Crows Nest OSD – Site B

Flood Impact Assessment

Prepared for:	**Third.i Crows Nest Residential Developments Pty Ltd**
Date:	**2nd September 2024**
Prepared by:	**Nathan Oakley**
Ref:	**301351270**

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Revision

Site Address:	477-495 Pacific Highway, Crows Nest, NSW, 2065
Real Property Description:	Lot A/ DP442804 Lot 101/ DP747672 Lot 100/ DP747672
Proposed Development:	Mixed use development – 14 storey tower above the Crows Nest Metro Station
Client:	Third.i Crows Nest Residential Developments Pty Ltd
Local Authority	North Sydney Council
Authority Reference #:	N/A
Stantec Reference:	301351270-CI-RP-002

Revision	Date	Comment	Prepared By	Approved By
001	13.11.23	SSDA Submission	LDS	MDR
002	29.02.24	SSDA Submission	LDS	MDR
003	28.06.24	SSDA Submission	LT	VE
004	08.07.24	SSDA Submission	PD	VE
005	02.09.24	SSDA Submission	NO	VE

Stantec hereby declares the following:

Stantec understands that, to the best of our knowledge, this report contains all available information relevant to the assessment of the proposed development. Stantec has taken every effort to confirm that the information contained in this report is neither false nor misleading.

Vivie Eccles – CPEng, NER, MIEAust

Civil Project Technical Lead, Team Lead

For and on behalf of: Stantec Australia Pty Ltd

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Design with community in mind

Contents

1. Executive Summary

This flood impact assessment report provides an assessment of the flood risk to, and impacts from, the new mixed use development located at 477-495 Pacific Highway, Crows Nest (the project site). The purpose of this report is to:-

- Identify and evaluate flood risk factors that may affect the project site and surrounds and the proposed development including the potential impacts of climate change for the full range of events (i.e. up to and including the probable maximum flood (PMF) event);
- Assess the impacts of the development, including any changes to flood behaviour and risk, impacts of flooding on the development and its future community and on existing community for the full range of events;
- Provide recommendations for mitigation measures to minimise flood risk, and;
- Ensure that the development is consistent with NSW Policy in relation to flood impacted development.

The North Sydney TUFLOW flood model has been obtained from North Sydney Council, undertaken by GRC Hydro in 2022, to confirm the existing flood conditions across the site. It can be confirmed that the proposed Crows Nest OSD – Site B development will not negatively impact on adjacent and downstream properties. The site in its existing current day and climate change condition is not impacted by flooding. As such, proposed developments to be undertaken internal to the lot will not alter the flooding behaviour in the 1% AEP and PMF storm events in terms of flood depths, levels, velocity, and hazard. Furthermore, as the site is not classified as a flood planning area, no flood-related development controls apply to the site.

2. Introduction

Stantec have been commissioned by Third.i Crows Nest Residential Developments Pty Ltd to prepare this Flood Impact Assessment (FIA) in support of the State Significant Development Application (SSDA) for the proposed Crows Nest Metro Station Over Station Development (OSD) – Site B development at 477-495 Pacific Highway, Crows Nest, NSW 2065. The overall site is bounded by:

- Pacific Highway to the South West
- Crows Nest Metro Station and Hume Street to the North West
- Mixed Use Properties and Clark Lane to the North East
- Crows Nest Metro Station to the North, and Mixed-Use Properties to the South, and East

Refer to locality plan in Figure 1 for further clarification.

Figure 1: Site Location Plan (Source: Nearmaps 2023)

2.1 Proposed Development

The proposed development consists of a single building with fourteen (14) storeys above the Crows Nest Metro Station. The site area is 1872 square metres. The concept approval includes a maximum height to the top of the service zone of RL 158m and includes a maximum residential FSR of 13,000 m^2.

The Metro Station is comprised of 3 levels:

- Ground Level - Hume Street includes the OSD tower lobby, retail, and back of house spaces
- Level 01 includes a retail mezzanine, back of house, and a loading dock which is used for OSD garbage collection and is a future easement for rail authority access
- Level 02 contains plant rooms for the metro station.

The OSD car parking levels are located on level 5 and 6. These are naturally ventilated with 27 car spaces on level 5 and 28 car spaces on level 6. There is a total of 55 spaces. Apartments are located from level 7 to 18. Level 19 and 20 contain penthouses. A roof terrace on level 21 includes communal gardens and pools, as well as private penthouse terraces.

Refer to Figure 2 for an illustration of the site plan.

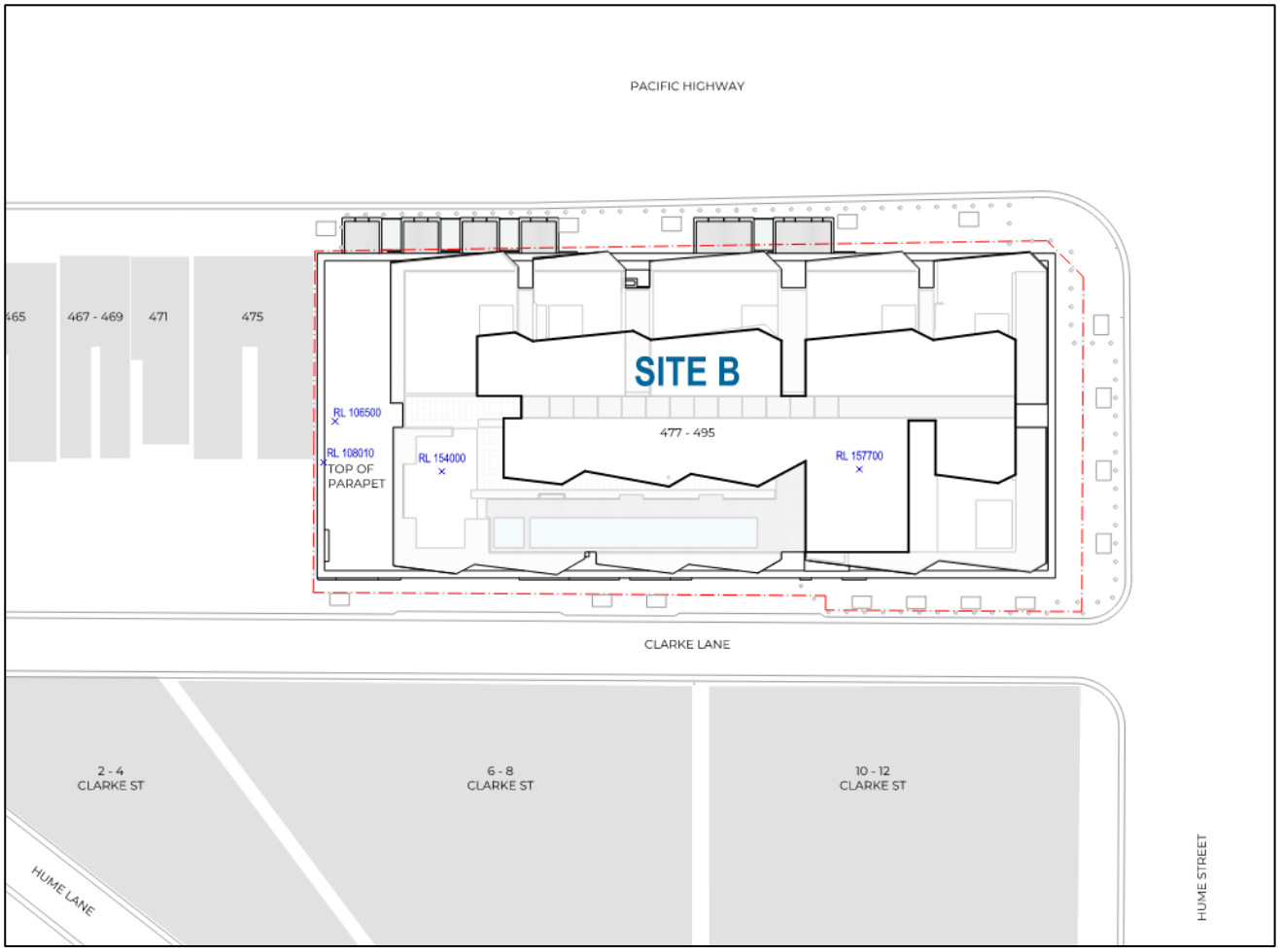

Figure 2: Proposed Site Plan (Source: Proposed Site Plan DA-1104 by Woods Bagot, dated 14 August 2024)

