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## Re: Re-development, 31 Cowper Street, Glebe – Flood Assessment Report

This report provides a flood assessment of proposed development at 31 Cowper Street, Glebe. The development consists of two medium rise residential buildings, on two blocks between Wentworth Park Road and Wentworth Street, separated by Park Lane. The site lies in the Blackwattle Bay catchment in the City of Sydney (CoS) Local Government Area, and is affected by overland flooding in the area. This flood risk assessment describes flood behaviour at the site, before assessing the development's compliance with City of Sydney's Interim Floodplain Management Policy, as well as the Local Environment Plan (LEP).

### Background

The subject site consists of two blocks, bounded by Wentworth Street, Cowper Street, Mitchell Lane East and Wentworth Park Road, with Park Lane separating the two blocks. The two blocks are referred to here as the south block, on Wentworth Street, and the north block, on Wentworth Park Road. Other adjacent features include a small park (MJ Doherty Reserve) immediately west of the south block, and Wentworth Park, immediately north of the north block.

The site is located in the lower parts of the Blackwattle Bay catchment. Runoff from the suburbs of Pyrmont, Ultimo, Chippendale and Glebe generally accumulates in Wentworth Park, before discharging to Blackwattle Bay near the Sydney Fish Markets. The park is 1-2 m above sea level and experiences widespread inundation in a flood event. The subject site is around 2-3 m above sea level and experiences overland flooding from two sources: overland flow from the south-west that arrives at the site via flow on Mitchell Lane East, Cowper Lane and Cowper Street, and overland flow from the majority of the wider catchment that inundates Wentworth Park, including Wentworth Park Road and the north side of the site.

Flood behaviour, including peak flood depths and levels, has been extracted from City of Sydney's *Blackwattle Bay Catchment FRMS&P* (WMAwater, 2015), which utilised a TUFLOW hydraulic model to determine flood behaviour throughout the catchment. Results for the 1% Annual Exceedance Probability (AEP) event are shown in Figure 1, and results for the Probable Maximum Flood (PMF) event are shown in Figure 2. The following observations are made:

- The south block experiences overland flooding on all sides, with the majority of flow occurring on Mitchell Lane, flowing north-east. In the 1% AEP, there is around 0.5-1 m of flow on Mitchell Lane East, in Park Lane and near the south-west corner of the block. The majority of depth on Cowper Street and near the south-east corner is 0.1-0.3 m. In the PMF, the flood level is around 0.5 m higher, except for around the north side where there is around 0.9 m increase relative to the 1%

AEP. This is due to flooding in Wentworth Park, which is around 1 m higher in the PMF, reaching further across the site.

- The north block also experiences flooding on all sides, with 1% AEP depth of 0.5 – 1 m adjacent to the majority of the building. There is a relatively shallow area of around 0.4 m on Cowper Street. In the PMF, flood depths are around 1 m higher in the PMF event, with more than 1 m depth surrounding the north block.

Currently the south block is completely developed with a series of townhouses and three garage entrances on Park Lane. The north block has a series of four townhouses facing Wentworth Park, with rear courtyards/gardens backing onto Park Lane.

### **Proposed Development**

The proposed development consists of two medium-rise buildings, with a mix of residential and community space, and a series of townhouses in the south block on Mitchell Lane East. The footprint of the proposed development is largely the same as what currently exists, with the largest changes being the north block building extending into what is currently rear courtyard/gardens, and a new triangular outdoor space on Wentworth Street. With regards to flooding, the salient features of the proposed development are its ground floor and basement features. For the two blocks, these consist of entrances to the following areas:

- residential dwellings on Mitchell Lane East and from the triangular outdoor space.
- the foyer of residential spaces on higher floors, with entrances on Cowper Street for each block, and from the triangular outdoor space
- A basement car park on Wentworth Street, which has an entrance that ramps up to a car lift.
- a ground level and a basement level bike room.
- a waste collection room in each building.
- a non-residential space on Wentworth Park Road
- a substation off of Park Lane in the north block

### **Flood Planning Levels**

City of Sydney has a Local Environment Plan and an Interim Floodplain Management Policy that set flood planning controls for development in the LGA. The LEP sets out objectives for floodplain management while all controls are contained in the policy. The primary considerations for the proposed development are the applicable Flood Planning Levels and the impact on existing flood behaviour.

