IGLU
Level 4, 68 York Street
Sydney NSW 2000

R190710_118116_75CarltonCrescent_SiteFloodAssessment_Final

10 July 2019

Attention: Mr A Brown

Dear Adam

74-75 Carlton Crescent, Flood Impact Assessment

1. BACKGROUND

Iglu No. 210 Pty Ltd (Iglu) proposes the redevelopment of 74-75 Carlton Crescent, Summer Hill. The site is immediately north of the Summer Hill Supa IGA, separated from the store by a pedestrian footpath. To the west of the site is the Darrell Jackson Gardens, including the Summer Hill Skate Park and tennis courts. The subject site is shown on Diagram 1. The site is located within the Hawthorne Canal Catchment. WMAwater completed the Hawthorne Canal Flood Study in 2015 on behalf of the former Ashfield Council and the former Marrickville Council (now amalgamated with the former Leichhardt Council to form the Inner West Council).

The proposed development involves the demolition of the existing 2-storey warehouse building (former Summer Hill Ambulance Station), retention of the Ambulance Station façade and construction of a new 3 to 4-storey student accommodation building with landscaping works. Given that the development involves a change to the existing building footprint, it is necessary to assess the impact of the proposed development on flood behaviour in the vicinity of the site in the 1% AEP event. Furthermore, Council has requested an assessment of the impact of the development in the Probable Maximum Flood (PMF). Flood behaviour around the site is highly hazardous in the PMF, and this event forms the basis of flood emergency management and evacuation plans for neighbouring commercial premises. As such, it is important to understand the impacts of the proposed development on flood behaviour in this size event.

Details of the proposed development have been taken from the *74-75 Carlton Crescent Summer Hill, DA Flood Condition Response*, prepared by Taylor Thomson Whitting, 4/6/2019 (Reference 5).

Diagram 1 Site Location

2. AVAILABLE INFORMATION

2.1. Source of Flood Information

The flood models developed in the Hawthorne Canal Flood Study, undertaken by WMAwater in February 2015 (Reference 1), have been refined locally using the below data. The revised modelling has been presented herein and used for the provision of design flood behaviour and as the basis for the flood impact assessment.

2.2. Detailed Survey

Detailed survey of existing ground levels, topographic features and building footprints surrounding the site were provided for this assessment in PDF and DWG format, attached in Appendix A. The survey was undertaken by LTS Lockley and dated 17th September 2018.

2.3. LiDAR Data

The LiDAR used for the development of the Flood Study (Reference 1) DEM was updated from 2007 data to LiDAR collected in 2013 by LPI.

2.4. Proposed Building Design

The proposed building extent, finished floor and site grading levels used for this assessment were taken from the DA Flood Condition Response (181975 CAAA) provided by Taylor Thomson Whitting

and dated 4th June 2019. A copy of this document is included in Appendix A. Further details of the proposed development features are provided in Section 4.1.

3. EXISTING FLOOD BEHAVIOUR

3.1. Peak Flood Depths and Levels

The site is impacted by overland flow affectation at the Carlton Street frontage, along the western boundary, and at the rear of the site. The most significant flood risk occurs at the south (rear) of the site, where fast flowing water moves from the Darrell Jackson Gardens eastwards towards Hardie Avenue and into the IGA carpark. Peak flood depths at the rear of the site within this flowpath vary between 0.3 m and 0.7 m in the 1% AEP event, and can reach depths of up to 2 m in the PMF.

At the front of the site, Carlton Crescent is subject to shallow overland flow moving from east to west towards the low point just north of the Darrell Jackson Gardens, which then moves south and joins the flow path described above.

A summary of 1% AEP and Probable Maximum Flood (PMF) flood levels from the refined flood modelling is provided in Table 1. Figure 2 shows peak flood depths and levels in the 1% AEP event, and the refined base case results for the PMF are provided in Figure 3. It is noted that the refinement of existing building footprints east of the site has led to the further constriction of the flowpath through the pedestrian walkway at the rear of the site. This has caused peak flood levels to be higher at the rear of the site in the PMF than was shown in results from the Council adopted Flood Study (in a Flood Information Report supplied to Iglu No. 210 3/12/2018), though the 1% AEP flood levels are not materially affected. The PMF flood levels provided in the original report are provided in brackets. The model refinement has not affected existing flood behaviour at the front of the site.

Table 1: Peak Flood Levels

Location	Corner	Peak Flood Level 1% AEP Event (mAHD)	Peak Flood Level PMF (mAHD)
Carlton Crescent (Front of Site)	East	23.4	23.9
	West	23.3	23.7
Rear of Site	East	20.1	21.6 (21.0)
	West	20.5	21.8 (21.3)

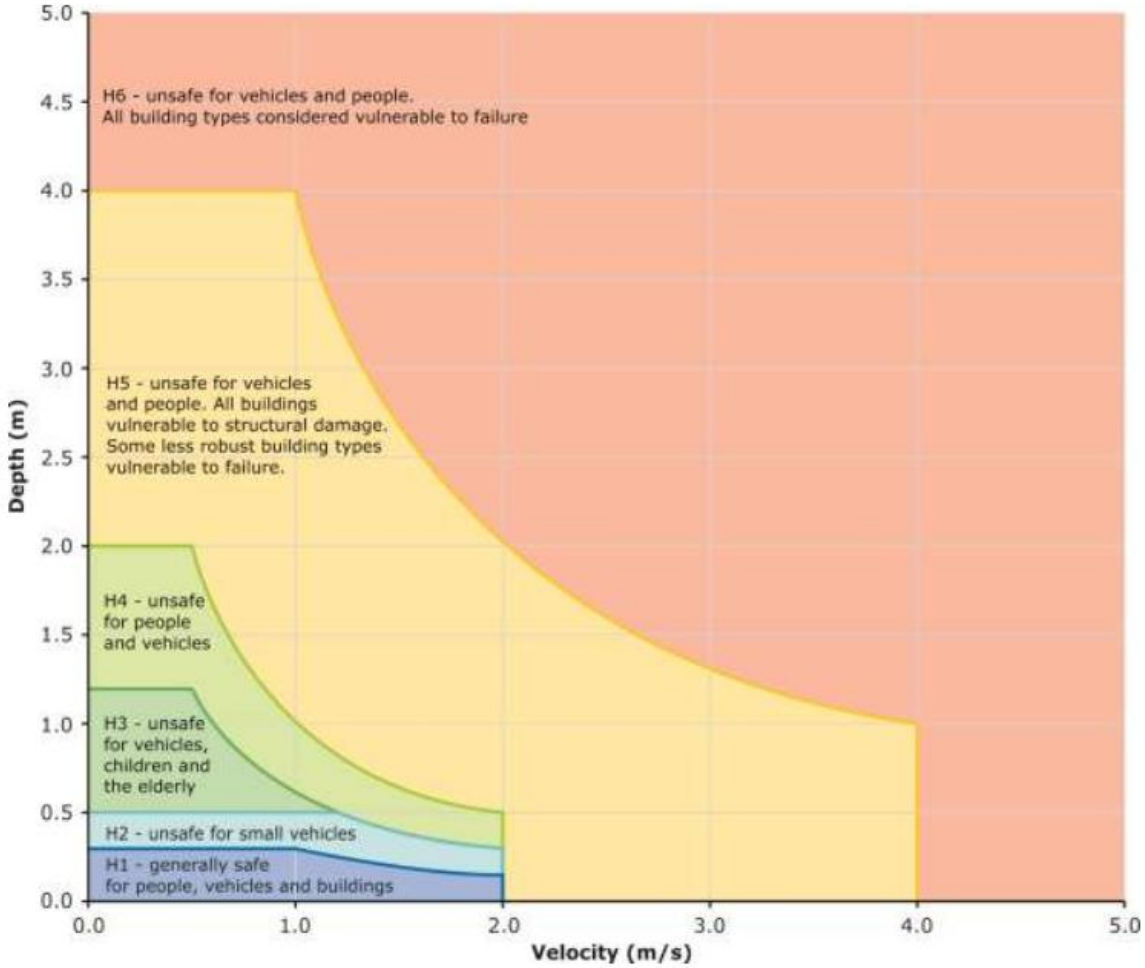
3.2. Flood Hazard

Hazard classification plays an important role in informing floodplain risk management in an area as it reflects the likely impact of flooding on development and people. In recent years there has been a number of developments in the classification of hazard especially in *Managing the floodplain: a guide to best practice in flood risk management in Australia (Third Edition)* (Reference 6). The classification is divided into 6 categories (H1-H6), listed in Table 2, which indicate the constraints of the hazard on people, buildings and vehicles appropriate to apply in each zone. The criteria and threshold values for each of the hazard categories are presented in Diagram 2.

Table 2: Hazard Categories

Category	Constraint to people/vehicles	Building Constraints
H1	Generally safe for people, vehicles and buildings	*No constraints*
H2	Unsafe for small vehicles	*No constraints*
H3	Unsafe for vehicles, children and the elderly	*No constraints*
H4	Unsafe for vehicles and people	*No constraints*
H5	Unsafe for vehicles and people	All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6	Unsafe for vehicles and people	All building types considered vulnerable to failure

Diagram 2: Hazard Classifications



The hydraulic hazard classifications in the refined base case are shown on Figure 4 and Figure 5 for the 1% AEP event and PMF respectively. The classifications indicate that in the 1% AEP, flood hazard in the southern flow path is variable, with sheltered areas classified as H1/H2, while areas of greater velocity (away from the existing warehouse, towards the IGA building) are classified as H3-H5. In the PMF however, the flowpath immediately south of the site is largely classified as H5 – *"unsafe for vehicles and people, all buildings vulnerable to structural damage. Some less robust building types vulnerable to failure".* Velocity results have not been reported specifically, but based on the relationship shown in Diagram 2, peak flood velocities within this flowpath would be expected to be greater than 0.5 m/s in the PMF event.

It is noted that the front of the site on Carlton Crescent is subject to a much lower hazard classification, consistent with the shallow depths of overland flow occurring. In the 1% AEP event, the front (northern) and western sides of the building are classified as H1, while in the PMF, this classification increases to H2 on Carlton Crescent, with localised areas of higher hazard, and up to H4 along the western boundary.

4. FLOOD IMPACT ASSESSMENT

The proposed development involves the demolition of the existing 2-storey warehouse building, retention of the original 1924 Ambulance Station façade, and construction of a new 3 to 4- storey student accommodation building with landscaping works. As the proposed development changes the existing building footprint, and given the flood affectation at the rear of the site on Hardie Avenue, an impact assessment was undertaken to determine whether the proposed development has the potential to cause off-site flood impacts.

4.1. Representation of Proposed Design

Once the refined base case was established, the hydraulic model was modified to represent the proposed building footprint and landscape works. The design includes an open central courtyard, and ground floor level at RL 20.35 mAHD, below the flood planning level (21 mAHD, based on the 1% AEP level at the southwestern corner of the site (20.5 mAHD plus 0.5 m freeboard).

To prevent ingress of water into the site in events up to and including the 1% AEP event, five 'Flood Control' measures are proposed (Reference 6 - refer to Attachment B), and have been incorporated in the proposed design modelling (Figure 6):

1. **Flood Control 1** (northern frontage of the building): levels at property boundary to fall back (northwards) towards kerb at 2.5% grade. Footpath ground levels along the Carlton Crescent frontage were raised in the proposed design model to reflect this control.

2. **Flood Control 2** (west): Driveway Crest Level at 23.80m AHD. The driveway crest was included in the proposed design model.

3. **Flood Control 3** (southwest): top of flood wall at 23.80 mAHD at northern end and 20.90 mAHD (0.4 m above the 1% AEP level of 20.50 mAHD) at southern-most point. A permanent, impermeable wall was included in the model with the above level. It is noted that at the southern end, this wall is below the FPL (21 mAHD, based on the 1% AEP + 0.5 m).

4. **Flood Control 4** (south): Landscaped section set at 20.90 mAHD at western edge and 20.75 mAHD at eastern edge, and a wall along property the southern boundary set at 20.75 m AHD. Ground levels were modified in the landscaped section and a permanent, impermeable wall was included in the proposed design model with the above level. It is noted that this wall would be overtopped in rarer events (by approx.. 1.5 m in the PMF).

5. **Flood Control 5** (south): Suspended bike storage slab with slab underside at 20.40 mAHD, 0.15 m above 1% AEP flood level (20.25 m AHD). It is assumed that there is flow beneath suspended slab in the 1% AEP event following advice from TTW by email, K Smith, 25/6/2019. In larger events, the walls around the bike storage area would cause obstruction to flow moving west to east along the flow path at the rear of the site. The proposed construction above the bike storage slab has been assumed to be solid, impermeable walls around the perimeter of the bike storage area. It is understood these walls are structural elements that support the above residential floors.