3. Abbreviations Definitions

- **ABCB** Australian Building Codes Board
- **AEP** Annual Exceedance Probability
- **AHD** Australian Height Datum
- **AIDR** Australian Institute of Disaster Resilience
- **ARI** Average Recurrence Interval
- **ARR** Australian Rainfall and Runoff
- **DCP** Development Control Plan
- **DECCW** Department of Environment, Climate Change and Water NSW
- **DN** Diameter Nominal (mm)
- **EY** Exceedances per Year
- **FFL** Finished Floor Level
- **FPA** Flood Planning Area
- **FPL** Flood Planning Level
- **FRM** Floodplain Risk Management
- **IFD** Intensity-Frequency-Duration
- **IL** Invert Level
- **L/s** Litres per second
- **LEP** Local Environmental Plan
- **m/s** Metres per second
- **NSC** North Sydney Council
- **OSD** Over-Station Development
- **PMF** Probable Maximum Flood
- **RCP** Representative Concentration Pathway
- **RL** Relative Level

4. Information Sources

The following listed policies, standards and guidelines were referred to in the preparation of this report:-

- NSW Planning Portal – information sought regarding property, planning and site constraints;
- North Sydney Council (NSC) LEP and DCP 2013;
- North Sydney Council Floodplain Management Interim Policy 2022;
- North Sydney Flood Risk Management Study and Plan 2022;
- NSW Flood Data Portal;
- NSW Floodplain Development Manual 2005;
- DPE Draft Shelter-in-Place Guidelines;
- Australian Rainfall and Runoff Guidelines 2019;
- Australian Building Codes Board (ABCB) Standard: Construction of buildings in flood hazard areas;

5. Flood Modelling

When considering a new development, it is important to assess the impact of existing flooding on the proposed development and also the impact of the proposed development on existing or potential flooding both upstream and downstream of the development.

Site-specific flood modelling has been undertaken for the proposed development to demonstrate the flood impact of the Crows Nest OSD – Site B development.

5.1 Existing Flooding

The North Sydney TUFLOW flood model has been obtained from North Sydney Council, undertaken by GRC Hydro in 2022, to confirm the existing flood conditions across the site. This is the latest flood model reviewed by Stantec to check that the model is relatively accurate in its representation of the catchment characteristics in the existing condition; e.g. mannings, building locations, stormwater drainage, etc. The flood model was then run to ensure that the results were in agreeance with the flooding results generated from the GRC Hydro flood model for the 1% AEP and PMF flood events. No differences were observed between Stantec's run of the model and the results from the GRC Hydro model. Once this was confirmed, a post development flood model was prepared with the Site B building footprint incorporated into the flood model to determine the potential impacts on existing flooding behaviour. No further changes were made to the model at this stage.

5.1.1 1% AEP Results

Figure 3, Figure 4 and Figure 5 below present the flood depth and level contours, velocity and hazard maps, respectively, in the existing scenario for the 1% AEP storm event.

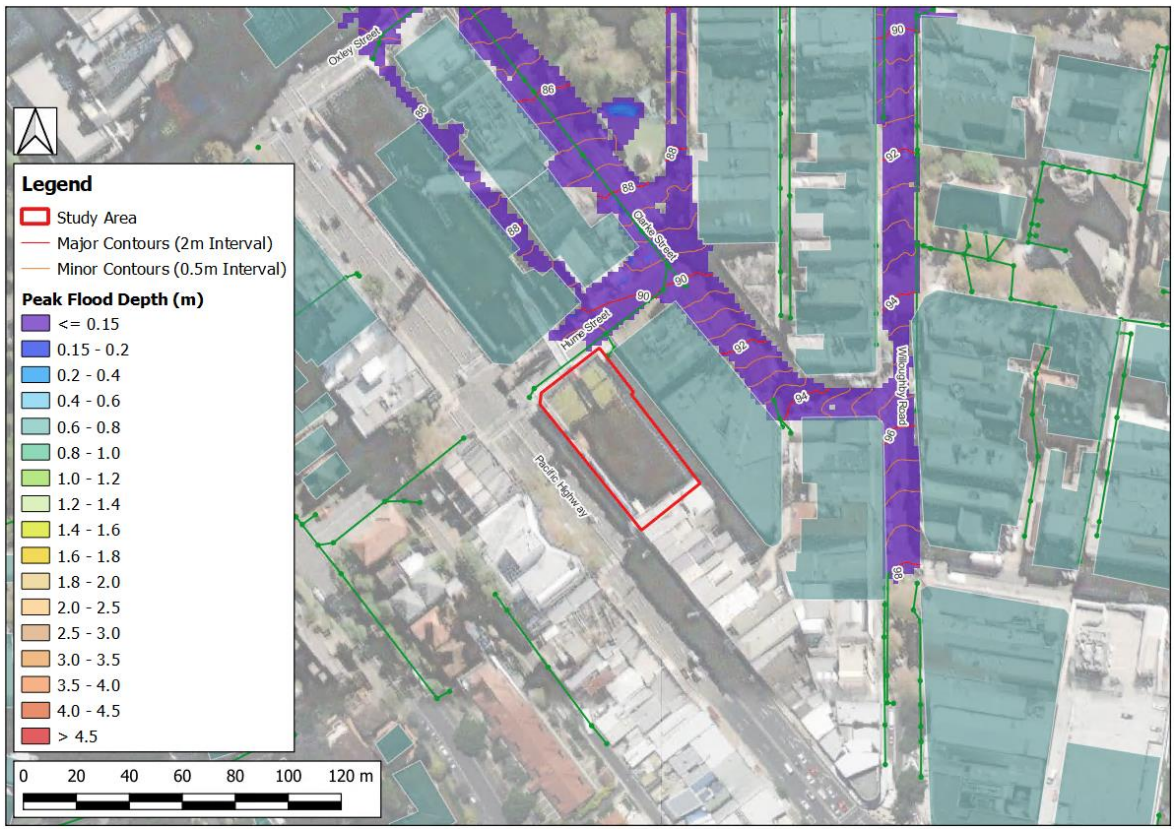

Figure 3 – 1% AEP Event Flood Depth and Level Contours (Existing Scenario)