The Flood Planning Level (FPL) for the property is a function of the type of development and flood behaviour. For the purposes of this analysis, three criteria are applicable for this site:

- Residential habitable rooms: 1% AEP flood level + 0.5m freeboard.
- Residential non-habitable rooms: 1% AEP flood level
- Below-ground car parks: the higher of 1% AEP flood level + 0.5m freeboard and PMF flood level.

The City of Sydney Interim Floodplain Management Policy (2014) specifies the following: “The below ground garage/car park level applies to all possible ingress points to the car park such as vehicle entrances and exits, ventilation ducts, windows, light wells, lift shaft openings, risers and stairwells”. As such, the vehicle entrance to the basement car park and the elevator and stair entrances to the basement car park are all identified as basement ingress points.

Moreover, the policy also specifies the definition of local drainage flooding which occurs where: the maximum cross-sectional depth of flooding in the local overland flow path through and upstream of the

site is less than 0.25m for the 1% AEP flood. Thus, local drainage flooding is not applicable on the site. The subject site is then subject to mainstream flooding controls.

Table 1 presents the flood levels and applicable FPL for various entrances around the site. The description is based on the floor plan (date 29/04/2020) provided by the client. The point locations are shown on Figure 3.

Table 1: Flood Levels and Depth and FPL summary at the site

Point	Type of development that entrance accesses	1% AEP Level (mAHD)	PMF Level (mAHD)	FPL Criteria	FPL (mAHD)
01	Basement car park (vehicle)	3.83	4.38	PMF	4.38
02	Basement car park (via lifts)	3.60	4.24	PMF	4.24
03	Waste collection room	3.32	4.25	1% AEP	3.32
04	Basement car park (stairs)	3.33	4.25	PMF	4.25
05	Residential (non-habitable)	3.32	4.25	1% AEP	3.32
06	Residential (habitable)	3.32	4.24	1% AEP +0.5m	3.82
07	Residential (habitable)	3.31	4.24	1% AEP +0.5m	3.81
08	Residential (habitable)	3.51	4.24	1% AEP +0.5m	4.01
09	Residential (habitable)	3.57	4.24	1% AEP +0.5m	4.07
10	Residential (habitable)	3.65	4.26	1% AEP +0.5m	4.16
11	Residential (habitable)	3.65	4.25	1% AEP +0.5m	4.16
12	Residential (habitable)	3.88	4.36	1% AEP +0.5m	4.38
13	Residential (habitable)	3.88	4.38	1% AEP +0.5m	4.38
14	Residential (habitable)	3.88	4.38	1% AEP +0.5m	4.38
15	Residential (habitable)	3.88	4.25	1% AEP +0.5m	4.38
16	Basement car park (via lifts)	n/a	4.36	PMF	4.36
17	Residential (non-habitable)	3.32	4.25	1% AEP	3.32
18	Non-residential	3.27	4.22	1% AEP	3.27
19	Non-residential	3.4	4.25	1% AEP	3.4
20	Substation	3.31	4.25	1% AEP +0.5m	3.81
21	Substation	3.31	4.25	1% AEP +0.5m	3.81
22	Residential Basement (non-habitable)	3.33	4.25	1% AEP	3.33
23	Waste collection	3.32	4.25	1% AEP	3.32
24	Non-Residential	3.67	4.24	1% AEP	3.67

The Flood Planning Level requirement is not currently satisfied at all locations. Specifically, the open space on Wentworth Street is flood-affected in the PMF event, which sets the FPL at the entrance to the residential foyer (including basement elevators) and adjacent basement car park stairway (point 16 in Table

1). On Wentworth Street along the boundary of the open space, the 1% AEP flood level is up to 3.87 mAHD and the PMF up to 4.35 mAHD. The open space is raised from the street level, with access via a ramp, and set at 4.20 mAHD. This means the open space is not flooded in the 1% AEP event, and experiences shallow flooding in the PMF of less than 0.2 m. Point 16 (see Table 1) is therefore below the FPL. Arguably the residential rear entrances (points 12 to 15) are in the Outer Floodplain (per policy definition) and, being 0.3 m above the street level, have satisfied their FPL requirements. However, a more conservative application of the policy would consider their FPL to be based on the 1% AEP + 0.5 m on Wentworth Street, which is the FPL listed in Table 1.

