Attachment A12

Flood Impact and Risk Assessment

Flood Impact and Risk Assessment

150 Day Street, Darling Harbour

Prepared for UOL / 04/08/2025

221199 CFAA

DOCUMENT REGISTER

Document Number		TTW- CF-CFAA-A1	
Rev	Date	Status	Approver
A	06/02/2025	Planning Proposal	Eirian Crabbe
B	24/03/2025	Planning Proposal	Eirian Crabbe
C	04/08/2025	Planning Proposal - RFI	Eirian Crabbe

APPROVAL

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Table of Contents

Flood Definitions (SES - New South Wales State Flood Plan Glossary)

Annual Exceedance Probability (AEP)

The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood level (height) has an AEP of 1%, there is a 1% chance (that is, a one-in-100 chance) of such a level or higher occurring in any one year

PMF (Probable Maximum Flood)

The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years)

Executive Summary

This FIRA assesses the flood risk and flood impact associated with Planning Proposal of an increase in height, proposed refurbishment and upgrades to the existing hotel at 150 Day Street, Darling Harbour.

This FIRA has included flood modelling analysis based on Council's adopted Darling Harbour Floodplain Risk Management Study, WMA Water (2018). Updates were made to Council's model following topographical survey and site inspection in and around the development site and provide a better representation of the real world. Flood modelling has assessed the flood behaviour, flood hazard and flood risk associated with the planning proposal.

Flood modelling confirms that there is a trapped low point in Sands Street which provides a source of overland flooding to the east of the building. The solid boundary wall to the west of Day Street prevents overland flow escaping this area and provides a source of overland flooding to the west of the building including the vehicle basement entrance.

A full range of flood events have been modelled including the 20%, 5%, 1% 0.2% and PMF. additional sensitivity testing has been completed that allow for future potential increases in rainfall and sea level associated with climate change.

The existing building is currently flood prone, with existing floor levels below the PMF and 1% AEP flood level. This creates a significant flood risk in the existing situation and would likely require evacuation in a flood event, relying on emergency services and further increasing risk due the high hazard flows in the surrounding streets.

The proposal includes flood mitigation measures of raised threshold floors and building entrance levels, and flood gates/barriers where entrances cannot be raised any higher due to existing building and access constraints. Although the proposal allows for a higher density of development, the proposed flood mitigation measures significantly reduce the flood risk to the building and provide flood protection above the 1% AEP and PMF. The proposal allows for a Shelter-in-Place flood emergency response which significantly reduces the need for reliance on government emergency management during a flood event.

Stormwater improvement and amplification has been tested to attempt to relieve flooding at the trapped low point in Sands Street. However, constraints with the existing stormwater system limits the effectiveness of the stormwater upgrades and fails to alleviate the flood risk to the development site or adjacent properties. Upgrades to the stormwater for flood mitigation purposes have therefore been discounted at this planning proposal stage but may be further explored during the detailed design stage.

There is no impact on flood behaviour associated with the development as the external building extent and external ground levels remain unchanged from existing. The planning proposal significantly reduces flood risk, and reliance on emergency services, whilst providing a more resilient development and meets Council and State flood planning requirements.

A preliminary Flood Emergency Response Plan has been provided within this report which gives a high level strategy for procedures and responses in the event of a significant flood. The primary response is for shelter in place due to the flash flooding nature at the site with limited or no warming time. This strategy for the proposal complies with the DPHI Shelter-in Place guidelines and requirements.

1. Introduction

TTW (NSW) Pty Ltd has been engaged by UOL to prepare this Flood Due Diligence Report for the proposed development at Park Royal Hotel, located at 150 Day Street, Darling Harbour (the site), within City of Sydney Local Government Area (LGA).

This report outlines the existing constraints of flooding and overland flow paths at the site. The details of this report are based on currently available information and correspondence undertaken at the time of writing.

The purpose of this FIRA is to confirm the flood risk and impact of the development to support a Planning Proposal for the increase in height of the existing building and proposed refurbishment and upgrades to the existing hotel.

1.1 Proposed Development

The planning proposal for the existing Park Royal Hotel at 150 Day Street, Sydney (the site), involves an ambitious upgrade and expansion of the existing hotel. This project aims to enhance the existing hotel offering while introducing a new, distinct hotel experience above the current structure, enabling the coexistence of the existing Park Royal and a new Pan Pacific Hotel on the same site. Strategically positioned at the edge of the City of Sydney, the development reinforces the city's entry into Darling Harbour by maintaining and emphasising the city wall characteristic of this prominent location.

The project is defined by 3 key principles – maximising adaptive reuse (setting a benchmark for future developments in Sydney), energising the Sydney visitor economy, and significantly enhancing the greening of both the public realm and the skyline, in alignment with the City of Sydney's sustainability goals. Achieving this vision involves expanding the existing core to support the new hotel above, employing a 'strip to structure' approach from ground to Level 02 to facilitate amenity upgrades, lightly refurbishing existing hotel rooms, and comprehensively upgrading all building services. This initiative aims to establish a contemporary hotel destination while setting a new standard for sustainable urban redevelopment.

To achieve the intended outcomes, this planning proposal seeks to amend the *Sydney Local Environmental Plan 2012* (the **LEP**) by inserting a new site-specific clause for the subject site under Part 6 Division 5 Site specific provisions to:

- allow a maximum building height of 85 metres,
- permit a maximum floor space ratio of 13.5:1 for hotel and associated land uses,
- restrict use to employment/hotel use and not residential accommodation or serviced apartments.

The Planning Proposal is supported by a site-specific Development Control Plan (**DCP**) and reference design scheme, prepared by Hassell. Key elements of the site specific DCP and reference design include:

- Renovation of existing 2 level basement and existing 11 storey hotel, with the addition of a new 11 storey hotel above (including a transfer floor between the two structures), and a rooftop plant floor resulting:
    - Two hotel brand offerings – Park Royal Hotel (3.5 star) and Pan Pacific Hotel (5 star)
    - 490-540 hotel keys with gross floor area of ~30,000m^2
    - Upgrade existing infrastructure and services (including new lift core),
    - New and upgraded hotel facilities (including lobby, dining areas, meeting rooms, ball room, gymnasium, bar and restaurants, and pool).
    - Removal existing Porte Cochere and exit ramp resulting in single vehicle entry/exit ramp from Day Street to be used by valet only.
- Ground floor public domain, public art and landscaping design, and
- Significant greening and landscaping of western façade.

The proposed spatial layout strategy and ground floor layout are shown Figures 1 and 2 respectively.

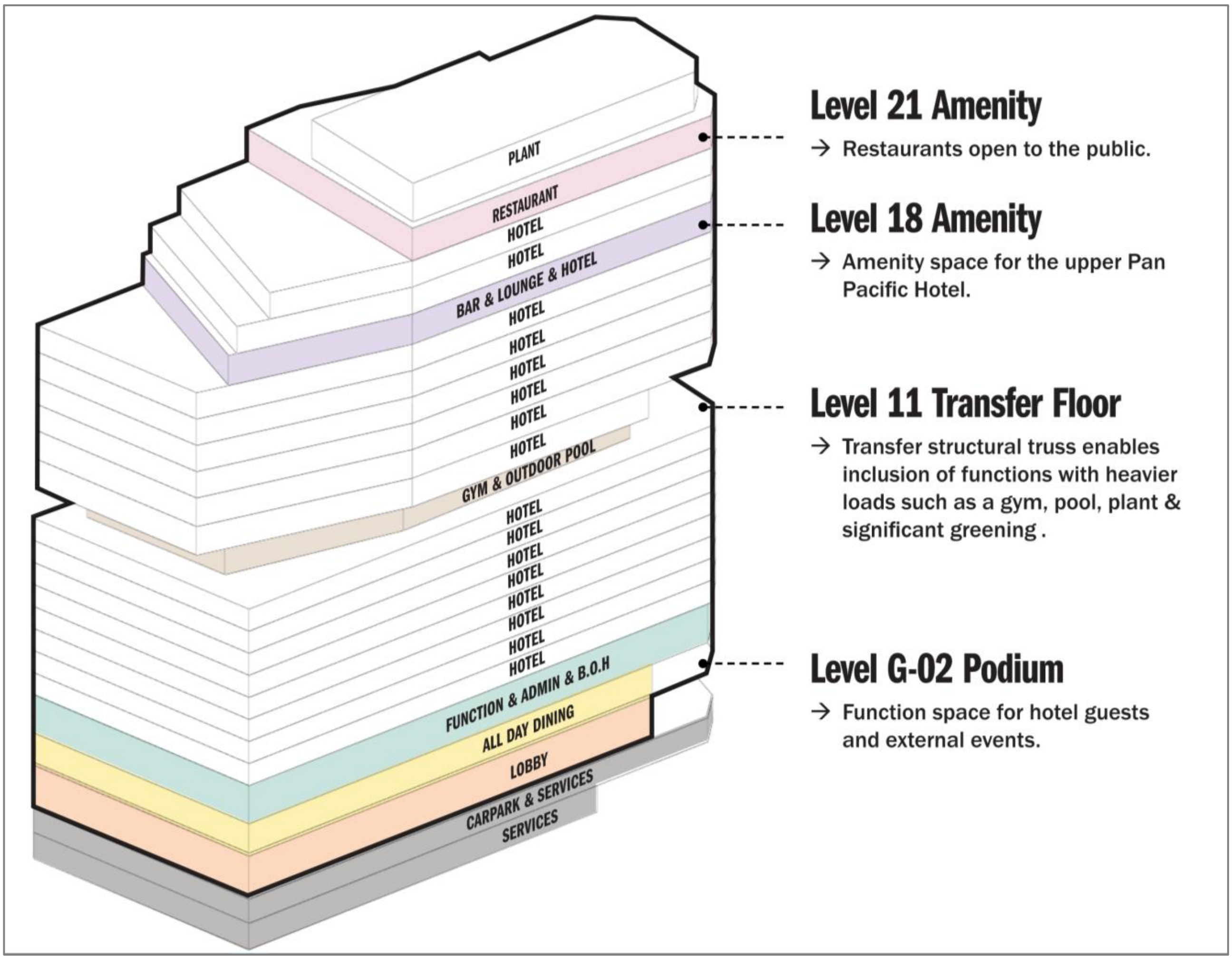


Figure 1: Proposed Spatial Layout Strategy (Source: Hassell).

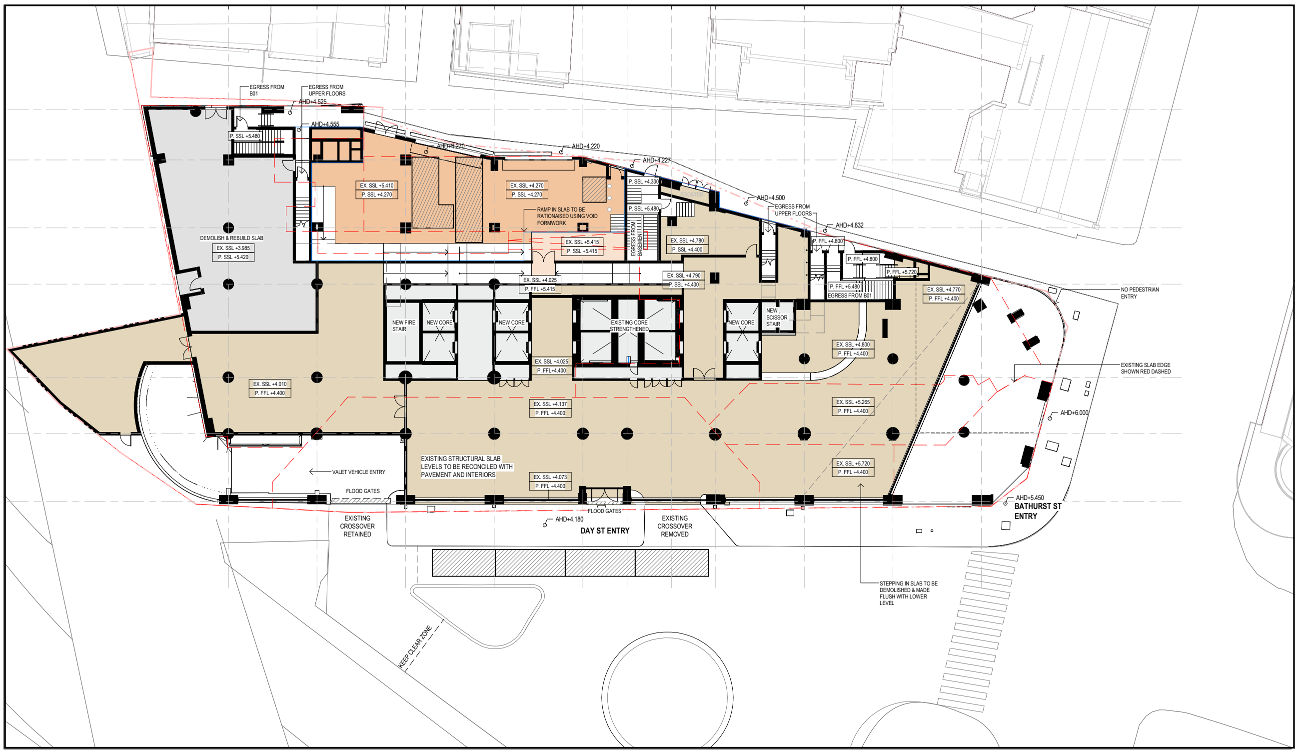


Figure 2: Proposed Ground Floor Layout (Source: Hassell).

1.2 Flood Planning Requirements

The site is situated within the City of Sydney Local Government Area and is subject to the controls outlined in the Interim Floodplain Management Policy, 2014 (IFMP). As there is no change to the external footprint of the existing building, there will be no change to flood behaviour for this development. This report therefore focusses on flood risk to the building and compliance with flood planning levels.

Section 5 of the IFMP outlines the minimum permissible building floor levels for different land use types. The proposed development is for hotel facilities including the reception, bar areas, and waste areas, regarded as commercial and industrial uses. Table 1 outlines the minimum required floor levels for commercial and industrial land uses.

Table 1: Flood Planning Levels - Interim Floodplain Management Policy (2014)

Land Use	Flood Planning Level
Business	Merits approach presented by the applicant with a minimum of the 1% AEP flood level.
Retail floor levels	Merits approach presented by the applicant with a minimum of the 1% AEP flood level. The proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation.
Below-ground car parks[1]	1% AEP flood level + 500mm freeboard, or the PMF (whichever is higher)

[1] 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.

The site is therefore subject to a minimum Flood Planning Level (FPL) of the 1% AEP level for all business and retail floor levels, with below-ground car parks protected to the higher of the 1% AEP + 500mm freeboard or the PMF.

1.3 Reference Documents

The following documents have been reviewed and referenced in preparing this report:

- Australian Institute of Disaster Resilience (AIDR) Guideline 7-3: Flood Hazard (2017)
- City of Sydney Development Control Plan (2012)
- City of Sydney Interim Floodplain Management Policy (2014)
- City of Sydney Local Environmental Plan (2012)
- NSW Department of Environment and Heritage – Flood Risk Management Guideline LU01, June 2023
- NSW Department of Planning, Housing and Infrastructure – Planning Circular PS 24-001, Update on addressing flood risk in planning decisions, 1st March 2024
- NSW Department of Planning, Industry and Environment – Considering Flooding in Land Use Planning Guideline (2021)
- NSW Floodplain Development Manual, June 2023
- NSW Planning Portal Spatial Viewer (Spatial Collaboration Portal - Map Viewers (nsw.gov.au))
- Darling Harbour Catchment Flood Study, BMT WBM (2014).
- Darling Harbour Floodplain Risk Management Study, WMA Water (2018)

2. Background

The purpose of this FIRA is to confirm the flood risk and impact of the development to support a Planning Proposal to increase the height of the existing building with additional levels added to the hotel. The existing levels of the hotel to be retained will be upgraded and refurbished. There will be no change to the external extent of the building at the ground floor plane.

2.1 Study Area

The site is located at Lot 20 DP1046870, 150 Day Street, Darling Harbour, NSW 2000, with a total area of approximately 0.25 ha. The current site conditions and surrounding area are presented in figure 3, with the site bounded by Day Street at its western frontage, Druitt Street to the north, Bathurst Street to the south and Sands Street to the east. The site is currently zoned as SP5 – Metropolitan Centre under City of Sydney Local Environment Plan (LEP) 2012 and currently operates as a hotel comprising 11 floors. This zone provides a range of facilities and services, commercial industries and offices. As a hotel, the development is permissible as a tourist and visitor accommodation under the SP5 land zoning.

