



van der meer

FLOODPLAIN MANAGEMENT REPORT

Palm Beach Mixed-Use Development
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2 Executive Summary

This report assesses the flood risk to the proposed development at 1112-1116 Barrenjoey Road, Palm Beach, NSW for compliance with Pittwater 21 Development Control Plan.

The proposed development is a mixed-use development that occupies a site previously used for commercial purposes with attached ancillary car parking.

Assessment of council flood information has indicated inconsistency between measured LiDAR information within the existing carpark and existing road levels. Council's TUFLOW model was analysed in GRC Hydro's Flood Impact Assessment.

The flood impact assessment shows that flooding is confined to the western (road facing) portion of the site. Minor changes to the existing flood extents are expected due to the development of the existing carpark.

A portion of the retail section at the front of the site is below the Flood Planning Level of 3.12m AHD and is below the 1%, AEP level. Council's DCP which allows for a 5m zone at the front of the building below the Flood Planning Level to facilitate street activation, The proposed zone extends an additional 3.6m into the shop fronts. This is considered suitable noting the following:

- The floor level of the retail area is higher than the street level
- Direct internal access has been proposed between retail areas above and below the FPL within the retail space
- The retail space is proposed to be non-F&B, and as such, there will be no electrical equipment below the FPL
- All residential areas are above the FPL
- The proposed building will be flood-proofed in its structure, materials, and utility connections up to the FPL.

3 Introduction

Van der Meer Consulting has been commissioned to prepare a Flood Management Report for the proposed mixed-use development at 1112-1116 Barrenjoey Road, Palm Beach NSW. This report will be lodged to Northern Beaches Council for the Development Assessment for this development.

The scope of this report includes an assessment of the flood risk for the proposed development and details the design measures and controls needed to achieve compliance with the relevant state and local plans and policies.

3.1 Planning and Policy Background

The following state and local environmental policies and plans are relevant to the development, and are addressed in this report:

- Pittwater Local Environment Plan 2014, Clauses 7.3, 7.4 and 7.5
- State Environmental Planning Policy (Coastal Management) 2018, Clause 15
- Pittwater 21 Development Control Plan, clauses B3.8, B3.9, B3.12, B3.11

4 Description of Development

4.1 Existing Site

The subject site area is approximately 1,360m² and faces west onto Barrenjoey Road. Currently, the site is utilised by a single-story commercial office and cafe with ancillary car parking supporting the development, with the lot naturally grading towards the west. A retaining wall is located on the eastern side of the carpark, with the upper extents of the lot remaining as thick vegetation. The site is bounded by a commercial building in the south and residential developments on the eastern and northern sides. The location of the subject site is shown in Figure 4.1 below.