4.2. Proposed Case Flood Behaviour

4.2.1. Peak Flood Depths and Levels

Peak flood depths and levels for the proposed development scenario are shown in Figure 7 and Figure 8 for the 1% AEP and PMF events. In the 1% AEP event, flood behaviour outside the site is generally consistent in both the base case and proposed design case, with the impacts of the proposed development detailed in Section 4.3. Overland flow is conveyed beneath the bike storage area at the south of the site, and excluded from the internal courtyard by the proposed flood control walls and landscaping.

At the rear of the site, the PMF is between 1.5 m – 2 m deeper than the 1% AEP event, and is deep enough to overtop the flood control measures described in Section 4.1 by around 1.5 m. In the PMF event, flow enters the site from the rear and is trapped in the internal courtyard, ponding to depths of up to 1.8 m above the ground floor level (situated at RL 20.35 mAHD). The impermeable walls around the bike storage area act as an obstruction to flow in the PMF, and increase the peak flood levels upstream of the bike storage area. It is noted that even without this obstruction, the PMF is deep enough to overtop the proposed flood control measures (by approximately 1.5 m) and enter the site.

4.2.2. Flood Hazard – Proposed Case

In the 1% AEP event the hazard classifications are generally consistent with the existing flood conditions, with areas of H3-H5 in the flowpath at the rear of the site, and remainder of the site surrounded by shallow flooding associated with a hazard classification of H1.

In the PMF event, the significant depths within the site (up to 1.8 m) lead to the internal courtyard being classified as H4 – indicating it is ‘Unsafe for people and vehicles’ based on the categorisation outlined in Reference 6, and the area of H5 hazard in the southern flow path is extended west into the tennis courts. The walkway area between the IGA and the bike storage area is classified as H6. Importantly, in regions classified as H5 and H6, all buildings are vulnerable to structural damage. The flood control walls and bike shed walls in particular will be exposed to deep, fast flows, and will need to be designed appropriately to withstand the flood conditions at the rear of the site.

It is noted also that the PMF event is based on a storm duration of 30 minutes, and the high rate of rise in the courtyard would significantly limit the available warning and evacuation time.

4.3. Impact Assessment Results

4.3.1. 1% AEP Event Flood Impacts

The peak flood levels for the refined base case and developed case were compared, with the results shown on Figure 11 for the 1% AEP. Flood level impacts within +/- 0.01 m are shown in grey as such variations are within the precision tolerance of the hydraulic modelling (Reference 4).

Within the site, open areas inside the flood walls/landscaping are classified as 'no longer flooded' in the 1% AEP as flooding is excluded from the site by impermeable 'flood walls' and raised sections of landscaping. These structures however would be overtopped and the courtyard inundated in larger events.

The design ground levels beneath the suspended bicycle storage locally increase peak flood levels by up to 0.04 m. The landscaped area just west of the bicycle storage (currently a driveway) causes peak flood level increases of up to 0.04 m. These impacts are within the proposed site boundary.

Outside the site at the western boundary, peak flood levels along the footpath and the tennis courts are reduced by 0.02 m.

At the front of the site, the raised footpath increases peak flood levels on Carlton Crescent by up to 0.03 m, with impacts occurring east of the site within the footpath. The impact is not limited to the frontage of the 75 Carlton Crescent building but extends to the 72A, 70 and 69 Carlton Crescent. The peak flood depth and level results at the Carlton Crescent frontage (Figure 7) indicate that this flooding is shallow (less than 150 mm). The hydraulic hazard on Carlton Crescent in the base case is shown on Figure 4 for the 1% AEP event, and Figure 9 for the proposed case for the same design event. Figure 4 and Figure 9 show that the hydraulic hazard associated with this shallow inundation is classified as 'H1' in the Australian Institute for Disaster Resilience Technical Flood Risk Management Guidelines (Flood Hazard) indicating it is 'generally safe for people, vehicles and buildings', and the hazard classification in this area is not changed by the proposed development.

4.3.2. PMF Impacts

Council has requested an assessment of the impact of the development in the PMF. Flood behaviour around the site is highly hazardous in the PMF, and this event forms the basis of flood emergency management and evacuation plans for neighbouring commercial premises. As such, it is important to understand the impacts of the proposed development on flood behaviour in this size event.

The proposed development affects flooding in three key areas – within the site itself, along the walkway between the site and the IGA, and in Darrell Jackson Gardens. The peak flood level impacts are shown on Figure 12, and a description of other flood metrics (e.g. depths and levels, hazard and velocity) is provided below.

Within the site at 74-75 Carlton Crescent, the internal courtyard is newly flooded (to depths of up to 1.8 m) as the PMF is deep enough to overtop the flood control measures at the southern end of the

site. With a peak flood level of ~22.3 mAHD, the flood control measures are overtopped by approximately 1.5 m. The hydraulic model assumes that the proposed building footprint is impermeable and is 'nulled out' of the model – resulting in parts of the proposed building shown as 'no longer flooded' compared to existing conditions. While this assumption is appropriate for simulating the obstruction to flow that the building would cause, in reality, water would ingress the ground floor and result in property damage and pose a significant flood risk to residents.

In the walkway between the bike storage area and the IGA building, the flow path is constrained by the proposed bike storage area. While the obstruction causes peak flood levels to drop on the downstream side (by up to 0.2 m at the eastern end of the walkway, and up to 0.05 m in the carpark), the flow is confined to a much narrower path, resulting in peak flood velocities of over 3 m/s and depths of 2.1 m within the walkway. This depth and velocity is associated with the highest hazard classification (H6, refer to Section 4.2.2), in which not just people and vehicles are endangered, but building structures are at risk of failure.

Upstream of the site to the west and south, the Darrell Jackson Gardens are subject to peak flood level increases of up to 0.4 m as a result of the proposed development, in particular, caused by the obstruction caused by the bike storage area. The peak flood level increases also affect the southern side of the IGA building (at 1-11 Hardie Avenue), and premises at 13-17 Hardie Avenue and 123-129 Smith Street.

5. CONCLUSIONS

WMAwater has undertaken a site-specific flood assessment for the proposed development at 74-75 Carlton Crescent, Summer Hill. The impacts of the proposed development on flood behaviour in the 1% AEP event and PMF were modelled using the Hawthorne Canal Flood Study model, with local refinements to appropriately represent the topographic features at the site.

The proposed development involves the retention of the existing building façade on Carlton Crescent, and demolition of the former NSW Ambulance Station building. The proposed residential building includes an internal courtyard and range of flood control measures to prevent ingress of flooding up to the 1% AEP event, with some freeboard allowance. It is noted however that part of the flood wall is below the flood planning level (1% AEP + 0.5m) typically required for residential development, and that these measures would be overtopped in the PMF event, by approximately 1.5 m.

The impact assessment found that in the 1% AEP event, the development would not increase peak flood levels at the rear of the site (south) outside the site boundary by more than 0.01 m, which is within the tolerance of the modelling. Raising the existing footpath along the Carlton Crescent frontage increases peak flood levels along the footpath by up to 0.03 m, but does not increase the associated hazard in this area as the flood depths are very shallow (less than 150 mm) in the 1% AEP event, in both the existing and proposed cases.

The flood behaviour in the PMF event was also assessed for both the existing and proposed cases. In this event, the highly hazardous flow path along the rear of the site (moving from Darrell Jackson

Gardens to Hardie Avenue) would overtop the flood control walls/landscaping and enter the courtyard. With no internal drainage, flooding in the courtyard would quickly pond to depths of 1.8 m in the PMF event, and would likely ingress the ground floor residential area causing damage to property and putting residents at risk. Outside of the site, peak flood levels are increased by up to 0.4 m in the Darrell Jackson Gardens (tennis courts and skate park), and the pedestrian walkway becomes particularly hazardous as flow is constrained by the proposed bike storage area.

6. EXCLUSIONS

- This assessment has identified that in the PMF event, the internal courtyard and ground floor of the proposed development would be subject to significant flood depths and hazard. No assessment of the rate of rise, or investigation of flood events between the 1% AEP and PMF (e.g. 0.5% AEP, 0.2% AEP) has been undertaken as part of this assessment.

Please contact the undersigned for clarification of the above.

Yours Sincerely,

WMAwater

Erin Askew

Director

References

1. WMAwater
Hawthorne Canal Flood Study
Ashfield Council and Marrickville Council, February 2015

2. WMAwater
Dobroyd Canal and Hawthorne Canal Floodplain Risk Management Study and Plan, Stage3
Ashfield Council and Marrickville Council, December 2018

3. Inner West Council
Comprehensive Inner West DCP 2016 for Ashbury, Ashfield, Croydon, Croydon Park, Haberfield, Hurlstone Park and Summer Hill
Inner West Council, January 2017

4. Institute of Engineers Australia
Australian Rainfall and Runoff Revision Project 15 – Two-Dimensional Modelling in Urban and Rural Floodplains
November 2012

5. Taylor Thomson Whitting
74-75 Carlton Crescent Summer Hill DA Flood Condition Response
4th June 2019

6. Australian Institute for Disaster Resilience
Technical Flood Risk Management Guideline: Flood Hazard
Second edition, 2017

Figures:

Figure 1 Study Area
Figure 2 Peak Flood Levels and Depths – Base Case – 1% AEP Event
Figure 3 Peak Flood Levels and Depths - Base Case – PMF Event
Figure 4 Hydraulic Hazard – Base Case – 1% AEP Event
Figure 5 Hydraulic Hazard – Base Case – PMF Event
Figure 6 Proposed Case Model Schematisation
Figure 7 Peak Flood Levels and Depths – Proposed Case – 1% AEP Event
Figure 8 Peak Flood Levels and Depths – Proposed Case – PMF Event
Figure 9 Hydraulic Hazard – Proposed Case – 1% AEP Event
Figure 10 Hydraulic Hazard – Proposed Case – PMF Event (Preliminary Only)
Figure 11 Peak Flood Level Impact – 1% AEP Event
Figure 12 Peak Flood Level Impact – PMF Event

Attachments:

Attachment A Detail Survey – LTS Lockley
Attachment B DA Flood Condition Response – Taylor Thomson Whitting

