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28 August 2019  
11685 – L1

Mrs G and Mr P Green  
43 Eurobin Avenue  
Manly NSW 2095

P (02) 9976 0070

Dear Georgie and Peter,

### **Subject: 43 Eurobin Avenue, Manly - Flood Risk Assessment**

#### **1. Introduction**

This assessment has been undertaken in support of the Development Application for alterations and additions to the existing dwelling at 43 Eurobin Avenue, Manly. The proposed works are detailed on the architectural plans accompanying the DA; drawings DA01 to DA08 by Duffy Regan Design, dated May 2019. They include a first floor addition, with modifications to the existing ground floor to accommodate a new staircase and remove an external toilet.

#### **2. Description of existing site and flood regime**

The site is located on the northern side of Eurobin Avenue, adjacent to Manly Lagoon Park. It covers 437m<sup>2</sup>, with little variation in site levels, which fall very slightly from around RL 3.1m AHD at the northern boundary to approximately RL 3.0m AHD at the street frontage.

Flood information for the DA was provided by Northern Beaches Council with the Pre-Lodgement Advice (PLM2019/0125) following the meeting held on 2 July 2019. The 1% AEP flood level for the site would be RL 3.1m AHD, while the Probable Maximum Flood level would be RL 5.6m AHD. The site is located within the Medium Flood Risk Precinct indicated on Northern Beaches Council online Flood Hazard Map (website accessed 23 August 2019).

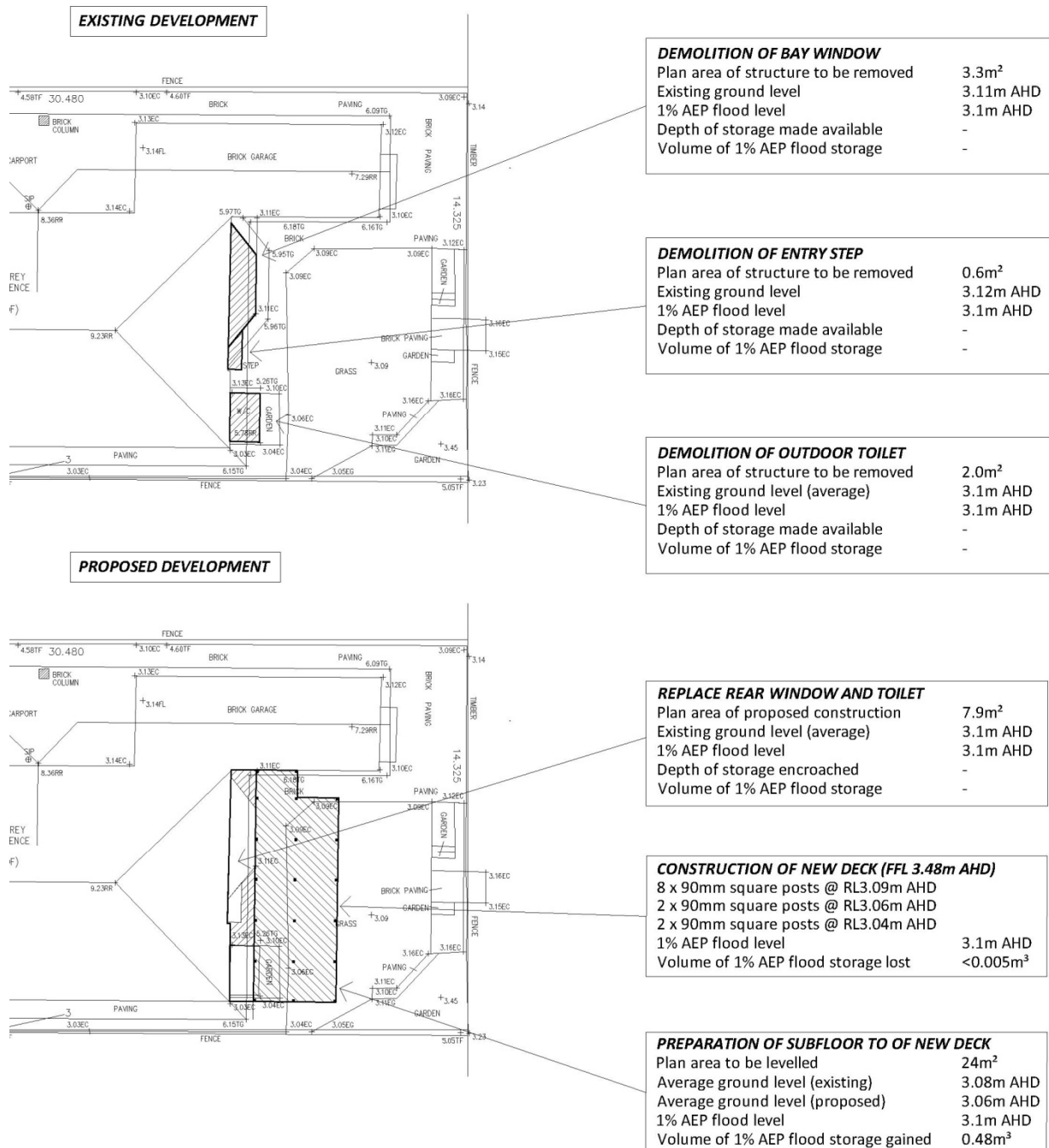
#### **3. Description of proposed development and impact on local flood behaviour**