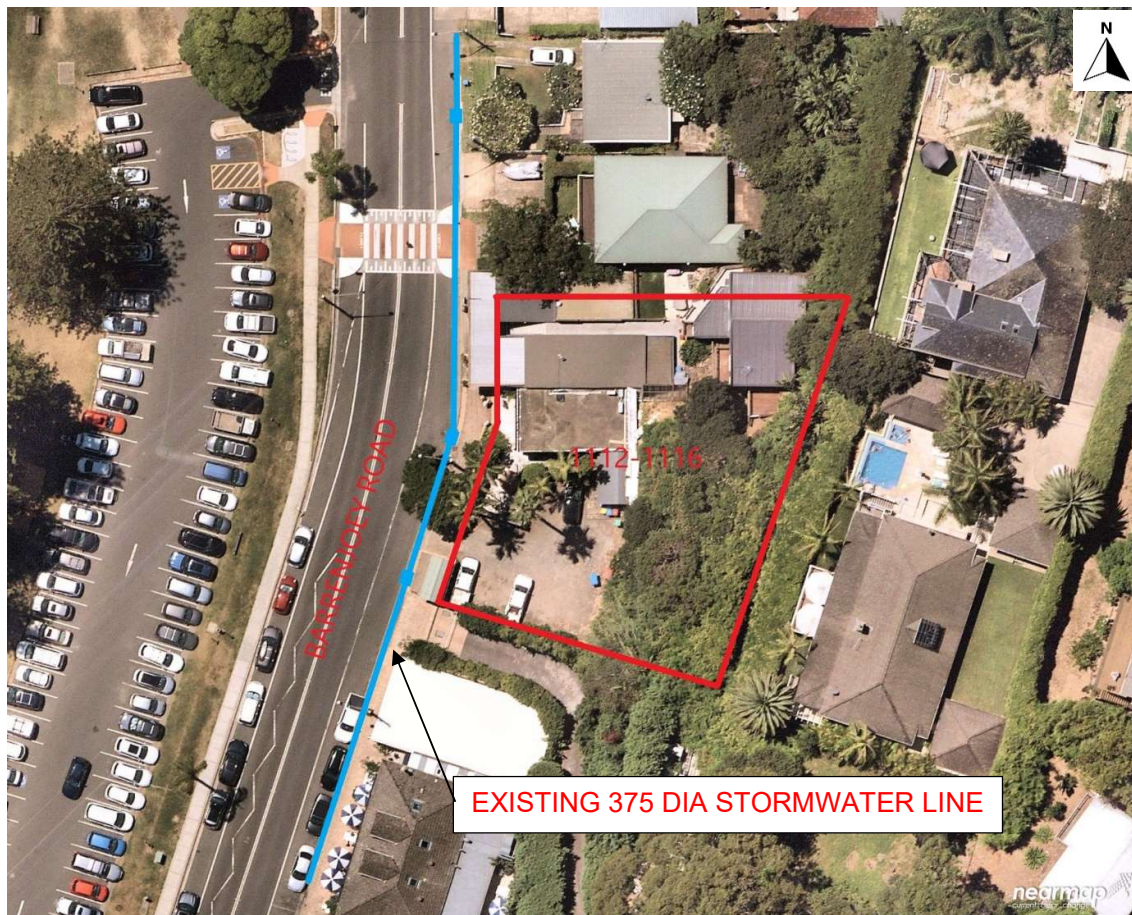


Figure 4.1 - Site Plan (Nearmaps, 2021)

4.2 Proposed Works

The proposed development consists of demolition of all existing structures within the site and construction of a mixed-use shopfront housing development with basement car parking, ground-level retail spaces, and above-ground residential levels as illustrated in Figure 4.2 below. The building footprint will cover most of the property.