The site is located at the lower area of the fully urbanised Darling Harbour Catchment, approximately 320m west of Town Hall Station and 150m southeast of Darling Harbour, with close connections to the A4 Western Distributor and the Cross City Tunnel. Other than the harbour There are no natural watercourses in the vicinity of the site, however there is an extensive below ground pit and pipe stormwater network that collect and convey stormwater runoff from the urban catchment to Darling Harbour.

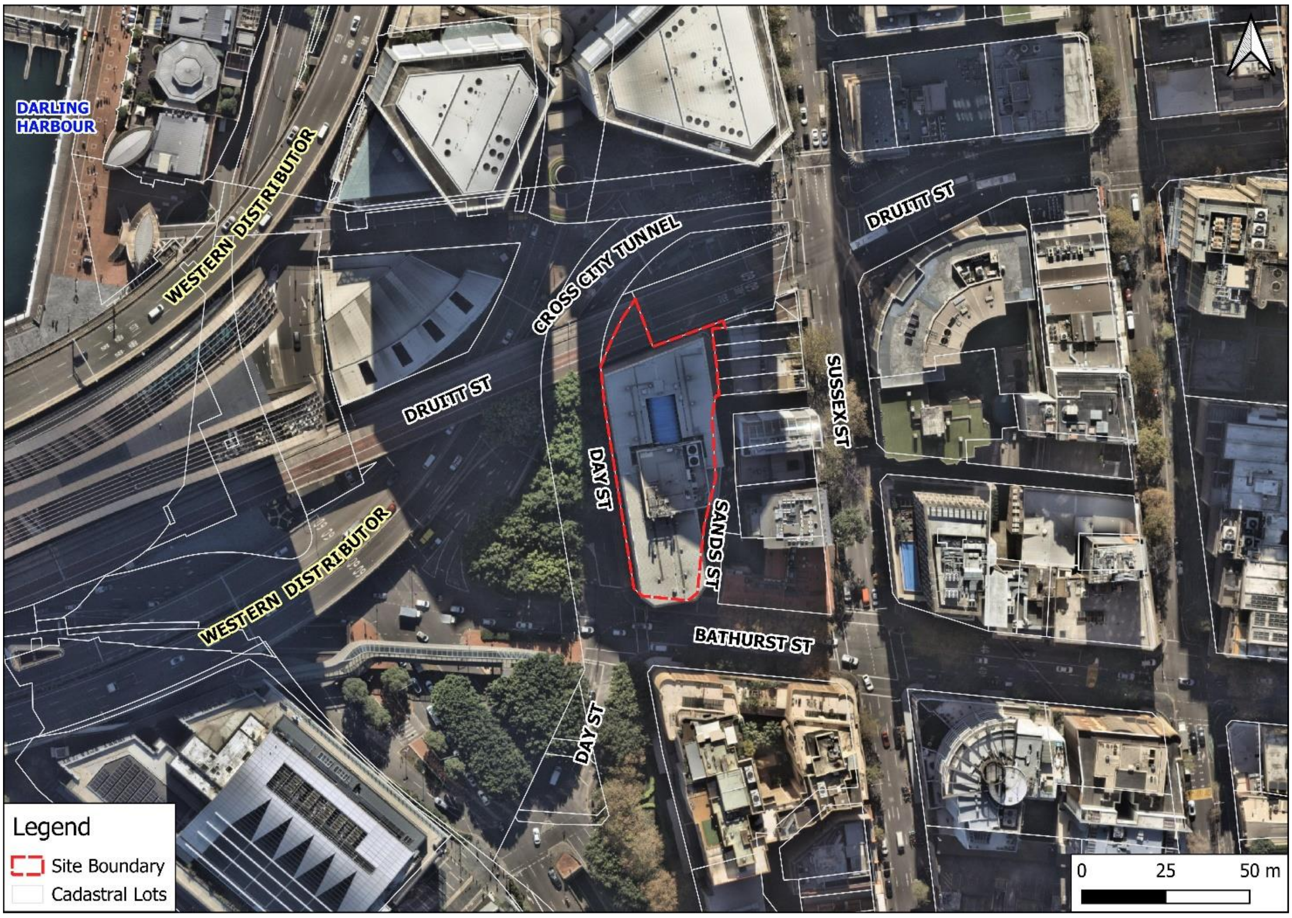


Figure 3: Site Location and Surrounding Area (Source: Nearmap, Dated April 2024).

2.2 Site Topography

To assess the topography of local area, the latest available elevation data (2020) was obtained from Elevation Information System (ELVIS) at a 1-metre resolution. As presented in the Digital Elevation Model (DEM) in Figure 4, the site is located on the lower plains of the wider Darling Harbour Catchment, with higher elevations to the east beyond Sussex Street reaching more than 20m AHD. The elevation generally falls northwest of the site with proximity to Darling Harbour, falling to around 1m AHD at the harbour.

Within the site itself, there is a prevailing southeast to northwest slope, with a high of 6.5m AHD at the corner of Sands Street and Bathurst Street, falling to a low of 3.7m AHD at the northwest corner of the existing building at a 4% gradient. The site's overall slope is shown in the cross-sectional elevation profile in Figure 5.

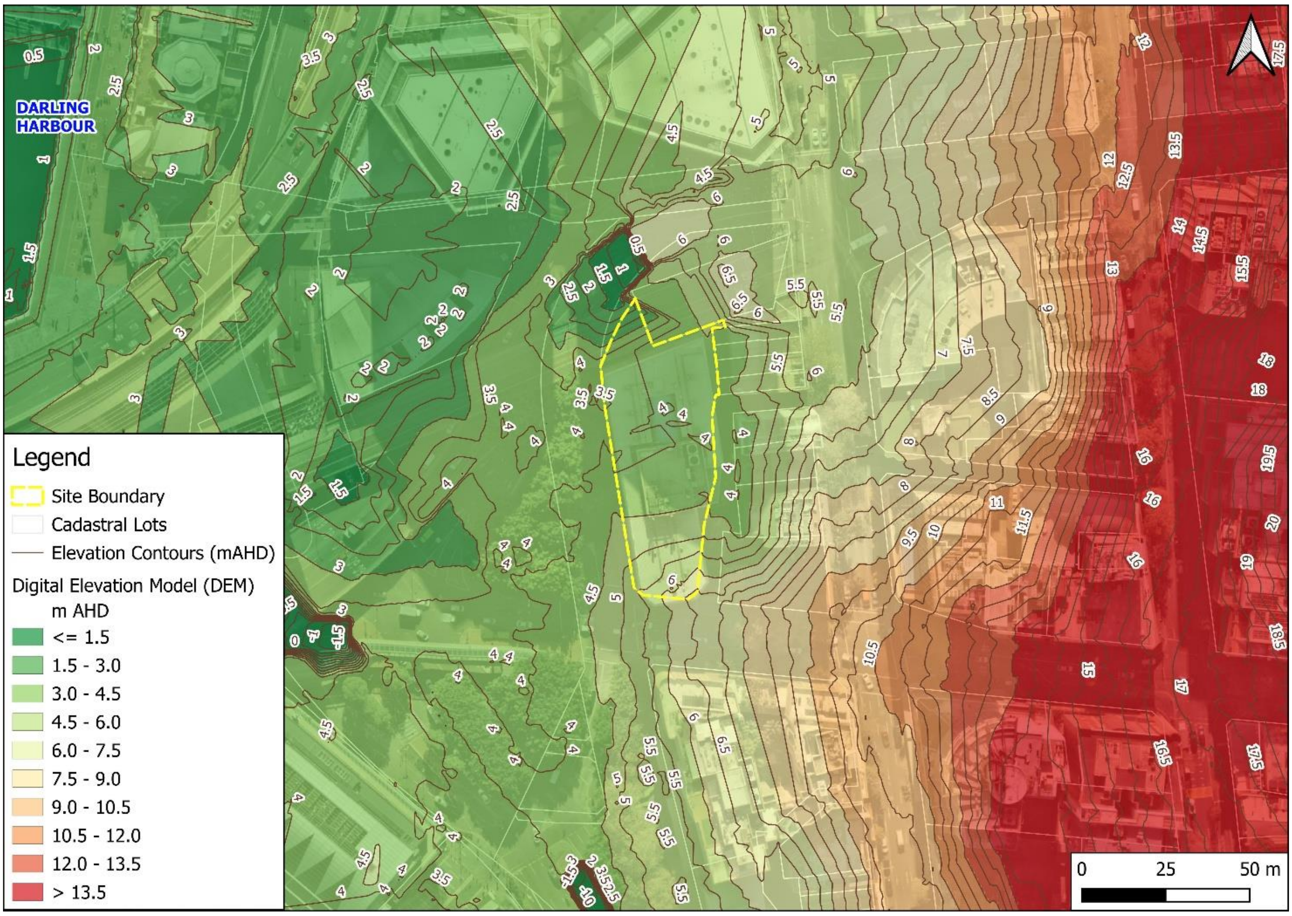


Figure 4: Topography of the Site and Its Surrounding Area Using 2019 And 2020 Lidar Data (Source: ELVIS).

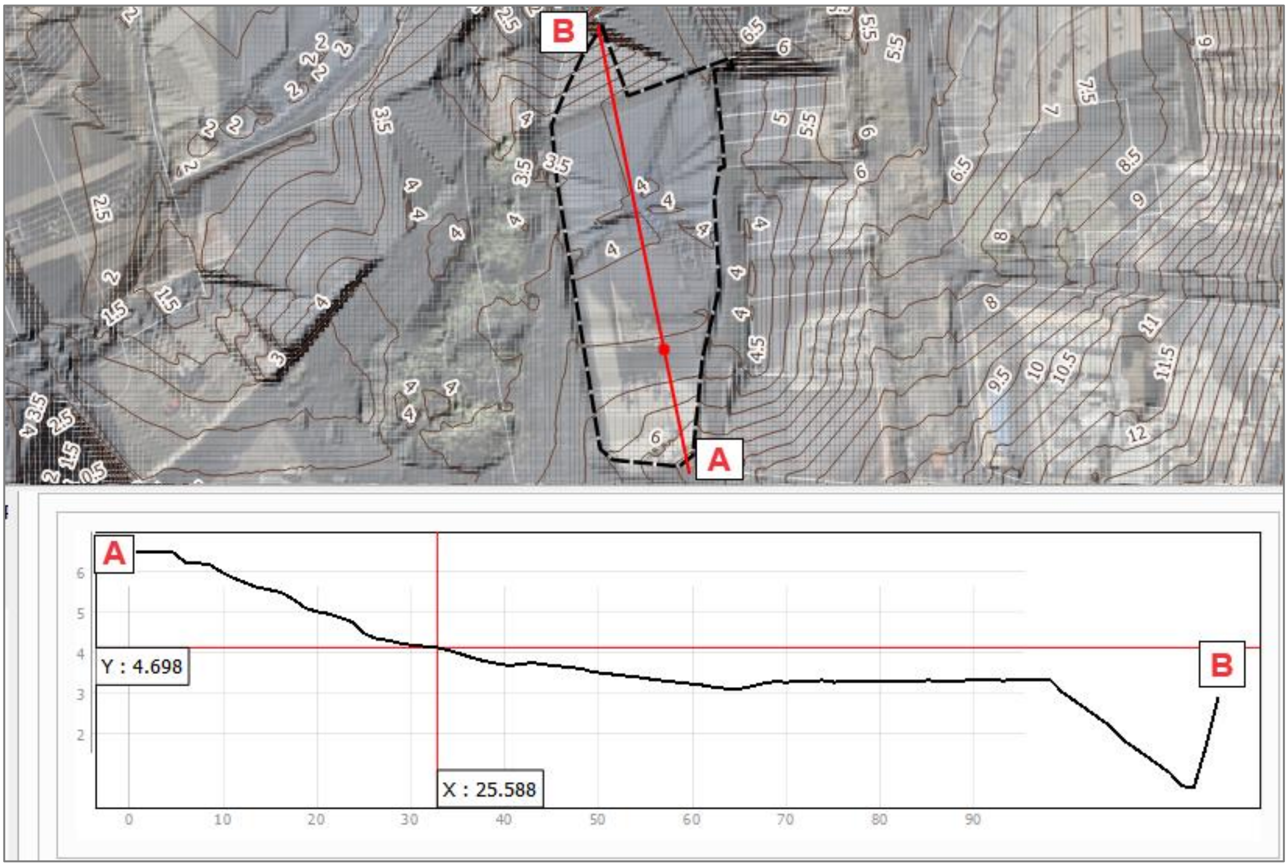


Figure 5: Cross-Sectional Elevation Profile Through The Site From West To East

3. Existing Flooding

3.1 Darling Harbour Catchment Flood Study, 2014

The latest flood study available for the site and adopted by City of Sydney Council is the Darling Harbour Catchment Flood Study, completed by BMT WBM (2014). As part of the assessment a 1D/2D TUFLOW hydraulic model was established and verified by a calibration/verification process. A rainfall on grid (ROG) hydrology approach was adopted, in which rainfall is applied to each active cell in the 2D mesh. Hydrologic losses and runoff are therefore calculated for each cell and routed through downstream cells to evaluate flood depths and velocities.

The model was used to define the flood behaviour within the Darling Harbour catchment, producing information on flood flows, velocities, levels and extents for a range of flood event magnitudes under existing catchment conditions. The catchment covers an area of about 307 ha and drains into the Sydney Harbour. The study noted that the Darling Harbour catchment is highly urbanised with minimal opportunity for infiltration due to the prevalence of impervious surfaces. Most properties have common walls to neighbours, limiting opportunities for flow to pass between properties and as a result the roads form the primary overland flow paths.

3.2 Darling Harbour Floodplain Risk Management Study, 2018

The latest and most up-to-date source of flood behaviour adopted by City of Sydney Council is the Darling Harbour Floodplain Risk Management Study, completed in 2018 by WMA Water. A full assessment of the existing flood risk in the catchment was carried out, including flood hazard across the catchment, over floor flooding of residential, commercial and industrial properties, road flooding and emergency response during a flood event.

WMA Water made minor updates to the TUFLOW model previously established by BMT WBM for the flood study, including revisions to the dimensions and alignment of the pit and pipe data, which was informed by more recent survey.

TTW obtained the Darling Harbour Floodplain Risk Management Study TUFLOW model and results files from Council for the purpose of this flood assessment. The existing Council flood results were only provided for the 90 minute duration storms, which were generally the critical duration for the catchment as a whole. However the critical duration storm (that which produced the highest flood levels) at the site location was found to be the 25 minute storm for all events below the PMF, and the 15 minute storm for the PMF.

TTW have used the Council flood model to regenerate the existing council flood maps at a higher resolution scale at the site location. The only change to the model was to use the latest TUFLOW 2023 version, with backward compatibility to pre-2016 to match the existing council model.

Blockage factors of 20% for graded pits and 50% for sag pits are applied to all surface inlet pits within the model as per the original council model and stormwater guidelines.

3.3 Existing Council Flood Results

The existing Council flood depths and levels surrounding the site in the 1% AEP event and PMF are shown in figures 6 and 7 respectively.

The flood results show that overland flow approaches the east of the site from Sussex Street, along Sands Street. There is a trapped low point in Sands Street where overland flow ponds when it exceeds the capacity of the pit and pipe stormwater system. Relief from this trapped low point is to the north of the site along the public footpath adjacent to, and below the Western Distributor Overpass. Flood depths at the trapped low point in Sands Street are up to 0.73m in the 1% AEP, increasing to 1.05m in the PMF event.

Overland continues north of the site and enters to the north west of the site at Day Street and continue to flow north and west toward the cross city tunnel exit. Flood depths are shown to be negligible with generally less than 0.05m depth in both the 1% AEP and PMF events.

Overland flow from the south and west is also conveyed along Bathurst Street which bypass the site to the south. These flows are minimal, less than 100mm in the 1% AEP) and less than 250mm in the PMF.

Flood levels are highest to the southeast boundary, reaching 6.55m AHD in the 1% AEP and 6.64m AHD in the PMF at the corner of Bathurst and Sands Street. Flood depths along the west of the site are negligible at less than 0.05m depth in both the 1% AEP and PMF events, likely a result of the ROG modelling method. Flooding is more significant to the east of the development along Sands Street.