For discussion purposes, it is noted that the FPL around the perimeter of the open space would be significantly different were the space to be made flood free in all flood events. This would mean the ingress points (specifically points 12 to 16) would not be flood-affected in any event, including the PMF, and would therefore be located in the Outer Floodplain, and only require a floor level 300 mm above Wentworth Street. Such a scenario could be achieved by raised the courtyard a further 0.2 m, to above 4.37 mAHD (equivalent to the 1% AEP + 0.5 m on Wentworth Street). The below image illustrates the hypothetical change.



Plan showing the open space off Wentworth Street

Other locations that do not meet the FPL requirement are the substation in the north block, and the waste collection rooms on either side of Park Lane. The waste collection rooms use a split-level configuration with bins stored on a raised level (3.85 mAHD and 4.3 mAHD in the two buildings), with a lifter and stairs connecting to the lower part of the room at street level (around 2.9 mAHD). The FPL at the waste collection rooms is 3.32 mAHD, equivalent to the 1% AEP. Therefore, any electrical features in the lower part of the room, including the lifter, will be required to be “suitable for continuous underwater immersion and should contain no fibrous components”, as per CoS policy. Similarly, the substation is below the flood level and requires flood-proofing to ensure damage does not occur during a flood event.



## Flood Impact Assessment

The Interim Floodplain Management Policy and the Local Environment Plan require that development in the floodplain avoids significant adverse impact on flood behaviour. Adverse impacts occur when there is a significant loss of flood storage or floodway, which leads to increase flood levels in an adjacent area. Where such an increase occurs on or against adjacent property, there is a corresponding increase in flood risk, which the policies seek to prevent.

The proposed development is situated in a fully-developed area of the Blackwattle Bay catchment and is not expected to have any significant impact on existing flood behaviour. The minor changes to the building footprints of the two blocks has been tested via schematisation in Council's hydraulic model, using the 1% AEP flood event. The difference in flood level in the existing and proposed model scenarios is presented on Figure 4.

The figure shows that the increased building footprint on the north block slightly reduces the conveyance on Park Lane, and has an associated increase in flood level. The increase is minor and does not impact any adjacent properties. On Wentworth Street, there is a reduction in flood level due to the slight adjustment in building footprint. The impact map shows that the development does not have a significant adverse impact on the area's flood behaviour.