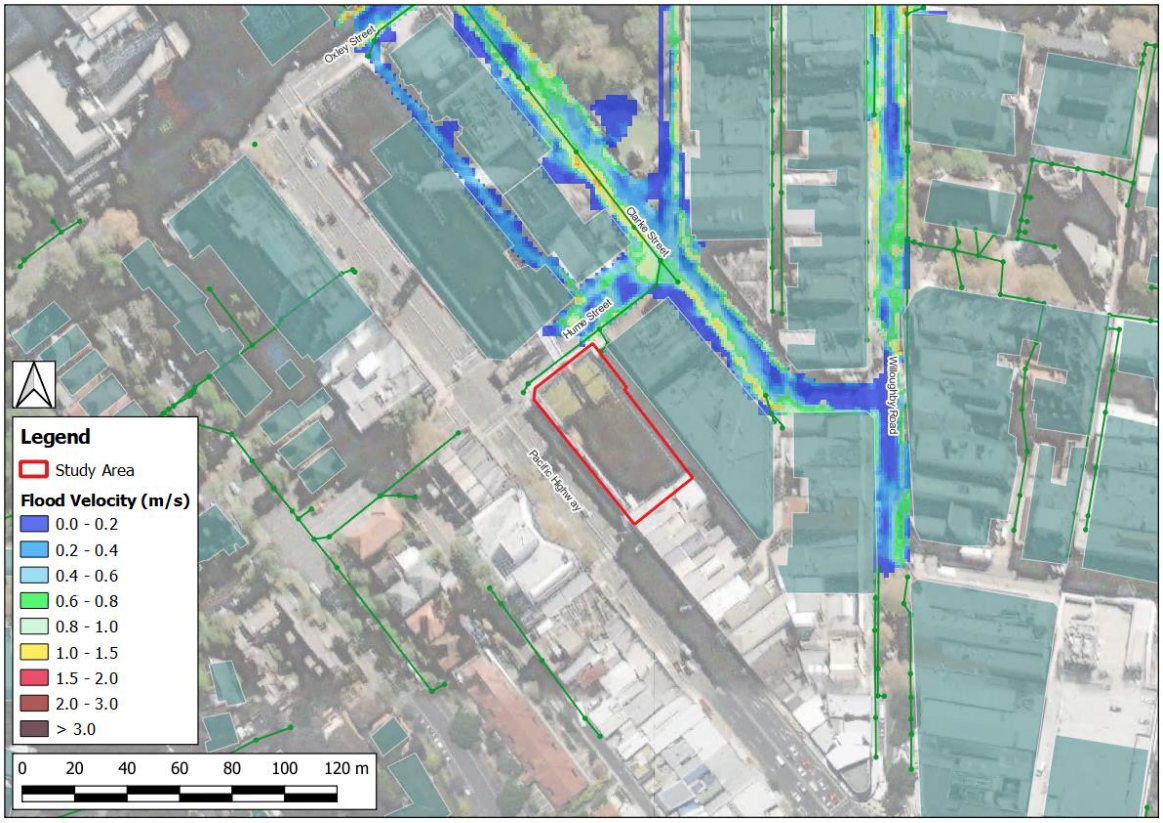

Figure 4 – 1% AEP Event Flood Velocity (Existing Scenario)

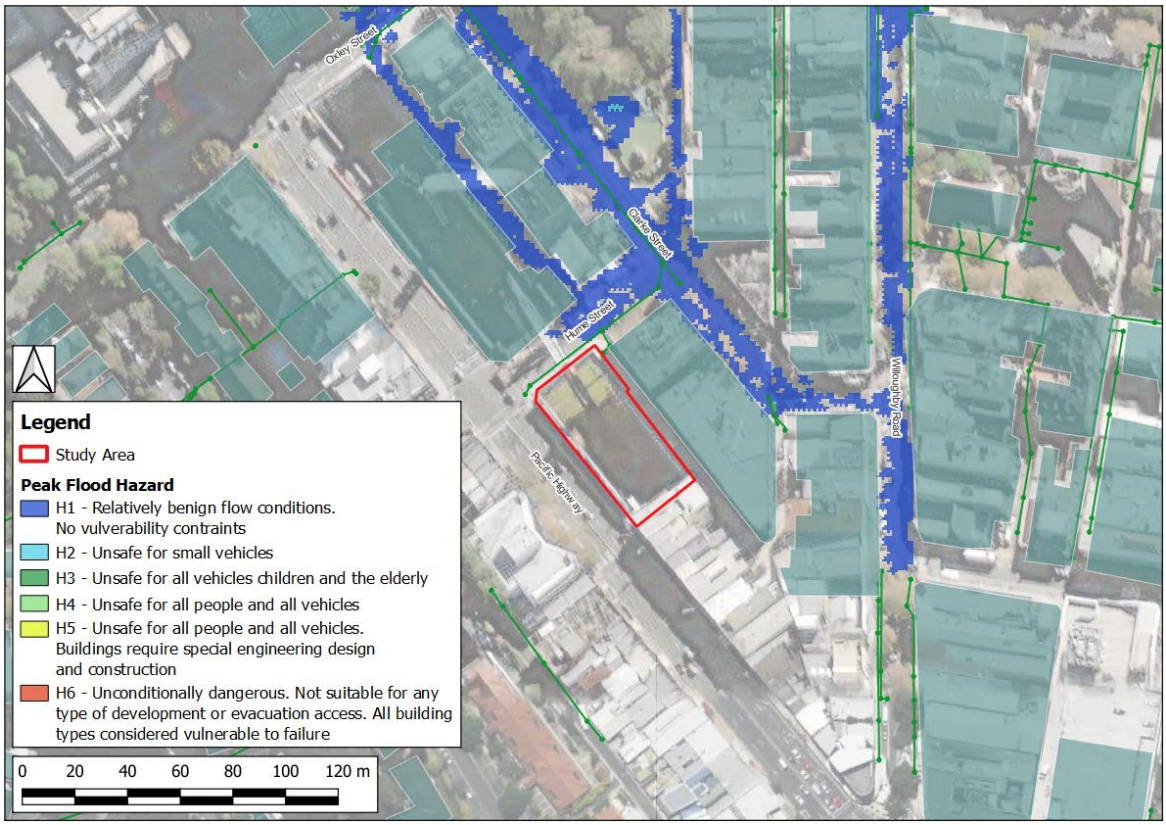

Figure 5 – 1% AEP Event Provisional Flood Hazard (Existing Scenario)

As can be seen from the flood mapping, the development site is not subject to flooding in the 1% AEP storm event. Flooding is evident in the surrounding road network at the intersection of Hume Street and Clarke Stret north of the site, with flood depths of up to 240mm observed at the intersection of the two roads. Flood velocities within the road reach a maximum of 1.38m/s in Hume Street. The flood hazard is also typically low, being classified as a H1 hazard which is defined as relatively benign flow conditions with no vulnerability constraints, in the 1% AEP event in the surrounding road network.

5.1.2 PMF Results

Figure 6, Figure 7 and Figure 8 below present the flood depth and level contours, velocity, and hazard maps, respectively, in the existing scenario for the PMF storm event.