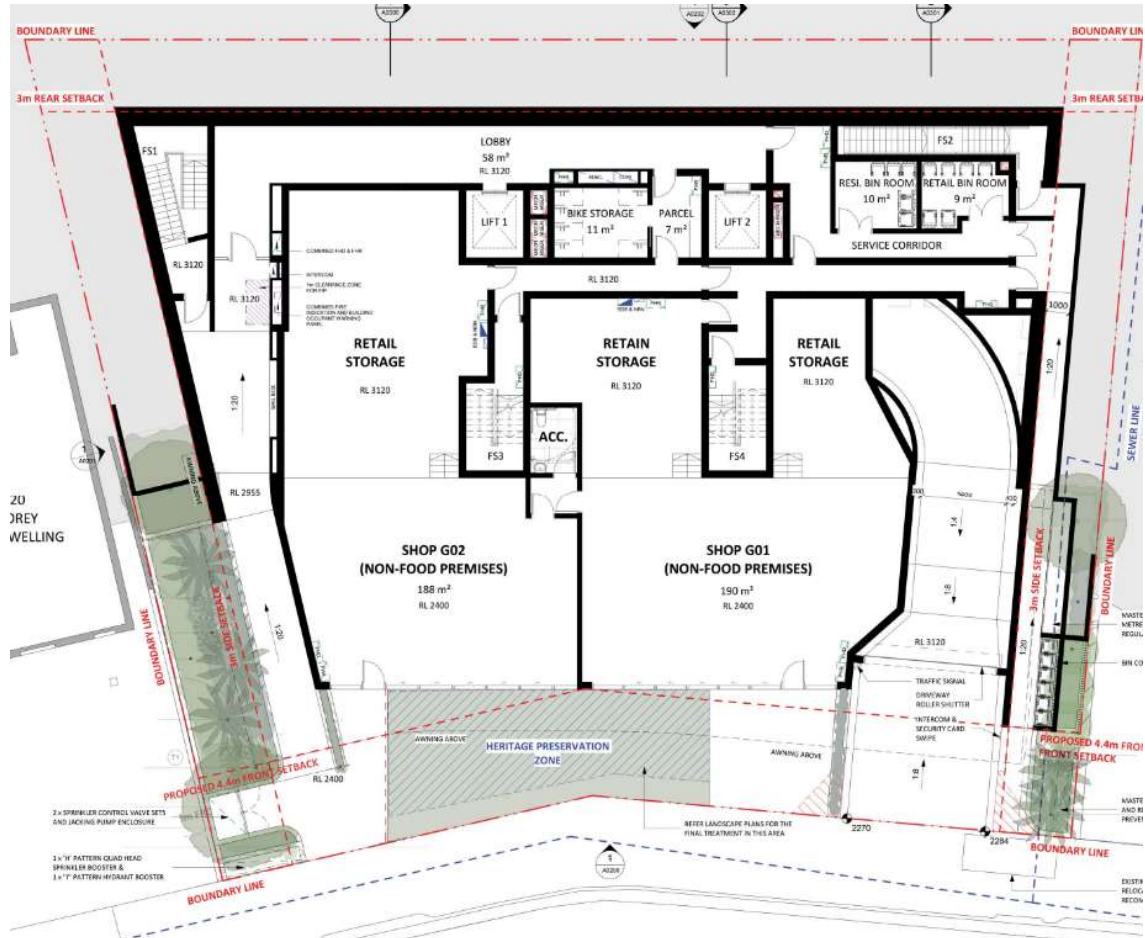


Figure 4.2 - Proposed Ground Floor Plan (Koichi Takada Architects, 24 August 2023)

5 Flood Analysis

Barrenjoey Road is flood liable being a low point where the flow can collect. In the 1%, AEP event the water level is in the order of 2.62m AHD. (GRC Hydro, 2021) The flood planning level is 3.12m (Northern Beach Council, 2021).

The currently existing site is a combination of commercial buildings (at the northern end of the site) with parking to the south. Levels at the site are in order of 2.3m AHD but range up to 15m AHD at the point furthest from the street. Broadly the site does receive runoff from minor catchments in upper areas, but such flows are insignificant relative to the flow path on Barrenjoey road which is the main source of floodwater affecting the site.

The extents of the 1% AEP flood behaviour, as detailed by GRC Hydro (depth, extent and levels) are shown in Figure 5.1 and Figure 4.2.

The PMF level at the subject site is 2.76m AHD, 0.14m deeper than the 1% AEP event.

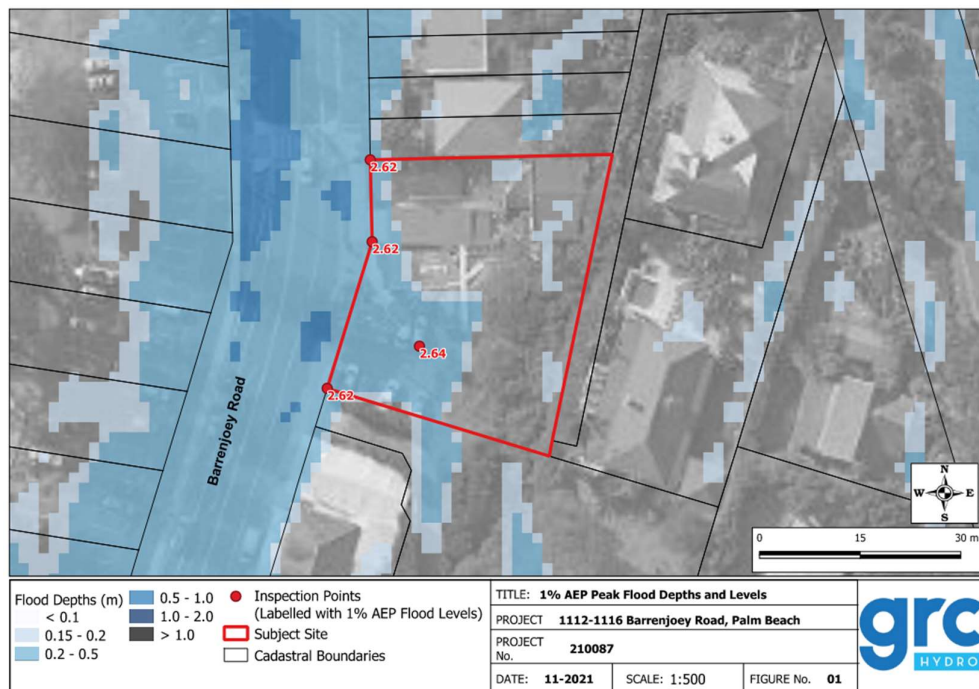


Figure 5.1 – 1% AEP Peak Flood Depths and Levels (GRC Hydro, 2021)

