

## **Flood Risk Management Report for No. 40 Winbourne Road, Brookvale**

### **Introduction**

The site comprises of two warehouses. It is proposed to convert the back warehouse into an ax throwing facility. Only internal partitioning is proposed without any modifications to the exiting floor and ground levels.

The Council issued a comprehensive flood advice letter (Appendix A), indicating that the subject site is located in the medium flood risk precinct. The locations of the provided 1%AEP flood levels (Table 1) are reproduced on Figure 1.

Table 1, Flood Levels

<b>ID</b>	<b>5% AEP Max WL (m AHD)</b>	<b>5% AEP Max Depth (m)</b>	<b>1% AEP Max WL (m AHD)</b>	<b>1% AEP Max Depth (m)</b>	<b>1% AEP Max Velocity (m/s)</b>	<b>Flood Planning Level (m)</b>
<b>1</b>	N/A	N/A	N/A	N/A	N/A	16.55
<b>2</b>	N/A	N/A	16.01	0.38	N/A	16.51
<b>3</b>	N/A	N/A	15.98	0.60	N/A	16.48
<b>4</b>	N/A	N/A	N/A	N/A	N/A	16.24
<b>5</b>	N/A	N/A	15.56	0.54	N/A	16.06
<b>6</b>	N/A	N/A	15.29	0.56	N/A	15.79
<b>7</b>	N/A	N/A	15.21	0.21	N/A	15.71
<b>8</b>	N/A	N/A	15.04	0.64	N/A	15.54
<b>9</b>	N/A	N/A	15.00	0.49	N/A	15.50
<b>10</b>	N/A	N/A	14.72	0.58	N/A	15.22

Velocities and hydraulic flood categories were not provided. The Probable Maximum Flood was also not addressed in the flood advice letter. Velocities and PMF levels are necessary for the development of a flood risk management strategy for the site.

It was therefore necessary to determine the catchment gravitating towards the site and establish and calibrate a hydraulic model against the provided by the Council flood levels and then use that model to estimate the velocities for the 1% AEP Flood and to estimate the approximate PMF levels and velocities.



Figure 1, Locations of the 1% Flood Levels from Table 1

## Modelling

The catchment area affecting the site was determined from an analysis of the LIDAR based ground level contours (Figure 2), Google Map image (Figure 3), site survey (Figure 4) and site visit. The runoff from the catchment upstream of Pittwater Road is directed to West Street. The Local runoff from the catchment between Pittwater Road and the site is directed towards the gap between the existing warehouse and No. 38.

The catchment area is 1.4 ha and it is fully impervious. The 1% AEP rainfall intensity was determined in accordance with AR&R (1987) as 267 mm/hr and the corresponding peak discharge value is 1.04 m<sup>3</sup>/s.

HEC-RAS, a steady state hydraulic model was established for the site area. The model parameter values were adjusted until a good fit was obtained between the reported by the Council 1% AEP flood levels and the calculated by the model flood levels (Table 2).

Table 2, Comparison of HEC RAS model results and the flood levels from the flood advice.

Point from Fig. 1	1% AEP Level	HEC RAS XS	HEC RAS Level	Difference (mm)
3	15.98	8	15.99	+10
5	15.56	4	15.40	-160
7	15.21	2	15.21	0.0
10	14.72	1	14.72	0.0*

\*14.72 was used as a boundary condition

The gap between No. 38 and No. 40 had to be reduced from 1.9 m (as measured from the survey) to 1.25 m as measured from the Google Map to achieve the flood level as reported by the Council at point 3. It can be seen from the table that the hydraulic model matched closely the flood levels as reported by the Council.

