward Bellevue Ave, starting in Palm Grove Park. The site has areas nominated both Low and Medium Risk (Figure 1) and is not subject to mainstream flooding but located within an area designated as flood fringe (Map G, Appendix B).

All aspects of the proposed development are categorised as concessional, low / medium risk and comply with the relevant flood controls of Pittwater Council 21DCP sB3.11 except for the proposed extension to the primary dwelling. An exception to control F4 is sought and is considered acceptable given that the proposed extension to the existing primary dwelling:

- exceeds the maximum allowable increase to the ground floor area by 0.5% (16 m2 vs 15.3 m2),
- converts an existing outdoor covered veranda to an internal living space and is technically contained within the existing footprint of the dwelling, and;
- does not increase the risk profile of the development (i.e. it is not an additional bedroom).

Provided that the recommendations within this report are followed no additional adverse flooding impacts are expected to occur to the neighbouring upstream and downstream properties as a result of the proposed development.

2.0 Introduction

GZ Engineers was engaged to assess the proposed alterations and additions to the existing dwelling at 12 Bellevue Ave in reference to potential risks and impacts connected with flooding. Architectural plans and a detailed survey were used in conjunction with Council supplied flood information to assess the proposed development against the relevant flood controls found in Northern Beaches Council (Pittwater) Development Control Plan (21DCP).

3.0 Description of the Site and Proposed Development

The development site, known as 12 Bellevue Ave (Lot 40, DP11462), is a 1073 m^2 rectangular shaped block located in Avalon Beach, New South Wales. The property is situated in the upper reaches of the Careel Bay Creek catchment and drains to Council's stormwater system in Bellevue Ave.

The development proposes alterations to the existing primary and secondary dwellings on site and construction of an outdoor deck area linking the two.

4.0 Flooding

The property is identified as being flood affected by the *"Careel Creek Catchment Flood Study"* (WMA Water, 2013). Council supplied flood information (refer Appendix B) was used to determine flooding extents, impacts and to assess associated risks to the development.

4.1 Analysis & Assessment of Impacts

Council's flood data predicts that during the 1% annual exceedance period (AEP) rain event the site will be inundated with floodwaters traversing the property in a north-east direction toward Bellevue Ave, starting in Palm Grove Park. The site has areas nominated both Low and Medium Risk (Figure 1) and is not subject to mainstream flooding but located within an area designated as flood fringe (Flood Map G, Appendix B). Table 1 summarises the flood characteristics for the site.

Table 1. Summary of flood characteristics

Summary	Alterations to Primary Dwelling	Proposed Deck	Alterations to Secondary Dwelling
Existing FFL / surface level (1) (mAHD)	18.06	-	18.99
Proposed FFL (1) (mAHD)	18.06	18.06 – 18.62	18.99
Natural Surface Level (1) (mAHD)	-	18.08 – 18.38	-
Flood Risk Precinct (2)	Medium	Medium	Low
Predicted 1% AEP Flood Level (3) (mAHD)	18.3	18.3	Null
Flood Planning Level (4) (mAHD)	18.6	18.6	-
Probable Maximum Flood Level (5) (mAHD)	18.4	18.4	Null
Flood Life Hazard Category (6)	H1-H2	H1-H2	H1-H2

1. Refer attached architectural plans and survey (Appendix A)
2. Refer to Figure 1
3. Refer to Map B, Appendix B
4. 1% AEP flood level (refer note 3) + 300mm freeboard
5. Map D, Appendix B
6. Refer to Map A, Appendix B