Yours Sincerely

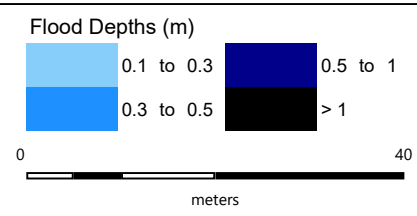
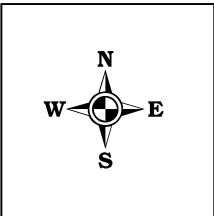
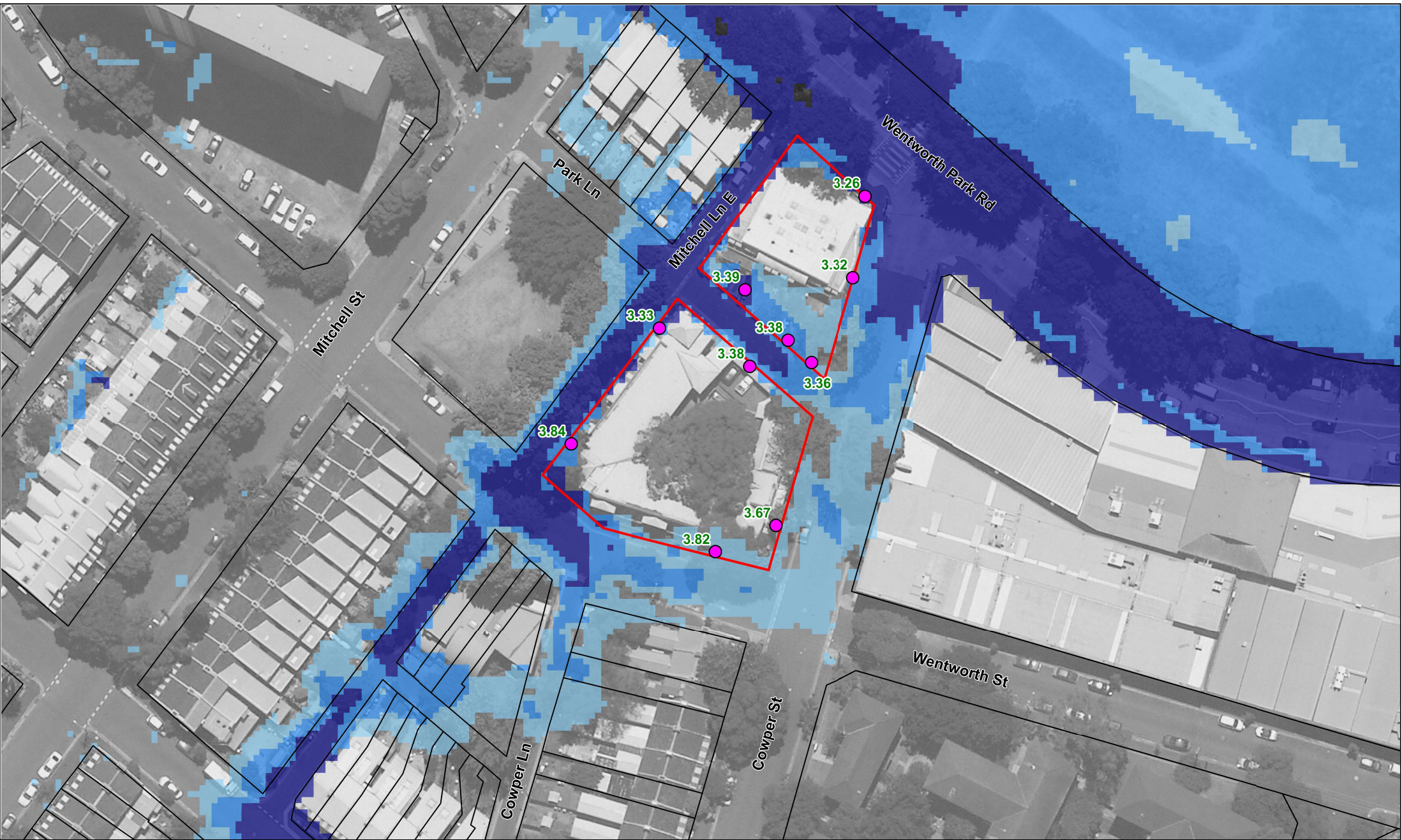


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- Study Area
- Cadastral\_Boundaries
- Inspection Points
- 123 1% AEP Flood Level