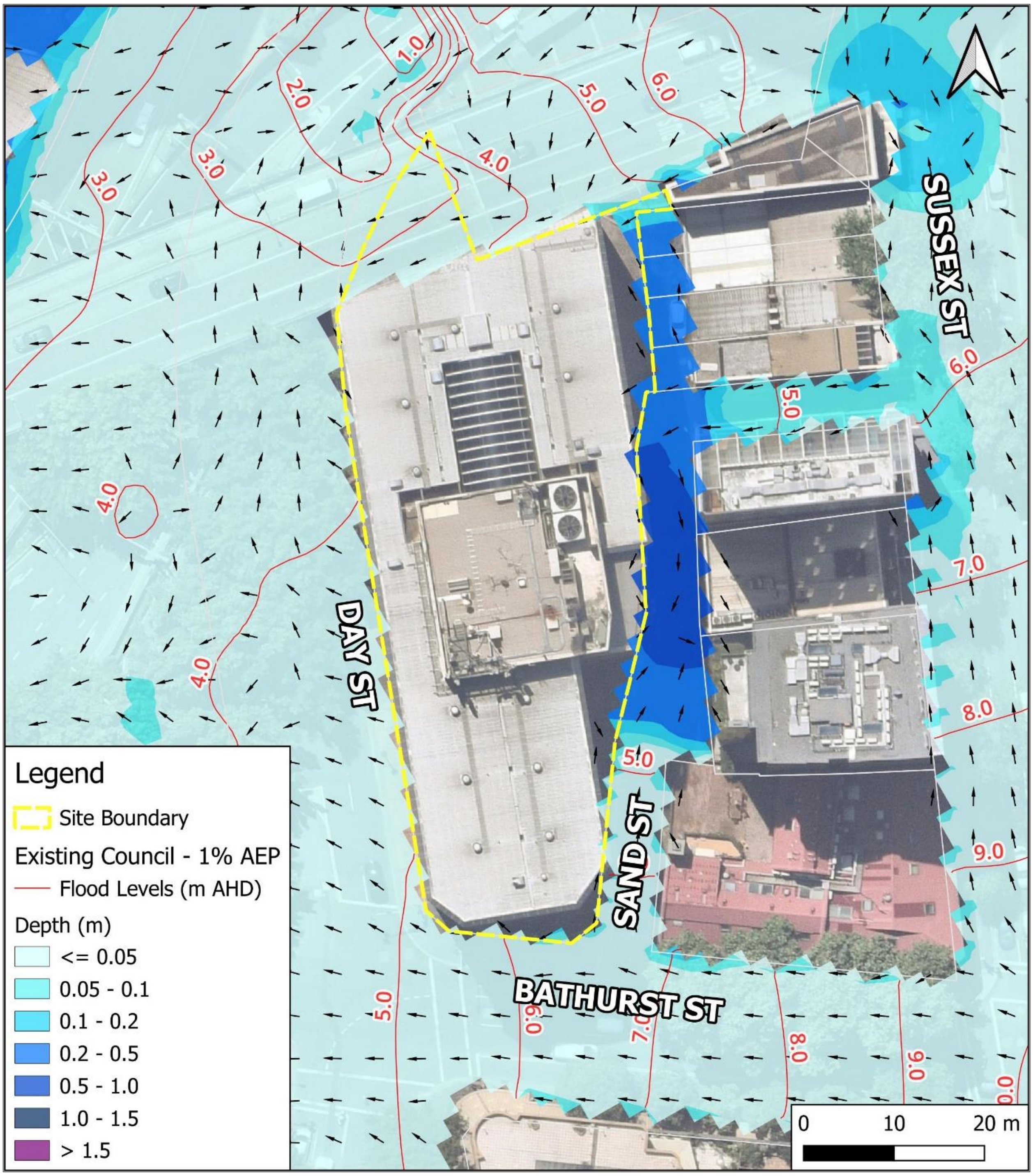


Figure 6: Existing Council 1% AEP Flood Depths and Levels

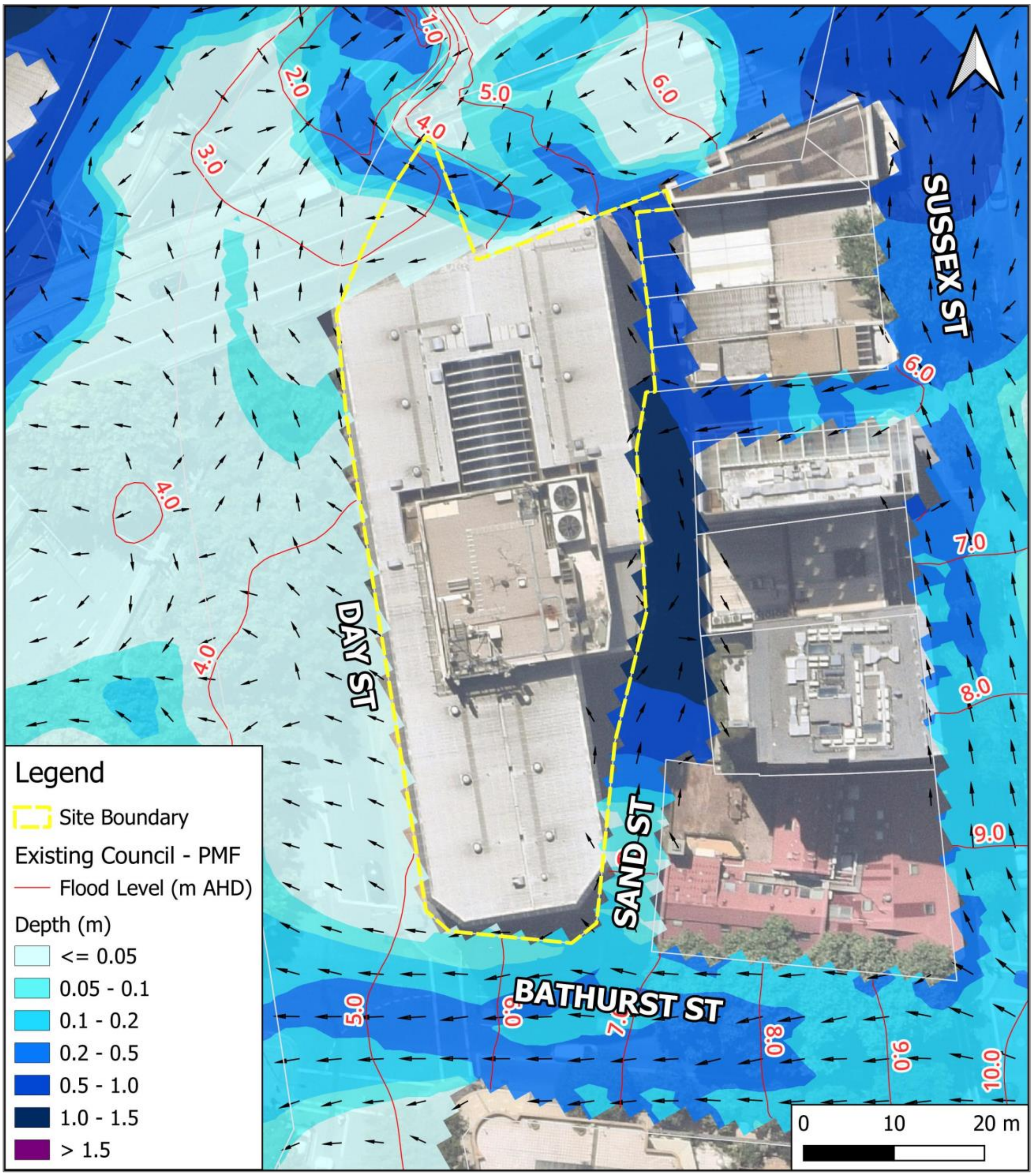


Figure 7: Existing Council PMF Depths and Levels

3.4 Updates to the Existing Council Model

Following a review of the council model, site inspection and detailed topographical survey of the site, it was found that there are some inaccuracies at the detailed site level in the Council flood model. The existing council model was therefore updated to incorporate the following changes to make the model a more accurate representation of the real world situation.

- Topographical survey was used to update the DTM in the model
- Building extents were updated based on topographic survey
- Minor amendments to the stormwater network were made based on topographic survey
- Western Boundary Wall Adjacent to Cross City Tunnel was included in the model:

There is an existing solid concrete wall that runs along the western boundary of the site, adjacent to the Cross City Tunnel. Site inspection and survey shows that this wall is over 2m high and would prevent overland flow passing from Day Street onto the Cross City tunnel. Overland flow would effectively pond behind this wall until it reached an overflow level on Bathurst Street. This wall is included in the updated existing model as solid 2m wall. A site inspection photo and survey extent of the wall are shown in figures 8 and 9 respectively.

Figure 8: Site Inspection Photo of Solid Wall along Western Boundary of Day Street

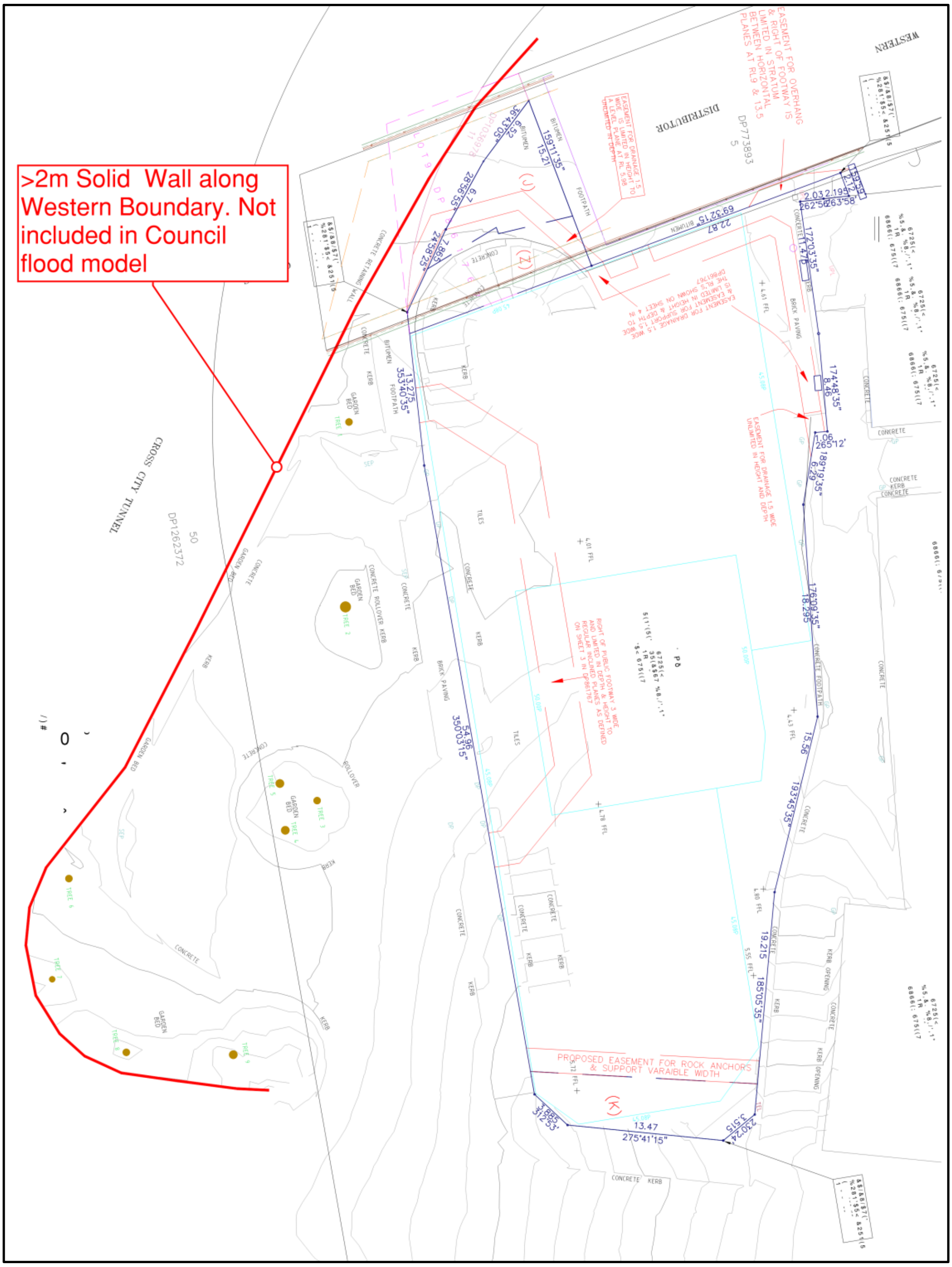


Figure 9: Topographical Survey of Solid Wall Along Western Boundary of Day Street

- Pedestrian Paths adjacent to and below the Western Distributor were included in the model:

Site Inspection confirmed that there are pedestrian paths to the north of the on-ramp of the Western Distributor from Sussex Street and also along the south of the on-ramp from Sands Street. These pedestrian paths join beneath the elevated section of the Western Distributor and connect to Day Street to the northwest of the existing hotel building. These paths were not modelled accurately in the Council model and would effectively provide an overland flow path from Sussex Street and the trapped low point in Sands Street. Images of the pedestrian paths are shown in figure 10.

Figure 10: The Pedestrian Paths Adjacent To And Below The Western Distributor on-ramp (Google Maps). Top image is south of the on-ramp, middle image is north of the on-ramp, bottom image is where the paths meet at Day Street.

3.5 Updated Existing Flood Results

The updated model provided slightly different flood results in the 1% AEP and more significant differences in the PMF. The main changes were the blockage of flows from Day Street to the north and west onto the Cross City Tunnel due to the solid boundary wall. Other changes were due to changes in DTM levels using the topographical survey and better representation of the overland flow paths adjacent to the Western Distributor.

A comparison of the Existing Council flood results and the updated Existing flood results are shown in Table 2. The sample points for comparison are taken at the low point of Day Street (point A) and the trapped low point in Sands Street (Point B) as shown in figure 11.

The updated existing 1% AEP and PMF flood depths and levels are shown in figures 12 and 13 respectively.

Table 2: 'Council Existing' and 'Updated Existing' Flood Levels and Depths, along with Existing FFL's

Sample Point	**1% AEP**		**PMF**	
	Council Existing	Updated Existing	Council Existing	Updated Existing
A - Day Street Flood Level	3.73m	3.78m	3.80m	4.64m
A - Day Street Flood Depth	0.02m	0.29m	0.09m	1.15m
B - Sands Street Flood Level	4.68m	4.58m	5.28m	5.41m
B - Sands Street Flood Depth	0.46m	0.35m	1.06m	1.18m

Building Entry Point	**Existing Floor Level**
Day Street – Basement Ramp Exit	**3.77m**
Day Street – Lobby	**4.01m**
Sands Street - Loading Dock	**4.27m**