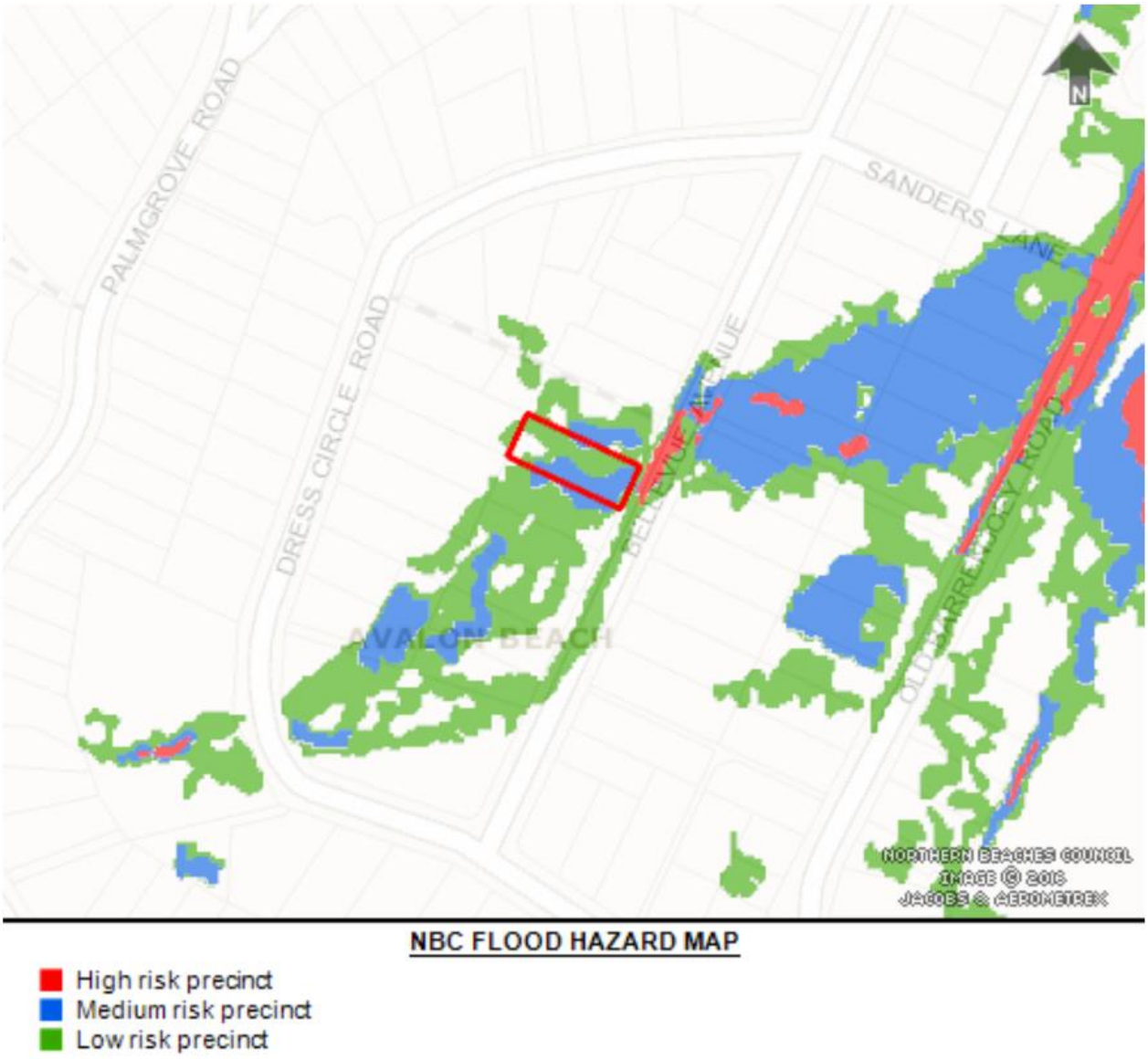


Figure 1 - Northern Beaches Council Flood Hazard Map (ePlaning website)

4.2 Assessment of Impacts

The proposed alteration to the existing secondary dwelling is categorised as concessional and located within the low-risk precinct (Figure 1). In accordance with Pittwater Council 21DCP sB3.11, no flood controls are applicable to this aspect of the development.

The proposed deck and extension to the existing living room within the primary dwelling are categorised as concessional and located within the medium-risk precinct (Figure 1). In accordance with Pittwater Council 21DCP sB3.11, flood controls are applicable to this aspect development. Table 2 provides a summary of the applicable controls for the proposed alterations and additions.

Table 2 – 21DCP flood controls, medium-risk precinct, concessional development

#	Prescriptive controls	Compliance with controls			Relevant Controls
		NA	Yes	No	
A	Flood effects caused by development		✓		A2, A3
B	Drainage infrastructure and creek works	✓			-
C	Building components and structural		✓		C1, C2, C3
D	Storage of goods		✓		D1, D2
E	Flood emergency response		✓		E1
F	Floor levels			✓	F1, F2, F3, F4, F6, F11
G	Car parking		✓		G1, G2, G3, G4, G5, G6, G7
H	Fencing		✓		H1
I	Pools		✓		I1

NA – Not Applicable

4.2.1 Addressing the Controls

Control A - Flood effects caused by development

A2. The certification shall be provided in accordance with Northern Beaches Council's Standard Hydraulic Certification Form (Forms A and A1 of Northern Beaches Council's Guidelines for preparing a Flood Management Report) to the effect that the works have been designed and can be constructed to adequately address flood risk management issues.

Refer to attached Form 1 (Appendix C)

A3. No filling is proposed below the 1% AEP flood level. The proposed external deck is tiered and is cut into the existing landscape at grade or raised above 1% AEP flood level.

Control B - Not applicable

Control C - Building components and structural

C1. The proposed footings, slabs and structures, shall be designed / checked by a structural engineer and constructed of flood compatible materials in accordance with Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas, Hawkesbury-Nepean Floodplain Management Steering Committee (2006).

C2. All proposed structures must be designed and constructed to ensure structural integrity up to the FPL, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. The structural certification shall be provided confirming the above.

C3. All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or located above the FPL.

Control D - Storage of goods

D1. Hazardous or potentially polluting materials shall not be stored below the FPL unless adequately protected from floodwaters in accordance with industry standards.

D2. Goods, materials or other products which may be highly susceptible to water damage are to be located/stored above the FPL.

Control E - Flood emergency response

E1. The recommended emergency response is to shelter in place. The secondary dwelling is above both the FPL and PMF level. In the event that floodwaters overtop the boundary at any point on the property, the recommended actions are:

- The occupants of the property shall be directed to the secondary dwelling, above the 1% AEP and PMF water surface level.
- Emergency services shall be contacted stating the property's location; the situation faced, number of people on the property and any evacuation measures to be carried out.

Control F - Floor levels

F1. The development proposes an extension to the existing living room within the primary dwelling's existing footprint. The proposed extension is below the FPL (refer to control F4).

F2. The proposed development will not create any additional blockages to the flow of floodwaters through the site:

- The proposed extension to the living room of the primary dwelling is within the footprint of the existing dwelling which already blocks the flow of floodwaters through the site.
- The proposed lower deck area is either at or below the existing natural grade
- The proposed upper deck is raise above the natural surface level and is above the 1% AEP flood level.
- The proposed privacy screen and BBQ area along the edge of the deck facing the southern boundary shall be constructed with openings along its base up to the 1% AEP flood level.

F3. Not applicable – The raising of floor levels is not proposed.

F4. The development proposes to convert the existing covered veranda are to a habitable living space which will form an extension to the existing living room within the primary dwelling. The proposed extension is below the FPL in order to tie into the existing FFL of the living room.

An exception to control F4 is sought and is considered acceptable given that the proposed extension to the existing primary dwelling:

- exceeds the maximum allowable increase to the ground floor area by 0.5% (16 m2 vs 15.3 m2),
- converts an existing outdoor covered veranda to an internal living space and is technically contained within the existing footprint of the dwelling, and;
- does not increase the risk profile of the development (i.e. it is not an additional bedroom).