FIGURE 1
74-75 CARLTON CRESCENT, SUMMER HILL
STUDY AREA

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FIGURE 2

74-75 CARLTON CRESCENT, SUMMER HILL
PEAK FLOOD DEPTH AND LEVEL CONTOUR
EXISTING CASE - 1% AEP EVENT

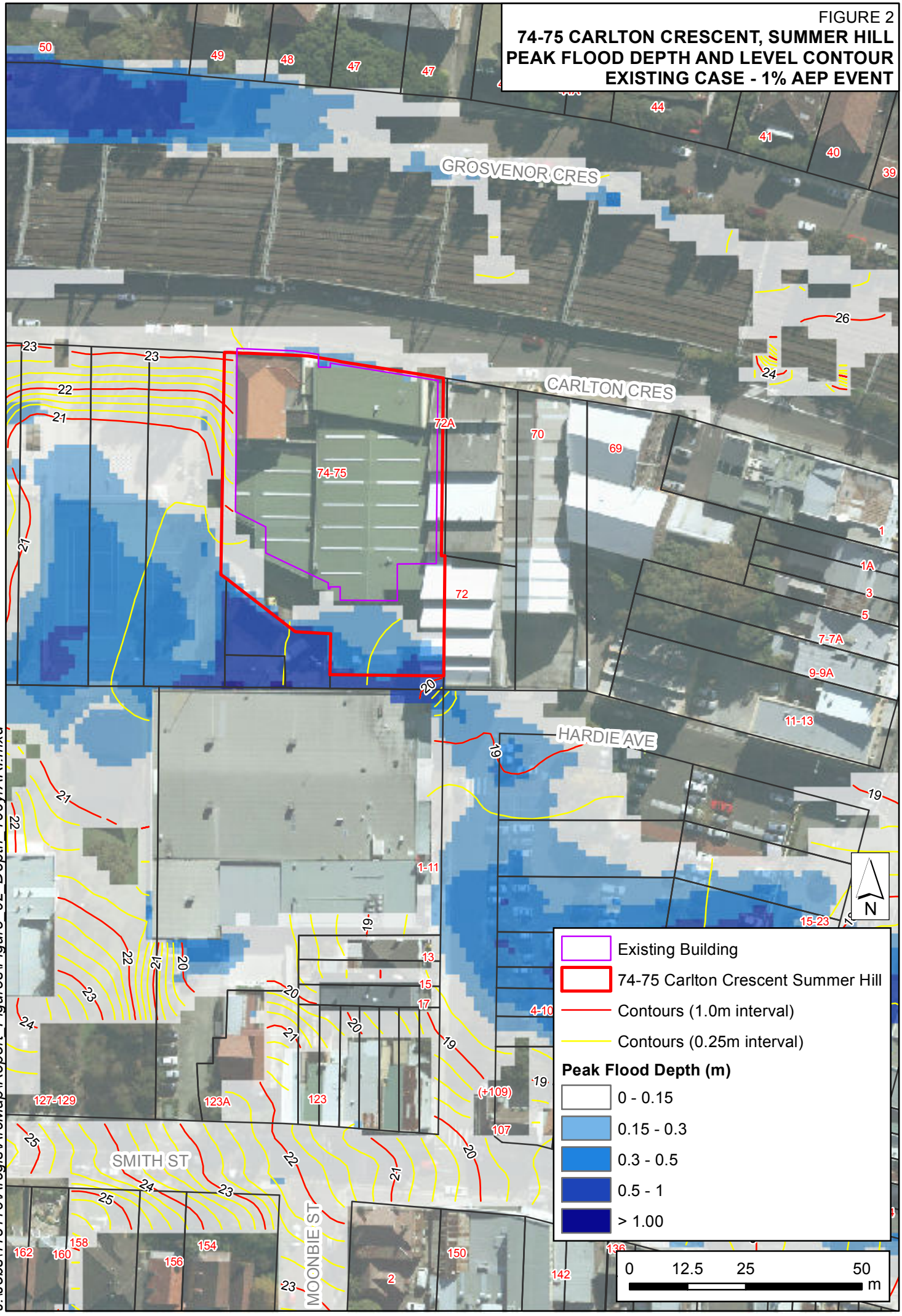

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FIGURE 3

74-75 CARLTON CRESCENT, SUMMER HILL
PEAK FLOOD DEPTH AND LEVEL CONTOUR
EXISTING CASE - PMF EVENT

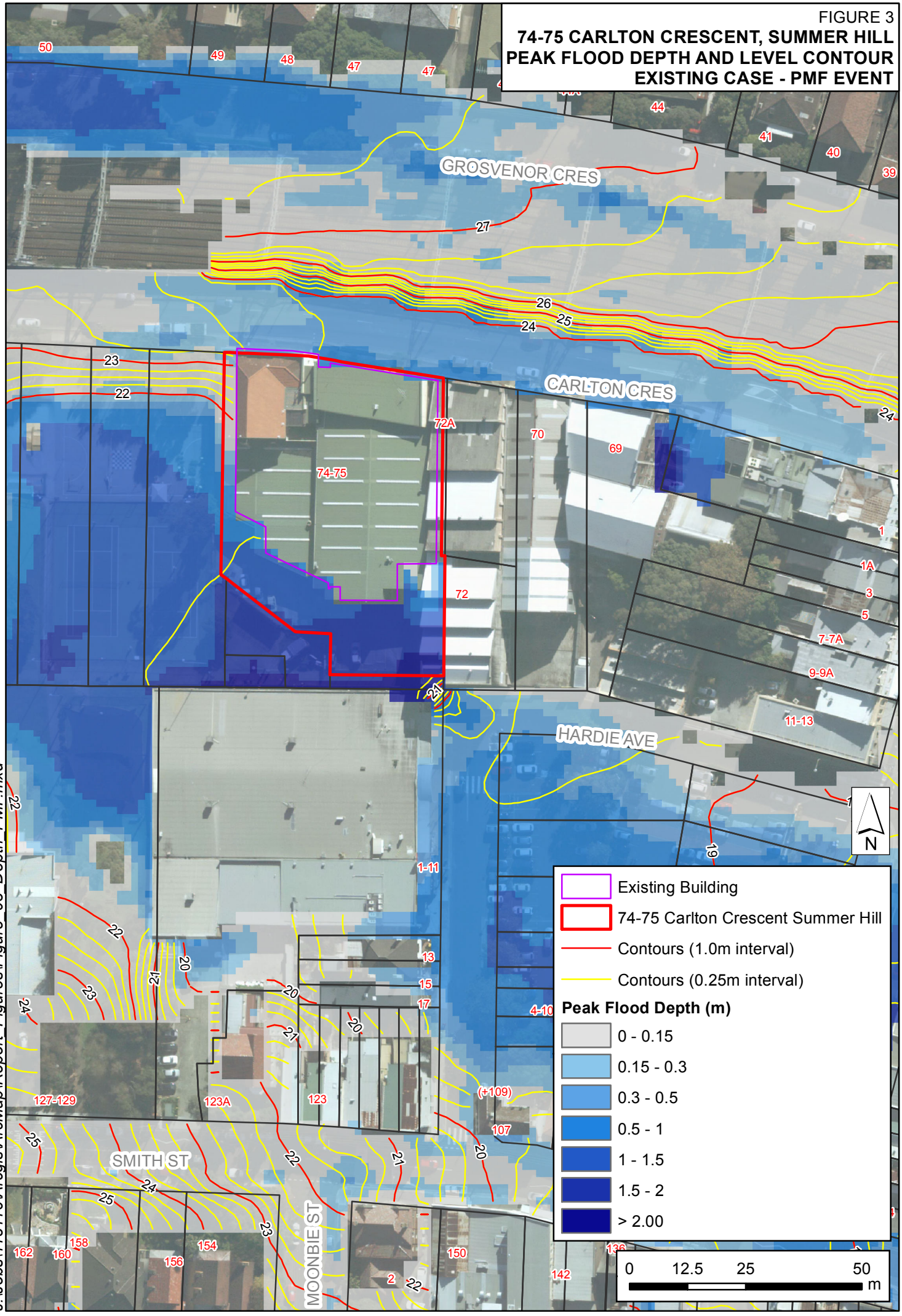

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FIGURE 4

74-75 CARLTON CRESCENT, SUMMER HILL
FLOOD HAZARD
EXISTING CASE - 1% AEP EVENT

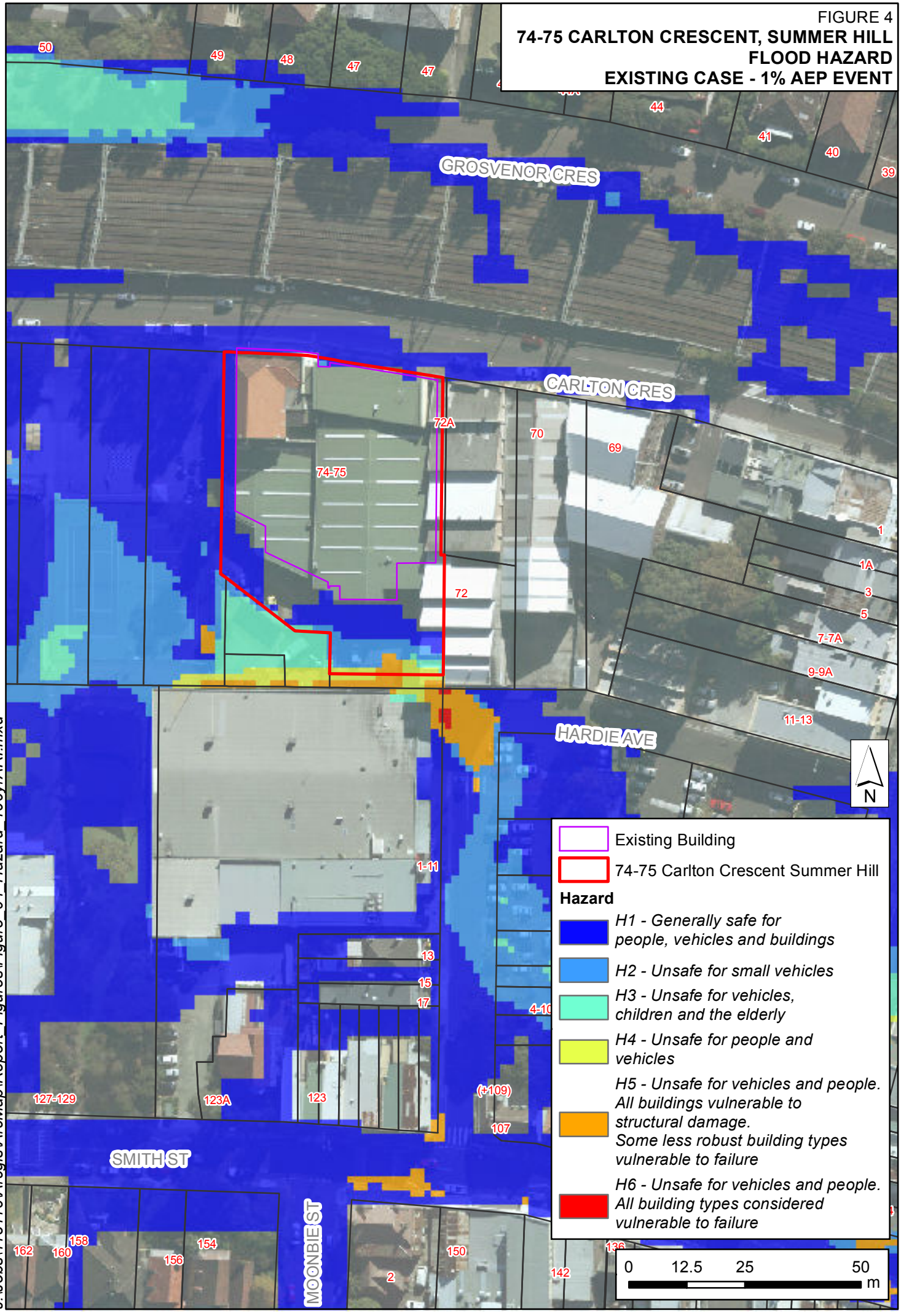

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FIGURE 5
74-75 CARLTON CRESCENT, SUMMER HILL
FLOOD HAZARD
EXISTING CASE - PMF EVENT