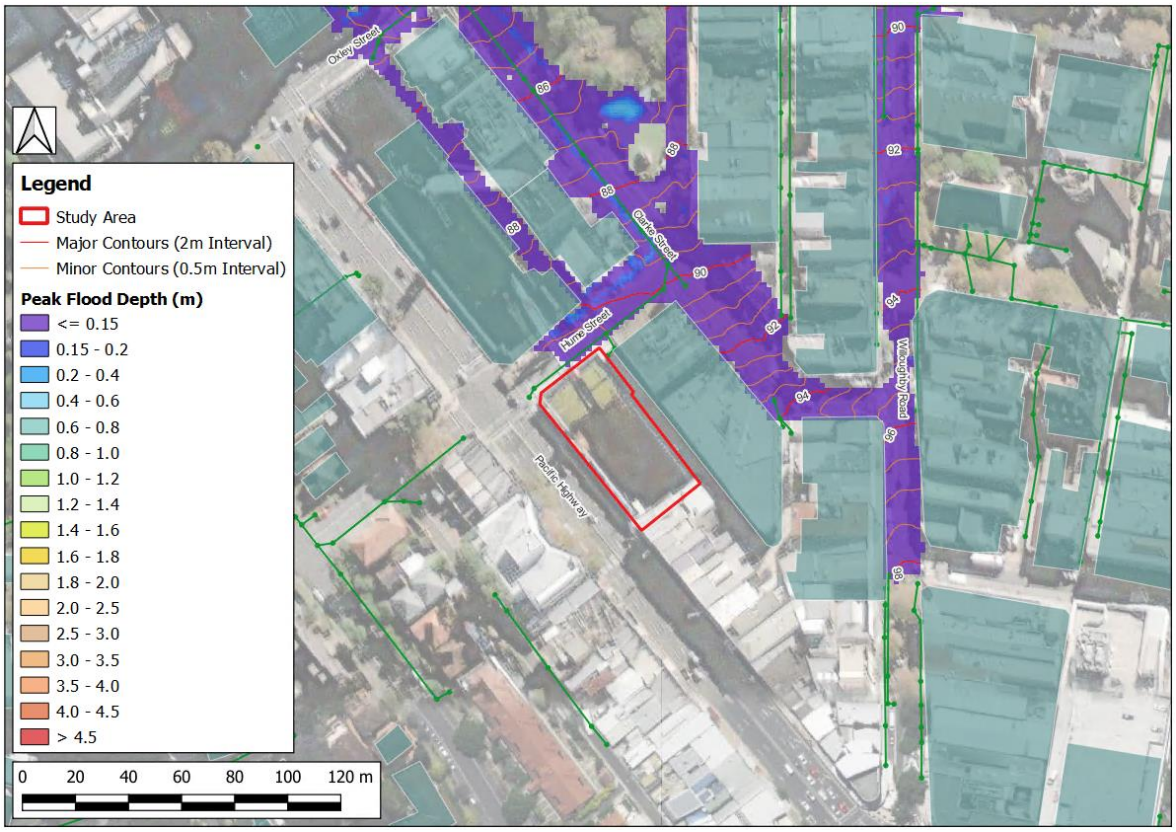

Figure 6 – PMF Event Flood Depth & Level Contours (Existing Scenario)

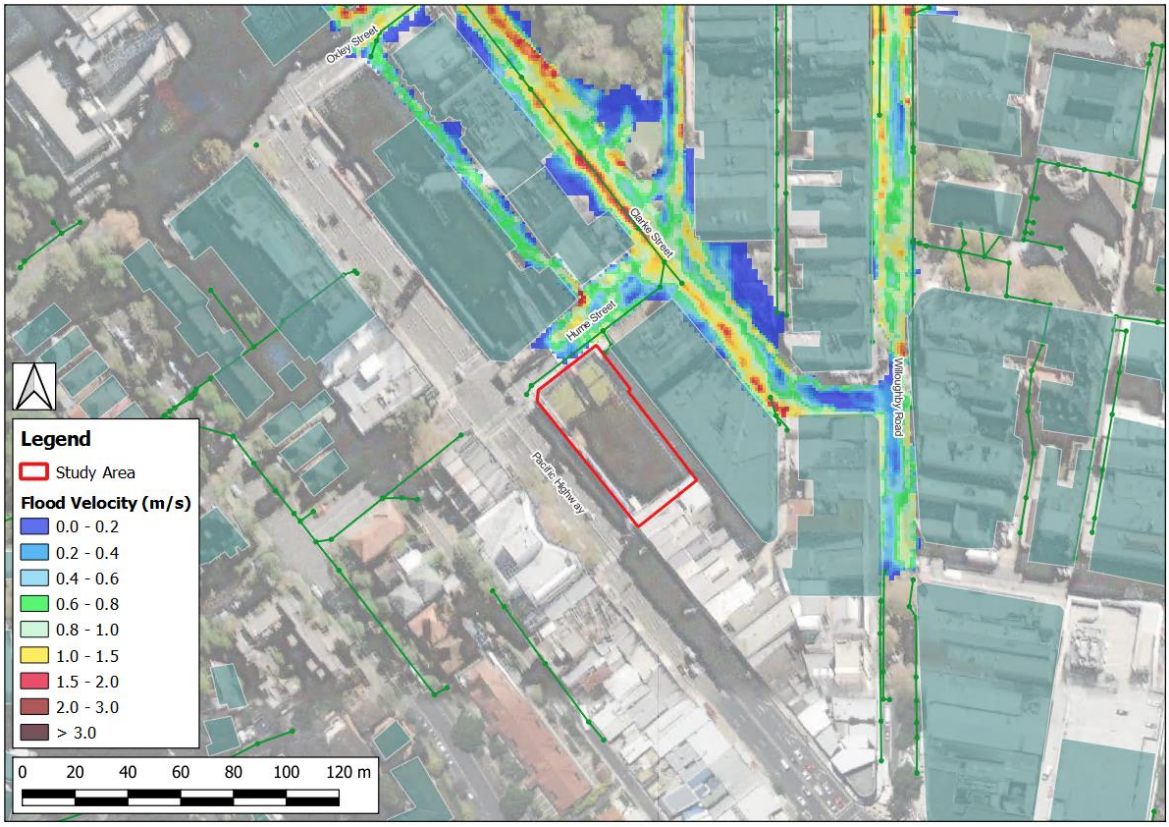

Figure 7 – PMF Event Flood Velocity (Existing Scenario)