A calculation of the increase to the ground floor area is attached in Appendix D.

F6. Not applicable – No first-floor addition is proposed.

F11. Not applicable – Residential development.

Control G - Not applicable

G1. Not applicable

G2. Not applicable

G3. Not applicable

G4. Not applicable

G5. Not applicable

G6. Not applicable

G7. Not applicable

Control H - Not applicable

H1. Not applicable – no new fencing is proposed.

Control I - Not applicable

I1. Not applicable

5.0 Conclusion

Council's flood data predicts that during the 1% annual exceedance period (AEP) rain event the site will be inundated with floodwaters traversing the property running in a north-east direction toward Bellevue Ave and starting in Palm Grove Park. The site has areas nominated both Low and Medium Risk (Figure 1) and is not subject to mainstream flooding but located within an area designated flood fringe.

The proposed alteration to the existing secondary dwelling is categorised as concessional and located within the low-risk precinct (Figure 1). In accordance with Pittwater Council 21DCP sB3.11, no flood controls are applicable to this aspect of the development.

The proposed deck and extension to the existing living room within the primary dwelling are categorised as concessional and located within the medium-risk precinct (Figure 1). In accordance with Pittwater Council 21DCP sB3.11, flood controls are applicable to this aspect development.

An exception to control F4 is sought and is considered acceptable given that the proposed extension to the existing primary dwelling:

- exceeds the maximum allowable increase to the ground floor area by 0.5% (16 m2 vs 15.3 m2),
- converts an existing outdoor covered veranda to an internal living space and is technically contained within the existing footprint of the dwelling, and;
- does not increase the risk profile of the development (i.e. it is not an additional bedroom).

To meet Council's 21DCP sB3.11 requirements it is recommended that:

- An FPL of 18.3 mAHD is adopted for the site.
- All new structures below the FPL, including the deck and primary dwelling extension, must be constructed of flood compatible materials and designed/verified as capable of withstanding the forces generated due to wave action and tidal inundation during the 1% AEP rain event.
- The proposed privacy screen and BBQ area along the edge of the deck facing the southern boundary shall be constructed with openings along its base up to the 1% AEP flood level to allow the passage of flood waters.
- Non-waterproofed electrical services and stored materials (e.g. fuel, chemicals) must be located above the FPL.

Provided that the recommendations within this report are followed no additional adverse flooding impacts are expected to occur to the neighbouring upstream and downstream properties as a result of the proposed development.

Please contact me if you have any questions regarding the content of this report.

Kind Regards,

Logan English-Smith
Engineer
E: logan@gzengineers.com.au

Appendix A – Architectural Plans and Survey

Architectural Plans by Rachel Hudson Architect (dated: 04.04.19)

DEVELOPMENT APPLICATION TO NORTHERN BEACHES COUNCIL

APRIL 2019

J - 01 - DA	SITE ANALYSIS PLAN	1:200
J - 02 - DA	SEDIMENT / EROSION CONTROL + WASTE MANAGEMENT PLAN	1:200
J - 03 - DA	SITE PLAN	1:200
J - 04 - DA	LANDSCAPE PLAN	1:200
J - 05 - DA	GROUND FLOOR PLAN	1:100
J - 06 - DA	ROOF PLAN	1:100
J - 07 - DA	NORTH ELEVATION	1:100
J - 08 - DA	SOUTH ELEVATION	1:100
J - 09 - DA	EAST ELEVATION	1:100
J - 10 - DA	WEST ELEVATION	1:100
J - 11 - DA	SECTION AA	1:100
J - 12 - DA	SHADOW DIAGRAMS JUNE 21 EXISTING	N/A
J - 13 - DA	SHADOW DIAGRAMS JUNE 21 PROPOSED	N/A
J - 14 - DA	SCHEDULE OF EXTERNAL FINISHES	N/A
J - 15 - DA	NOTIFICATION SITE PLAN	1:200
J - 16 - DA	NOTIFICATION ELEVATIONS 1	1:200
J - 17 - DA	NOTIFICATION ELEVATIONS 2	1:200

Survey by Adam Clerke Surveyors pty ltd

Ref: 12915 dated 17.0.15

Appendix B – Council Supplied Flood Information

FLOOD INFORMATION REQUEST – GENERAL PURPOSE

Property: 12 Bellevue Ave, Avalon Beach
Lot DP: 40//11462
Issue Date: 11 June 2015
Flood Study Reference: 2013 Careel Creek Catchment Flood Study (WMA Water)

A property can be impacted by more than one Category of flooding.

Flood Categories defined by the Pittwater 21 Development Control Plan include:

- **Flood Category 1 Areas-** Properties identified on the Flood Hazard Maps and located within Primary Floodplain Areas where the lowest point of the property is affected by the Flood Planning Level (FPL) (1% AEP flood level plus 500mm Freeboard). Flood Category 1 areas are further defined under flood hazard subcategories of high hazard and low hazard.

- **Flood Category 2 Areas-** Properties identified on the Flood Hazard Maps where the lowest point of the property lies above the Flood Planning Level but below the level of the Probable Maximum Flood.

- **Flood Category 3 Areas-** Properties generally located outside or adjacent to the Primary Floodplain Areas that are affected by flooding hazards associated with major stormwater drainage systems, local overland flow paths or drainage easements. Flood Category 3 Areas are further defined under the subcategories of Overland Flow Path – Major and Overland Flow Path – Minor.