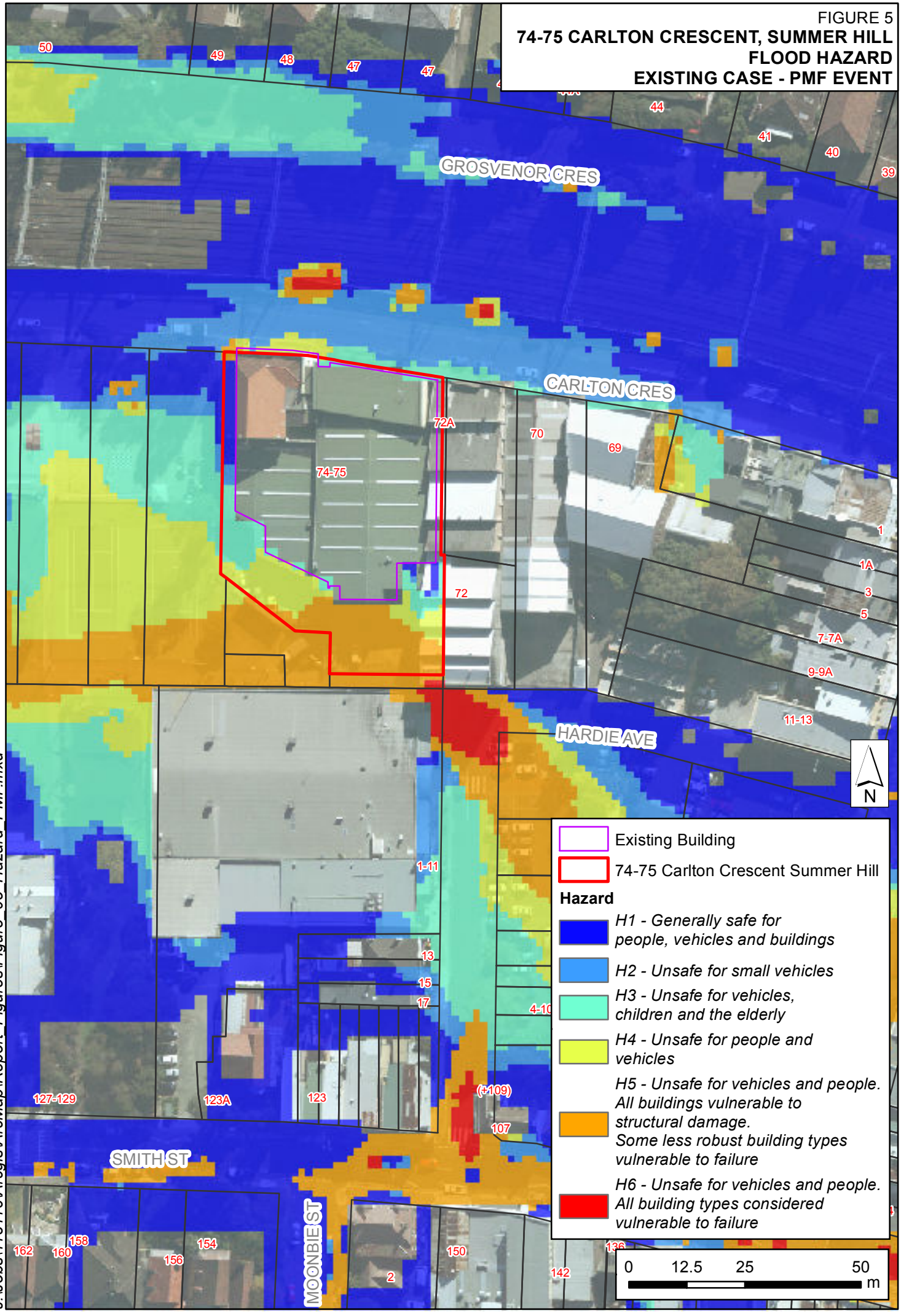

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FIGURE 6

74-75 CARLTON CRESCENT, SUMMER HILL
PROPOSED CASE
MODEL SCHEMATISATION

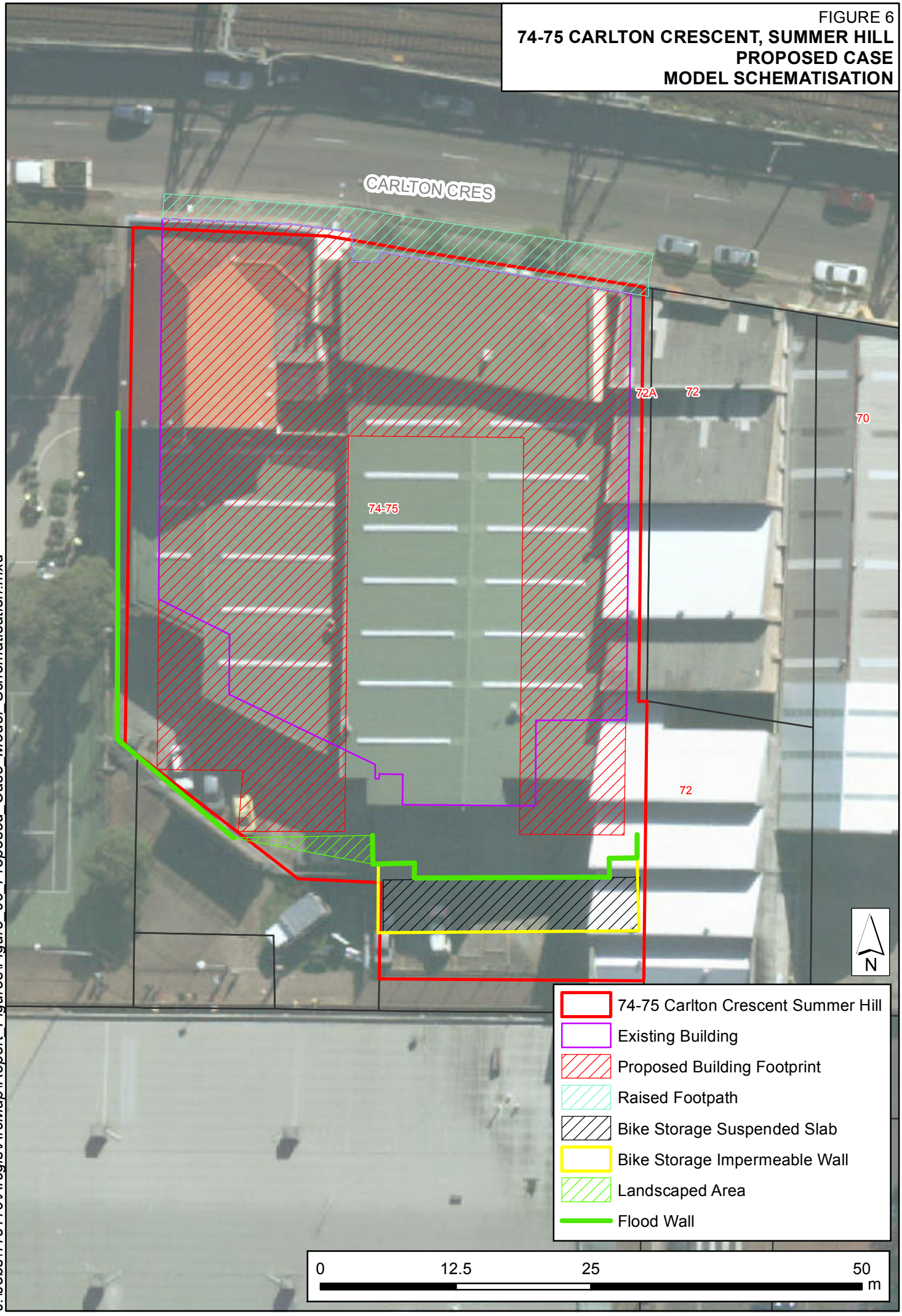

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FIGURE 7

74-75 CARLTON CRESCENT, SUMMER HILL
PEAK FLOOD DEPTH AND LEVEL CONTOUR
PROPOSED CASE - 1% AEP EVENT

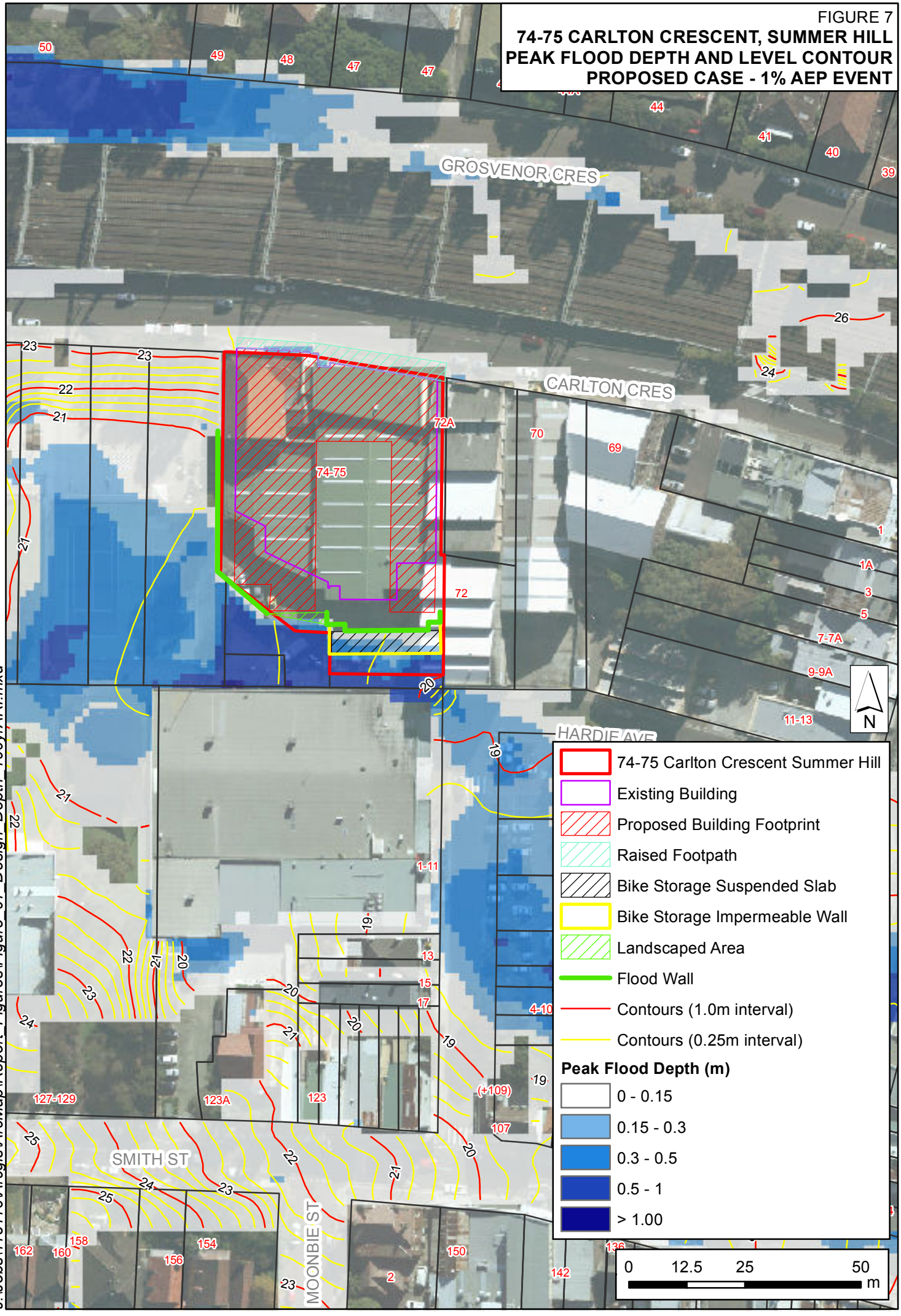

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FIGURE 8

74-75 CARLTON CRESCENT, SUMMER HILL
PEAK FLOOD DEPTH AND LEVEL CONTOUR
PROPOSED CASE - PMF EVENT

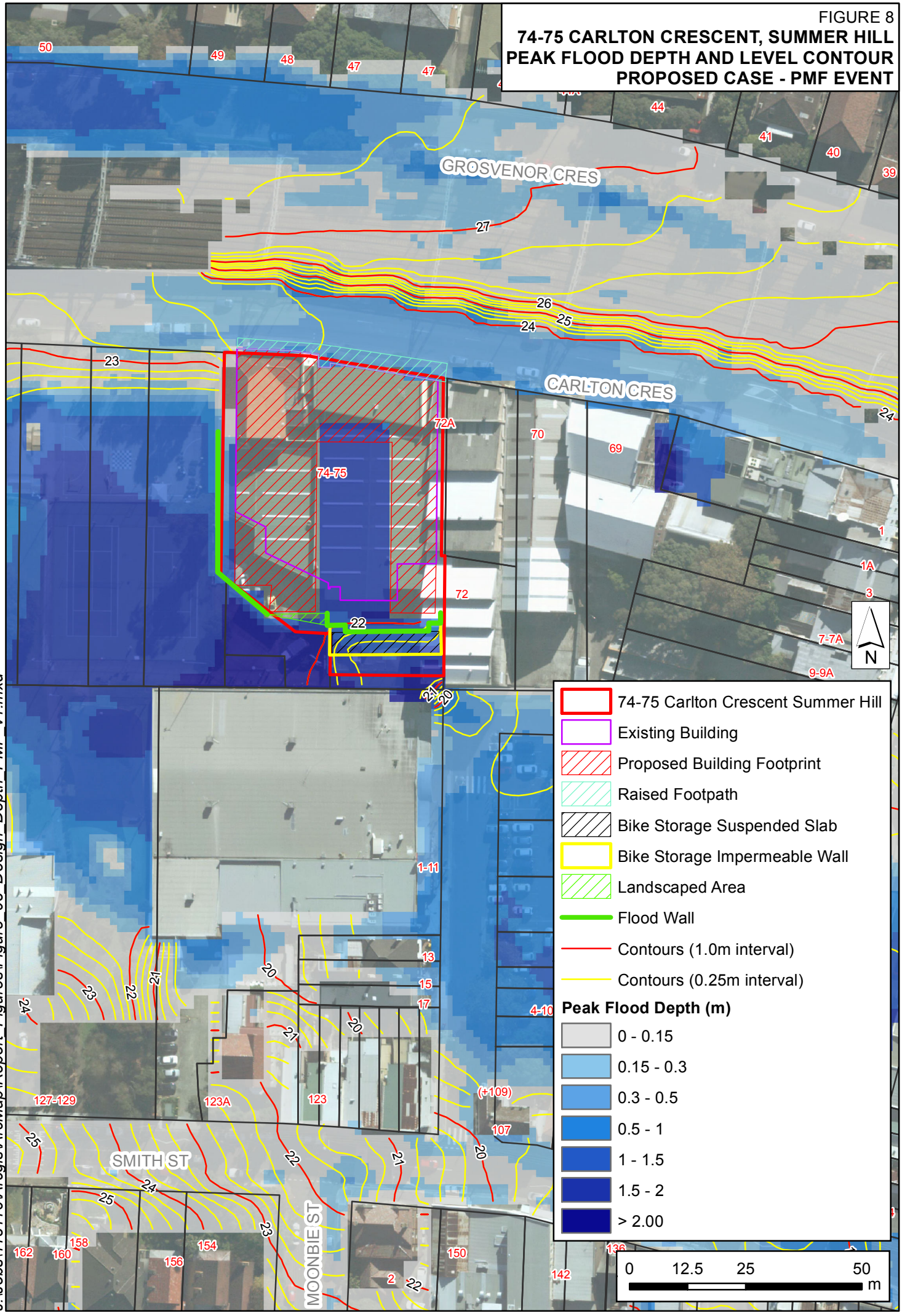

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FIGURE 9

74-75 CARLTON CRESCENT, SUMMER HILL
FLOOD HAZARD
PROPOSED CASE - 1% AEP EVENT

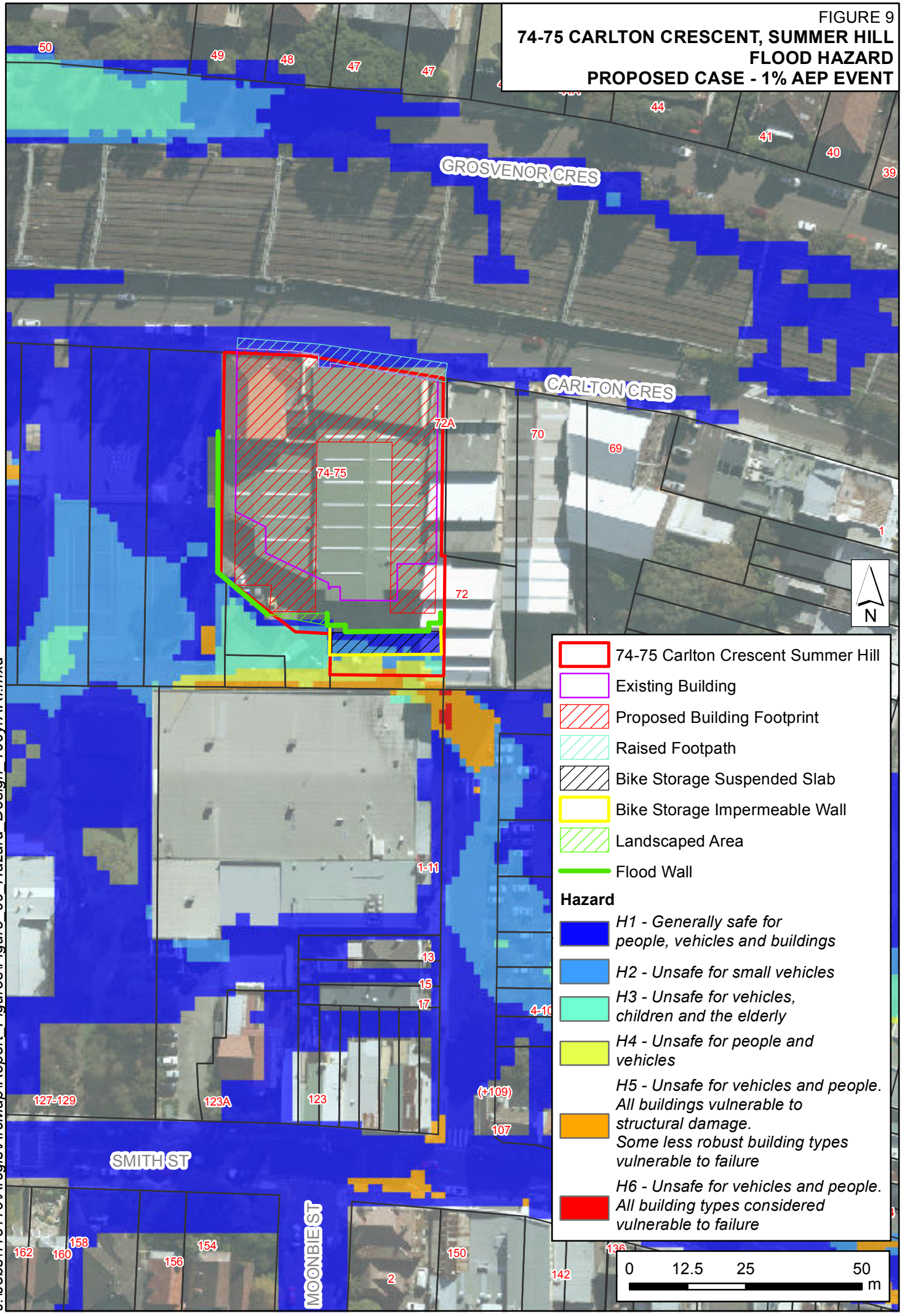

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FIGURE 10

74-75 CARLTON CRESCENT, SUMMER HILL
FLOOD HAZARD
PROPOSED CASE - PMF EVENT

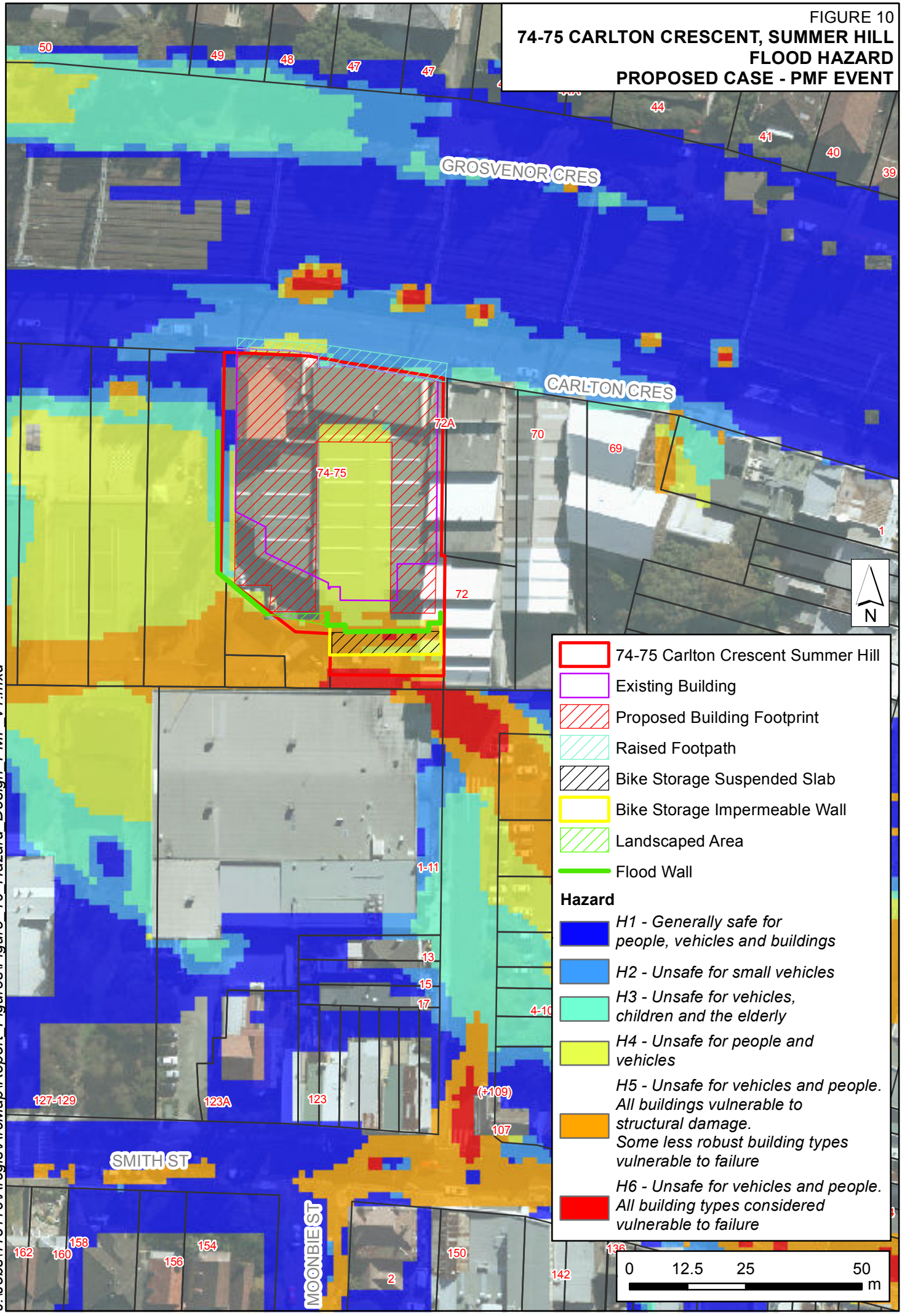

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FIGURE 11

74-75 CARLTON CRESCENT, SUMMER HILL
CHANGE IN PEAK FLOOD LEVEL
PROPOSED CASE - 1% AEP EVENT

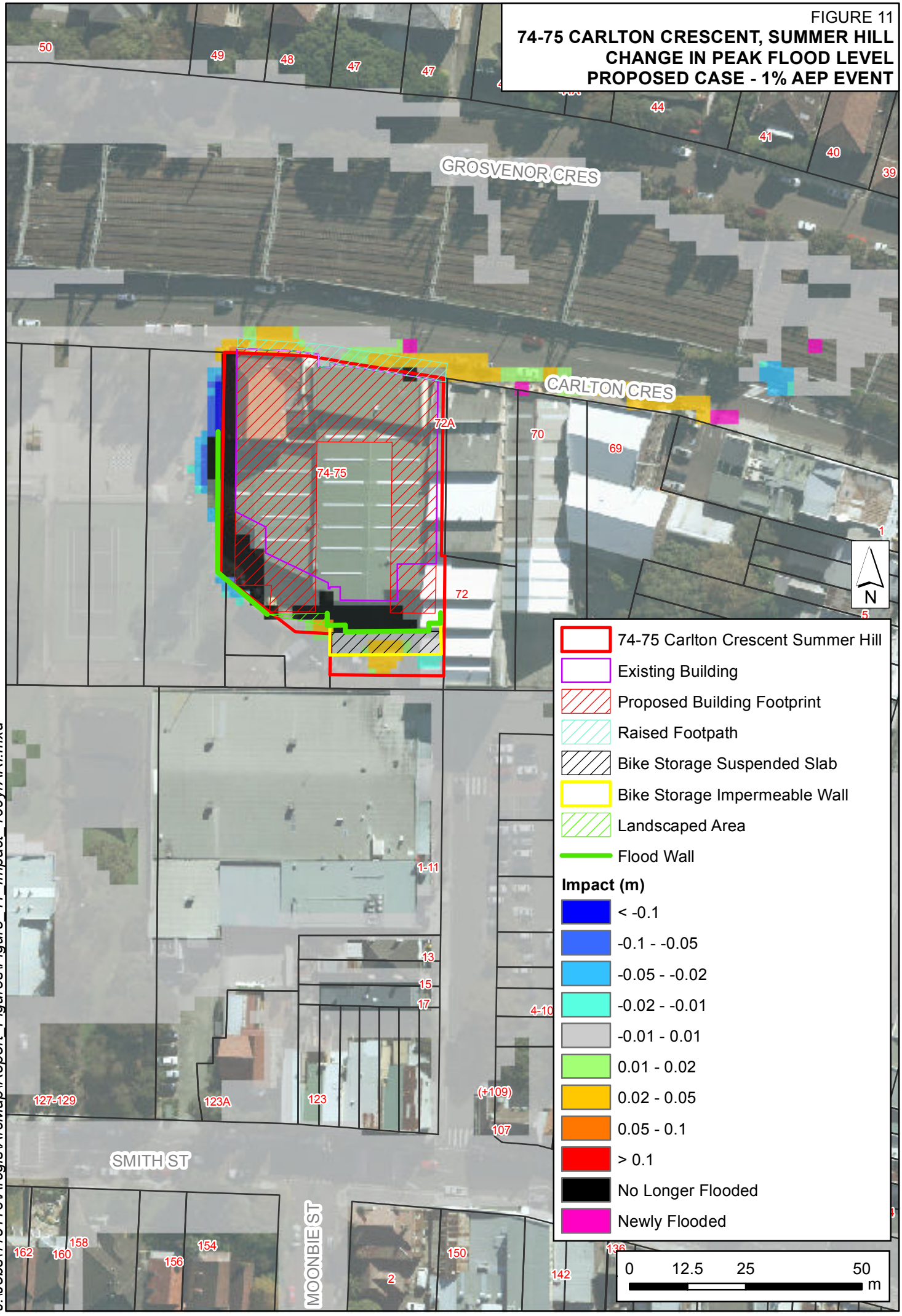