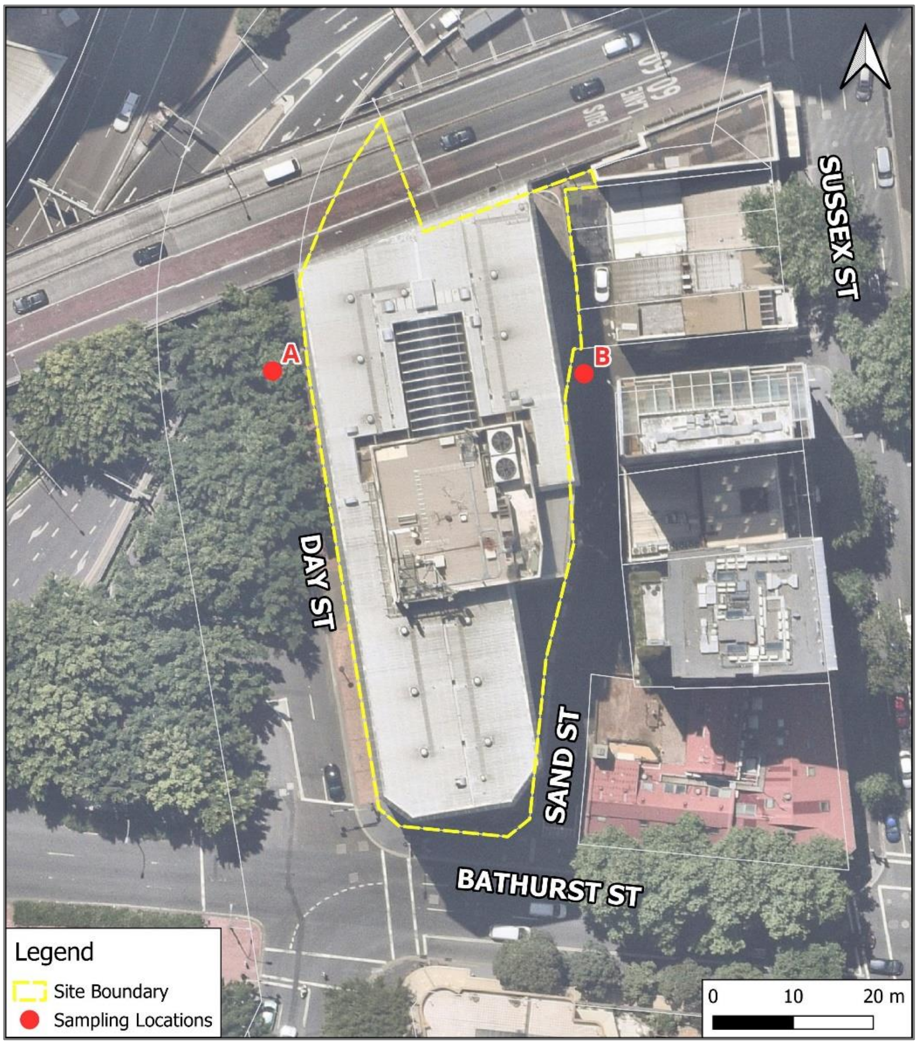


Figure 11: Sampling Points for Comparison of Flood Results

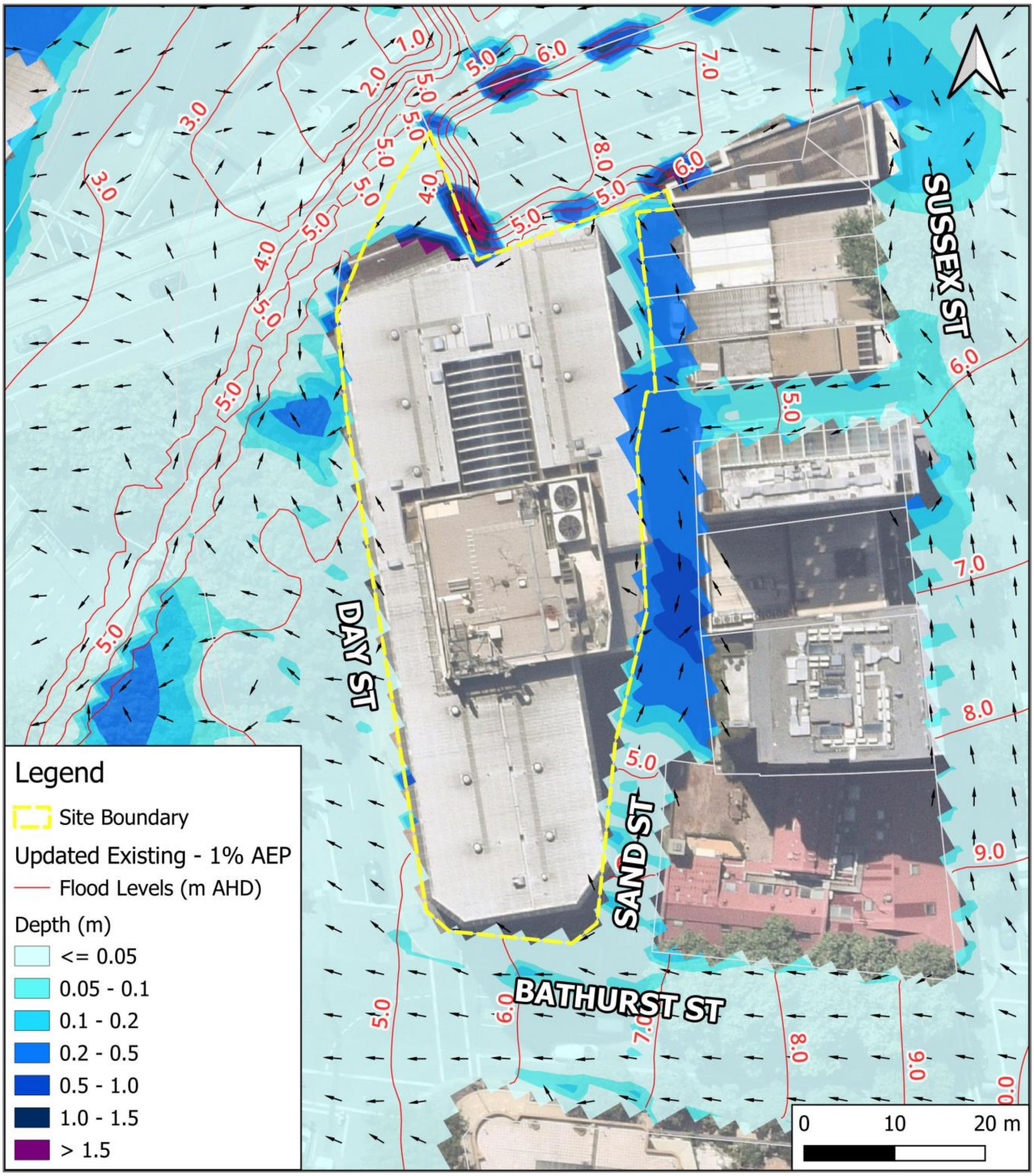


Figure 12: Updated Existing 1% AEP Flood Depths and Levels

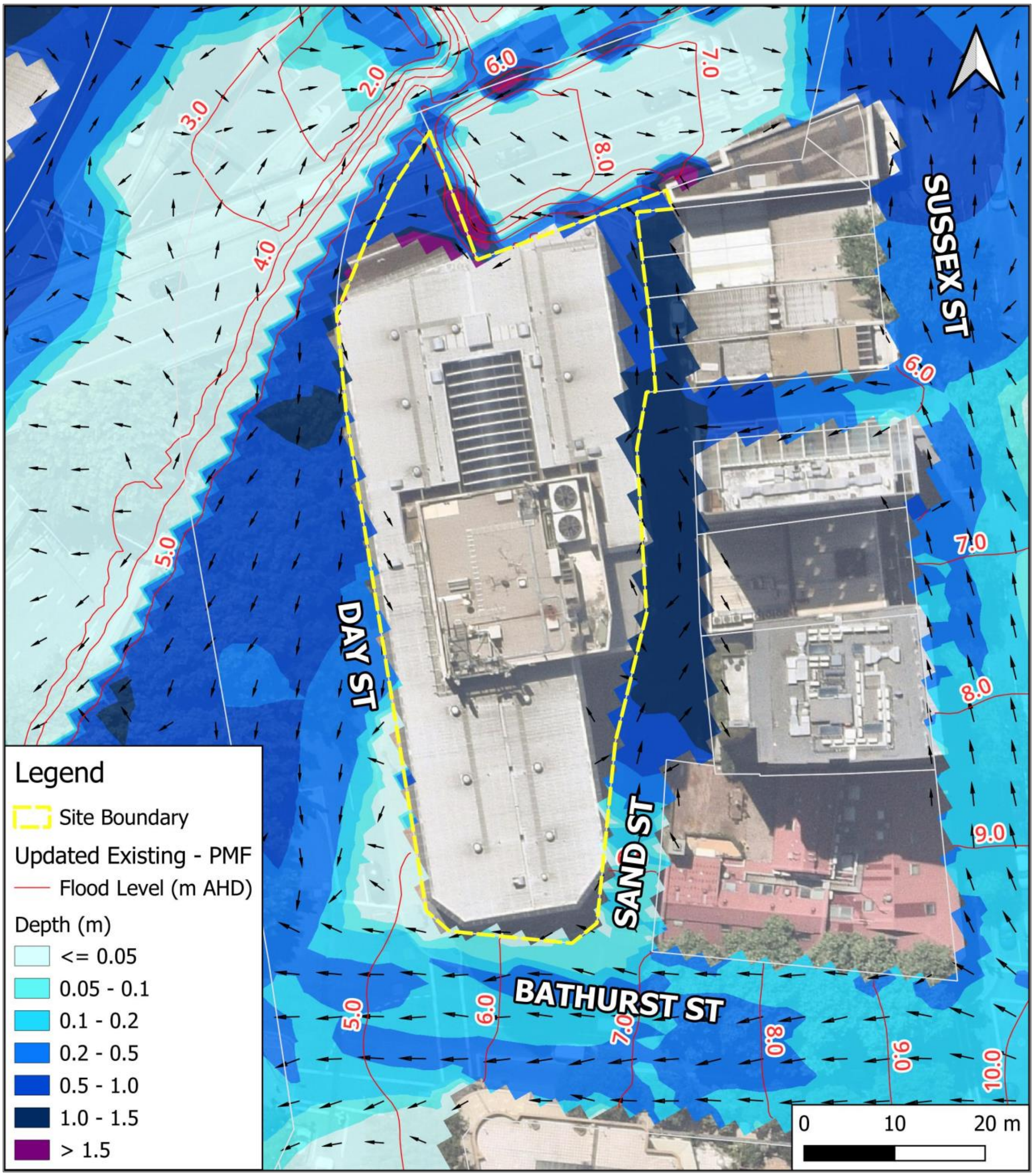


Figure 13: Updated Existing PMF Depths and Levels

3.6 Flood Hazard Assessment

The relative vulnerability of the community to flood hazard has been assessed by using the flood hazard vulnerability curves set out in 'Handbook 7 – Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia' of the Australian Disaster Resilience Handbook Collection (2017).

These curves assess the vulnerability of people, vehicles and buildings to flooding based on the velocity and depth of flood flows. The flood hazard categories are outlined in Figure 14, ranging from a level of H1 (generally safe for people, vehicles and buildings) to H6 (unsafe for vehicles and people, with all buildings considered vulnerable to failure). Table 3 outlines the threshold limits for each hazard category.

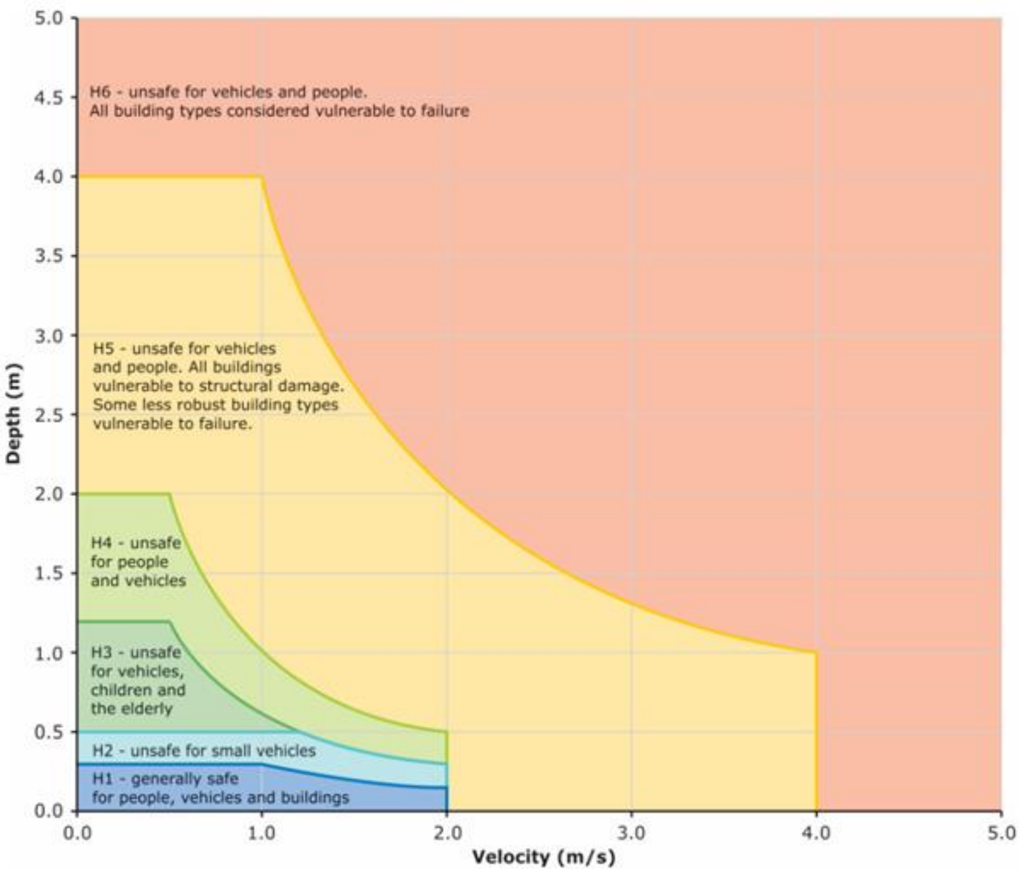


Figure 14: Flood Hazard Vulnerability Curve (NSW DPE Flood Risk Management Guide FB03)

Table 3: Hazard Vulnerability Threshold Limits

Hazard	Description	Classification Limit (m2/s)	Limiting still water depth (D) (m)	Limiting velocity (V) (m/s)
H1	Generally safe for people, vehicles and buildings	D x V ≤ 0.3	0.3	2.0
H2	Unsafe for small vehicles	D x V ≤ 0.6	0.5	2.0
H3	Unsafe for vehicles, children and the elderly	D x V ≤ 0.6	1.2	2.0
H4	Unsafe for people and vehicles	D x V ≤ 1.0	2.0	2.0

H5	Unsafe for people and vehicles. All buildings vulnerable to structural damage.	D x V ≤ 4.0	4.0	4.0
H6	Unsafe for people and vehicles. All building types considered vulnerable to failure.	D x V > 4.0	–	–

Flood Hazard for the 1% AEP and PMF for the updated existing model are shown in figures 15 and 16 respectively. The flood hazard is generally low H1-H2 around the site in the 1% AEP except for the trapped low point in Sands Street with H3 hazard associated with the increased flood depth. There are isolated areas of up to H5 hazard where water is trapped at the edges of buildings/structures or flows over steep terrain due to the model resolution.

Flood hazard is higher in the PMF with greater flow depths and velocities around the site. Flood hazard up to H3 is show in Day Street to the west and up to H5 within the pedestrian paths to the north. Flood hazard is H4 in the trapped low point but up to H5/H6 in the steeper sections of Sand Street to the east and Bathurst Street to the south, associated with higher flow velocities.