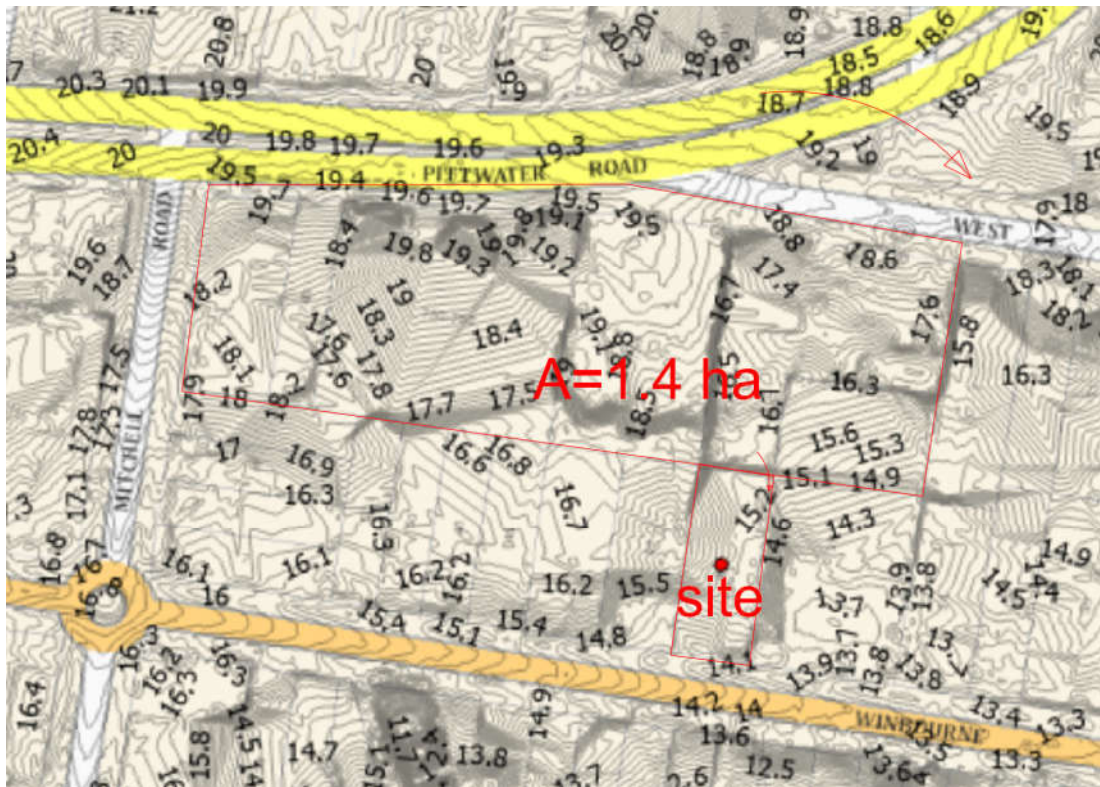
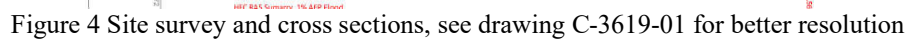


Figure 2, Catchment Layout



Figure 3, Site Location





The gap between No. 38 and No. 40 was widened to 1.9 m and the model was re-run using the 1 %AEP discharge value and the results are given in Table 3.

XS	Q (m/s)	Inv. (m)	WL (m)	Depth (m)	Velocity (m/s)	V x D (m2/s)	Flood Hazard
9	1.04	15.38	15.81	0.43	0.62	0.2666	H3
8	1.04	15.32	15.7	0.38	1.45	0.551	H4
7	1.04	15.06	15.37	0.31	1.76	0.5456	H4
6	1.04	15.1	15.41	0.31	0.5	0.155	H1
5	1.04	14.97	15.4	0.43	0.48	0.2064	H2
4	1.04	15	15.21	0.21	1.19	0.2499	H1
3	1.04	14.85	15.05	0.2	1.22	0.244	H1
2	1.04	14.75	14.94	0.19	1.22	0.2318	H1
1	1.04	14.17	14.72	0.55	0.35	0.1925	H3

XS	Q (m/s)	Inv. (m)	WL (m)	Depth (m)	Velocity (m/s)	V x D (m2/s)	Flood Hazard
9	3.12	15.38	16.33	0.95	0.83	0.7885	H4
8	3.12	15.32	16.12	0.8	2.05	1.64	H5
7	3.12	15.06	15.71	0.65	2.53	1.6445	H5
6	3.12	15.1	15.67	0.57	0.78	0.4446	H3
5	3.12	14.97	15.64	0.67	0.8	0.536	H3
4	3.12	15	15.36	0.36	1.73	0.6228	H2
3	3.12	14.85	15.21	0.36	1.77	0.6372	H2
2	3.12	14.75	15.1	0.35	1.77	0.6195	H2
1	3.12	14.17	15	0.83	0.65	0.5395	H3

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**Categorization of the Flood Risk**

The subject site is inundated by the 1% AEP flood with low hydraulic hazard. It must be noted that the provisional hydraulic hazard along the gap is high, however, the hazard in the downstream areas is low and therefore the high hazard can be reclassified as a low hydraulic hazard. The driveway area of the warehouse is therefore classified to be located in the medium flood risk precinct.