Flood Information for lot:

Flood Life Hazard Category – See Map A

Flood Category 1 (Mainstream) - See Flood Map C

Flood Category 3[5] (Overland Flow) – See Flood Map E

Overland Flow Path: Minor

1% AEP Maximum Water Level[3&4]: 18.3m AHD (See Map B)

1% AEP Overland Flow Maximum Depth from Natural Ground Level[3&4]: 0.29m

1% AEP Maximum Velocity: 0.5-1.0 m/s

Minimum Floor Level[1,2,3 &4]: 0.5m above the 1% AEP Major overland flow extent and 0.3m above the 1% AEP Minor overland flow extent

Probable Maximum Flood (PMF) Level[2]: 19.39m AHD (See Flood Map D)

PMF Maximum Depth from natural ground level: 0.42m

PMF Maximum Velocity: 0.5-1.0m/s

1% AEP Provisional Flood Hazard: See Map F

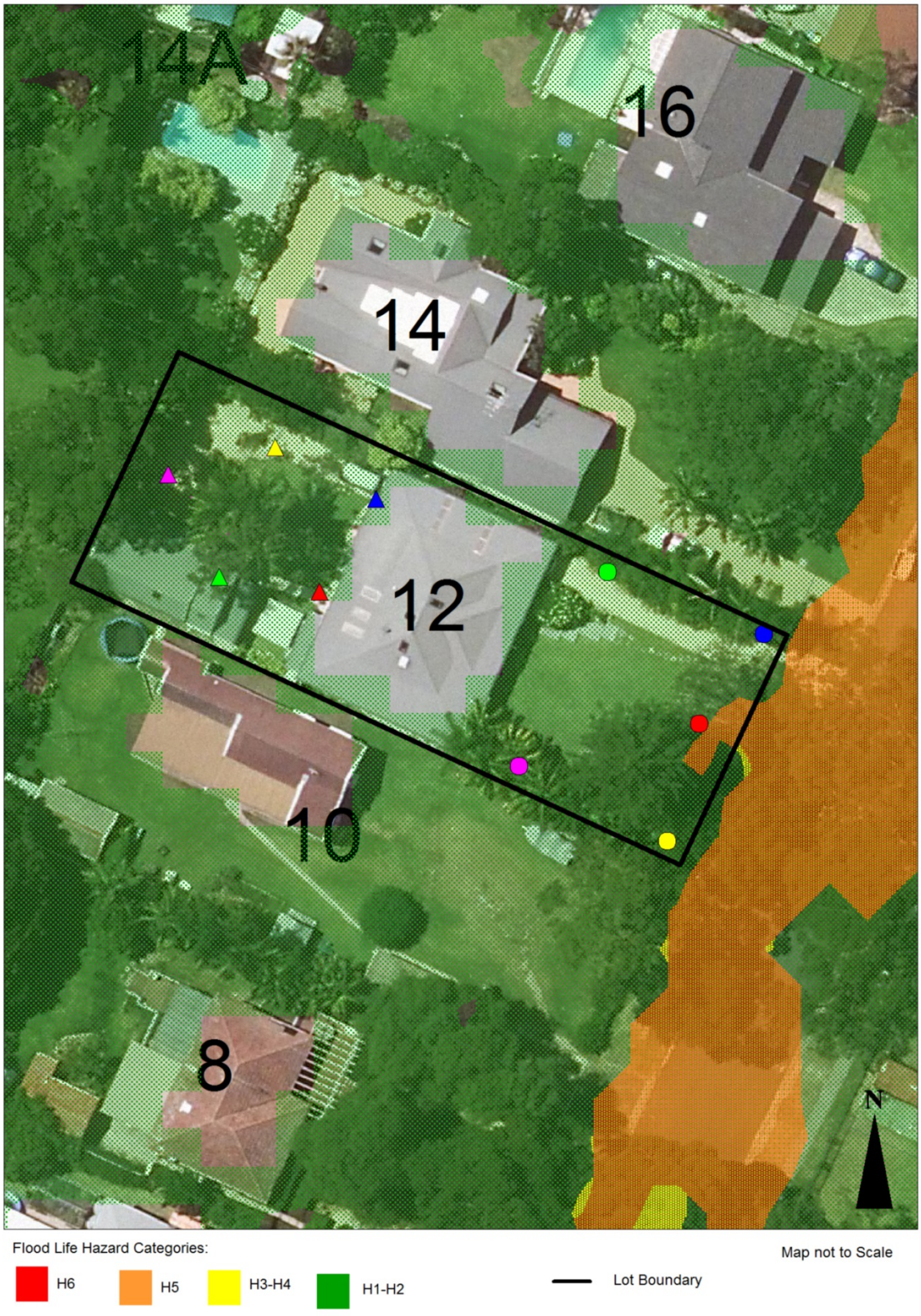
1% AEP Hydraulic Categorisation: See Flood Map G

[1]The flood information does not take into account any local overland flow issues with a depth below 0.15m nor private stormwater drainage systems.
[2]Overland flow water levels may vary across a sloping site, resulting in variable minimum floor/ flood planning levels across the site.
[3]Intensification of development requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.
[4]Special Flood Protection developments require higher minimum floor levels using the higher of the PMF and the 1%AEP+0.5m.
[5]The applicable Flood Category 3 classification applied for the purpose of development assessment unless otherwise demonstrated in the Flood Risk Management Report that a different classification should apply (dependent on the location of the proposed development).

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- The source information on this advice was obtained from numeric modelling prepared by consultants for Pittwater Council for existing site conditions at the time of the flood study. Separate review and flood model verification has not been undertaken by Council.
- The interpolated information is for the purpose of planning only. Detailed flood data for individual land areas were not determined from the exercise.
- Flood models only approximate flood behaviour. Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding. A site specific flood study/risk assessment may be required for any future development. Care and expertise is required in the interpretation of these flood levels. Engage a suitably qualified engineer to assist you in this matter.
- You need to refer to the Pittwater 21 DCP flood development controls, if you are planning to lodge a Development Application.The advice may be reviewed and amended by Pittwater Council in the course of assessment of a specific development application.
- While this advice is periodically updated, it is possible that the Council holds further information dealing with the flooding which has not been incorporated into the above advice.
- Estuarine/coastal inundation has not been taken into account in the flood information.
- Council is currently reviewing the 2013 Careel Creek Catchment Flood Study and as such the property's flood classification and flood level may be subject to changes as a result of the updated flood modelling.

FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



Notes:

- Refer to Pittwater 21DCP for '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: Flood study reference) and aerial photography (Source Near Map 2014) are indicative only

FLOOD LEVEL POINTS

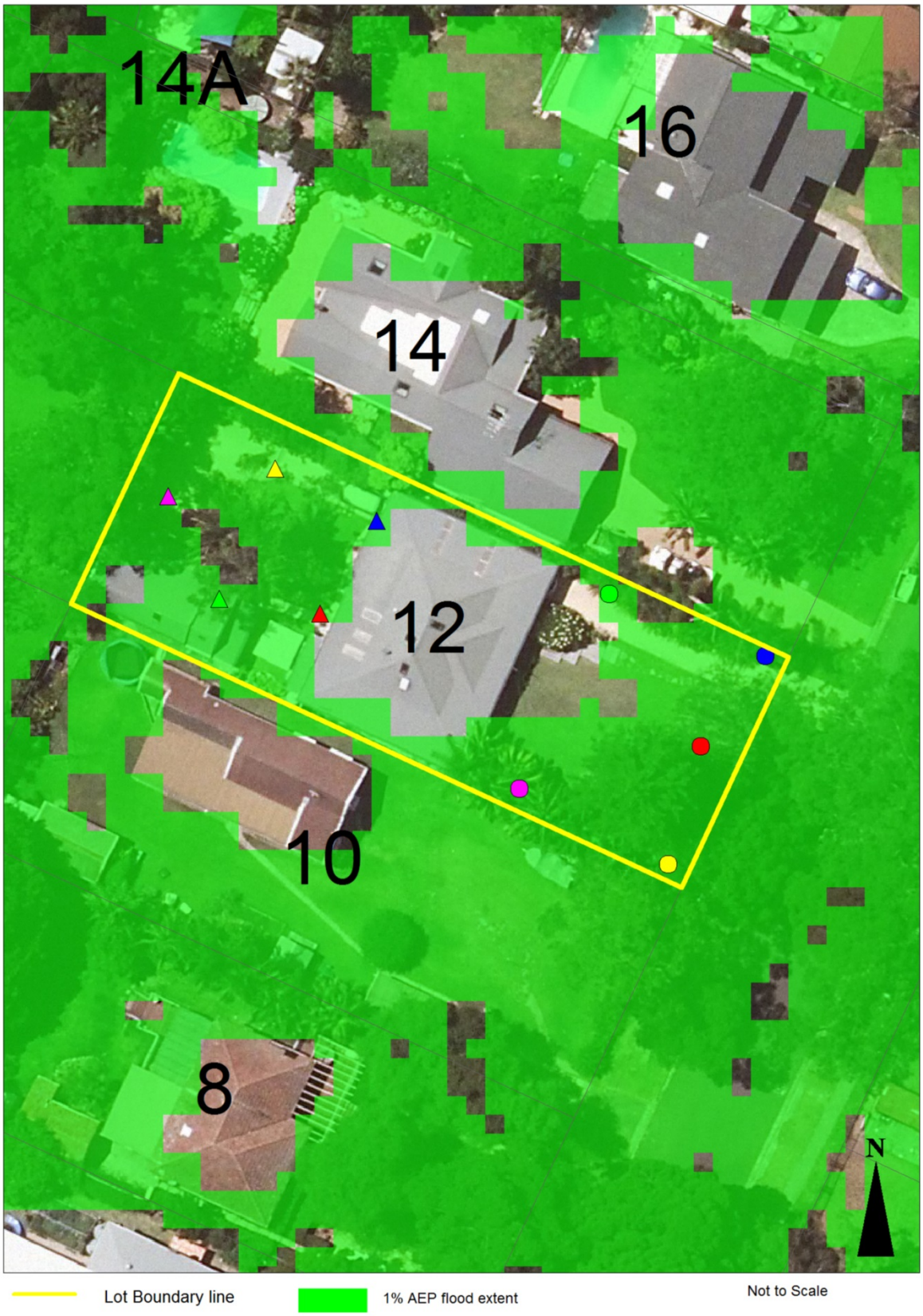
Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

Flood Levels

	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)	PMF Max WL (m AHD)	PMF Max Depth (m)	PMF Max Velocity (m/s)
●	16.6	0.17	16.6	0.2	1.62	16.6	0.2	1.0
●	16.9	0.20	16.9	0.2	1.32	17.0	0.3	1.9
●	17.1	0.18	17.1	0.2	0.75	17.2	0.2	1.6
●	Null	0.04	Null	0.04	0.00	Null	0.1	1.0
●	Null	0.15	17.6	0.2	0.75	17.7	0.2	1.1
▲	18.1	0.16	18.1	0.2	1.43	18.3	0.4	1.7
▲	18.3	0.16	18.3	0.2	0.52	18.4	0.3	0.5
▲	Null	0.09	Null	0.1	0.94	18.6	0.2	1.6
▲	Null	0.01	Null	0.02	0.23	Null	0.1	0.6
▲	Null	0.004	Null	0.01	0.16	Null	0.0	0.4

WL – Water Level
PMF – Probable Maximum Flood
Null = peak water level/depth identified in flood event , but does not meet Council's overland flow depth classification of above 0.15m from natural ground level – Refer to Appendix 8 of the Pittwater 21 DCP.