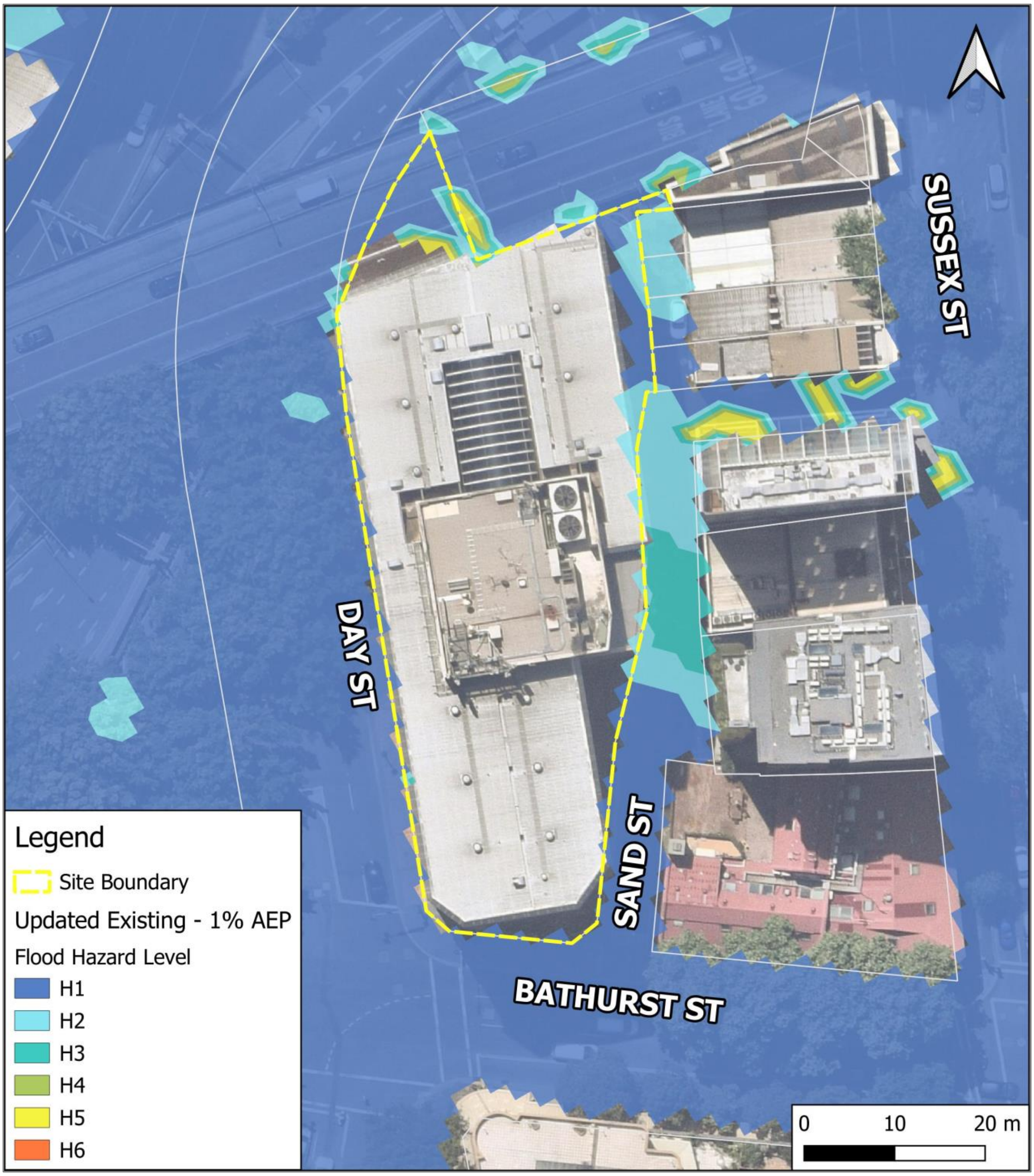


Figure 15: Updated Existing 1% AEP Flood Hazard

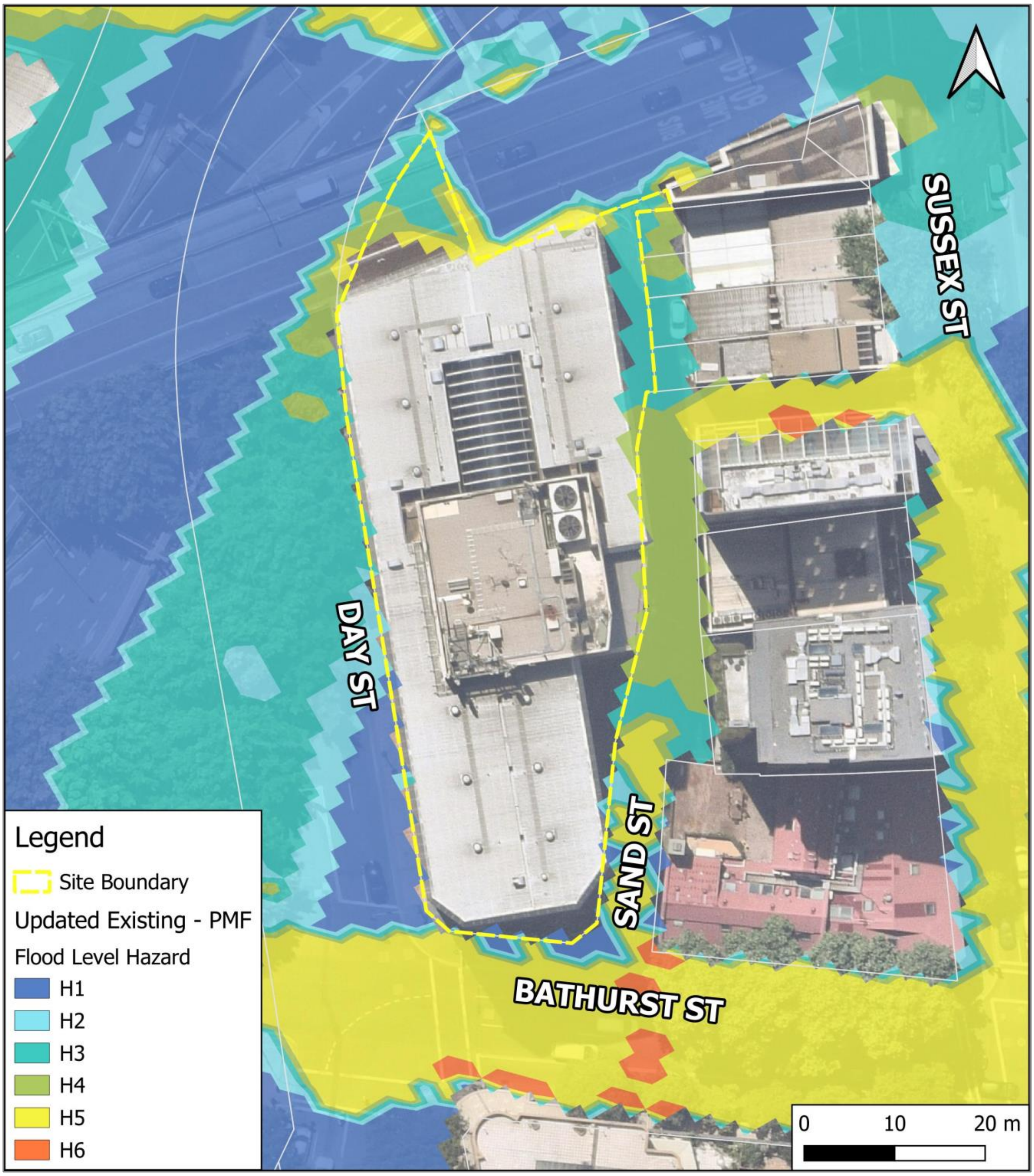


Figure 16: Updated Existing PMF Hazard

3.7 Additional Storm Events

The updated flood model was also run for additional flood events to understand the flood behaviour across a range of flood events. A summary of the flood depths and levels for the 20%, 5% 1%, 0.2% and PMF and is included in table 4, with flood maps of all events included in Appendix A. Refer to Figure 11 for sampling point locations.

Table 4: Comparison Of Updated Existing Flood Levels And Depths Across A Range Of Flood Events

Sample Point	20% AEP	5% AEP	1% AEP	0.2% AEP	PMF
A - Day Street Flood Level	3.58	3.64	3.78	3.97	4.64
A - Day Street Flood Depth	0.09	0.15	0.29	0.48	1.15
B - Sands Street Flood Level	4.31	4.40	4.58	4.75	5.41
B - Sands Street Flood Depth	0.08	0.17	0.35	0.52	1.18

4. Climate Change Sensitivity

The the Darling Harbour Catchment Flood Study (BMT WBM 2014) included sensitivity assessment of flooding associated with potential impacts of climate change.

The potential impacts of climate change for this site are increased rainfall and increase sea level. The impacts on rainfall allow for increased peak rainfall volume (and intensity) in the 1% AEP event by 10%, 20% and by 30% increases. The 10% (RCP4.5 equivalent) increase in rainfall can generally be used as a proxy for the 0.5% AEP flood event.

The impacts of sea level rise allow for an increase in the downstream tailwater level at Darling Harbour by +0.4m representing the sea level in 2050 and by +0.9m representing the sea level in 2100.

These climate change factors were adopted for the updated existing scenario and a summary of the results, including the 1% AEP flood levels and depths for reference, are shown in table 5, 6 and 7.

The overall impact of climate change with the worst case scenario of +30% increase in rainfall and +0.9m sea level rise produces an increase in flood level of 340mm in Day Street, and 250mm in Sands Street which is within typical freeboard requirements (+500mm above the 1% AEP) and well below PMF levels.

Table 5: Comparison of 1% AEP With Increased Rainfall Due To Climate Change

Sample Point	1% AEP	+10% rainfall	+20% rainfall	+30% rainfall
A - Day Street Flood Level	3.78	3.88	3.96	4.02
A - Day Street Flood Depth	0.29	0.39	0.47	0.53
B - Sands Street Flood Level	4.58	4.67	4.74	4.80
B - Sands Street Flood Depth	0.35	0.44	0.51	0.57

Table 6: Comparison Of 1% AEP With Increased Sea Level Rise Due To Climate Change

Sample Point	1% AEP	2050 Sea level (+0.4m)	2100 Sea level (+0.9m)
A - Day Street Flood Level	3.78	3.80	3.93
A - Day Street Flood Depth	0.29	0.31	0.44
B - Sands Street Flood Level	4.58	4.61	4.65
B - Sands Street Flood Depth	0.35	0.38	0.42

Table 7: Worst Case Climate Change +30% increase in rainfall and 2100 Seal level

Sample Point	1% AEP	1% AEP +30% rainfall + 2100 Sea level (+0.9m)
A - Day Street Flood Level	3.78	4.12
A - Day Street Flood Depth	0.29	0.63
B - Sands Street Flood Level	4.58	4.84
B - Sands Street Flood Depth	0.35	0.61

5. Post Development Analysis

As there is no change to the existing building extent at the ground floor plane, there will be no change in flood behaviour compared with the existing scenario. As such there is no flood impact associated with the development. The proposed development will implement raised thresholds and flood protection to satisfy flood planning controls in accordance with Council's Interim Floodplain Management Policy and the development will therefore have a lower flood risk than the existing building. This is discussed further in the section 6.

The use of flood barriers is only acceptable within City of Sydney LGA when all other options have been explored. Due to the adaptive reuse of the existing building, limitation on space constraints, active frontage requirements and gradient constraints, there is no opportunity to raise floor levels higher than those that are currently proposed. An Architectural statement on adaptive reuse and limitations is included in Appendix 2.

An assessment has also been made to try and reduce flood levels at the trapped low point of Sand Street by increased stormwater capacity to prevent flooding to the loading dock. This is detailed in the following section.

5.1 Loading Dock - Stormwater Flood Mitigation Assessment

The trapped low point at Sands Street provides a source of flooding to the existing loading docks. Overland flow approaches this area from Sussex Street and begins to pond when the flow exceeds the capacity of the stormwater pits and/or the pipe network. Ponding continues until it reaches a crest level at the northern extent of Sands Street and then continues to flow along the pedestrian path to the north of the building toward Day Street. The existing flood model shows that the existing loading dock floor level (4.27m) is below the 20%, 5%, 1% and PMF as shown below.

In addition there are several loading dock entrances to adjacent properties along Sand Street as shown in figure 17.

	Floor Level	20% AEP	5% AEP	1% AEP	0.2% AEP	PMF
Sands Street Flood Level	4.27m	4.31	4.40	4.58	4.75	5.41
Sands Street Flood Depth		0.08	0.17	0.35	0.52	1.18

Figure 17: Existing Loading Dock Entry Levels along Sands Street

The CoS flood planning level for loading docks is the 1% AEP flood level and therefore the existing (and proposed) loading dock's along Sands Street do not comply.

An architectural review of constraints has been completed for the proposed loading dock which confirms that:

- Moving the loading docks is not possible due to vehicle turning space required.
- Raising the loading dock is not possible due to the limited space, gradient compliance and tie into existing road levels of Sands Street
- Raising Sands Street low point is not possible due to existing adjacent properties and loading dock entrances

An assessment has also been completed to upgrade the stormwater in Sands Street to provide higher capacity to try and reduce the flood level below the loading dock entrance. The stormwater upgrades are limited by the existing 600mm that runs through the basement easement of the existing building and across Day Street and offsite west below the Cross City Tunnel exit ramp. A further constraint is the existing invert levels of the 600mm pipe which are approximately RL1.15m and below the tidal tailwater level in Darling Harbour of RL1.38m for the 1% AEP event. This means that the existing 600mm pipe leaving the site has an effective reduced capacity of 65%.

The following stormwater options were reviewed and assessed and are shown in figure 18, with results shown in figure 19..

- Upgrading the existing 600mm pipe within the easement through the basement, to either 2x 600mm pipes, a 750mm dia pipe, or a 600x900mm box culvert.
- Upgrading the pits and pipes around the Sands Street trapped low point and Loading docks, with twice the capacity of the existing pits and upsizing pipes from 225mm up to 600mm.
- Large capacity surcharge pit to allow the additional flows from Sands Street to discharge as overland flow to Day Street.
- Making a direct connection to the existing trunk stormwater 1500mm diameter pipe that runs under the western distributor overpass and Cross City Tunnel exit – this option was discounted due to extremely limited space under the overpass and deep excavation could undermine adjacent structural supports of the Cross City Tunnel retaining wall and overpass abutments. Furthermore, the 1500mm pipe diameter has an invert even lower of approximately RL 0.5m and also has limited capacity due to the tidal downstream water levels.

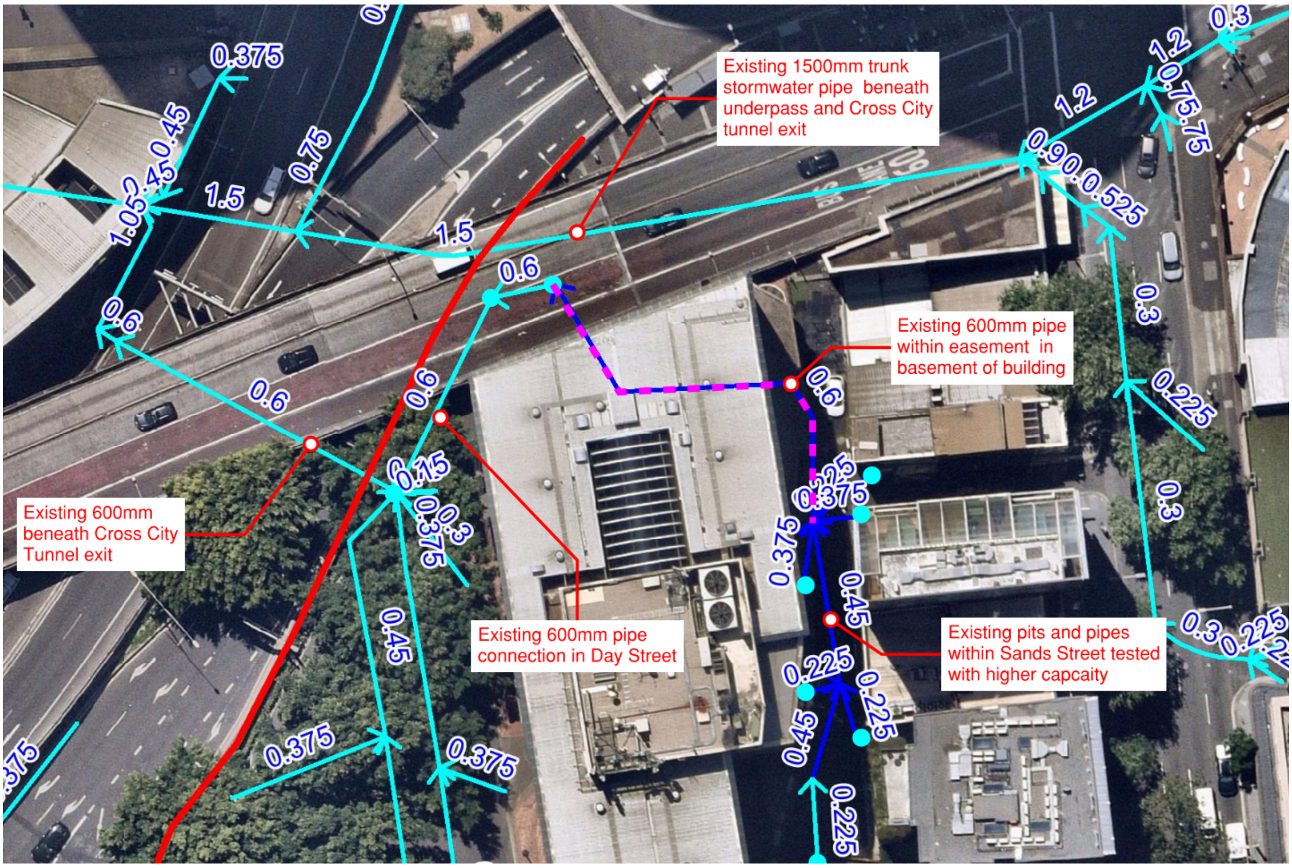


Figure 18: Existing Stormwater Tested for Flood Mitigation

The following table summarises the impact of the different stormwater upgrades. The biggest reduction in flood levels is from a 900x600mm box culvert with up to 600mm pipes connecting additional large capacity pits around Sands Street. However, the flood levels for this scenario are not reduced below the loading dock level in the 1% AEP and also remains above the adjacent loading dock levels even in the 5% AEP.

Due to the high cost, large disruption and no significant improvement in flood risk provided by stormwater upgrades, it is not recommended to include the upgrades to the stormwater for flood mitigation to reduce flood levels within Sands Street. It is therefore proposed to protect the loading dock from flooding through the use of a flood barrier as detailed in section 5.2. However, stormwater upgrades may be further explored during the detailed design stage.