The proposed works would reconfigure the existing laundry and open plan kitchen, dining and living room to the rear of the dwelling to modernise and accommodate the proposed staircase to a new first floor addition. The rear façade would be reconstructed to suit the removal of the bay window and outdoor toilet. A new entertaining deck would be constructed across the width of the rear of the dwelling off the kitchen and living rooms. The works would be categorised as *Residential* land-use for the purposes of a flood risk assessment under Council's Development Control Plan.

The proposed works at the ground floor level would largely be constructed above the 1% AEP flood level, with adjacent ground levels varying from RL 3.03m AHD to RL 3.13m AHD. The only construction that would impact the available flood storage would be the external supports of the proposed deck, where ground levels vary from RL 3.04m to 3.09m AHD. This impact is considered to be negligible, as detailed in Figure 1 and summarised in Table 1. The removal of existing paving and grass, and levelling of the subfloor to the proposed deck would more than compensate for construction of the required footings.

**Table 1** Impact of proposed footings on available flood storage volume (1% AEP event)

Footing construction	20mm steel brackets	90sq timber posts	230sq brick piers
Flood storage encroachment	<0.0001m <sup>3</sup>	0.002m <sup>3</sup>	0.015m <sup>3</sup>

**Figure 1** Impact of proposed works on available flood storage volume (1% AEP event)

Council's consideration is requested for a minor increase of 4.6m<sup>2</sup> in the floor area below the 1% AEP flood level that would be associated with the reconstruction of the rear of the house following the removal of the bay window and outdoor toilet. It is proposed to construct these ground floor works with a floor level of RL 3.48 to match the existing as achieving the flood planning level would be incompatible with the minimal footprint of the proposed works. This would still provide 380mm freeboard to the predicted 1% AEP flood level of RL 3.1m AHD. The works would be outside of the predicted 1% AEP flood extent and represent only 3% of the existing ground floor area.

All works below the PMF would be constructed from flood compatible materials designed to withstand the hydraulic forces from the 1% AEP and PMF flow velocities. The requirements of the DCP as they relate to the proposed residential development are summarised in Table 2 and detailed in Appendix A.

**Table 2** Assessment of flood impacts of proposed development

<i>DCP Planning Consideration</i>	<i>Compliance</i>
A Flood effects caused by development	Yes
B Drainage infrastructure and creek works	Not Applicable
C Building components and structural design	Yes
D Storage of goods	Yes
E Flood Emergency Response	Yes
F Floor levels	No
G Car parking	Not Applicable
H Fencing	Not Applicable
I Pools	Not Applicable

#### 4. Evacuation Response and Shelter-In-Place Development Controls

The site lies within the floodplain on the southern side of Manly Lagoon, in an area characterised by the backwater effects of the tidal lagoon outlet at Queenscliff Beach. Due to the relatively small catchment area, the predicted critical flood durations range from two to nine hours, indicating that the catchment is prone to flash flooding and there will be very limited notice that can be provided to prepare for a significant flood event.

The proposed first floor development would be constructed above the PMF level, providing a suitable option for residents to “shelter in place” during significant flood events. The available flood refuge area would include over 70m<sup>2</sup> floor space, including two bedrooms, two bathrooms and a living room and representing 8m<sup>2</sup> per resident (assuming nine residents accommodated by a four bedroom plus study house). The proposed floor level of RL 6.68m AHD would provide over one metre freeboard to the PMF. The prescriptive controls required to satisfy Council’s shelter in place requirements are summarised in Table 3.