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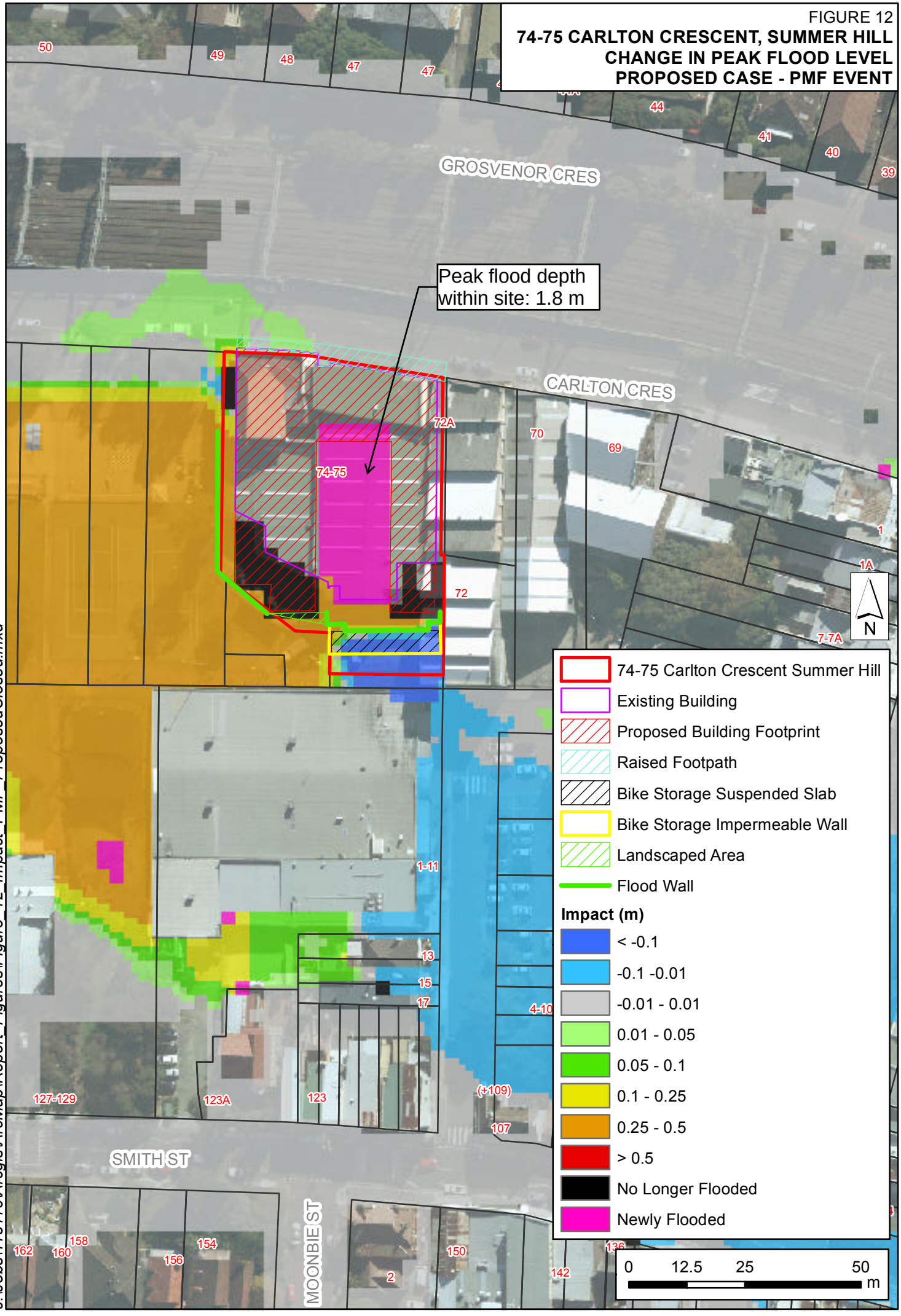
FIGURE 12

74-75 CARLTON CRESCENT, SUMMER HILL
CHANGE IN PEAK FLOOD LEVEL
PROPOSED CASE - PMF EVENT



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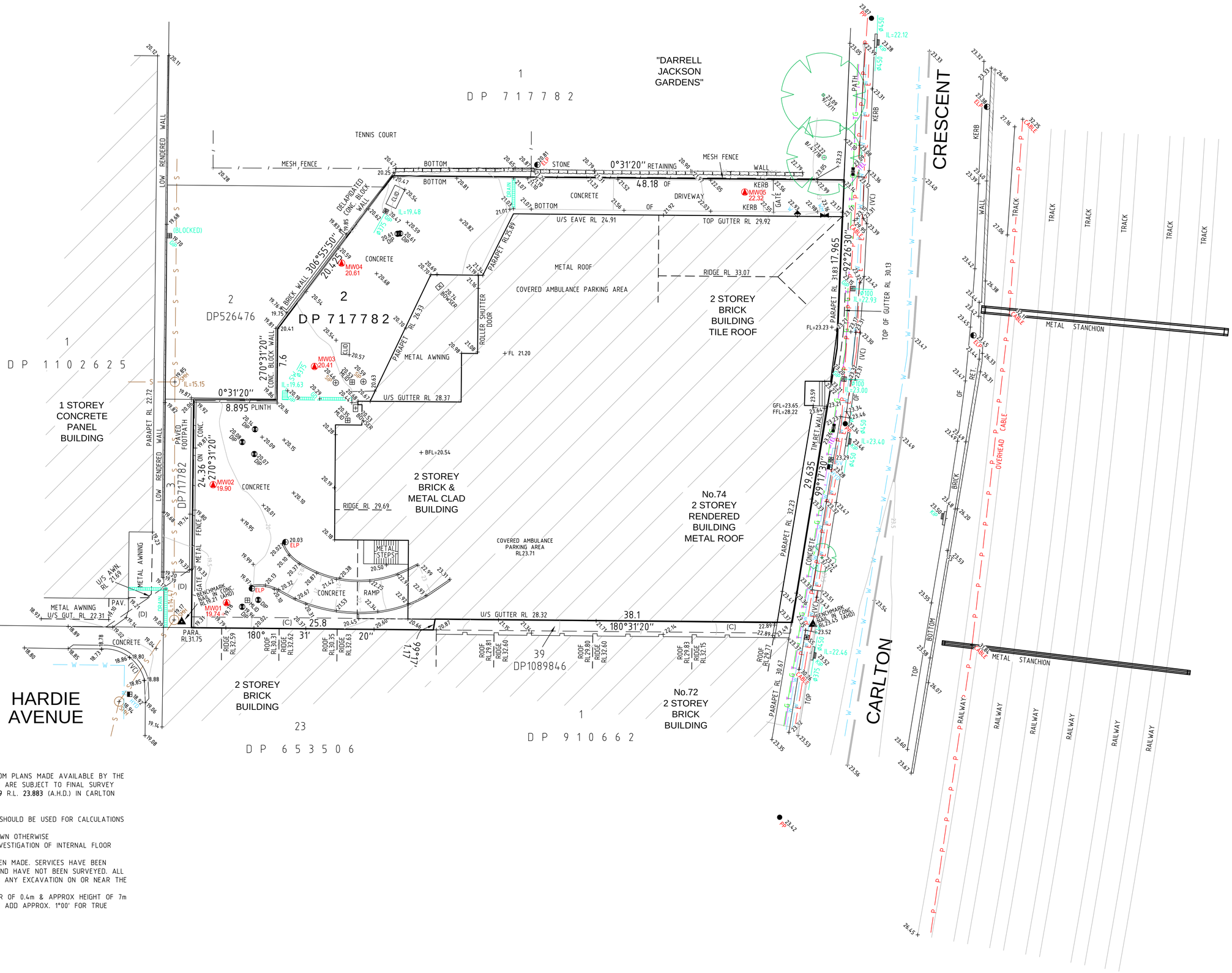
MGA

APPROX. TN 100

LEGEND

BENCH MARK	▲
TELSTRA PIT	TEL
ELECTRIC LIGHT POLE	ELP
POWER POLE	PP
PIT WITH CONCRETE LID	CLID
PIT WITH METAL LID	MLID
STREET SIGN	SS
GRATED INLET PIT	GIP
KERB INLET PIT	KIP
SEWER INSPECTION POINT	SIP
SEWER MANHOLE	SMH
FUEL DIPPING POINT	DIP
STOP VALVE	SV
HYDRANT	HYD
WATER METER	WM
WATER TAP	TAP
WATER VALVE	W
VEHICLE CROSSING	(VC)
FLOOR TO BEAM	F/B
FLOOR TO CEILING	F/C
FLOOR TO HEAD	F/H
FLOOR TO SILL	F/S
HEAD RL	H
SILL RL	S
WINDOW	W
GAS (DBYD)	G
TELSTRA (DBYD)	T
WATER (DBYD)	W
STORMWATER (DBYD)	SW
SEWER (DBYD)	S
ELECTRICITY (OVERHEAD)	P
ELECTRICITY (U'GROUND) (DBYD)	E
MONITORING WELL	▲



NOTES

1. THE BOUNDARIES HAVE NOT BEEN MARKED
2. ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY THE OFFICE of LAND & PROPERTY INFORMATION (NSW) AND ARE SUBJECT TO FINAL SURVEY
3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM **SSM96409** R.L. **23.883** (A.H.D.) IN CARLTON CRESCENT