1% AEP Flood Level	Loading Dock Floor Level	Existing Scenario	Twin 600mm pipes	900x600mm culvert	750mm pipe
Loading Dock Flood Level	4.27m	4.58	4.33	4.35	4.45
Loading Dock Flood Depth		0.35	0.11	0.13	0.23

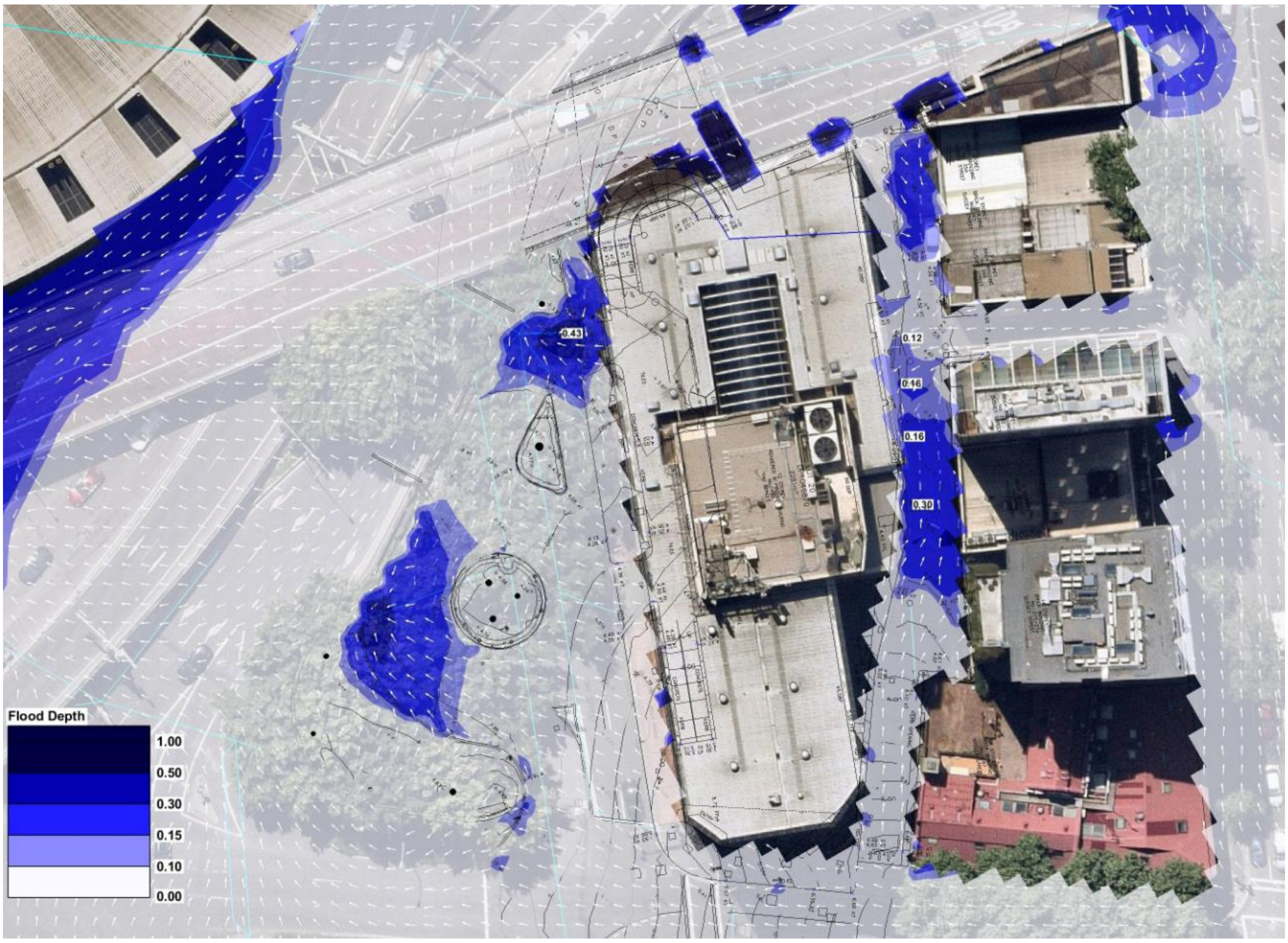


Figure 19: Flood Depths With Upgraded 900x600 Culvert And Double Pit Capacity In Sands Street

5.2 Loading Dock – Flood Barrier.

Due to the limited options available for raising or moving the loading dock, or lowering the flood level in Sands Street it is proposed that the loading docks are protected from flooding using flood barriers in the form of automated roller shutter doors. These can be fully automated and will have their own independent power supply. An example of the roller shutter door is shown in figure 20.

Features

A range of activation options is available:
- Push button
- Full automation via sensors
- Remotely via mobile phone

Operation powered via 24V battery independent from the mains power supply.

Alarm(s)s and strobe(s) warning system included.

Design

Sleek design for architectural applications.

Stainless steel framing with aluminium panels for rust resistance.

Proprietary design which can suit each project's flood protection height requirements and opening widths. Available spans range from 1200mm to 7000mm.

Motor box and panel housing can be exposed or above ceiling.

Operation

Early warning alarm system initiated using flood sensor pit. Powered via 24V battery independent from the mains power supply.

System deployment via overhead box.

Maintenance

Periodic maintenance is required, and system testing is completed using Control Panel functionality.

Quality

A proprietary product with a proven track record in Taiwan, Asia, Europe and Australia.

Documentation

Full set of barrier drawings including coordination drawing and Operation and Maintenance Manual issued for each project.

Figure 20: Flood Roller Shutter Example (Flooding Solutions Pty Ltd)

6. Flood Planning Compliance

As outlined in Section 1.2, the Council's IFMP specifies the requirements for different types of development and the associated flood planning controls. Since the proposed development does not impact flood behaviour, the primary planning control relates to the Flood Planning Levels, as shown in Table 1. Where an external entrance to the building provides internal access to basement levels, the applicable flood planning level is the higher of the 1% AEP or the PMF, due to the potential for basement floodwater ingress. For all other habitable areas without such ingress points to the basement, the applicable Flood Planning Level is the 1% AEP for commercial/business use.

Figure 21 and Table 8 provide an assessment of the ground floor layout, identifying potential floodwater ingress points and raised thresholds to ensure compliance with Flood Planning Requirements. It should be noted that this assessment excludes building access points that lead to stairways connecting to upper levels above the PMF. Where flood depths are less than 50 mm on the road adjacent to an entrance, this is considered minor stormwater flow resulting from the rainfall-on-grid method, not classified as flooding, and therefore does not require compliance with the Flood Planning Level.

Due to the reuse of the existing building at ground floor, requirement for DDA compliance and direct street activation, there are instances where the internal floor level does not comply with the Flood Planning Level:

- **The loading dock off Sands Street:**
  Due to constraints associated with the existing loading dock (refer to Section 5.1 and 5.2), a raised floor level cannot be achieved and flood barriers will be installed along the entrances to protect against inundation for all flood events including the PMF.

- **Pedestrian Entrance Lobby off Day Street:**
  The Entrance Lobby needs to be flush for DDA requirements and cannot currently be raised to the FPL. However, a concealed automatic flood gate is proposed at this entrance. The flood gate is raised by the hydraulic pressure of flood water itself and does not require human intervention and is therefore considered passive. This entrance is not affected by flooding in the 1% AEP (<50mm) and therefore the flood gate only should only be implemented for the extremely rare PMF.

- **Vehicle Basement Entrance off Day Street:**
  The vehicle entrance to the basement be flush with the external road and there is insufficient internal space or headroom for the existing ramp to be raised or lengthened to provide a crest above the FPL. However, a concealed automatic flood gate is proposed at this vehicle entrance. The flood gate is raised by the hydraulic pressure of flood water itself and does not require human intervention and is therefore considered passive.

Note that the option of raised floor levels and thresholds without the requirement for flood gates will be reviewed and investigated in more depth during the more detailed Development Approval stage.

This assessment confirms that the proposed development complies with the required Flood Planning Levels and will improve flood risk to the development compared with the existing hotel building. There is no impact on flood behaviour associated with the development and the proposal therefore meets Council's Interim Floodplain Management Policy and associated flood planning requirements.

866

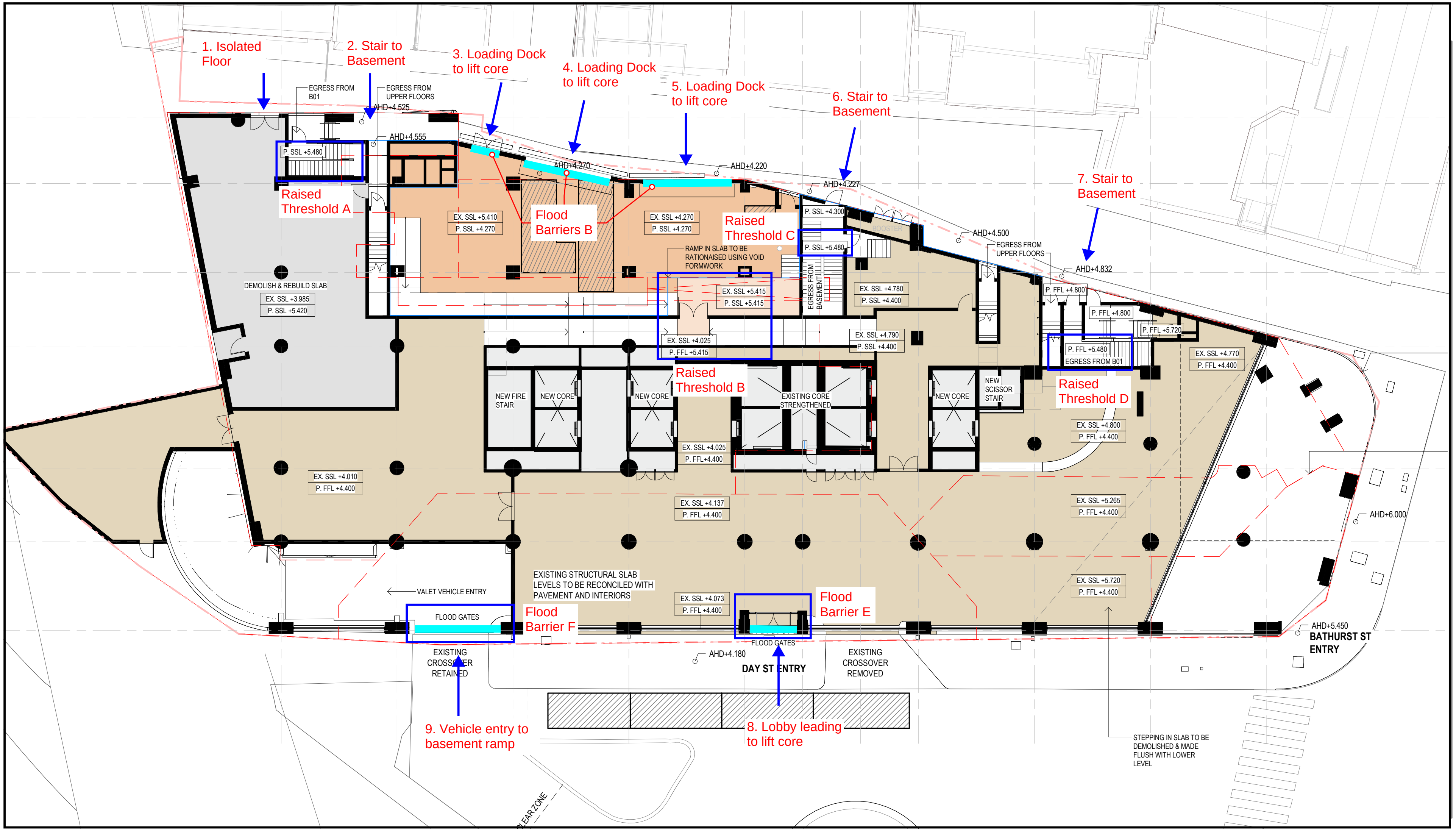


Figure 21: Flood Planning Levels Compliance Plan

Table 8: Flood Planning Levels Compliance

Flood Ingress Point	1% AEP flood level	PMF level	Basement Entry	Flood Planning Level	Proposed Floor Level	Raised Threshold Type	Raised Threshold Level	FPL Met
1. Isolated floor	4.58	5.41	No	**4.58**	5.42	Floor level	**5.42**	YES
2. Stair to basement	4.58	5.41	Yes	**5.41**	5.48	Raised stair at A	**5.48**	YES
3. Loading Dock to lift core	4.58	5.41	Yes	**5.41**	4.27	Flood barrier and raised internal floor at B	**5.42**	YES
4. Loading Dock to lift core	4.58	5.41	Yes	**5.41**	4.27	Flood barrier and raised internal floor at B	**5.42**	YES
5. Loading Dock to lift core	4.58	5.41	Yes	**5.41**	4.27	Flood barrier and raised internal floor at B	**5.42**	YES
6. Stair to basement	4.58	5.41	Yes	**5.41**	5.48	Raised stair at C	**5.48**	YES
7. Stair to basement	4.85	5.43	Yes	**5.43**	5.48	Raised stair at D	**5.48**	YES
8. Entrance to lift core	<50mm deep	4.64	Yes	**4.64**	4.40	Flood barrier at E	**4.65**	YES
9. Vehicle entry	3.78	4.64	Yes	**4.64**	3.70	Flood barrier at F	**4.65**	YES

7. Preliminary Flood Emergency Management Plan

It is important that users of the site are aware of any potential flood risks and that procedures are in place to ensure personal safety. This section provides preliminary recommendations to ensure that in the event of a flood, risk to personal safety is appropriately managed. The plan provides strategic advice that needs to be implemented as part of the site's construction and on-going operation.

A detailed Flood Emergency response plan will need to be completed as part of the detailed design stage and reflect any changes to the development proposal.

7.1 Flood Behaviour and Risks on Site

Flood modelling confirms that there is a trapped low point in Sands Street which provides a source of overland flooding to the east of the building. The solid boundary wall to the west of Day Street prevents overland flow escaping this area and provides a source of overland flooding to the west of the building.

As a result, flood depths peak at approximately 1.6m west of the site, with a peak hazard rating of H3. Bathurst Street, the main access road in and out of the site, reaches H5 hazard in the PMF. Mapping of the peak flood hazard categorisation in the wider area during the critical PMF storm event is shown in Figure 22.

7.2 Flood Inundation Times

The Darling Harbour FRMSP notes that the majority of flooding within the Darling Harbour catchment is characterised by overland flow, with no mainstream flooding and only a small area of tidal influence near Darling Harbour. The critical storm duration is between 1-2 hours across most of the catchment, and 15-minutes for the site. As such, there is very little warning time prior to the onset of a flood event, although floodwaters in the roadways quickly recede.

Table 9 accesses the time to inundation and recession time in three PMF events of varying duration. The 15-minute storm is critical in terms of inundation time, with less than 5 minutes before flood hazard levels reach H5 (unsafe for people and vehicles, all buildings vulnerable to structural damage) along Bathurst Street.

Longer duration runs have been reviewed to determine the maximum potential isolation time at the site. In the six-hour duration PMF event, flows adjacent to the basement entrance are unsafe for small vehicles for a total period of approximately 4 hours and 30 minutes. However, the site is not entirely isolated in this event, given that Bathurst Street and the lobby entrance remains accessible for the duration of this storm, with only minor low hazard (H1) flows adjacent to the main entry.

Table 9: Time to inundation and recession at the site in PMF storm

PMF Storm Duration	Time to Inundation	Recession Time
15 minutes	< 5 minutes until flooding along Bathurst St reaches H5 hazard, prohibiting access to and from the vehicular entryway. < 10 minutes until flooding adjacent to the entry lobby and basement ramp reaches H3 hazard.	**Bathurst Street returns to H1 hazard less than 20 minutes after the onset of the storm**. However, access to and egress from the site is restricted due to ponding of H3 hazard at the basement entry and adjacent car park. While this recedes, there is still ponding of H3 hazard at the basement ramp two hours after the onset of the storm. Flows immediately adjacent to the lobby entrance reduce to **below 50mm depth after 35 minutes** the onset of the storm, with vehicular pickup available from this point onto Bathurst Street, which is flood-free by the time the lobby entry becomes accessible.

2 hours	< 15 minutes until flows adjacent to the basement entry become unsafe for small vehicles (H2 hazard level). < 35 minutes until flows with hazard classification of H2 reach the lobby entrance	Ponding across the west of the site begins to recede 1 hour after the onset of the storm. The lobby entrance is impacted by **H2 flows for a total of 30 minutes.** The vehicular entry to the basement returns to trafficable conditions 2 hours and 20 minutes after the onset of the storm.
6 hours	< 35 minutes until flows across Sand Street (the eastern frontage of the site) reach H3 hazard. < 45 minutes until floodwaters adjacent to the basement ramp reach H2 hazard, unsafe for small vehicles.	Floodwaters begin to recede 2 hours and 20 minutes after the onset of the storm. Flows adjacent to the basement entrance return to low (H1) hazard conditions 5 hours and 10 minutes after the onset of the storm, with a total "out of action" period of approximately 4 hours and 30 minutes. However, the o**verall risk to the site is lower, with flows adjacent to the lobby entry categorised as low (H1) hazard for the duration of this storm**. Flows across Bathurst Street are similarly low hazard, with depths below 50mm across this road.