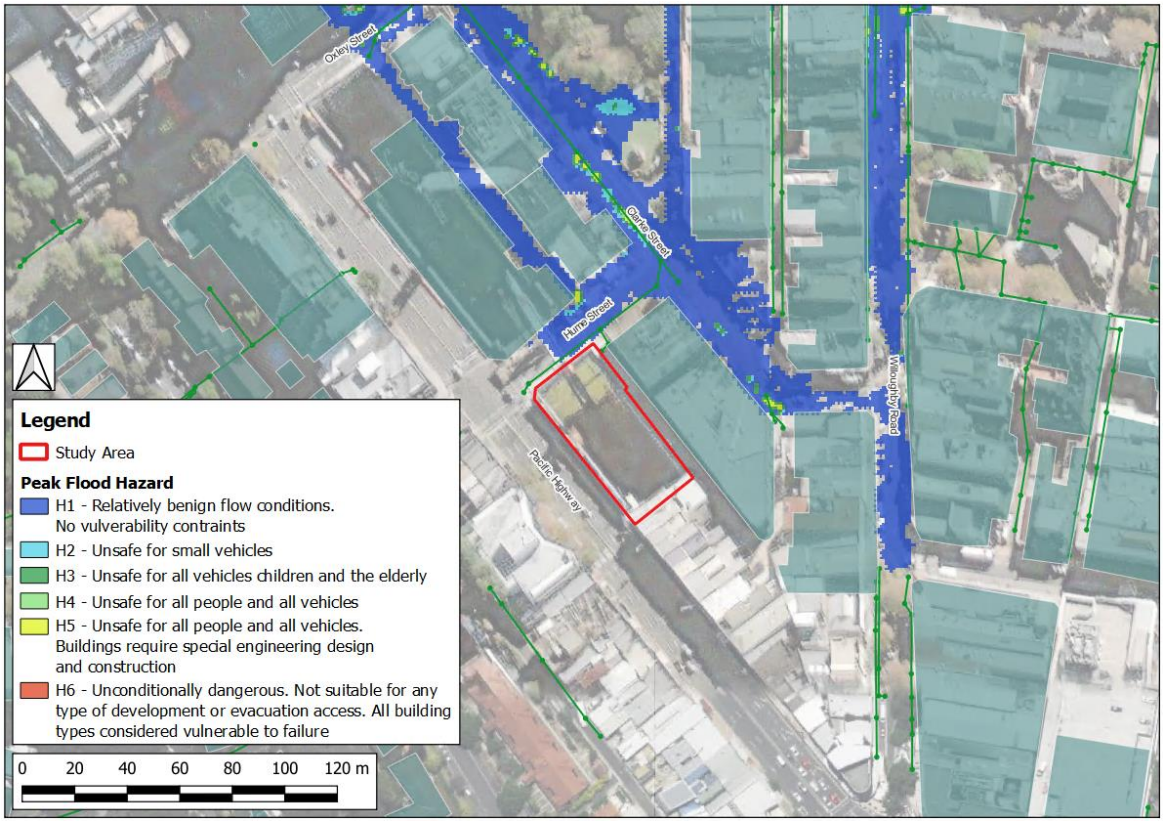

Figure 8 – PMF Event Provisional Flood Hazard (Existing Scenario)

The subject site is also not affected by flood waters during the PMF storm event. However, the road network surrounding the site is subject to flooding in the PMF storm event, with maximum flood depths of 360mm and velocities of 2.98m/s observed in Hume Street. Similar to the 1% AEP event, the flood hazard is also typically low in the PMF storm event around the site.

5.2 Post Development Flooding

A post development scenario has been modelled to determine the impact of the proposed Site B development on existing flood levels. The existing flood model has been utilised and amended to include the proposed building extent, to produce the site-specific assessment.

5.2.1 1% AEP Results

Figure 9, Figure 10 and Figure 11 below present the flood depth and level contours, velocity, and hazard maps, respectively, in the post development scenario for the 1% AEP storm event. Figure 9 presents the flood level impact as a result of the proposed development on existing flood levels.

Figure 9 – 1% AEP Event Flood Depth & Level Contours (Post Development Scenario)

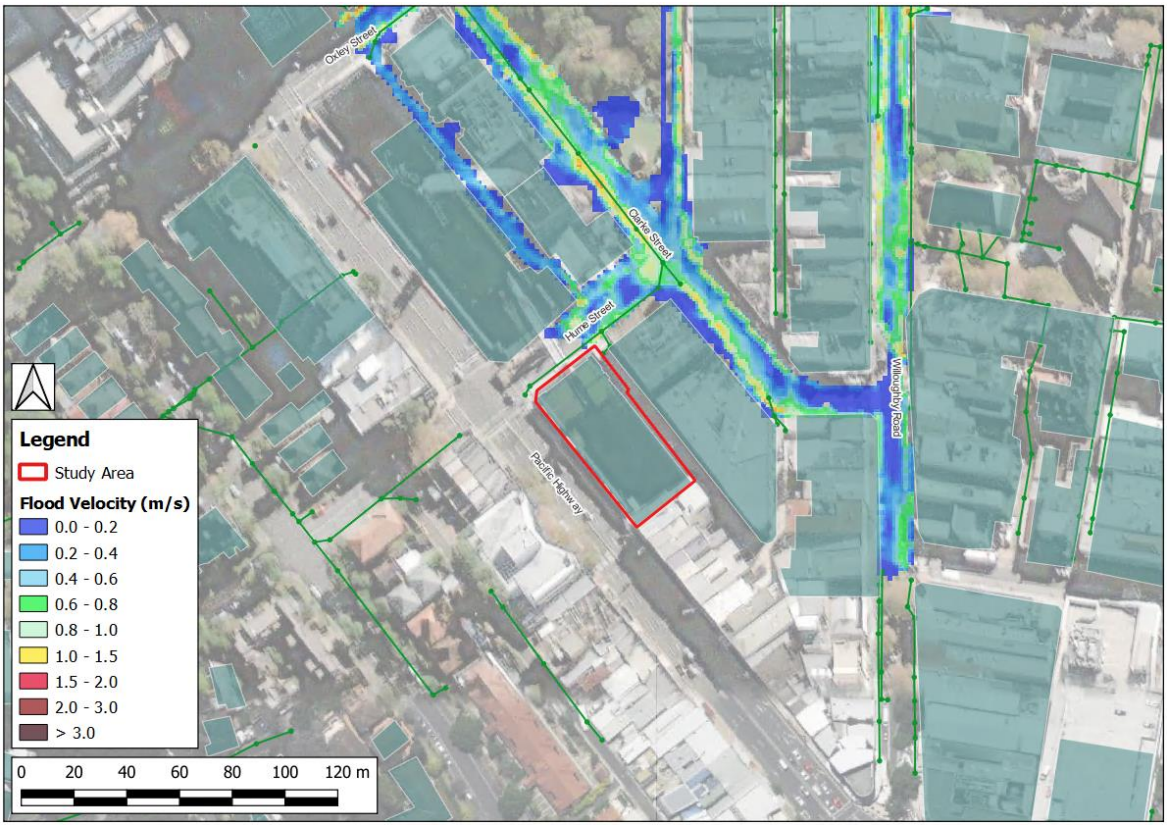

Figure 10 – 1% AEP Event Flood Velocity (Post Development Scenario)