4. CONTOUR INTERVAL **0.5 m**
5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
6. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
7. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
8. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
9. 8/.4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
10. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH

(C) RIGHT OF FOOTWAY AND EASEMENT FOR DRAINAGE (VIDE C509554)
(D) RIGHT OF CARRIAGEWAY (VIDE F346770 & W919219)

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

0 4 6 8 12 16 20
SCALE 1:200 @ A1

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	01/11/18	FLOOR PLAN AND ELEVATION ADDED	50006 004

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

.....

Registered Surveyor NSW

LTS LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client IGLU No.210 PTY LTD

Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 2 IN DP717782 KNOWN AS 74 CARLTON CRESCENT, SUMMER HILL

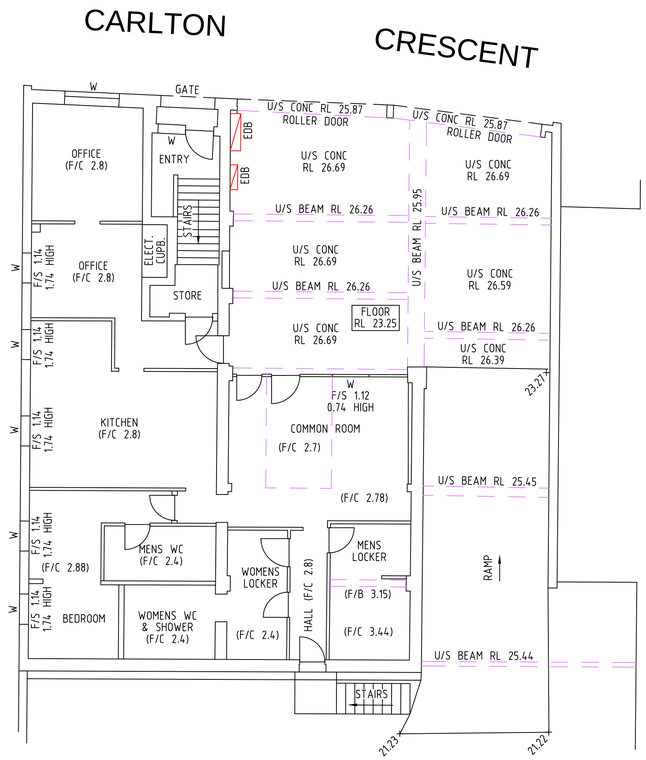
datum AHD
site Area 2896m²
LGA INNER WEST

reference number 50006_003DT
scale 1:200 @A1
date of survey 17/09/2018
SHEET 1 OF 2 SHEETS