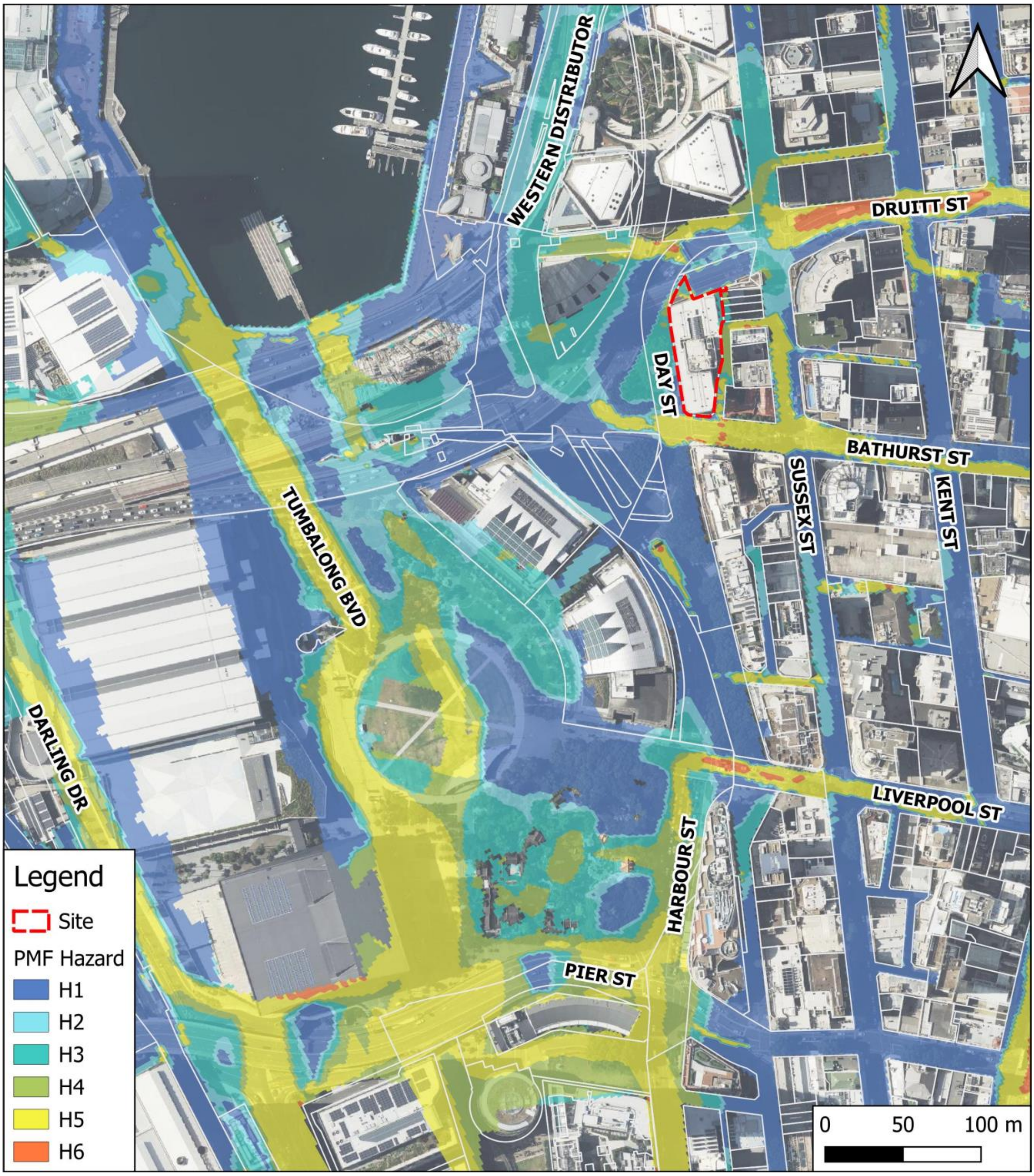


Figure 22: Peak PMF hazards at the site and wider site area in the critical duration 15-minute storm

7.3 Flood Response Strategy: Shelter-in-Place

While there is often advanced warning time of extreme rainfall events such as those endured in a 1% AEP-PMF event, this cannot be relied upon. Flash flood events are usually characterised by minimal warning times, and pre-emptive closure of the site cannot be accomplished.

This flood response strategy acknowledges that short interval of time between the onset of the storm and the peak of the storm does not allow sufficient time to evacuate residents and workers from their properties. In these situations, evacuation is generally not recommended as it is likely to be hurried and uncoordinated, which can expose evacuees to a hazardous situation. This strategy similarly notes that any warning provided would be for immediate safety precautions such as temporary refuge (if available nearby or onsite), raising of items off the ground and accounting for people on site.

The flood response strategy concludes that “the preferred response to flooding in flash flooding catchments is for people to remain within the property, preferably above the ground floor level”.

Shelter-in-place (SIP) guidance published by the NSW Department of Planning, Housing and Infrastructure (DPHI) in January 2025 provides considerations that can inform whether SIP is an appropriate response strategy in a flash flood environment, alongside design considerations that should be met. Table 10 outlines the varying factors that must be considered when proposing SIP, and how this site meets the recommendations.

Table 10: DPHI SIP Guidelines

SIP Guideline	Response
Initial assessment	
1. Does shelter in place align with existing emergency management strategies for the area, as determined through the flood risk management process and by the NSW SES?	Pre-emptive evacuation of the site is recommended when there is advanced warning of a major storm event, which is consistent with the flood response strategy discussed in the City of Sydney Local Flood Emergency Sub Plan (Section 5.8.3 of the sub plan). However, the main flood mechanism impacting the immediate area around the site is flash flooding via overland flow. Flash flood events are characterised by minimal warning times and therefore there is unlikely to be sufficient warning time available to achieve evacuation at the site.
2. Has evacuation off-site (the primary emergency management strategy) been investigated and determined to be unachievable?	With less than five minutes from the onset of the shorter duration (15-minute) PMF storm until inundation of the adjoining roads of the proposed site (refer Table 9), there is little warning time to implement evacuation off-site. As evident in Figure 22, there is no way in or out of the site that does not go through hazardous waters during the critical duration PMF event. NSW SES state that evacuation of a site must not require people to drive or walk through flood water. It is therefore recommended that the site is prepared for a shelter-in-place strategy.
3. Does the development include medical centres, emergency service and community facilities, and sensitive and hazardous land uses, some of which may not be suitable for shelter in place?	N/A
4. Shelter in place for greenfield development is not supported	N/A

5. Whether there is existing government developed flood warning systems that give advanced detailed forecasts of flash flooding to allow sufficient time to evacuate to the proposed refuge locations[2] [2] Flash flood warning systems are not failsafe and should not be the only mechanism to get people to shelter in place.	There is less than five minutes from the onset of the 15-minute PMF storm until H5 inundation of the Bathurst Street access point. While there are flood warnings issued by the Bureau of Meteorology and the Australian Warning System, the flash nature of flooding at the site (and the inherently limited warning time associated with this type of flooding) limits the capacity of NSW SES to issue flood notifications and action statements with sufficient lead time. Warnings from the Australian Warning System (AWS) (including severe storm warnings and thunderstorm warnings) may not be available or occur with advanced warning.
6. Can the community effectively be informed of the risks associated with the emergency management strategy?	A PA system should be considered whereby site users can be quickly informed of any shelter-in-place procedures. Contact details for guests of the hotel should also be used to send email and SMS notifications.
Following satisfaction of the above, the following must be assessed:	
7. Detailed assessment of evacuation off-site (the primary emergency management strategy) to determine that evacuation off-site is not achievable	With less than five minutes from the onset of the 15-minute PMF storm until inundation of the adjoining roads for the proposed site (refer Table 9), there is little warning time to implement evacuation off-site. As evident in Figure 22, there is no way in or out of the site that does not go through hazardous waters during the critical duration PMF event. NSW SES state that evacuation of a site must not require people to drive or walk through flood water. It is therefore recommended that the site is prepared for a shelter-in-place strategy.
8. The flood behaviour at the site, with consideration of climate change and assessment of the potential maximum duration of isolation up to and including the PMF to identify that: a) flash flooding is the only flood risk present at the site, whether it be from overland flooding, local creek or riverine flooding, and b) the flooding occurs within less than 6 hours from the commencement of causative rain and the duration of shelter in place due to isolation by floodwaters is less than 12 hours from the commencement of rainfall, and c) the development is not subject to high hazard flooding (e.g. floodways, high hazard H5 or H6 areas) or surrounding roadways are not subject to high hazard flooding.[3] [3] Flood Risk Management Guideline FB03 Flood Hazard, DCCEEW, 2023.	Consideration of climate change has been made in Section 4 of this report. Duration of isolation in the PMF event has been assessed in Table 9. Section 3 of this FERP outlines the flood behaviour at the site, which is derived from flash flooding. There is less than five minutes from the onset of the 15-minute PMF storm until inundation of Bathurst St, the only vehicular access point for the site. The duration of flooding on the roads is short due to the flash nature of flooding in the area, although ponding within the site persists due to the solid boundary wall to the west of Day Street which prevents overland flow escaping this area. The basement entry to the site is isolated for approximately 4 hours 30 minutes in the 6-hour PMF storm event, while the lobby entrance is isolated for a maximum duration of 35 minutes in the 15-minute PMF event. Bathurst Street to the south of the site is impacted by H5 hazard in the critical 15-minute PMF event. Despite this, it is deemed more hazardous to attempt to evacuate the site once a severe storm event has already commenced, as this would involve moving vulnerable site users from safe refuge into roads of high hazard.

9. How shelter in place will be: a) used as part of the site's emergency management response, including actions before, during and after sheltering in place, and b) communicated to occupants and visitors of the building and how this communication will be maintained for the life of the development.	A PA system should be considered whereby site users can be quickly informed of any shelter-in-place procedures. Contact details for guests of the hotel should also be used to send email and SMS notifications.
10. a) An understanding of the secondary risks and how the proponent proposes they will be managed is outlined in the FIRA. Secondary risks include medical emergencies, building fire, health and wellbeing. b) Table 12 of EM01 should be used to consider whether the risks could be effectively managed.	Secondary emergencies are considered in Section 7.3.1. Table 12 of the EM01 notes that a risk management consideration is limiting exposure of people to floodwaters. The EM01 document suggests that this can be aided by providing sufficient readily accessible habitable areas above the PMF to cater for potential occupants, clients, and visitors. With 21 levels, there is adequate space across the Park Royal Hotel in which site users can shelter, making the site safe for refuge. Table 12 of the EM01 also notes that to reduce human behaviour risks, "*Where facilities, such as businesses, schools and childcare centres have site emergency plans that consider flooding these plans should by regularly exercised similar to building fire evacuation drills.*" Table 12 also states "*Consider developing a PA system to communicate evacuation directions and safety messages to the population in the lead-up to and during a flood to assist in improving the safety of the community*."
Design criteria for consideration	
i. the floor level of the shelter in place part of the development be above the PMF, and	Flood gates are proposed to prevent above-floor inundation of the site. Guests of the hotel will be able to shelter in their rooms, which are located on Level 3 and above, elevated well above the PMF.
ii. structural soundness for conditions in a PMF event, considering flood and debris forces, be verified by a suitably qualified structural engineer, and	A structural engineers report is required to verify that buildings are designed with flood compatible building materials for conditions in a PMF event.
iii. area and access to the area does not rely on access to electricity, is self-directing, and have clearly marked internal access for all people on site, including consideration of access for potential occupants and/or visitors	Access and clearly marked internal access will be achieved.
iv. protection from weather and appropriate heating and cooling	As a site offering hotel facilities, this will be achieved.
v. access to personal hygiene facilities such as a toilet	As a site offering hotel facilities, this will be achieved.

vi.	a minimum floor space of 2 m² per person	Overall, the site will provide refuge space well over 2sqm per person with various communal spaces across the site for refuge, including function rooms and dining areas.
vii.	items for self-sufficiency that are stored, maintained and are regularly updated in an accessible location above the PMF, including sufficient drinking water and food for occupants, fire extinguishers, radios and torches with spare batteries, and a first aid kit with an automated external defibrillator (AED)	Availability of an AED should be considered by the site manager.
viii.	centralised communal shelters may be considered but must be freely accessible internally at all times and externally accessible during events	This won't be required. There will also be communal spaces available to refuge, including the residents' hotel rooms, function rooms, and dining areas etc.
ix.	access is provided to onsite systems that generate power of the shelter in place location during and after the event for a full range of flood events up to the PMF	The ground floor and basement will be protected from flooding up to the PMF power generation and substation will also be protected
x.	detail how these requirements will be maintained and enforced for the life of the development.	Flood Emergency Response Plans are 'living documents' which need to be regularly reviewed once the site is operational to ensure they remain appropriate to address the risk to the site, can be practically implemented, and consider changing information and lessons learnt from any floods since the last review. It is recommended that the FERP is reviewed following staff changes, flood drills as well as flood events to ensure that the details remain relevant.

7.3.1 Secondary Emergency

Although shelter-in-place is the emergency response strategy if a severe flash flood event begins without sufficient warning, any decision to shelter-in-place must be accompanied by alternative plans in the event of a secondary emergency (e.g. medical or fire). The following items should be considered to ensure sufficient preparedness in the event of a secondary emergency:

FIRE:
- Ensure adequate access to fire extinguishers and internal fire suppression systems (e.g. sprinklers).
- Check that they are not reliant on mains pressure that may fail.

MEDICAL:
- Designate trained personnel and maintain a flood-resilient first aid station with supplies sufficient for prolonged isolation.
- Nominate a safe, elevated, easily accessible area for care of injured or ill persons until external assistance can arrive.
- Consider evacuation aids including stretchers, wheelchairs, or other aids for internal transfer if

POWER:
- Install and maintain flood-resilient generators or battery systems for critical power (lighting, communications, medical equipment)

7.4 Flood Warnings and Notifications

Severe weather and thunderstorm warnings are issued by the Bureau of Meteorology (BoM). These warnings are continually updated with descriptions of the likely conditions, including predicted severe rainfall. Flood warnings are issued by the BoM when flooding is occurring or is expected to occur in an area however this is for mainstream flooding and would not cover the flash flooding at this site. These warnings are distributed by BoM to government, emergency services and the community, including local SES, and are available on the BoM website.

- A ***Severe Weather Warning*** is issued by the BoM when severe weather is occurring or expected to develop, that is a the direct consequence of a thunderstorm. For broad severe weather such as east coast lows or vigorous cold fronts, Severe Weather Warnings are aimed to be issued 24-36 hours ahead of the expected onset. This warning time may be reduced particularly for more localised severe weather. Once a severe weather warning is issued it is routinely updated every six hours until the threat has passed, but may be updated more frequently for rapidly evolving situations.

- *A* ***Severe Thunderstorm Warning*** is issued by the BoM whenever there is sufficient meteorological evidence to suggest that severe thunderstorm development is likely, or when a severe thunderstorm has been directly reported or observed. Regional warnings are provided for one or more forecast areas and aim to give 3 hours warning before thunderstorms develop. Detailed thunderstorm warnings are provided for capital cities (including this site) and aim to give 60 minutes warning before severe thunderstorms develop. Warnings are updated routinely every 30-60 minutes until the threat has passed or more frequently if required.

7.5 NSW SES Australian Warning System

NSW SES has recently implemented the Australian Warning System (AWS) which replaces their previous evacuation orders and warnings system. The AWS is a new national approach to information and ‘Calls to Actions’ for hazards including storms and flooding. The system uses a nationally consistent set of icons, with three warning levels: Advice, Watch and Act, and Emergency Warning. The storm warnings are described in Figure 23.

Figure 23: Australian Warning System - Three Warning Levels

The NSW SES utilises a range of sources to build detailed flood intelligence within local communities, including information from flood studies and historical flood data. As part of the transition to the Australian Warning System, the NSW SES has increased flexibility to tailor warnings at the community level, based on the expected consequences of severe weather events.

The Site Manager is responsible for monitoring information from the AWS. The NSW SES has also developed an all-hazards warning platform, Hazard Watch, to provide an additional channel for communities to access important warning information.

Each warning has three components:

1) **Location and hazard**: The location and the type of hazard impacting the community.
2) **Action statement**: For each warning level there are a range of action statements to guide protective action by the community. These statements evolve as the warning levels increase in severity. Statements range from ‘prepare now’ and ‘monitor conditions’ at the Advice level, to ‘stay indoors’ at the Watch and Act level, to ‘seek shelter now’ in the Emergency Warning level. As the situation changes and the threat is reduced, the level of warning will decrease accordingly.
3) **The warning level**: The severity of the natural hazard event based on the consequence to the community.

As the site is affected by flash flooding, little to no warning time is likely to be available, with Severe Storm Warnings and Severe Thunderstorm Warnings likely to be the only warnings available.

It is also important to acknowledge that neither the NSW SES nor the Bureau of Meteorology can provide special individual flood warning services for each affected property or school. The more specific the warning requirement for individuals and sites becomes, the more difficult it is for the NSW SES to deliver warnings in the short time frames that often apply. School operators must be weather aware and act early on publicly broadcast severe weather and thunderstorm warnings.