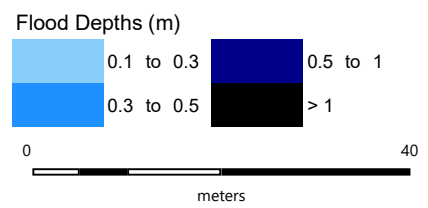
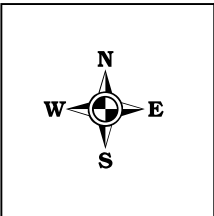
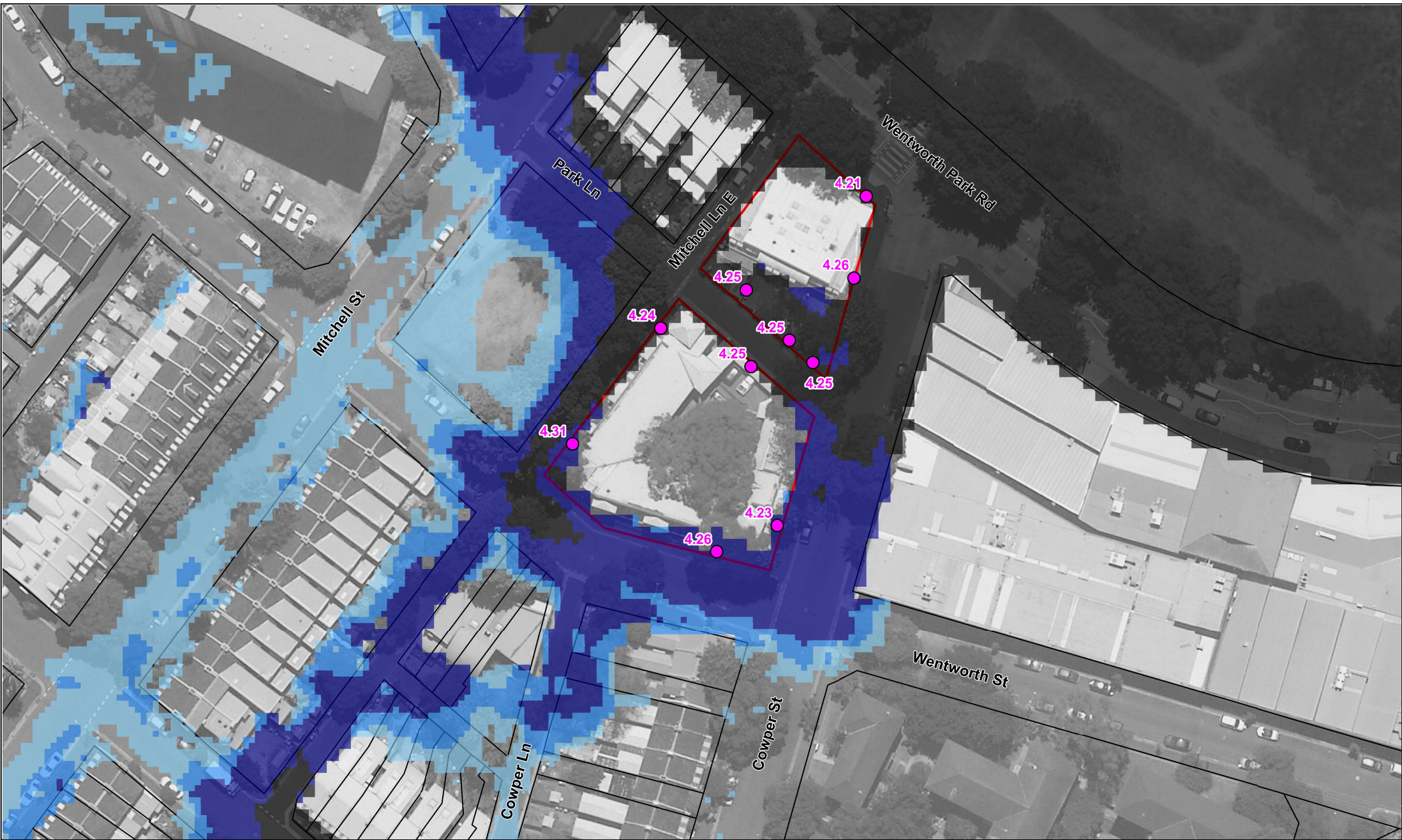
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PROJECT: 31 Cowper Street Re-development  
 PROJECT No. 190052