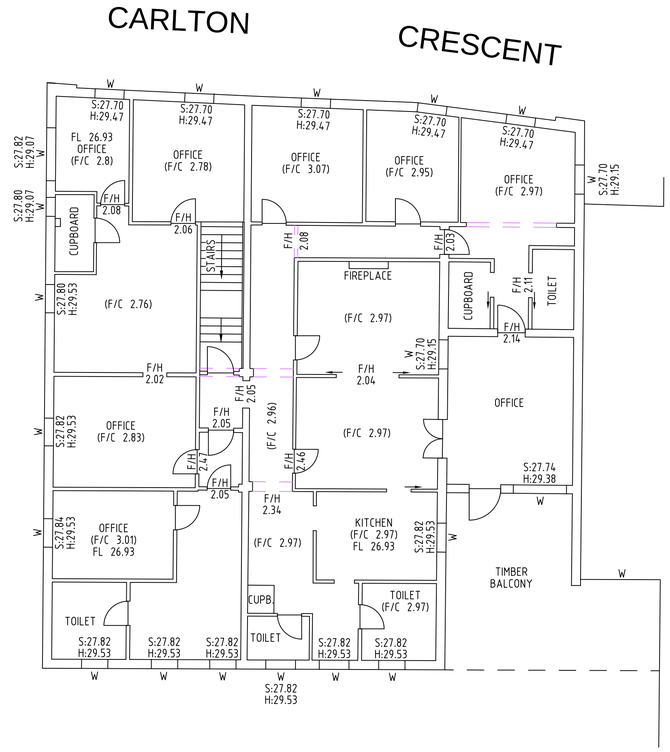
MGA

TN

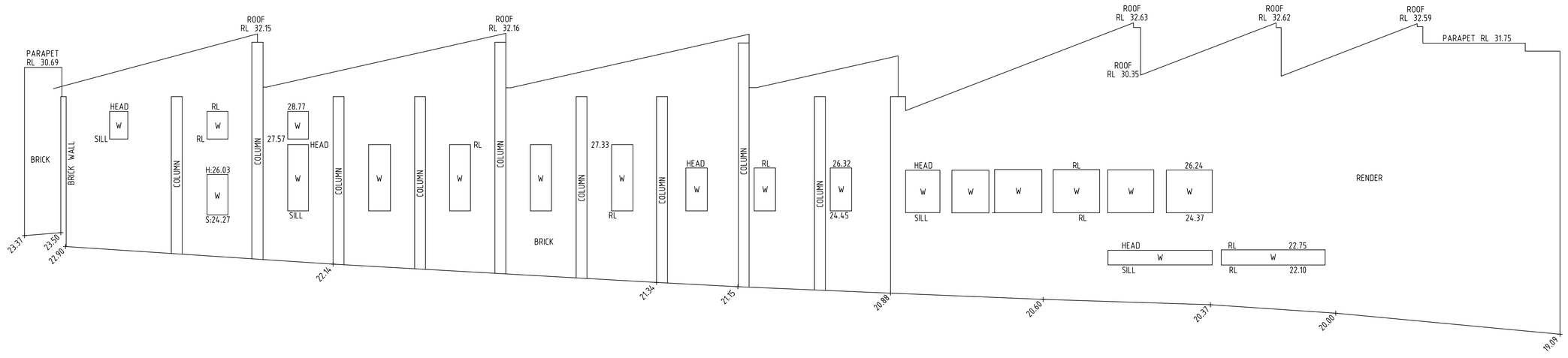
1:100 APPROX.



GROUND FLOOR PLAN



FIRST FLOOR PLAN
FL 26.93



WESTERN ELEVATION OF No72

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

0 2 3 4 6 8 10
SCALE 1: 100 @ A1

SEE NOTES AND LEGEND ON SHEET 1

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	01/11/18	FLOOR PLAN AND ELEVATION ADDED	50006 004

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

.....

Registered Surveyor NSW

LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client IGLU No.210 PTY LTD

Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 2 IN DP717782
KNOWN AS 74 CARLTON CRESCENT, SUMMER HILL

datum AHD
site Area 2896m²
LGA INNER WEST

reference number 50006_003DT
scale 1:100 @A1
date of survey 17/09/2018
SHEET 2 OF 2 SHEETS

04/06/2019 181975 CAAA

IGLU No. 210 Pty LTD
Level 4, 68 York Street
Sydney NSW 2000

Attention: Adam Brown

74-75 Carlton Crescent Summer Hill
DA Flood Condition Response

Dear Adam,

TTW have prepared the following in response to Inner West Council's (Council) Development Application Review for 74-75 Carlton Crescent, Summer Hill as it pertains to flooding. A copy of Council's DA response and the is included as Appendix A.

Flood Control 1

As per Council's DA response, the proposed installation of flood gates and a stormwater drainage line is not considered a satisfactory flood mitigation control. TTW considers Council's alternative control – the raising of the existing low-lying footpath along the Carlton Crescent Frontage to at least the kerb height – appropriate as an alternate option. Flood modelling undertaken as part of the Hawthorne Canal flood study suggests that minor ponding will occur along the frontage of 74-75 Carlton Crescent during the 1% AEP event due to low-lying levels footpath levels, and therefore raising of the footpath is likely to reduce this ponding and the flood risk during this event.

As per Council's response, raising of the footpath along the Carlton Crescent frontage must be accompanied by raising of the frontage (or part of the frontage) of the Summer Hill Skate Park to the west. It will also require re-grading of the existing footpath to the east and west of the site to assure DDA compliance.

Flood Control 2

Council's DA response indicates that finished levels for the proposed raised landscaping area are to be set at RL 23.9m AHD *"such that it is set to PMF level..*[and] *the level of 1% AEP + 500 mm freeboard"*. The table below indicates peak flood levels identified in the WMAwater Flood Certificate for 75 Carlton Crescent Summer Hill.

Location	Corner	Peak Flood Level 1% AEP Event (mAHD)	Peak Flood Level PMF (mAHD)
Front of Site (Carlton Crescent)	East	23.4	23.9
	West	23.3	23.7
Rear of Site	East	20.1	21.0
	West	20.5	21.3

As per the table, the peak flood level at the western corner of Carlton Crescent is 23.3 mAHD. TTW therefore recommends a finished level for the proposed ramp of 23.8 mAHD (assuming a 500 mm freeboard).

Flood Control 3

Council has indicated as part of their DA response that the proposed flood wall running along the western edge of the site will need to be set at the PMF level (23.9 mAHD at the northern end and 21.3 mAHD at the southern end). Correspondence with Council has indicated that this requirement is for flood evacuation purposes, as Council is concerned that during flood events rarer than the 1% AEP the open spaces at the rear/southern part of the site would be subject to significant flood hazard and present a significant flood risk.

TTW are of the view that setting the proposed flood wall at the PMF level is unnecessary given that:

- The PMF event for the proposed area is a short-duration overland flood with short inundation times for which;
    - Evacuation in place in the proposed building is the most practical evacuation method and
    - Isolation times due to proposed flooding are short; and
- Every IGLU property has an emergency evacuation plan and a number of emergency evacuation wardens (as they are a 24/7 operation), each of whom undergoes mandatory emergency training every 6 months

And therefore, the proposed development is equipped to handle the increased risks posed by the PMF event.

Given the above, Council Engineers have accepted TTW's recommendation that the height of the flood wall along the western edge of the property be set at 23.8 m AHD at the northern end, 21.0 m AHD at the southern end and 20.9 mAHD at the interface with the building (see correspondence attached as Appendix B).

Flood Control 4

Council has indicated as part of their DA response, that the proposed flood wall should not continue past the change in direction of the existing boundary (i.e. it should not continue to the horizontal). Bates Smart have provided landscaping outside of the building boundary with a crest level equivalent to the FPL as an alternative flood protection measure. TTW are of the view that the use of landscaping is an appropriate flood mitigation measure and adequately addresses Council's concerns with the channeling of flows along a proposed flood barrier. Landscaping crest levels will need to be set to the FPL of:

- 20.90 mAHD at the western edge of the landscaping area; and
- 20.75 mAHD at the eastern edge of the landscaping area.

Council has also indicated as part of their DA response that flood walls at the south of the site, providing they do not continue with the change in direction outlined above and are set back from the site boundary, will need to be set at the PMF level (21.3 mAHD). As per the discussions outlined in Flood Control 3, Council Engineers have accepted TTW's recommendation that the height of the flood wall along the western edge of the property be set at the FPL, a minimum of 20.75 mAHD.

TTW are of the view that a flood wall will not be required on the eastern side of the site, providing the footpath falls towards the road on Carlton Crescent (as per Flood Control 1), ground levels grade away generally and stormwater drainage is provided.

Flood Control 5

As per Council's DA response, *"elevating of the FFLs on a suspended slab (piered and beamed with freeboard to the underside of the beams 150 mm above the 1% AEP flood standard level)*" is satisfactory as a flood control. Assuming a 200 mm slab thickness, the finished floor level for the Lower Ground Floor towards the rear of the site shall be set at 20.6 mAHD, which provides a 150 mm freeboard above the 1% AEP flood level (20.25 mAHD). Overland flood flows must be allowed to freely traverse underneath the suspended building in order to prevent flood impact on neighbouring properties.

A markup outlining the proposed flood controls detailed above is included as Appendix C.

Should you require anything further please contact the undersigned.

Yours faithfully,
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
TAYLOR THOMSON WHITTING NSW TRUST

Nemesio Biason

P:\2018\1819\181975\Reports\TTW\Civil_FloodResponse\190531_FloodAssessment_DAResponse.docx

Appendix A

Inner West Council DA Response

3. Parking

Under the State Environmental Planning Policy Affordable Rental Housing 2009, the development is required to provide a minimum of 92 on-site parking spaces for future tenants. In this instance given the site location with very close proximity to the Summer Hill train station and IGLU's nature as an established and reputable provider of student accommodation, Council Officers have determined to provide in principle support for the current design, which does not provide any on-site parking for future tenants subject to demonstrating no impact on existing on site parking demand and traffic impacts.

However in order for Council Officers to recommend support for such a significant variation to the parking requirements further information and analysis is required. This analysis must be in the form of a compressive Green Travel Plan.

This Green Travel Plan must incorporate analysis of the following factors:

- Means of transport available to students to and from places of study, including analysis on the frequency of services
- Statistics on car ownership of students which currently utilize IGLU accommodation
- Review of availability and price of parking within the locality
- Active measures that will be put in place to encourage bicycle ownership and share bike use
- Car share schemes available in the locality

Please note that the above points are matters that must be addressed, any other relevant information is encouraged to be provided, as Council requires substantial justification to support such an extensive variation.

4. Rear Lane

Analysis of neighbouring sites has highlighted an approval at 1-11 Hardie Avenue (located directly to the south of the subject site). This approval at 1-11 Hardie Avenue provided consent for a new supermarket (within a basement) and shops addressing the pedestrian link at the southern boundary of the subject site. The combination of the current proposed development at 74-74 Carlton Crescent and, approved development at 1-11 Hardie Avenue and Darrel Jackson Gardens, is expected to result in this rear lane becoming a highly trafficable pedestrian link. For this reason any amended plans must provide a detailed analysis of the rear lane and detail how the current development will present and contribute to this emerging pedestrian link.

Please note that it is understood that the locality is an area of high hazard flooding and appropriate measures to ensure flood compatibility must be undertaken, however an attractive/encouraging presentation is still considered to be achievable.

Any amended plans should also consider the practicality of the space and likelihood of future residents utilising this access point frequently to go to the proposed supermarket and/or shops. Careful consideration should be given to pedestrian and bike access to this locality.

5. Flooding

Flood Control 1:

The two flood gates at the front of the building at the pedestrian access point (as shown in the TTW Stormwater Report, dated 30 November 2018 (Reference 181975CAAA)), in conjunction with the proposed stormwater drainage line shown in red in the Flood Assessment Report are not supported as a satisfactory flood mitigation control. The proposed stormwater drainage line within the property front setback area, aims to divert 1% AEP flood water from the front of the site and convey it to the rear of the site. As an alternative to this control, it is recommended that the existing low-lying footpath at the south of Carlton Crescent adjacent to the site's frontage be *raised to at least kerb height* for the full frontage and the frontage (or part of the frontage) of adjacent property to the west. The aim of this measure is to divert floodwater from Carlton Crescent away from the front of the buildings on the site toward the east into Council land (Darryl Jackson Gardens). However, such works would be at the full cost of the applicant.

If the footpath is not raised the Flood Planning Level (FPL) at the front of the buildings (both the former Western Suburbs District Ambulance (WSDA) and proposed new buildings at their northern end) is to be revised to be at RL 23.7m AHD (minimum). The architectural Ground Floor plan, prepared by Bates Smart (Drawing No. A03.000, dated 6 December 2018), shows a Finished Floor Level of RL 23.25m at the main pedestrian entry and RL 23.375m in adjoining areas. Council's requirement is for 300mm freeboard above the 1% AEP flood level at the front of the site, which is considerably higher at RL 23.7m AHD (as shown in the Flood Certification by WMA Water, dated 3 December 2018, reproduced in Appendix A of the TTW Site Flood Assessment). Freeboard requirements are to be applied in accordance with Inner West Council's Comprehensive Development Control Plan (DCP) 2016, Section 2 (General Guidelines), Chapter A (Miscellaneous), Part 3 (Flood Hazard) DS2.1 and in light of the Flood Levels provided by WMA Water as cited in the TTW Site Flood Assessment Report.