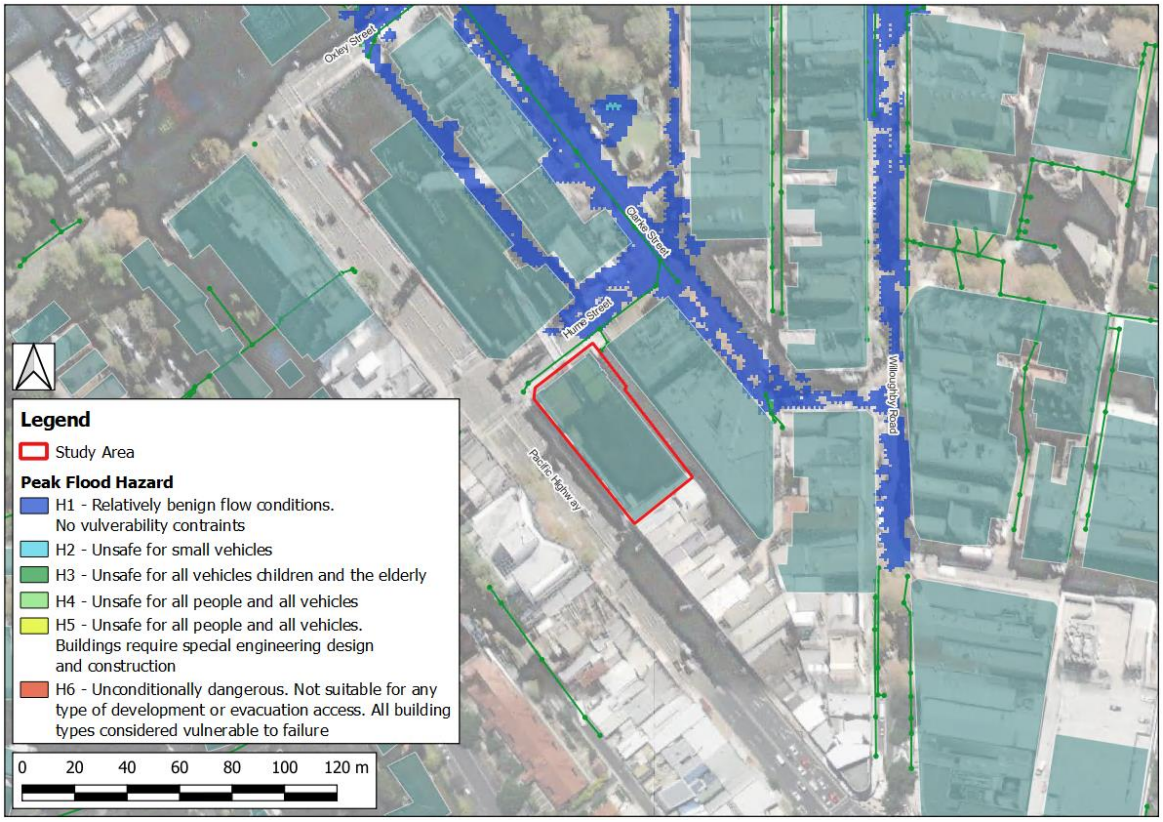

Figure 11 – 1% AEP Event Provisional Flood Hazard (Post Development Scenario)

Figure 12 – 1% AEP Event Peak Flood Level Impact

As can be seen, the subject site continues to be unaffected by flood waters during the 1% AEP storm event. There is no impact observed as a result of the development to flood levels and depths in the surrounding catchment in the 1% AEP event. The flood hazard remains low in the 1% AEP event post development scenario around the site.

5.2.2 PMF Results

Figure 13, Figure 14 and Figure 15 below present the flood depth and level contours, velocity, and hazard maps, respectively, in the post development scenario for the PMF storm event. Figure 12 presents the flood level impact as a result of the proposed development on existing flood levels.

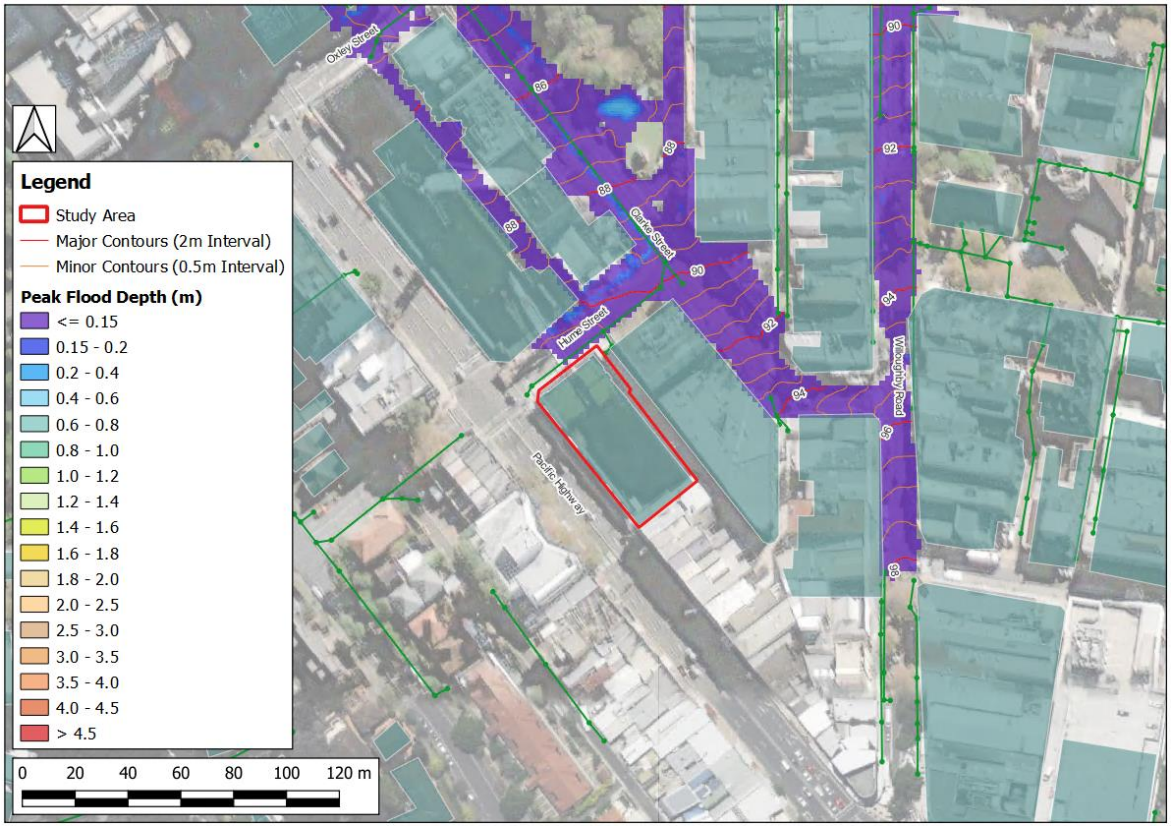

Figure 13 – PMF Event Flood Depth & Level Contours (Post Development Scenario)

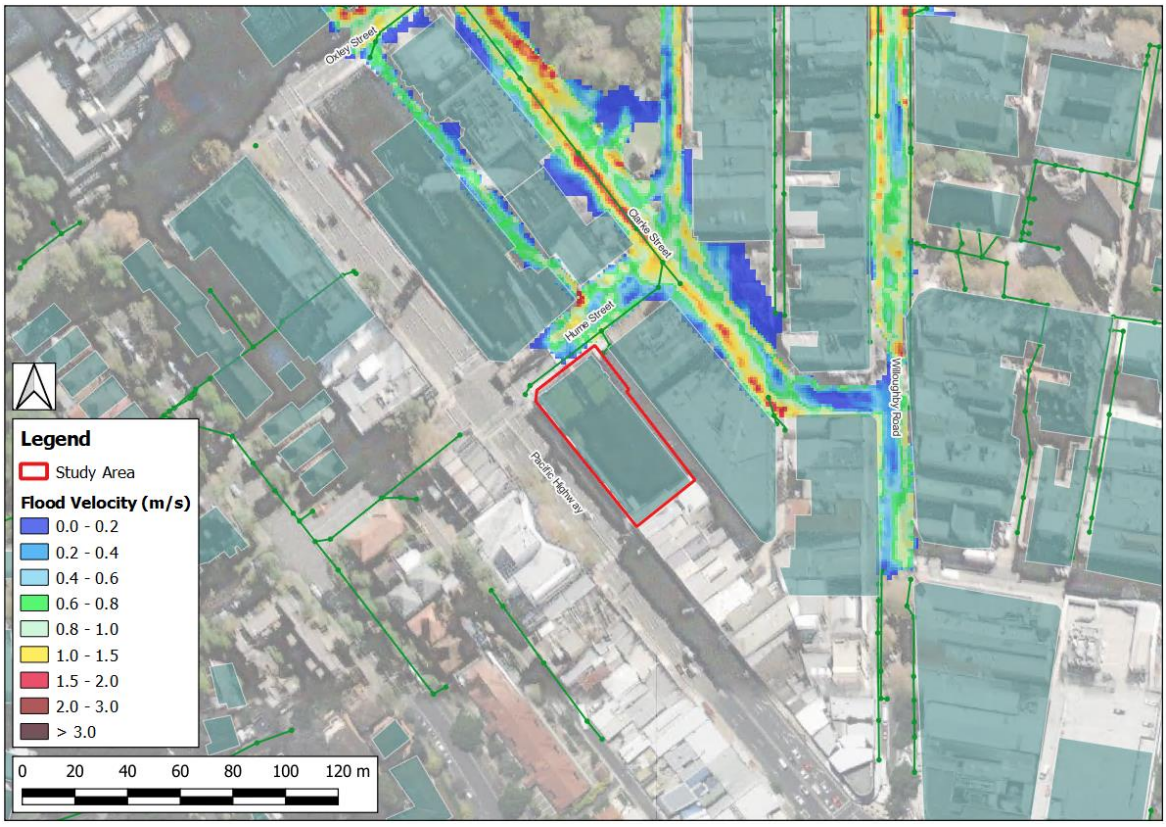

Figure 14 – PMF Event Flood Velocity (Post Development Scenario)