DATE: Nov 2019      SCALE: 1 : 800      FIGURE NUMBER: 01





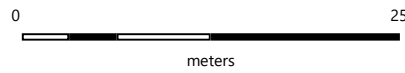
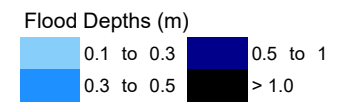
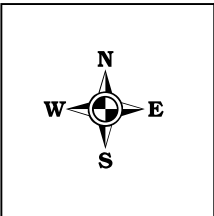
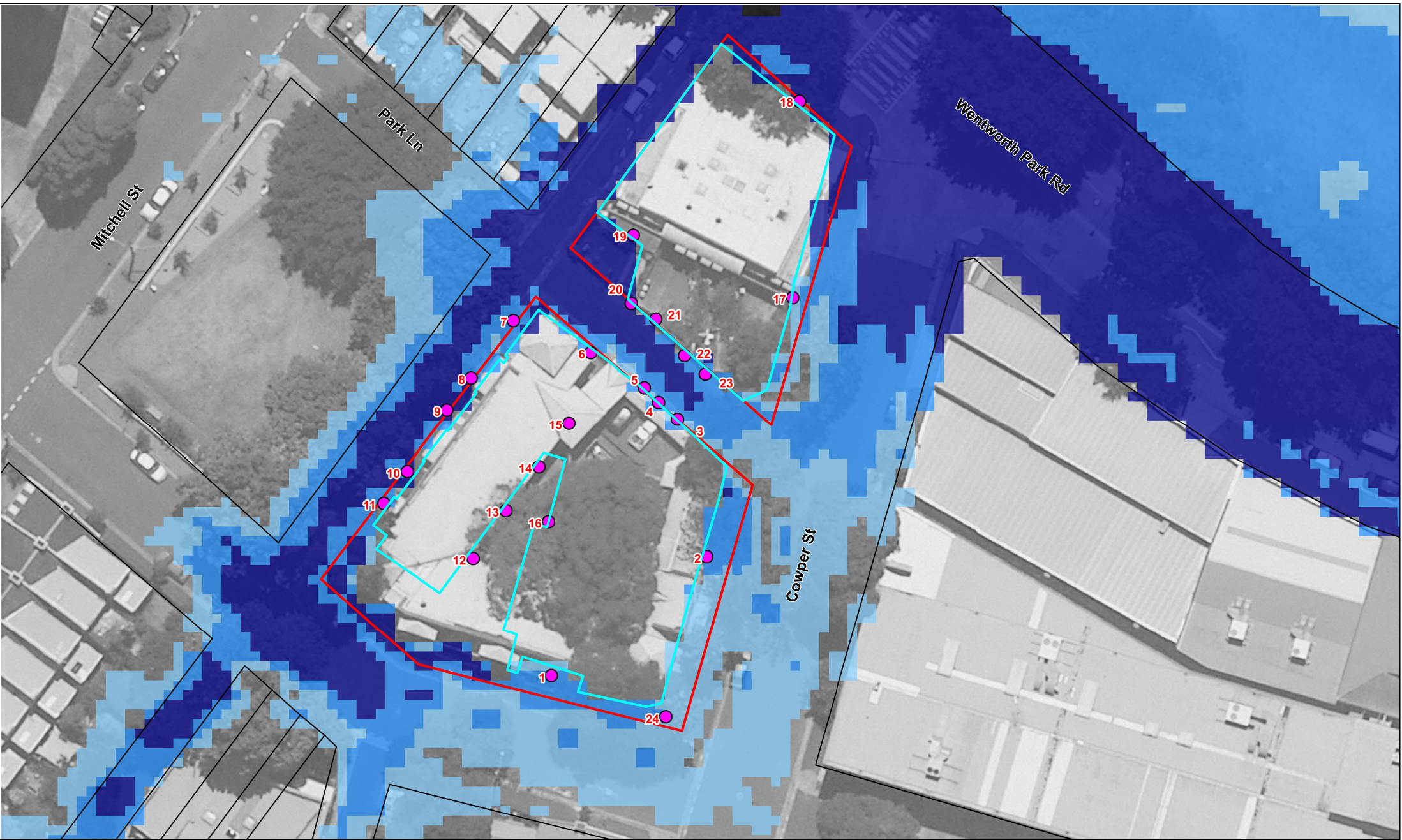


- Study Area
- Cadastral\_Boundaries
- Inspection Points
- 123 PMF Flood Level

<b>TITLE: PMF Peak Flood Depths &amp; Levels - Base Case</b>		
PROJECT: 31 Cowper Street Re-development		
PROJECT No. 190052		
DATE: Nov 2019	SCALE: 1 : 800	FIGURE NUMBER: 02







- Study Area
- Cadastral\_Boundaries
- Proposed Building Outline
- Entrances Points
- 123 ID in the Certificate