**Table 3** Shelter-in-Place Requirements

Land Use Group	Residential
<b>Control 1</b> – Flood Risk Emergency Assessment	Accompanying report prepared
<b>Control 2</b> – Minimum Floor Level	The proposed first floor extension (FFL 6.68m AHD) would be over one metre above the PMF level of 5.6m AHD, providing a suitable shelter-in-place refuge.
<b>Control 3</b> – Floor Space Requirement	The proposed flood refuge area would exceed 70m <sup>2</sup> , providing ample floor space per resident for a four bedroom home.
<b>Control 4</b> – Accessibility	The first floor extension would be accessed internally from the existing ground floor.
<b>Control 5</b> – Building Stability	The building would be designed to withstand the flood effects of the PMF design flood depths and velocities.
<b>Control 6</b> – Serviceability	<p>The shelter-in-place refuge (the proposed dwelling) would be fitted with the following emergency items:</p> <ul style="list-style-type: none"> <li>• sufficient clean water for all occupants; and</li> <li>• portable radio with spare batteries; and</li> <li>• torch with spare batteries; and</li> <li>• first aid kit.</li> </ul>

## 5. Conclusion

The proposed works are not expected to have an impact on upstream or downstream flood levels, flow velocities or distribution, flood response or the safe evacuation of the property or neighbourhood. A flood refuge would be provided to accommodate residents during extreme flood events.

Council's consideration is requested for a minor increase of 4.6m<sup>2</sup> in the floor area below the 1% AEP flood level that would be associated with the reconstruction of the rear of the house following the removal of the bay window and outdoor toilet. It is proposed to construct these ground floor works with a floor level of RL 3.48 to match the existing. This would provide 380mm freeboard to the predicted 1% AEP flood level of RL 3.1m AHD. The works would be outside of the predicted 1% AEP flood extent.

Please do not hesitate to contact me if you have any queries regarding the above assessment.

Yours sincerely,



Kate Waddington  
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MEAust CPEng NER

**Appendix A Medium Flood Risk Planning Precinct Requirements – Residential Land Use**

Planning Consideration	Assessment
<i>A Flood effects caused by development</i>	
1 Development (including earthworks and subdivision) shall not be approved unless it can be demonstrated in a Flood Management Report that it complies with the <i>Flood Prone Land Design Standard</i> found on Council's webpage.	The proposed development has been designed and can be constructed such that there are no noticeable changes to the 1% AEP flood characteristics.
3 The applicant shall include in their submission, calculations to illustrate that any fill or other structures that reduce the total flood storage are replaced by compensatory works.	No significant reduction in available 1% AEP flood storage.
<i>B Drainage infrastructure and creek works</i>	
1 Flood mitigation works or stormwater devices that modify a major drainage system, stormwater system, natural water course, floodway or flood behaviour within or outside the development site may be permitted subject to demonstration through a Flood Management Report that they comply with the <i>Flood Prone Land Design Standard</i> found on Council's webpage.	No modifications to drainage infrastructure or natural watercourses are proposed.
2 A Section 88B notation under the Conveyancing Act 1919 may be required to be placed on the title describing the location and type of flood mitigation works with a requirement for their retention and maintenance.	No flood mitigation works proposed other than the demolition of existing light weight shed along south-western boundary.
<i>C Building components and structural</i>	
1 All buildings shall be designed and constructed as flood compatible buildings in accordance with <i>Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas</i> , Hawkesbury-Nepean Floodplain Management Steering Committee (2006).	This requirement must be incorporated into the structural design of appropriate elements for Construction Certificate.
2 All structures 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. Structural certification shall be provided confirming the above. Where shelter-in-place refuge is to be provided the structural integrity is to be to the Probable Maximum Flood level.	All structures to be designed and constructed to ensure structural integrity up to the Probable Maximum Flood level.
3 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 must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected.	This requirement must be incorporated into the detailed design of appropriate elements for Construction Certificate.