**Flood Affection**

The proposed change of use will not affect the footprint of the existing warehouse and therefore would not have any impact on flood behavior anywhere in the catchment.

**Evacuation**

The timely evacuation from the premises would be difficult because the depth in Winbourne Road is high and evacuating through deep water would be more dangerous than to remain on the premises. The floor level of the warehouse is at RL 15.17 m AHD and the maximum depth during the 1% AEP would be 400 mm, with velocities close to zero.

**Structural soundness**

The existing warehouse should be able to withstand the forces of flowing water, debris and buoyancy during the PMF subject to the Structural Engineers report at the CC stage.

**Building material**

The existing warehouse is built of bricks and concrete which are considered as flood compatible materials. Any electrical power points and or connections must be above the flood planning level of  $15.67+0.5=16.17$  m AHD or 1 m above the existing floor level.

**Storage of goods**

Any goods subject to water damage must be stored 1m above the floor level. No dangerous goods which can result in water pollution must be stored below RL 16.17 m AHD.

**Flood warning/signage**

The flood depths through the site are variable. Flood depth indicators must be installed at the entrance and along the driveway advising the visitors that the site might be inundated during floods showing the depth of water. Inundated street and the water presence in the garage should be used to trigger the Flood Emergency Response Plan (Appendix B).



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## Appendix A Flood Advice



### FLOOD INFORMATION REQUEST – COMPREHENSIVE

**Property:** 40 Winbourne Road BROOKVALE NSW 2100

**Lot DP:** Lot 27 Sec 13 DP 1619

**Issue Date:** 16/06/2021

**Flood Study Reference:** Dee Why and Curl Curl Lagoons Floodplain Risk Management Study (2005), Lyall & Associates

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#### **Flood Information for lot 1:**

**Flood Risk Precinct** – See Map A

**Flood Planning Area** – See Map A

**Maximum Flood Planning Level (FPL)** <sup>2,3,4</sup>: 16.55 m AHD

**1% AEP Flood** – See Flood Map B

**1% AEP Maximum Water Level** <sup>2,3</sup>: 16.03 m AHD

**1% AEP Maximum Depth from natural ground level**<sup>3</sup>: 0.71 m

**Indicative Ground Surface Spot Heights** – See Map C

<sup>1</sup> The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.

<sup>2</sup> 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.

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

<sup>4</sup> 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.

**Specific Notes:**

- The Dee Why and Curl Curl Lagoons Floodplain Risk Management Study (2005) upon which these results are based will be superseded by results from the Greendale Creek Flood Study (currently underway), probably before the end of 2021.
- Results for Probable Maximum Flood, climate change, hydraulic categorization and flood life hazard categorisation are unavailable from the Dee Why and Curl Curl Lagoons Floodplain Risk Management Study (2005).

## 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.

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## 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)
1	N/A	N/A	N/A	N/A	N/A	16.55
2	N/A	N/A	16.01	0.38	N/A	16.51
3	N/A	N/A	15.98	0.60	N/A	16.48
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8	N/A	N/A	15.04	0.64	N/A	15.54
9	N/A	N/A	15.00	0.49	N/A	15.50
10	N/A	N/A	14.72	0.58	N/A	15.22

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<sup>2</sup>/s, a freeboard of 0.3m may be able to be justified.