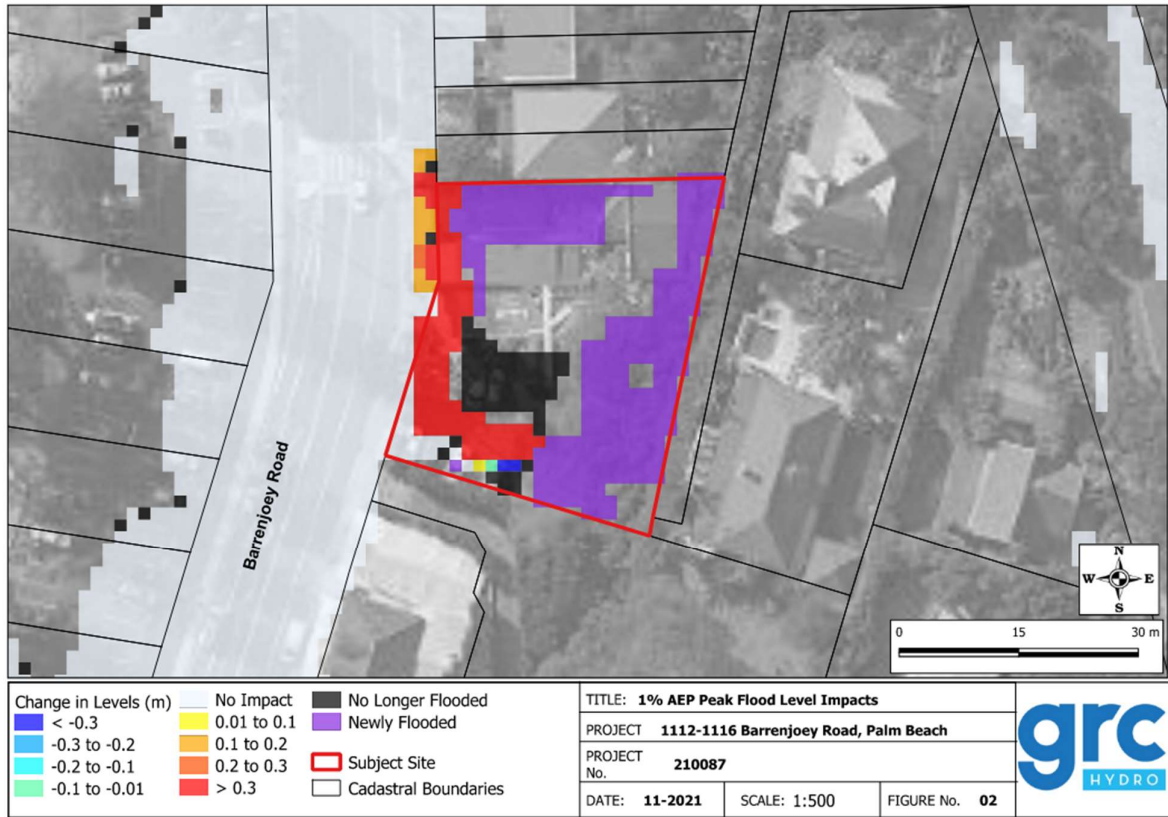


Figure 5.2 - 1% AEP Peak Flood Level Impacts (GRC Hydro, 2021)

6 Assessment of Impacts

The Pittwater 21 DCP, clause B3.11 specifies prescriptive controls for development on flood-prone land, which vary depending on flood risk and land use. The highest flood risk for the site of the proposed development is a medium risk (Northern Beaches Council, 2021) and the proposed land use is both residential and business & industrial. The controls that apply to the proposed development, their impacts on the development, and the proposed development's compliance with these controls are listed in Table 5.1 below.