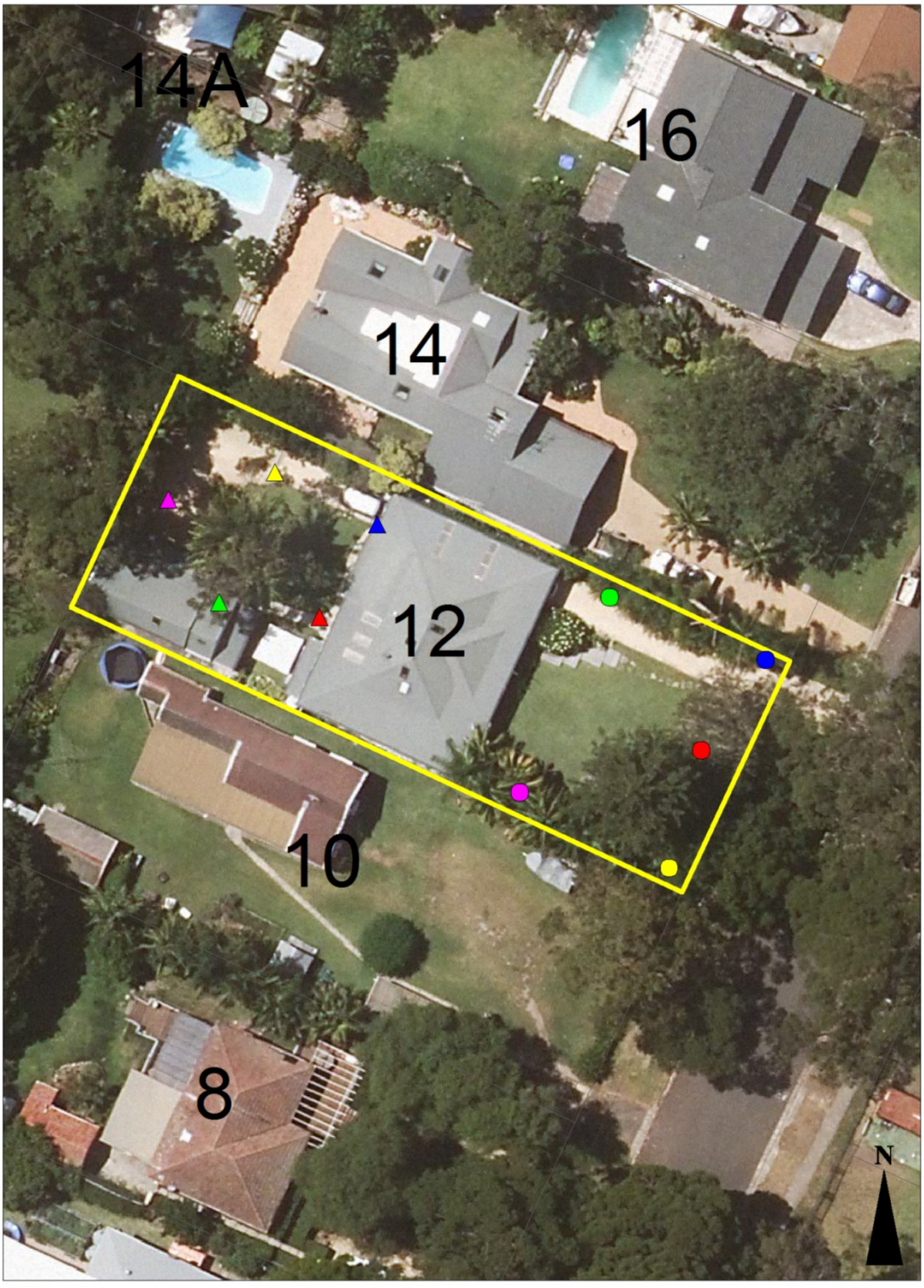
FLOOD MAP B: FLOODING – 1% AEP EXTENT



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- Flood events exceeding the 1% AEP can occur on this site.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP C: MAINSTREAM FLOODING EXTENT