## FLOOD MAP B: FLOODING - 1% AEP EXTENT



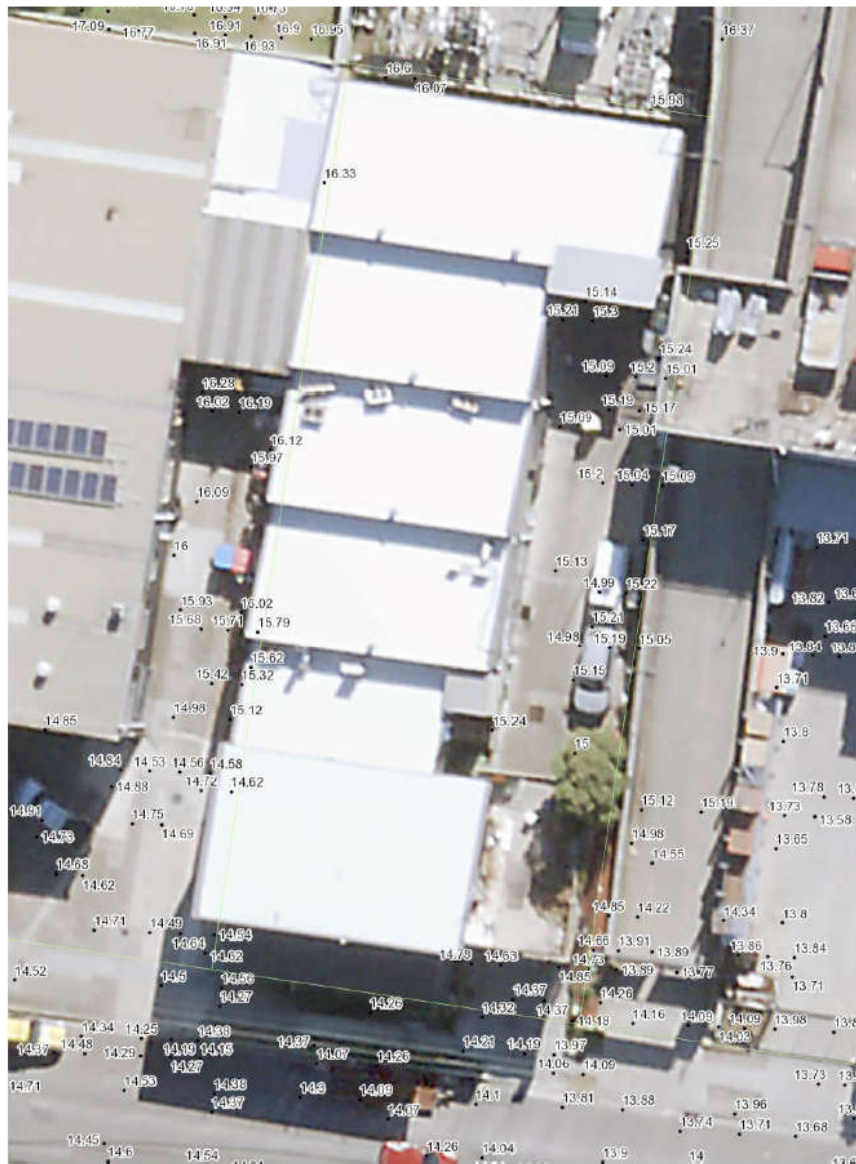
### Notes:

- 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.

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## MAP C: 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.

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## **Appendix B**

### **Flood Emergency Response Plan**

1. Floods in Brookvale are considered as “flash floods” and no warning system for this catchment is available. Storms leading to major flooding are typically 2 hours long, however shorter storms as little as a 5 minutes long can produce significant flooding. Once the storm passes floodwaters usually disappear rapidly.
2. During floods many local and major streets and roads will be cut by floodwaters. Travelling through floodwaters on foot, or in a vehicle can be very dangerous as the water may be polluted, obstructions can be hidden under the floodwaters, or you could be swept away. It is recommended to remain within the premises as much as practical as this is the safest option. If you need to leave the warehouse do it early in the flood event, before the flood level reaches the road level in the front.
3. Develop your own flood plan and be prepared if flooding should occur. Talk to the Council to determine the safer travel routes that are less likely to be cut by floodwaters.
4. Do not attempt to save the car if floodwaters start to enter the garage, it is too dangerous as water levels will rise rapidly and you could be trapped.
5. As the flood level approaches the warehouse floor level (but only if safe to do so) relocate any items that may be damaged by water, or poisons, or wastes to as high a level as possible.
6. In the rare event that floodwaters may enter the warehouse remain on site as the floodwaters will recede fast. Do not evacuate the home unless instructed to do so by the SES or the Police. Remember floodwaters are much deeper and flow much faster outside.
7. In the case of a medical emergency ring 000 as normal, but explain about the flooding.
8. A laminated copy of this plan should be permanently attached (glued) on an inside cupboard door in the kitchen and laundry and to the inside electrical meter box.
9. This flood management plan should be reviewed every 5 years, particularly with the potential effects of Climate Change with sea level rise and increased rainfall intensities.



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June 2021