Table 6.1 – Flood Risk Management Compliance Table

Item	Description	Impact on Development	Compliance
<i>A. Flood Effects Caused by Development</i>			
A1	<p>Development shall not be approved unless it can be demonstrated in a Flood Management Report that it has been designed and can be constructed so that in all events up to the 1% AEP event:</p> <p>(a) There are no adverse impacts on flood levels or velocities caused by alterations to the flood conveyance; and</p> <p>(b) There are no adverse impacts on surrounding properties; and</p> <p>(c) It is sited to minimise exposure to flood hazards.</p> <p>Major developments and developments likely to have a significant impact on the PMF flood regime will need to demonstrate that there are no adverse impacts in the Probable Maximum Flood.</p>	<p>The residential area of the proposed development complies with the FPL and is located above the 1% AEP event.</p> <p>According to the GRC Hydro Flood Impact Assessment Report (Appendix 2), No Impact on adjacent private property is noted. The GRC Hydro report also states that there is no impact on 1% AEP Flood behaviour.</p>	Y
A2	<p>Development shall not be approved unless it can be demonstrated in a Flood Management Report that in all events up to the 1% AEP event there is no net loss of flood storage. Consideration may be given for exempting the volume of standard piers from flood storage calculations. If Compensatory Works are</p>	<p>Loss of flood storage is not expected as the proposed development footprint is outside of the modelled flood storage footprint for the Flood Planning Level.</p>	Y

Item	Description	Impact on Development	Compliance
	proposed to balance the loss of flood storage from the development, the Flood Management Report shall include detailed calculations to demonstrate how this is achieved.		
<i>B. Building Components and Structural Soundness</i>			
B1	All buildings shall be designed and constructed with flood compatible materials by “Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas”, Hawkesbury-Nepean Floodplain Management Steering Committee (2006).	The proposed building is to be structurally designed and constructed with flood-compatible materials up to the FPL in the architectural and structural specifications.	Y
B2	All new development must be designed and constructed to ensure structural integrity up to the Flood Planning Level, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the Probable Maximum Flood level. Structural certification shall be provided confirming the above.	The development is to be designed and certified to ensure structural integrity up to the Flood Planning Level and account for the relevant forces associated with this flooding.	Y
B3	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 Flood Planning Level. All existing electrical equipment and power points located below the Flood Planning Level within the subject structure must have residual current devices installed that turn off all	Electrical, sewerage and other service connections such as Hydrant Boosters are to be located at or above the flood planning level or waterproofed appropriately. Existing electrical equipment to be retained is to have residual current devices installed that turn off all electricity supply to the property when floodwaters are detected.	Y

Item	Description	Impact on Development	Compliance
	electricity supply to the property when floodwaters are detected.		
<i>C. Floor Levels</i>			
C1	New floor levels within the development shall be at or above the Flood Planning Level.	Some of the floor areas do not comply with the FPL requirement. In the proposed design there is a retail area on the ground floor that is not above the FPL. Refer to C7.	N
C3	<p>All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event.</p> <p>(a) The underfloor area of the dwelling below the 1% AEP flood level is to be designed and constructed to allow clear passage of flood water, considering the potential for a small opening to block' and</p> <p>(b) At least 50% of the perimeter of the underfloor area is of an open design from the natural ground level up to the 1% AEP Flood level and</p> <p>(c) No solid area of the perimeter of the underfloor area would be permitted in a floodway</p>	<p>Loss of flood storage is not expected as the proposed development will not alter flood conveyance.</p> <p>Suspended pier/ pile footings are not associated with the proposed development.</p>	Y
C4	A one-off addition or alteration below the Flood Planning Level of less than 30 square meters (in total,	A one-off addition or alteration will not be included as part of the proposed development.	N/A