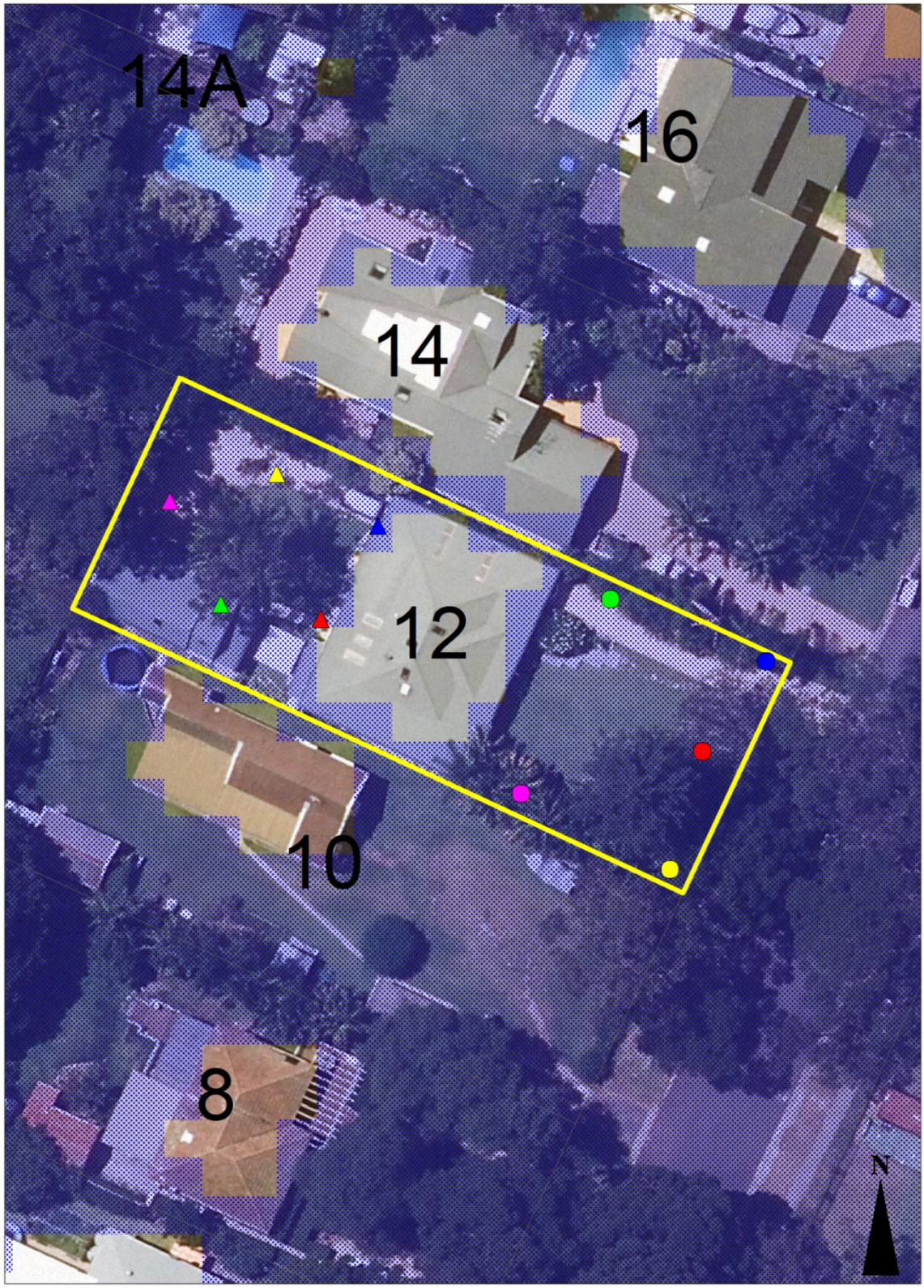


This Property is currently not identified as being affected by Mainstream flooding based off the 2013 Careel Creek Flood Study. Council is however undertaking a review of this model/Flood Study, and as a result this property's flood classification may change because of the update to the mainstream model.

Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Mainstream FPL – Mainstream Flood Planning Level includes the 0.5m freeboard on the 1% AEP extent for planning purposes
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP D - PMF EXTENT MAP



Notes:

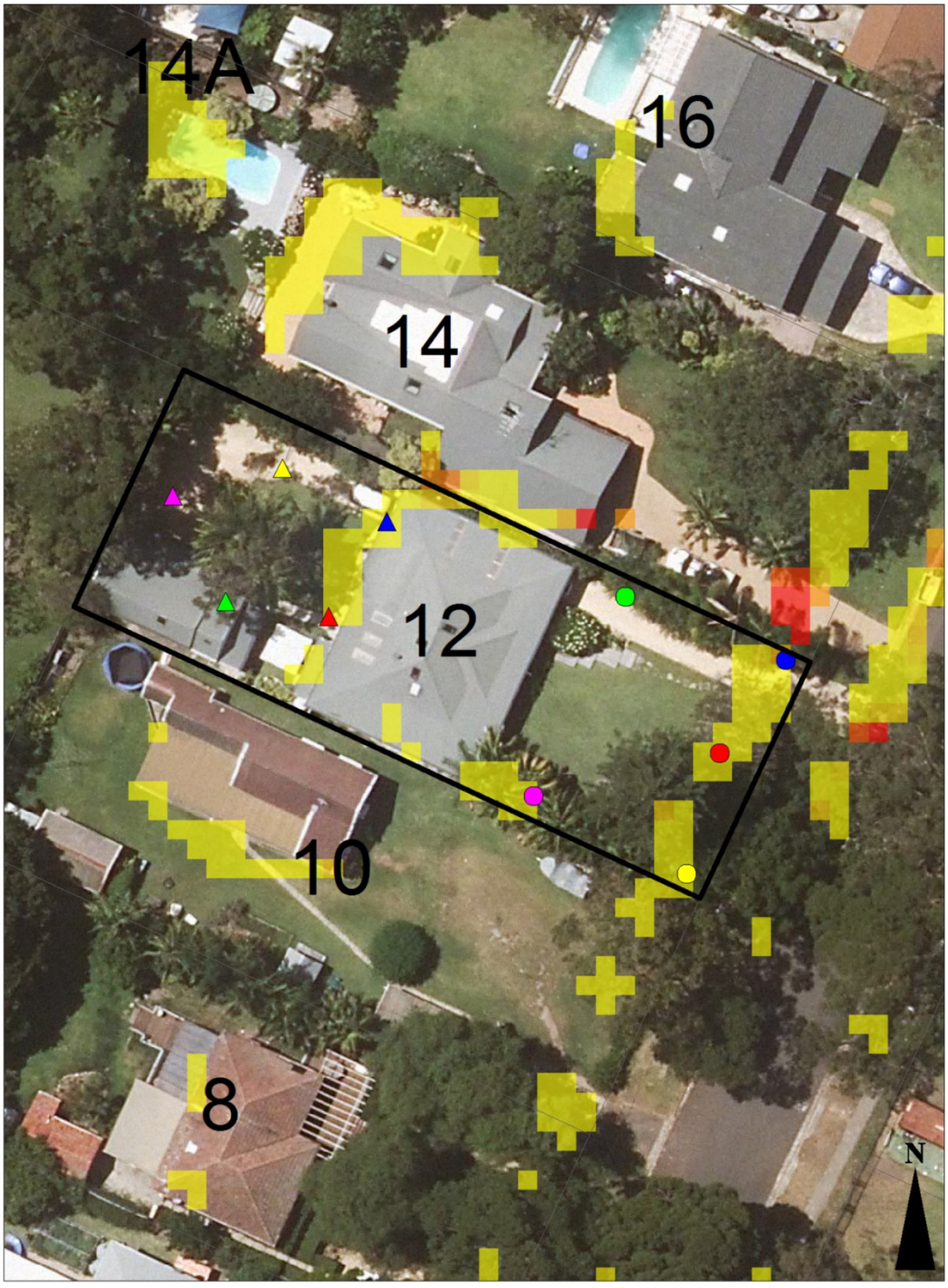
- extent represents the Probable Maximum Flood (PMF) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP E – OVERLAND FLOW EXTENT MAP

Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Overland Flow Path Major includes a fixed 5m horizontal planning buffer on the 1% AEP extent for planning purposes
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

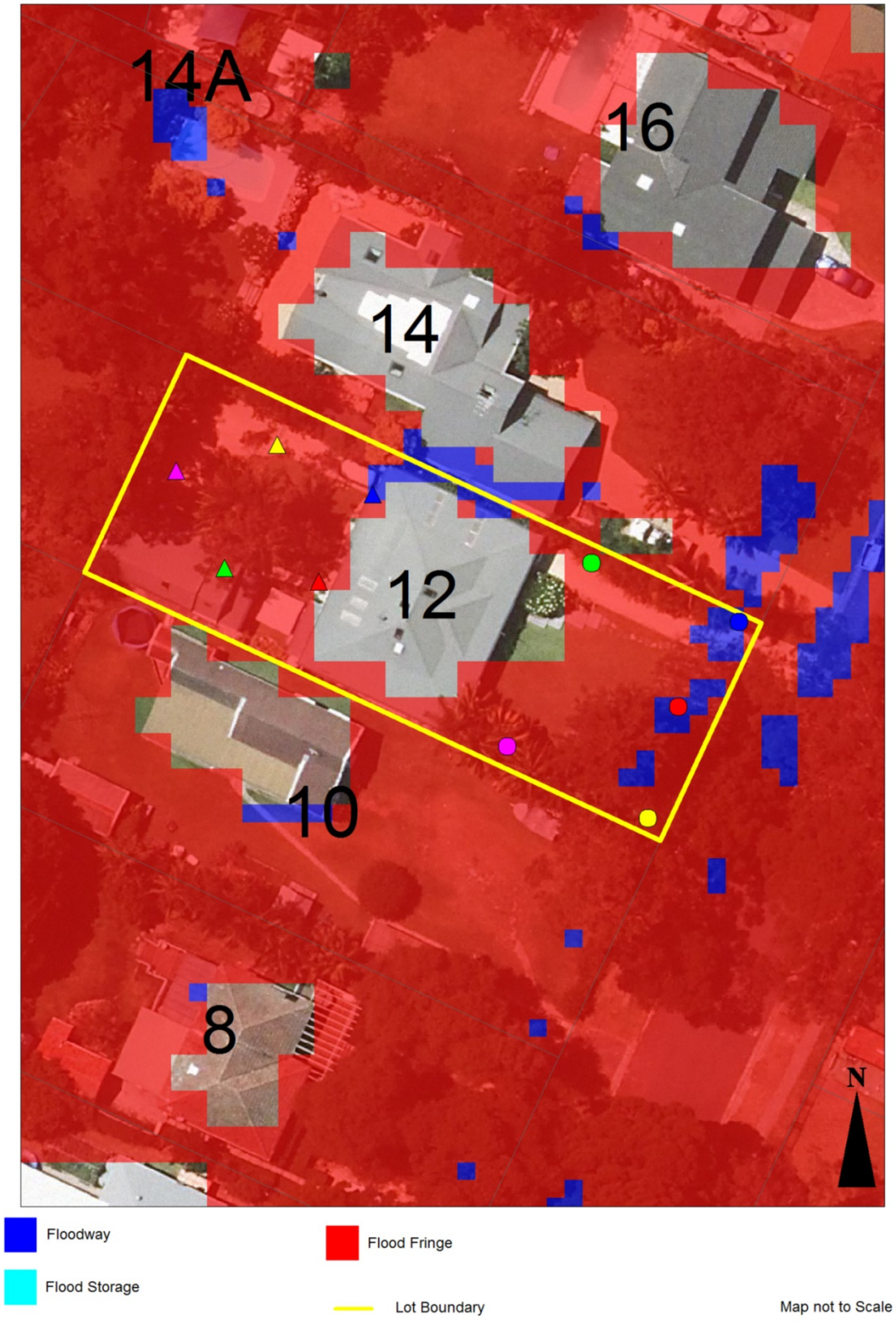
FLOOD MAP F – 1% AEP FLOOD HAZARD EXTENT MAP



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

FLOOD MAP G – 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: Flood study reference) and aerial photography (Source: NearMap 2014) are indicative only

Appendix C – NBC, Form 1

Attachment A

NORTHERN BEACHES COUNCIL
STANDARD HYDRAULIC CERTIFICATION FORM
FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: 12 Bellevue Ave, Avalon Beach

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

I, Logan English-Smith (Insert Name) on behalf of GZ Engineers (Trading or Business/ Company Name)

on this the 31.05.2019 (Date) certify that I am engineer or a 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 evaluation for proposed development at 12 Bellevue Ave, Avalon Beach (DA)

Report Date: 31.05.2019

Author: Logan English-Smith

Author's Company/Organisation: GZ Engineers

I: Logan English-Smith (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**) This flood report relies upon a Flood Information Request (11 June 2015) which is based on the 2013 "Careel Creek Catchment Flood Study" by WMA Water.

☑ 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 Logan English-Smith

Appendix D – Maximum allowable extension below FPL calculation for primary dwelling

Figure 2 – Calculation of allowable extension below FPL for primary dwelling