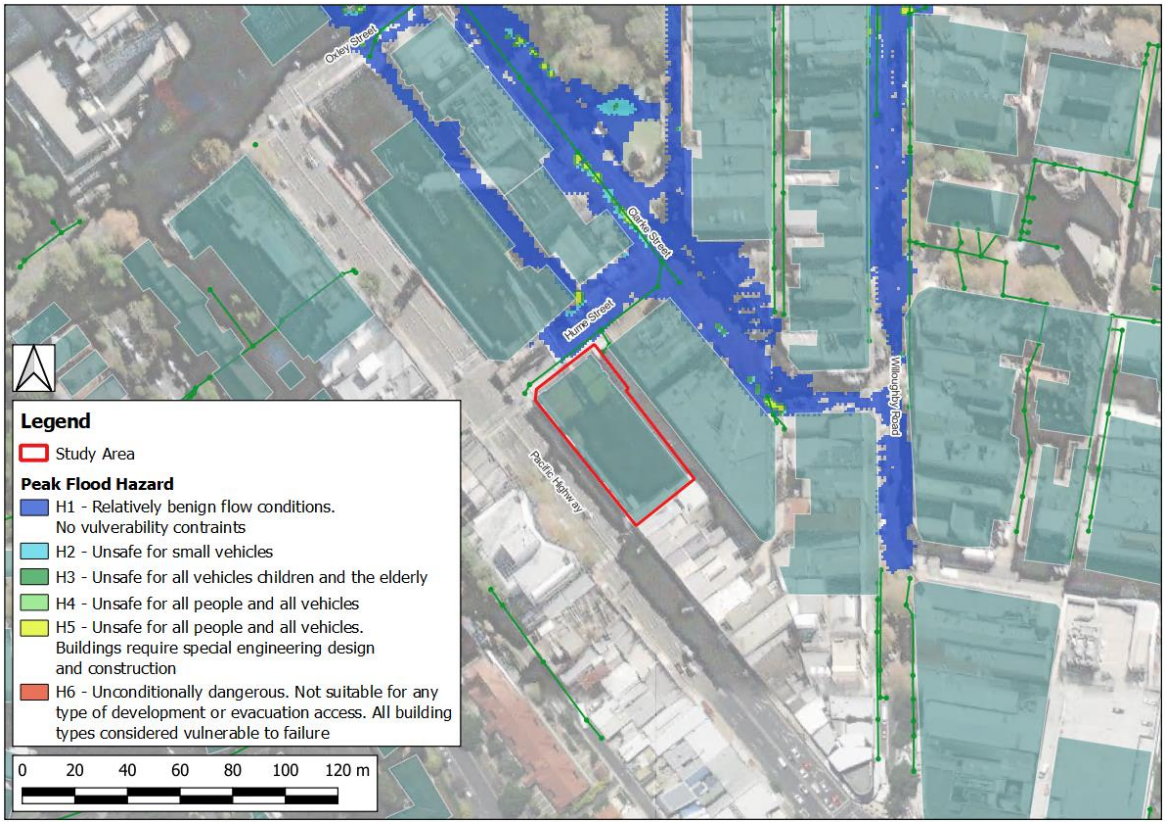

Figure 15 – PMF Event Provisional Flood Hazard (Post Development Scenario)

Figure 16 – PMF Event Peak Flood Level Impact

The flood level impact demonstrates that there is no change to existing flood behaviour within the catchment in the PMF event as a result of the development. The flood hazard also remains typically low within the road network in the PMF storm event around the site.

5.3 Climate Change Considerations

Climate change sensitivity was investigated as part of the North Sydney Flood Risk Management Study and Plan, with the flood modelling considering RCP 4.5 and RCP 8.5 scenarios in the 1% AEP event. RCP 4.5 is an intermediate scenario which assumes that greenhouse gas emissions peak around 2040, then decline, while RCP 8.5 is a worst-case scenario which assumed that greenhouse gas emissions continue to rise throughout the 21st century.

The NSW Government issued its Policy Statement on Sea Level Rise in 2009, which states that "Over the period of 1870-2001, global sea levels rose by 20cm, with a current global average rate of increase approximately twice the historical average. Sea levels are expected to continue rising throughout the twenty-first century and there is no scientific evidence to suggest sea levels will stop rising beyond 2100 or that the current trends will be reversed.

Sea level rise is an incremental process and will have medium to long-term impacts. The best national and international projections of sea level rise along the NSW coast are for a rise relative to 1990 mean sea levels of 40cm by 2050 and 90cm by 2100. In addition to considering the RCP scenarios in isolation, the North Sydney Flood Risk Management Study and Plan assessed both scenarios in conjunction with a sea level rise of 90cm. In our assessment of climate change impacts, the absolute worst-case scenario of RCP 8.5 with a sea level rise of 90cm was assessed. Refer to Figure 17 and Figure 18 for the 1% AEP event flood depth and level contours and flood hazard mapping with consideration for climate change in the pre-development scenario.

Figure 17 – 1% AEP Event Flood Depth and Level Contours (RCP 8.5 Scenario with 0.9m Increase in Sea Level – Pre-Development Scenario)