Item	Description	Impact on Development	Compliance
	<p>including walls) may be considered only where:</p> <p>(a) it is an extension to an existing room; and</p> <p>(b) the Flood Planning Level is incompatible with the floor levels of the existing room; and</p> <p>(c) out of the 30 squares meters, not more than 10 square meters is below the 1% AEP flood level.</p> <p>This control will not be permitted if this provision has previously been utilised since the making of this Plan.</p> <p>The structure must be floodproofed to the Flood Planning Level, and the Flood Management Report must demonstrate that there is no net loss of flood storage in all events up to the 1% AEP event.</p>		
C6	<p>Consideration may be given to the retention of an existing floor level below the Flood Planning Level when undertaking a first-floor addition provided that:</p> <p>(a) it is not located within a floodway; and</p>	<p>An existing floor level is not proposed to be retained as part of the development</p>	<p>N/A</p>
C7	<p>Consideration may be given to a floor level below the Flood Planning Level within the first 5 meters from the street front in an existing business zone provided it can be demonstrated that:</p>	<p>Some of the retail area at the front of the site is below the Flood Planning Level of 3.12m. Council's DCP allows for a 5m zone at the front of the building to be below the FPL to facilitate street activation. The proposed zone extends an additional 3.6m into the shop fronts. This is</p>	<p>N</p>

Item	Description	Impact on Development	Compliance
	<p>(a) The minimum floor level is no lower than the adjacent footpath level, and</p> <p>(b) The maximum internal distance from the front of the building is 5 meters, which can only apply to one side of an individual premises, and</p> <p>(c) The maximum area for the floor area to be below the Flood Planning Level for an individual premises are 30 square meters, and</p> <p>(d) There is direct internal access between areas above and below the Flood Planning Level for each individual premises.</p>	<p>considered suitable noting the following:</p> <ul style="list-style-type: none"> - The floor level of the retail area is higher than the street level - Direct internal access has been proposed between retail areas above and below the FPL within the retail space - The retail space is proposed to be non-F&B, and as such, there will be no electrical equipment below the FPL - All residential areas are above the FPL - The proposed building will be flood-proofed in its structure, materials, and utility connections up to the FPL. 	
D. Car Parking			
D1	Open carpark areas and carports shall not be located within a floodway.	There are no open car parks or carports associated with the development.	N/A
D2	The lowest floor level of open carparks and carports shall be constructed no lower than the natural ground levels, unless it can be shown that the carpark or carport is free draining with a grade greater than 1% and that flood depths are not increased.		N/A
D3	<p>Carports must be of open design, with at least 2 sides completely open such that flow is not obstructed up to the 1% AEP flood level. Otherwise, it will be considered to be enclosed.</p> <p>When undertaking a like-for-like replacement and the existing garage/carport is located on the</p>		N/A

Item	Description	Impact on Development	Compliance
	street boundary and ramping is infeasible, consideration may be given for dry floodproofing up to the 1% AEP flood level.		
D4	Where there is more than 300mm depth of flooding in a car park or carport during a 1% AEP flood event, vehicle barriers or restraints are to be provided to prevent floating vehicles leaving the site. Protection must be provided for all events up to the 1% AEP flood event.		Y
D5	Enclosed Garages must be located at or above the 1% AEP level.		N/A
D6	All enclosed car parks (including basement car park) must be protected from inundation up to the Flood Planning Level. All access, ventilation, driveway crests and any other potential water entry points to any enclosed car parking shall be above the Flood Planning Level. Where a driveway is required to be raised it must be demonstrated that there is no net loss to available flood storage in any event up to the 1% AEP flood event and no impact on flood conveyance through the site. Council will not accept any options that rely on the electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark.	<p>The underground carpark level is below the 1% AEP flood level.</p> <p>Parking facilities will be in the underground basement. All potential points of water ingress to the basement including ramp crest, stairs, utility connections and lift shafts will be complying with the appropriate FPL.</p>	Y

Item	Description	Impact on Development	Compliance
<i>E. Emergency Response</i>			
E1	<p>If the property is affected by a Flood Life Hazard Category of H3 or higher, then Control E1 applies and a Flood Emergency Assessment must be included in the Flood Management Report.</p> <p>If the property is affected by a Flood Life Hazard Category of H6, then development is not permitted unless it can be demonstrated to the satisfaction of the consent authority that the risk level on the property is or can be reduced to a level below H6 or its equivalent.</p> <p>If the property is flood affected but the Flood Life Hazard Category has not been mapped by Council, then calculations for its determination must be shown in the Flood Management Report, in accordance with the “Technical Flood Risk Management Guideline: Flood Hazard”, Australian Institute for Disaster Resilience (2012).</p> <p>Where flood-free evacuation above the Probable Maximum Flood level is not possible, new development must provide a shelter-in-place refuge where:</p> <ul style="list-style-type: none"> a) The floor level is at or above the Probable Maximum Flood Level; and b) Floor space provides at least 2m² per person where the flood duration is long (6 or more hours) in the Probable Maximum Flood event, or 1m² per person for less than 6 hours; 	<p>The proposed property is not affected by a Flood Life Hazard category of H3 or higher as only minor H3 extents are present at the site boundary and do not extend to the proposed development footprint, as such does not require a flood emergency assessment.</p>	N/A