Planning Consideration	Assessment
<i>D Storage of Goods</i>	
1 Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.	Storage facilities for hazardous or potentially polluting materials are available above the Flood Planning Level.
2 Goods, materials or other products which may be highly susceptible to water damage are to be located/stored above the Flood Planning Level.	Storage areas would be available above the Flood Planning Level.
<i>E Flood Emergency Response</i>	
1 Development shall comply with Council's <i>Flood Emergency Response Planning for Development in Pittwater</i> Policy and the outcomes of any Flood Risk Emergency Assessment Report where it applies to the land.	Refer to Section 4 of this report.
2 New development must provide an appropriately sized area to safely shelter in place above the PMF level and appropriate access to this area should be available from all areas within the development.	Occupants would be able to safely shelter in place for events up to and including the PMF.
<i>F Floor Levels</i>	
1 New floor levels within the development shall be at or above, the FPL. A reduced Flood Planning Level may be considered only where it is permitted in this Development Control Plan. The structure must be flood proofed (wet or dry) to the Flood Planning Level. This control cannot be applied to critical or vulnerable uses.	The proposed first floor extension would be above the FPL and PMF levels. A minor extension of the ground floor is proposed. Refer to F.4.
2 All development structures must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no loss of flood storage in a 1% AEP Event. Where the dwelling is located over a flow path it must be elevated on suspended pier/pile footings such that the level of the underside of all floors including balconies and decks within the flood affected area are at or above, or raised to the Flood Planning Level to allow clear passage of the floodwaters under the building. The development must comply with the <i>Flood Prone Land Design Standard</i> .	The proposed deck would be located on the fringe of the predicted 1% AEP flood extent. It would be constructed with an open subfloor and is not expected to impact the available flood storage.
3 Where the lowest floor has been elevated to allow the passage of flood waters, a restriction shall be imposed on the title of the land, pursuant to S88B of the Conveyancing Act confirming that the undercroft area is not to be enclosed.	Not applicable.
4 A one- off addition or alteration below the Flood Planning Level of less than 30 square metres or an increase of less than 10% of the ground floor area (whichever is the lesser) for residential development may be considered only where: (a) it is an extension to an existing room (b) the Flood Planning Level is incompatible with the floor levels of the existing room The structure must be flood proofed to the Flood Planning Level.	Council's consideration is requested for a minor increase of 4.6m <sup>2</sup> in the floor area below the 1% AEP flood level that would be associated with the reconstruction of the rear of the house and represents 3% of the existing ground floor area. It is proposed to construct these ground floor works with a floor level of RL 3.48 to match the existing. This would provide 380mm freeboard to the predicted 1% AEP flood level of RL 3.1m AHD.

Planning Consideration	Assessment
<i>F Floor Levels (cont'd)</i>	
<p><b>6</b> Any existing floor level may be retained below the Flood Planning Level when undertaking a first floor addition provided that:</p> <ul style="list-style-type: none"> <li>(a) it is not located within a floodway;</li> <li>(b) there is no increase to the building footprint below the Flood Planning Level;</li> <li>(c) it is flood proofed to the Flood Planning Level;</li> </ul>	The existing ground floor provide 380mm freeboard to the 1% AEP level. Refer to F.4.
<p><b>8</b> The minimum floor level of any first floor additions shall be at or above the PMF level.</p>	The proposed first floor addition is at RL 6.68m AHD, providing in excess of one metre freeboard to the PMF level of 5.6m
<p><b>9</b> Foyers – consideration may be given to a minimum floor level of a foyer being set at the 5% AEP flood level, provided it can be demonstrated that it complies with the <i>Flood Prone Land Design Standard</i>.</p>	Not applicable.
<i>G Car parking</i>	
<p><b>1</b> Open carpark areas and carports shall not be located within a floodway.</p>	Not applicable
<p><b>2</b> The lowest floor level of open carparks and carports (unroofed or with open sides) shall be constructed no lower than the natural ground levels.</p>	Not applicable
<p><b>3</b> All enclosed car parks must be protected from inundation up to the relevant flood planning level. For example, basement carparks must be provided with a crest at the entrance, the crest of which is at the relevant Flood Planning Level.</p> <p>All access, ventilation and any other potential water entry points to any enclosed car parking shall be above the relevant Flood Planning Level.</p> <p>Council will not accept any options that rely on electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark.</p>	No changes proposed to existing approved garage.
<p><b>5</b> Enclosed Garages must be located at or above the 1% AEP level.</p>	No changes proposed to existing approved garage.
<p><b>6</b> Carports must comply with the <i>Flood Prone Land Design Standard</i>.</p>	No changes proposed to existing approved carport.
<p><b>7</b> Where a driveway is required to be raised it must be demonstrated that there is no loss to flood stage in the 1% AEP flood event and no impact on flood conveyance through the site.</p>	No changes proposed to existing approved driveway.
<p><b>8</b> Multi Dwelling Housing and Shop Top Housing residential carparking – consideration may be given to a minimum floor level for open or covered carparking being set at the 5% AEP flood level, provided it can be demonstrated that it complies with the <i>Flood Prone Land Design Standard</i>.</p>	Not applicable

Planning Consideration	Assessment
<i>H Fencing</i>	
<p>1 Fencing, including pool fencing, shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. Appropriate fencing must comply with the <i>Flood Prone Land Design Standard</i> in addition to other regulatory requirements of pool fencing.</p>	No proposed changes to existing fencing.
<i>I Pools</i>	
<p>1 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>	Not applicable