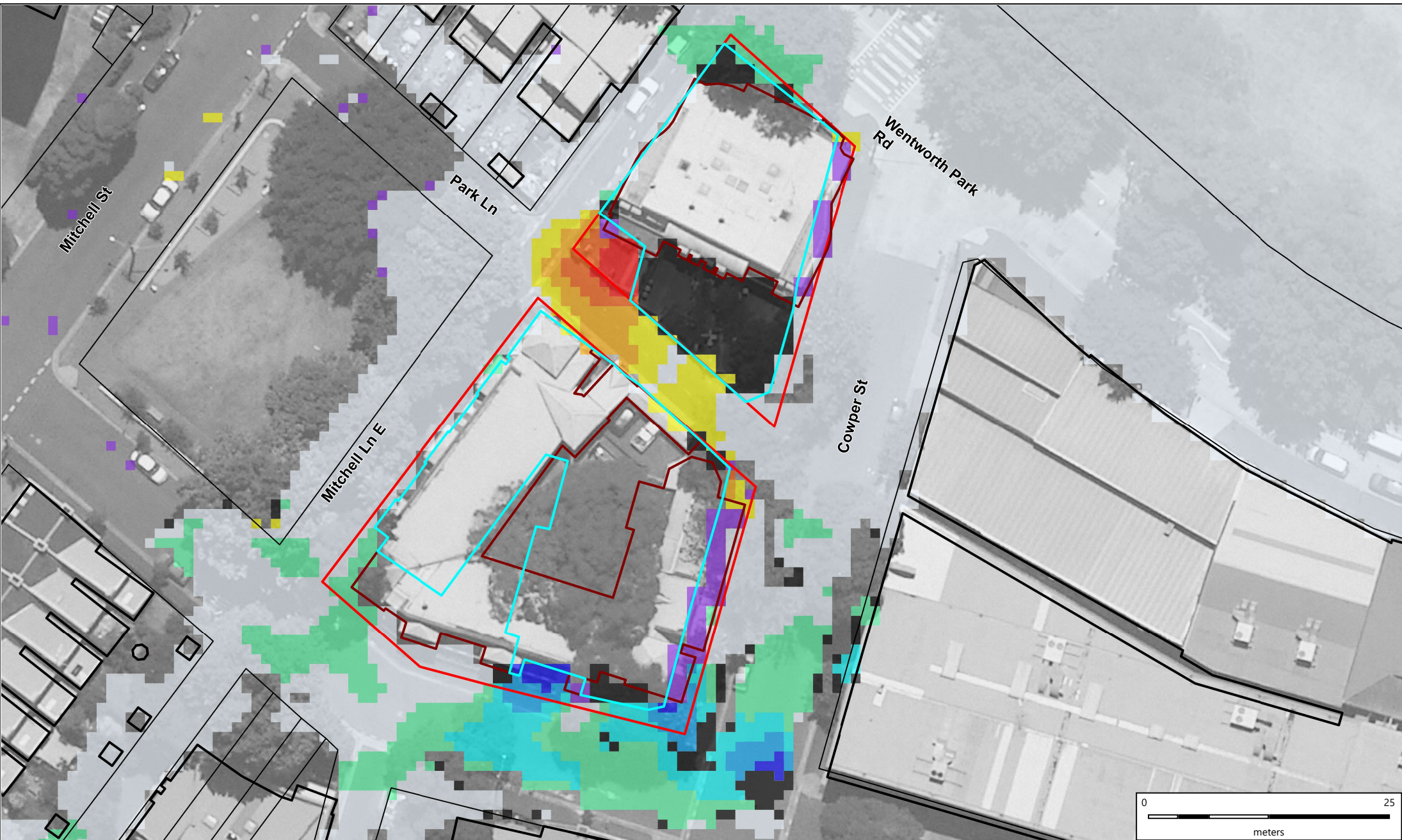
TITLE: **1% AEP (100 year ARI) Proposed Peak Flood Depths - FPL**

PROJECT: 31 Cowper Street Re-development  
 PROJECT No. 190052

DATE: May 2020      SCALE: 1 : 500      FIGURE NUMBER: 03







	<b>Change in Flood Level (m)</b> <table border="0"> <tr> <td> &lt; -0.07</td> <td> -0.03 to -0.01</td> <td> 0.03 to 0.05</td> </tr> <tr> <td> -0.07 to -0.05</td> <td> No Impact</td> <td> 0.05 to 0.07</td> </tr> <tr> <td> -0.05 to -0.03</td> <td> 0.01 to 0.03</td> <td> &gt; 0.07</td> </tr> </table>			< -0.07	-0.03 to -0.01	0.03 to 0.05	-0.07 to -0.05	No Impact	0.05 to 0.07	-0.05 to -0.03	0.01 to 0.03	> 0.07	<table border="0"> <tr> <td> Study Area</td> </tr> <tr> <td> Cadastral Boundaries</td> </tr> <tr> <td> Buildings in the Base Case</td> </tr> <tr> <td> Buildings in the Proposed Case</td> </tr> </table>		Study Area	Cadastral Boundaries	Buildings in the Base Case	Buildings in the Proposed Case	<b>TITLE: 1% AEP (100 year ARI) Peak Flood Impacts - Proposed Case</b>		
	< -0.07	-0.03 to -0.01	0.03 to 0.05																		
	-0.07 to -0.05	No Impact	0.05 to 0.07																		
-0.05 to -0.03	0.01 to 0.03	> 0.07																			
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			PROJECT: 31 Cowper Street Re-development PROJECT No. 190052																		
			DATE: May 2020	SCALE: 1 : 500	FIGURE NUMBER: 04																