Item	Description	Impact on Development	Compliance
	<p>c) It is intrinsically accessible to all people on the site, plainly evident, and self-directing, with sufficient capacity of access routes for all occupants without reliance on an elevator; and</p> <p>d) It must contain as a minimum: sufficient clean water for all occupants; portable radio with spare batteries; torch with spare batteries; and a first aid kit</p> <p>Class 10 classified buildings and structures (as defined in the Building Codes of Australia) are excluded from this control.</p> <p>In the case of change of use or internal alterations to an existing building, a variation to this control may be considered if justified appropriately by a suitably qualified professional.</p> <p>Note that in the event of a flood, occupants would be required to evacuate if ordered by Emergency Services personnel regardless of the availability of a shelter-in-place refuge.</p>		
<i>F. Fencing</i>			
F1	<p>Fencing, (including pool fencing, boundary fencing, balcony balustrades and accessway balustrades) shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. At</p>	<p>Fencing is not proposed in the areas of the property identified in the flood extents maps.</p>	Y

Item	Description	Impact on Development	Compliance
	<p>least 50% of the fence must be of an open design from the natural ground level up to the 1% AEP flood level. Less than 50% of the perimeter fence would be permitted to be solid. Openings should be a minimum of 75 mm x 75mm.</p>		
<i>G. Storage of Goods</i>			
G1	<p>Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.</p>	<p>Storage of goods is to occur above the Flood Planning Level or be adequately designed for in any basement storage.</p>	Y
<i>H. Pools</i>			
H1	<p>Pools located within the 1% AEP flood extent are to be in-ground, with coping flush with natural ground level. Where it is not possible to have pool coping flush with natural ground level, it must be demonstrated that the development will result in no net loss of flood storage and no impact on flood conveyance on or from the site.</p> <p>All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/or located at or above the Flood Planning Level.</p> <p>All chemicals associated with the pool are to be stored at or above the Flood Planning Level.</p>	<p>The proposed pool is on floor level 3, which is in RL 12.550m.</p> <p>All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/or located at or above the Flood Planning Level and chemicals associated with the pool area to be stored at or above the Flood Planning Level.</p>	Y

7 Conclusion

This report has sought to assess the flood risk for the proposed mixed-use development at 1112-1116 Barrenjoey Road, Palm Beach NSW. Whilst the site is impacted by flooding in the 1% AEP and PMF floods, most of the proposed development lies outside the extents of flooding. Floor levels and the design of the building frontage means that the development will not be adversely affected by flooding and will not affect flood storage or flood behaviour. The proposed development will not have any adverse impacts on adjacent private property. This is because flood affection in the pre-development (existing) event is relatively minor with shallow flood water on less than one half the lot (GRC Hydro, 2021). The proposed building is to be floodproofed in its structure, materials and utilities connections up to the Flood Planning Level as detailed in this report.

Some of the retail area at the front of the site is below the Flood Planning Level of 3.12m. Council's DCP allows for a 5m zone at the front of the building to be below the FPL to facilitate street activation. The proposed zone extends an additional 3.6m into the shop fronts. This is considered suitable noting the following:

- The floor level of the retail area is higher than the street level
- Direct internal access has been proposed between retail areas above and below the FPL within the retail space
- The retail space is proposed to be non-F&B, and as such, there will be no electrical equipment below the FPL
- All residential areas are above the FPL
- The proposed building will be flood-proofed in its structure, materials, and utility connections up to the FPL.

8 References

Howley, D. (2021). *Flood Information Report - 1112-1116 Barrenjoey Rd.* Sydney: NorthernBeaches Council.

Pittwater Estuary Mapping of Sea Level Rise Impacts” (Cardno 2015)

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