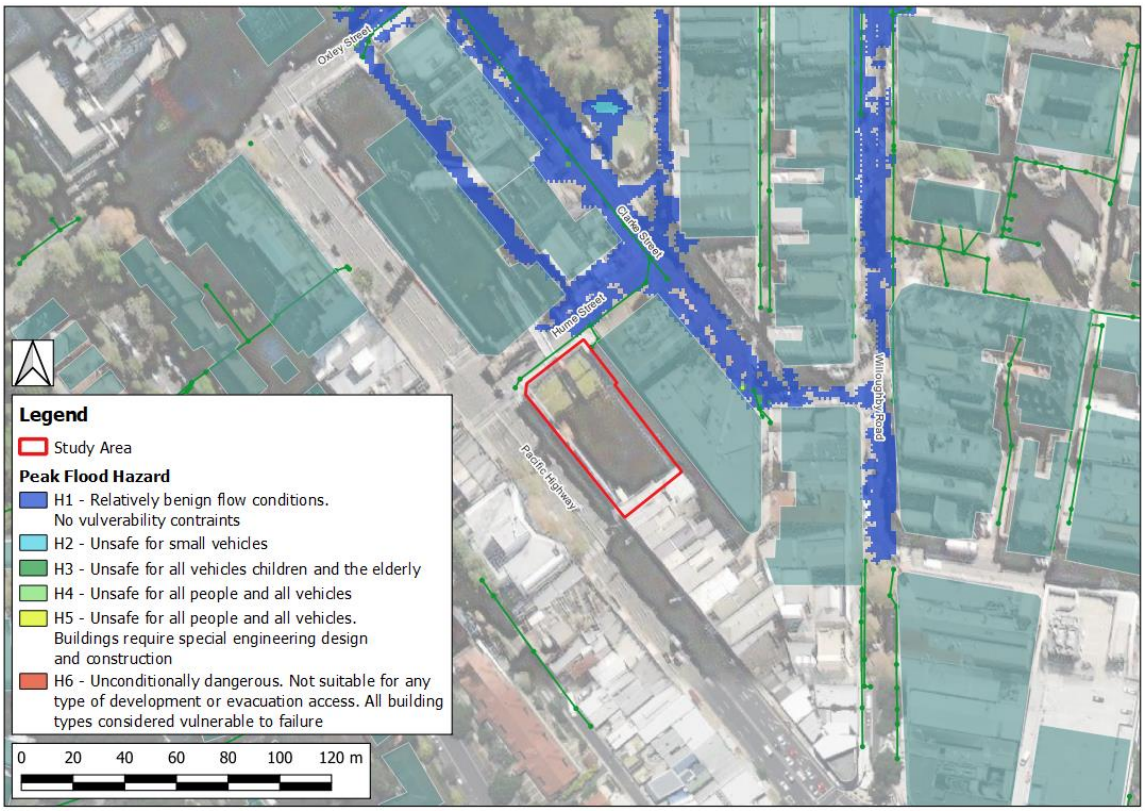

Figure 18 – 1% AEP Event Provisional Flood Hazard (RCP 8.5 Scenario with 0.9m Increase in Sea Level – Pre-Development Scenario)

Peak flood depths in Hume Street adjacent to the site increase to 200mm in the 1% AEP existing, climate change scenario. Similar to current conditions, the site is not expected to flood in the climate change scenario. The flood hazard within the surrounding road network is classified as H1, which is the equivalent of a low hazard.

Refer to Figure 19 and Figure 20 for the 1% AEP event flood depth and level contours and flood hazard mapping with consideration for climate change in the post development scenario. Figure 21 demonstrates the flood level impact between the post development scenario and existing conditions with climate change.

Figure 19 – 1% AEP Event Flood Depth and Level Contours (RCP 8.5 Scenario with 0.9m Increase in Sea Level – Post Development Scenario)

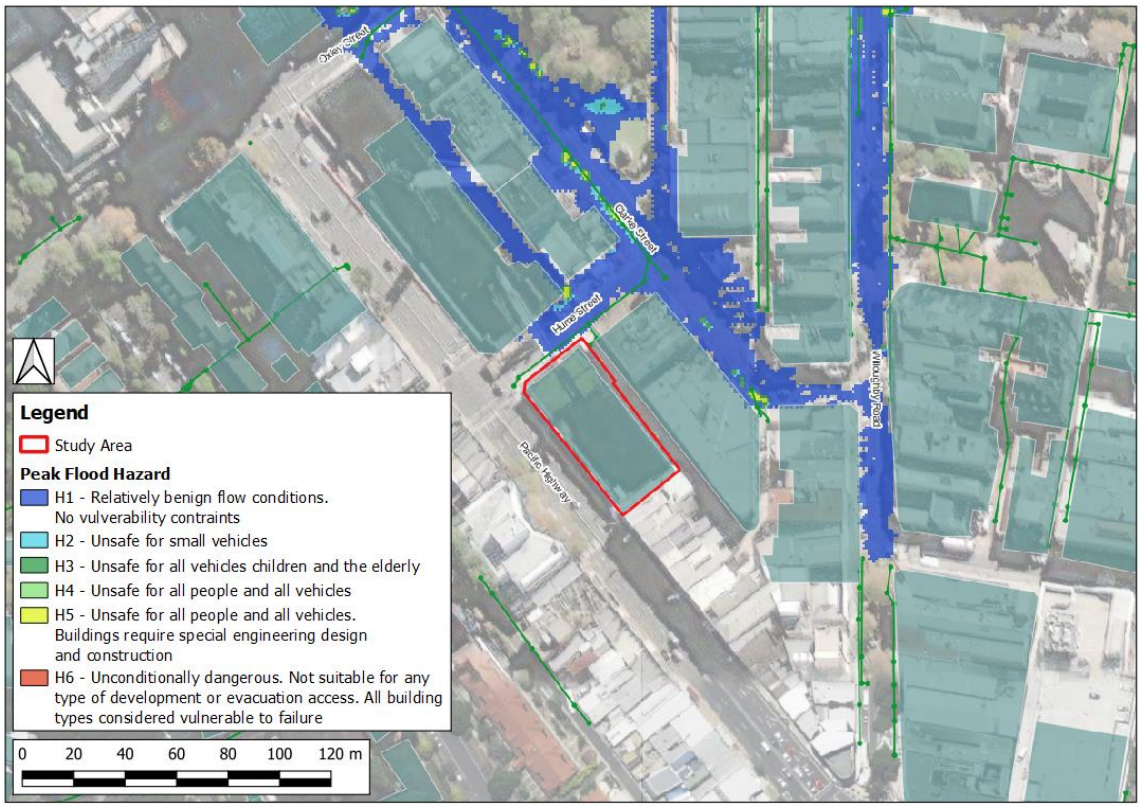

Figure 20 – 1% AEP Event Provisional Flood Hazard (RCP 8.5 Scenario with 0.9m Increase in Sea Level – Post Development Scenario)

Figure 21 – 1% AEP Event Peak Flood Level Impact (RCP 8.5 Scenario with 0.9m Increase in Sea Level)

Figure 21 demonstrates that no impact is observed to existing flood behaviours within the catchment as a result of the proposed Site B development.

It should be noted that the post development flood modelling undertaken does not take into account any proposed infrastructure drainage internal to the site and proposed upgrades to the public stormwater system external to the site in Clarke Lane and Hume Street which would have a beneficial effect on flood levels. This flood modelling is considered the worst-case scenario.

6. Flood Planning Requirements

With reference to North Sydney Council's Floodplain Management Policy (Interim) (2022), properties identified within the Flood Planning Area (FPA), as identified under the North Sydney Floodplain Risk Management (FRM) Study and Plan (2022), must comply with the relevant Prescriptive Requirements of the Policy.

The North Sydney FRM Study and Plan defines the FPA based on two (2) criteria; Category A being properties located on/in the proximity of an identified/designated floodway, and Category B being properties located on/adjacent to a localised flood with significant depth or flow (that is not part of the identified/designated floodway). This is in contrast to the Floodplain Development Manual (2005) which recommends that the FPA be derived from the 1% AEP plus 500mm freeboard level, whereby the area of land below this level is subject to flood related development controls. For the North Sydney LGA, the 1% AEP plus 500mm freeboard is much higher than the PMF level; hence, adopting this criterion resulted in an extent much larger than the PMF and the risk of imposing flood-related planning controls on properties which are not subject to flood risk. Therefore, no Flood Planning Levels (FPL) need to be considered for the site.

Refer to Figure 22 for an extract from the North Sydney FRM Study and Plan illustrating properties subject to flood-related development controls.

Figure 22 – Flood Planning Area (Source: North Sydney FRM Study and Plan 2022)

As can be seen above, the development site is not classified as a FPA and, as such, is not subject to flood-related development controls.

7. Conclusion

Based on the flood mapping prepared by Stantec, it can be confirmed that the proposed Crows Nest OSD – Site B development will not negatively impact on adjacent and downstream properties. The site in its existing current day and climate change condition is not impacted by flooding. As such, proposed developments to be undertaken internal to the lot will not alter the flooding behaviour in the 1% AEP and PMF storm events in terms of flood depths, levels, velocity, and hazard. Furthermore, as the site is not classified as a flood planning area, no flood-related development controls apply to the site.

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