Windows front of site

In the event that the existing garage doors of the former Western Suburbs District Ambulance building are converted to windows then the level of the underside of the proposed windows, are required to be raised, so that the underside of the windows will be at least equal with the higher 1% AEP flood level at the front of the site. This will assist in ensuring no pathway for 1% AEP floodwater to enter the building through building materials which are not flood compatible.

Flood Control 2:

The proposed raised landscaping area, where there is an existing driveway at the north west of the site, shall be set to the level stated in the TTW Flood Assessment Report, such that it is set to PMF level RL 23.9m AHD, (This is the same as the level of 1% AEP + 500mm freeboard, as indicated as Control 2 in the Flood Assessment Report).

However, for this control to be effective in preventing ingress of flood water to the building, the landscaping area must not be subject to any settlement; the threshold of any step to any access door (e.g., to a water meter) on the west side of the building near the front shall also be set at a minimum of RL 23.9m AHD; and the same level for the threshold for any access grille (e.g. to a fire hydrant booster valve near the western end of the front of the WSDA building).

Flood Control 3:

Details of the design of the flood walls on the site shall be submitted to Council, and certified by a practising, appropriately accredited structural engineer.

It may not be feasible for flood walls to be constructed at the west of the site, if it is located within the current easement for overhang.

The southern extent of the north-south line of the flood wall, with the proposed height of RL 20.8m AHD is unacceptable (this height is indicated as superimposed on the Lower Ground Floor plan, Bates Smart architectural drawing Drawing A03.100, dated 7 December 2018, reproduced in Appendix B of the TTW Flood Assessment Report).

The height of the flood wall for this control shall be set as RL 23.9m AHD at the northwest of the site and RL 21.3m AHD at the southern extent on the approximate north-south line of this wall.

Flood Control 4:
The flood wall shall not continue past the change in direction of the existing boundary from the section where the northwest-southeast wall alignment ends at the south of the site. Council's concern is that flood walls at the southern end of the site shall exacerbate the High Hazard flood conditions by training the flow of flood water and increasing depth. The height at the extent of the flood wall at the south of the site shall also be RL 21.3m AHD.

It is not clear if a flood wall is also proposed on the eastern boundary of the site. Any such flood wall shall have a wall height of RL 21.3m AHD at its southern extent (no further south than the flood wall on the south western side of the site), but shall only be constructed with a north-south alignment.
Any flood wall proposed to be constructed adjacent to 72A Carlton Crescent (Lot 39, DP 1089846), shall require the written concurrence of the owner(s) of this property, to ensure against encroachment of any footings, and that the rights of footway and easement for drainage are not impaired, including any adverse impact on any existing drainage line(s) within the easement.

Similarly, the rights of footway and easement for drainage over 74-75 Carlton Crescent adjacent to 72 Carlton Crescent shall not be encroached. Investigation into any existing drainage lines within these easements shall be undertaken, such that there are no adverse impacts on any such drainage lines. If there are no drainage lines existing within these easements, or if alternative arrangements for drainage can be made, with the written concurrence of the parties that both benefit and are burdened by the easements, then there may be a case to have the easements extinguished, including rights of footway.

Flood Control 5:

The Finished Floor Levels for the Lower Ground Floor toward the rear of the site shall be set to a minimum of RL 20.6m AHD at the east of the site and RL 21.1m AHD at the west of the site. Elevating of the FFLs on a suspended slab (piered and beamed with freeboard to the underside of beams 150mm above the 1%AEP flood standard level), designed by a practising and appropriately accredited structural engineer, to afford flood water flow under the building, is satisfactory as a flood control.

In this instance a casual communal area at the south of the site is acceptable, where it can be demonstrated through an appropriate plan of management that any future tenants will be kept away from the locality during a high hazard flood event. The aim is to encourage a safe evacuation plan for the site to Carlton Crescent via a communal space within the building for PMF conditions, made more feasible within the raising of the footpath in Carlton Crescent as discussed above.

6. Geotechnical/ Stormwater

The provided Geotechnical Report relies on the architectural layout, upon the submission of amended plans a suitably updated geotechnical report should also be provided.

On-site Stormwater Detention (OSD) is required to be incorporated in the stormwater management of the site.

Any proposal for connection to Council's and/or Sydney Water's stormwater drainage systems must be designed to ensure no backwater effects into the site that would exacerbate flooding.

7. Heritage

The former ambulance station is of at least local heritage significance and may be the oldest surviving purpose-built ambulance station in suburban Sydney, as the former Ambulance Station in the Rocks was a conversion of an earlier, nineteenth century building. No other surviving ambulance stations from the early 1920s have been identified and the building appears to be rare at both a local and a state level.

As the building has already been identified in a State Government S170 Heritage and Conservation Register and is a contributory item within a Heritage Conservation Area the retention of only part of the substantially intact façades and the gutting of the interior cannot be justified on heritage grounds. Instead the proposal should be amended to rework and retain more of the original portion of former Ambulance Station, including evidence of the original interior configuration.

The proposed glazing of the vehicle bays makes the original purpose of the building harder to determine. Typical timber doors have been installed in the former Ambulance Stations. Examples of a recent conversion at George Street North are shown below and it is recommended that the proposal be amended to be of similar nature.

Appendix B

Inner West Council Flood Correspondence

Kieran Smith

From: Manel Mariner <manel.mariner@innerwest.nsw.gov.au>
Sent: Friday, 24 May 2019 11:11 AM
To: Kieran Smith
Cc: Joe Bertacco; Conor Wilson; Nemesio Biason Jr
Subject: RE: DA 10.2018.220.1 - 74-75 Carlton Crescent SUMMER HILL

Hi Kieran,

Yes, exactly.

Let me know if you require anything else.

Kind regards,

From: Kieran Smith [mailto:Kieran.Smith@ttw.com.au]
Sent: Friday, 24 May 2019 11:09 AM
To: Manel Mariner
Cc: Joe Bertacco; Conor Wilson; Nemesio Biason Jr
Subject: RE: DA 10.2018.220.1 - 74-75 Carlton Crescent SUMMER HILL

Hi Manel,

Thanks for getting back to me. Can I confirm that FPL Plus 500 mm freeboard refers to the 1% AEP Level + 500 mm freeboard?

Regards,

Kieran Smith | Civil Engineer
+61 2 9439 7288 | (02) 9439 7288 | ttw.com.au |
Level 3, 48 Chandos Street, St Leonards NSW 2065

From: Manel Mariner <manel.mariner@innerwest.nsw.gov.au>
Sent: Friday, 24 May 2019 11:04 AM
To: Kieran Smith <Kieran.Smith@ttw.com.au>
Cc: Joe Bertacco <Joe.Bertacco@innerwest.nsw.gov.au>; Conor Wilson <conor.wilson@innerwest.nsw.gov.au>
Subject: DA 10.2018.220.1 - 74-75 Carlton Crescent SUMMER HILL

Hi Kieran,

Hope this email finds you well.

I will be the Development Engineer dealing with this project from now on.

In response to your question. Please, use **FPL plus 500mm freeboard.**

Kind regards,

Manel Mariner | Development Engineer
Inner West Council
P: +61 2 9392 5293 | **E:** manel.mariner@innerwest.nsw.gov.au

Ashfield Service Centre: 260 Liverpool Road, Ashfield NSW 2131
Leichhardt Service Centre: 7-15 Wetherill Street, Leichhardt NSW 2040
Petersham Service Centre: 2-14 Fisher Street, Petersham NSW 2049
PO Box 14, Petersham NSW 2049

INNER WEST COUNCIL

Council acknowledges the Traditional Custodians of these lands, the Gadigal-Wangal people of the Eora Nation.

Appendix C

Proposed Mitigation Measures Markup

REVISED FLOOD CONTROL 1

LEVELS AT PROPERTY BOUNDARY TO FALL BACK TOWARDS KERB AT 2.5% GRADE

REVISED FLOOD CONTROL 2

DRIVEWAY CREST LEVEL AT 23.8 mAHD

REVISED FLOOD CONTROL 3

TOP OF FLOOD WALL AT FPL. 23.8 MAHD AT NORTHERN END AND 20.9 AT SOUTHERN-MOST POINT

REVISED FLOOD CONTROL 4

FLOOD WALL ALONG PROPERTY AT FPL, 20.75 mAHD

REVISED FLOOD CONTROL 4

FLOOD WALL ALONG PROPERTY LINE TO BE REMOVED IN THIS SECTION (TO PREVENT CHANNELLING OF FLOOD WATERS). FLOOD BARRIER REPLACED BY LANDSCAPED SECTION SET AT THE FPL:
* 20.9 mAHD AT WESTERN EDGE
* 20.75 mAHD AT EASTERN EDGE

REVISED FLOOD CONTROL 5

BOTTOM OF BIKE STORAGE SLAB AT 20.4 mAHD, 150 mm ABOVE 100 YEAR FLOOD LEVEL (20.25 MAHD)

OPENING TO BE PROVIDED AT WESTERN END OF THE BIKE STORAGE AREA (PIPES, SUSPENDED RAMP).

OPENING PROVIDED AT EASTERN END OF STORAGE AREA - OPEN RAISER STAIR, OPEN SCREEN.

BOUNDARY
LINE OF EXISTING BUILDING ABOVE
ELECT/PV STORE
FIRE SERVICES
SERVICE CAVITY
LAUNDRY ROOM
WASTE ROOM 1
COMM
SHAFT
ELECT
VOID OVER
COMMUNAL LOUNGE & GAMES
MEDIA ROOM
CLEANER STORE
WASTE ROOM 2
STORE
STAIR 2
RL. 20.35
sliding doors
RL. 20.30
Driveway Crest Flood Barrier
TOW 23.8 mAHD
Blue line indicates continuous flood barrier
Fence
Landscape Flood Barrier
(ALIGN TO EXISTING)
Landscape design in accordance with Landscape Architect
Wall Flood Barrier along the property boundary
TOW 21.7 mAHD
STAIR 4
RL. 20.35
RL. 20.85
RL. 20.75
RL. REFER TO ENGINEER'S DESIGN
TOW 20.9 mAHD
EXRL 19.81
EXRL 19.98
EXRL 20.16
Landscape Flood Barrier
TOW 20.75 mAHD
EX RL 19.87
EX RL 19.82
Secure Egress
Grade 1:40
Secure Egress
Services
BBQ
Services
Bicycle storage (60)
RL. 20.60
Ramp 1:14
RL. 20.00
Screen
Ramp 1:14
RL. landscape at lower pedestrian walkway levels
Bicycle Form Flood Barrier
Building floor datum
TOW 20.75 mAHD
RL. 20.60
COURTYARD
1:80 Approx.
1:40 Approx.
BREEZEWAY
levels/grade adjusted within boundary
RL. EX21.44
RL. EX20.66
RL. EX19.09
72 Carlton Cres
71 Carlton Cres
69 Carlton Cres
Darrell Jackson Gardens
Skate Park
Tennis Courts
Pedestrian Walkway
Pedestrian Walkway
11 HARDIE AVE
Playground
Solid Walls for planters
Open raiser Stair with Bikes Ramp
Open Screen along side of Bike Storage

Revision summary:
-Additional bike storage and re… rm part of the overland flood path during maj…
-Improved pedestrian link with Waste holding bay removed.
-Revised flood mitigation strate…
1. Southern boundary lower ground finish floor level at RL. 20.75m
-Heritage
1. Additional interior walls on level 01 of former ambulance station building are retained. Retention resulted in levels changes throughout proposed development.

Revision	Date	Description	Initial	Checked
B	17.05.19	For Development Application	JC	WG
A	07.12.18	For Development Application	JC	WG

DEVELOPMENT APPLICATION | NOT FOR CONSTRUCTION

74 Carlton Crescent
Summer Hill

Lower Ground Plan

Melbourne 1 Nicholson Street
Melbourne VIC 3000 Australia
T 03 8664 6200 F 03 8664 6300
email melb@batessmart.com.au
http://www.batessmart.com.au

Sydney 43 Brisbane Street
Surry Hills NSW 2010 Australia
T 02 8354 5100 F 02 8354 5199
email syd@batessmart.com.au
http://www.batessmart.com.au

Bates Smart Architects Pty Ltd ABN 68 094 740 986

Project No.	S12235
Status	FOR INFORMATION
Plot Date	3/6/2019 8:36:09 PM
Plot File	S:\12200-12299\s12235_iglu_74carltoncrsummerhill\70_Cad\Plo ... ... ts\DA\A03.100 - Lower Ground Plan.dwg
Drawing No.	A03.100 [Revision]

A03.100 - LOWER GROUND PLAN

BATESSMART