7.6 Triggers

The nature of flash flooding at the site (and the inherently limited warning time) limits the capacity of NSW SES to issue flood notifications and action statements with sufficient lead time. It is important to note that the warnings outlined above may not be available or occur with advanced warning.

To ensure adequate response time, alternative triggers should be monitored including BOM Severe Weather and Thunderstorm Warnings, media updates via local radio stations and social media. While the Site Manager is responsible for monitoring information from the BOM website and AWS, NSW SES recommend that all site users (namely, all staff members and wardens) refer to the HazardWatch website and the Hazards Near Me app.

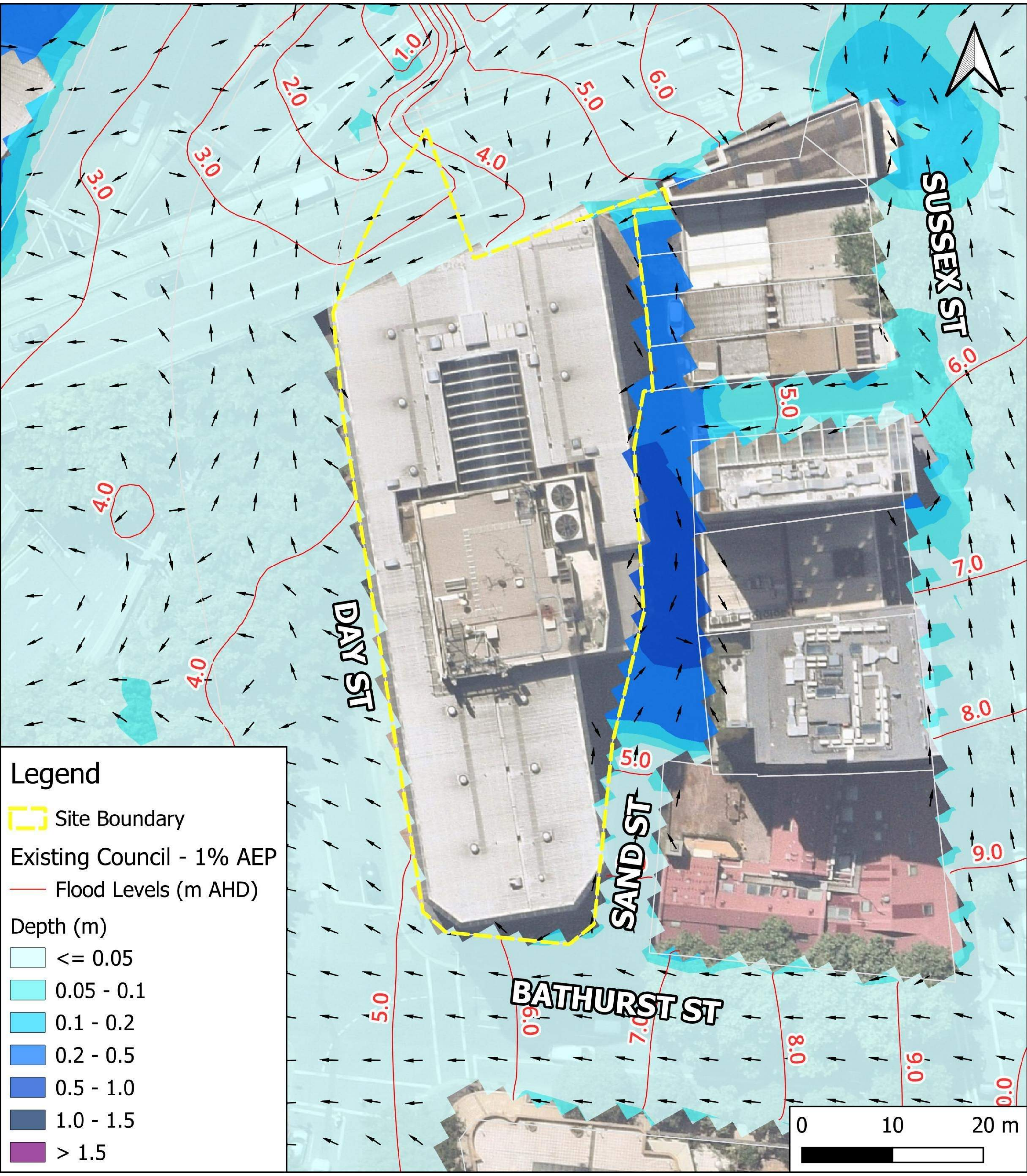
Additional flood depth gauges will be located within the staff carpark to the east of CHS building Y and within the playing field near the eastern boundary within the main overland flow corridor. This can be used as a visual trigger where flood depths reach 300mm relocation to the SIP is required if pre-emptive closure of the school cannot be made.

7.7 Emergency Signals

The site should have a Public Announcement (PA) system that can be used by the Site Manager to inform all staff and site users of the chosen response strategy in the event of a flood emergency. This ensures that staff with key responsibilities in the Plan can begin to fulfil their duties without delay.

A PA system (or similar) should be used alongside SMS and email updates to staff and students to inform them of any severe weather or flood warnings covering the site.

Appendix 1
Flood Maps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Legend
Site Boundary
Existing Council - 1% AEP
Flood Levels (m AHD)
Depth (m)
<= 0.05
0.05 - 0.1
0.1 - 0.2
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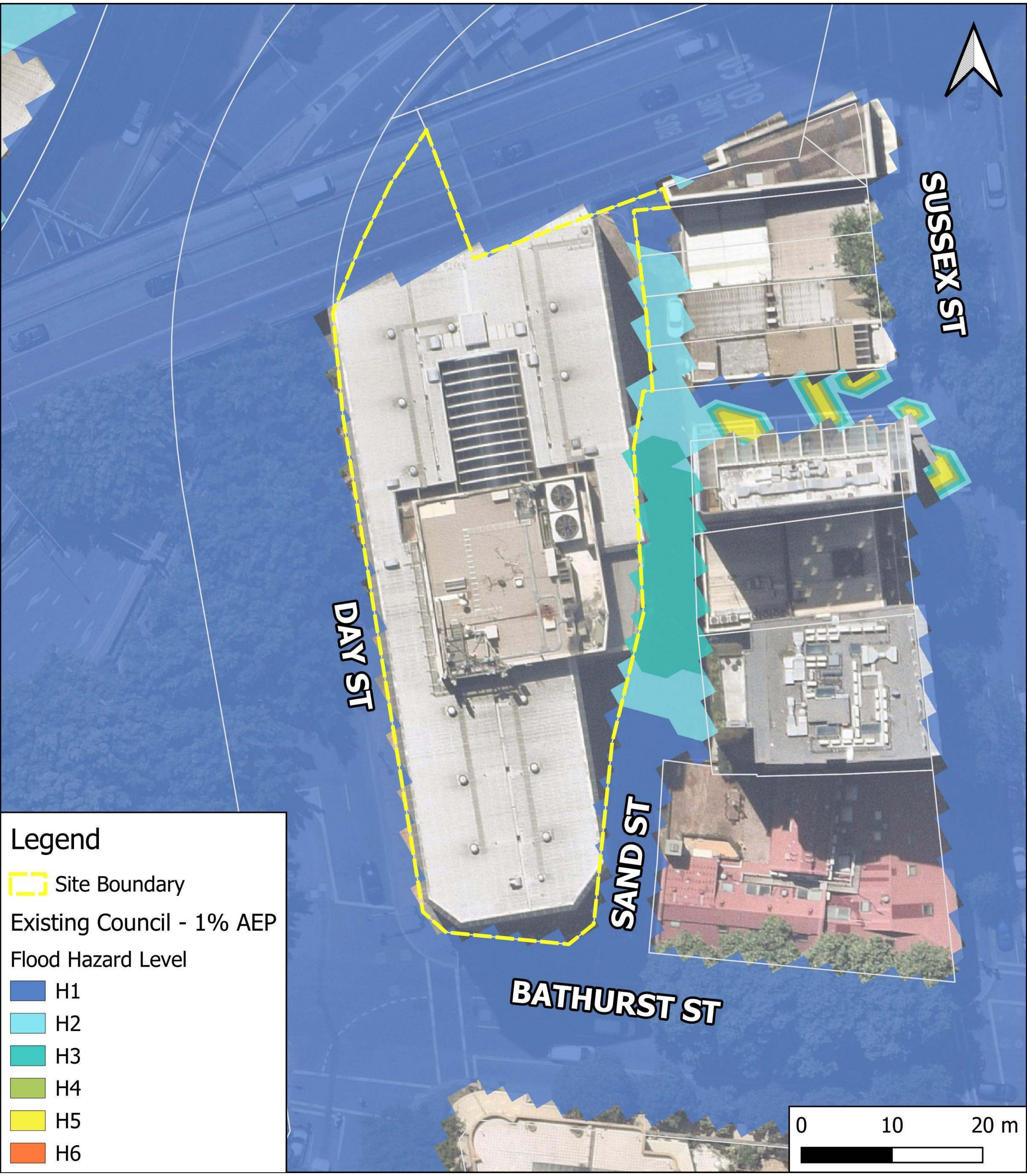
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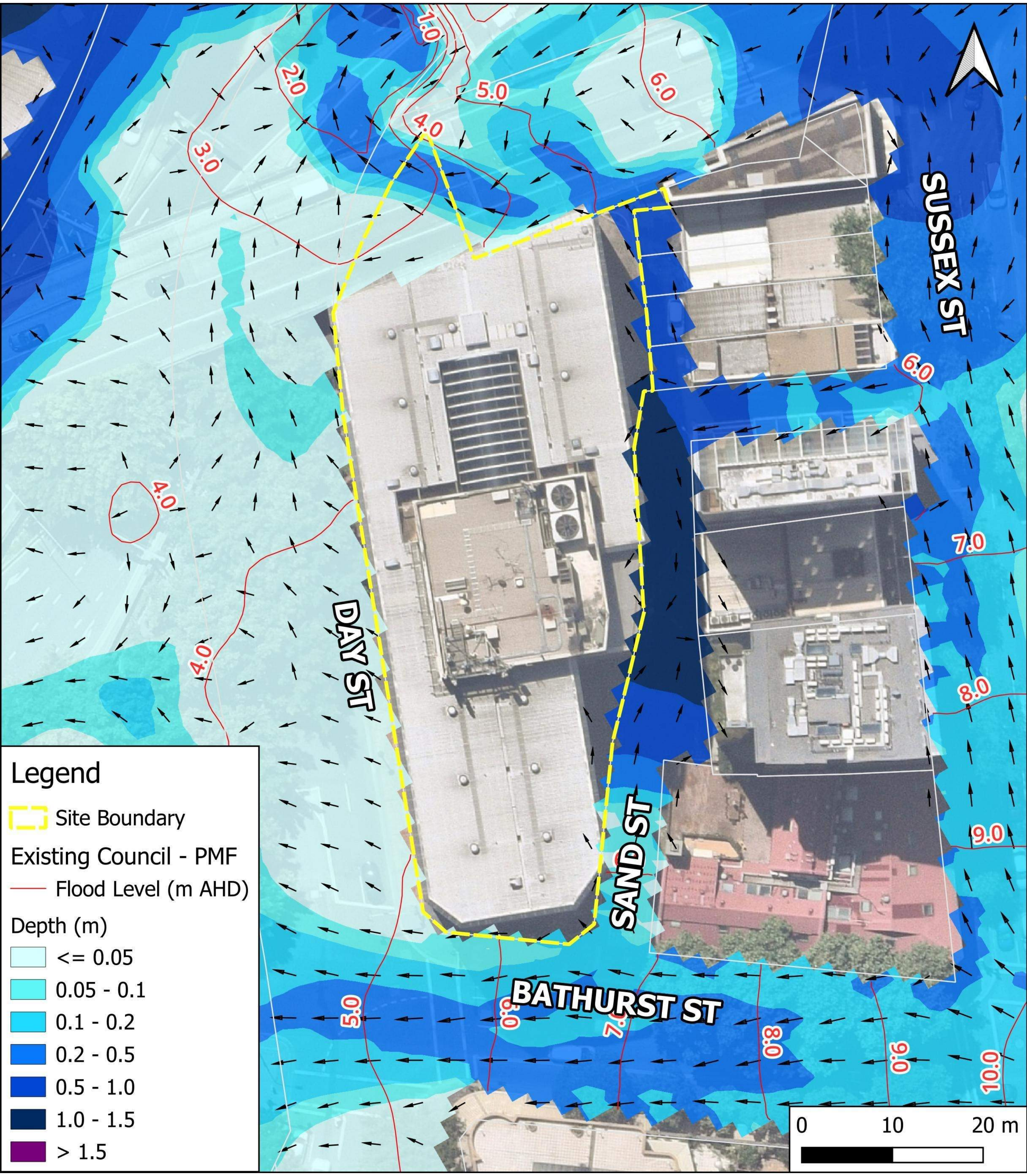
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Legend
Site Boundary
Existing Council - PMF
Flood Level (m AHD)
Depth (m)
<= 0.05
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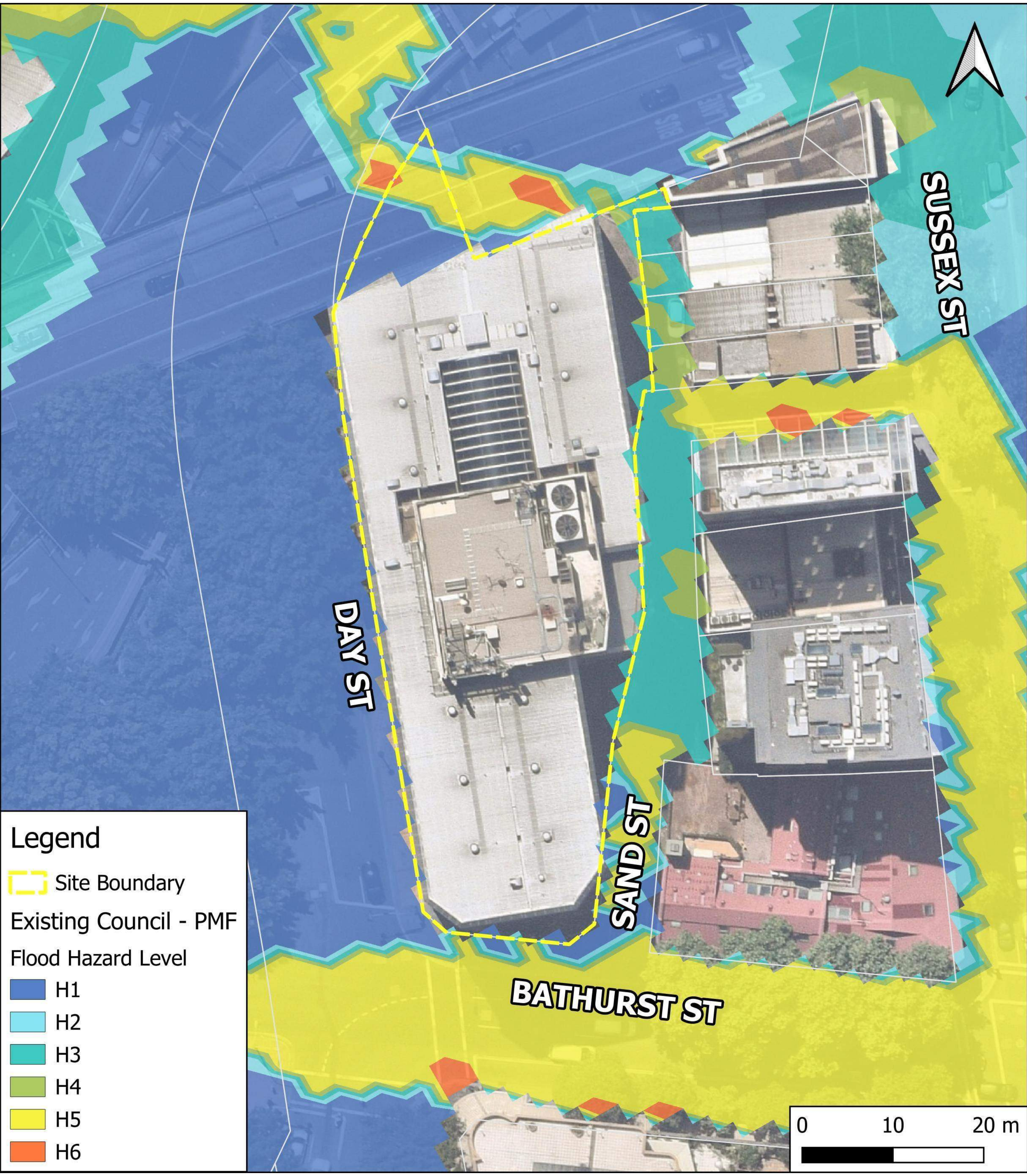
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Existing Council - PMF
Flood Hazard Level
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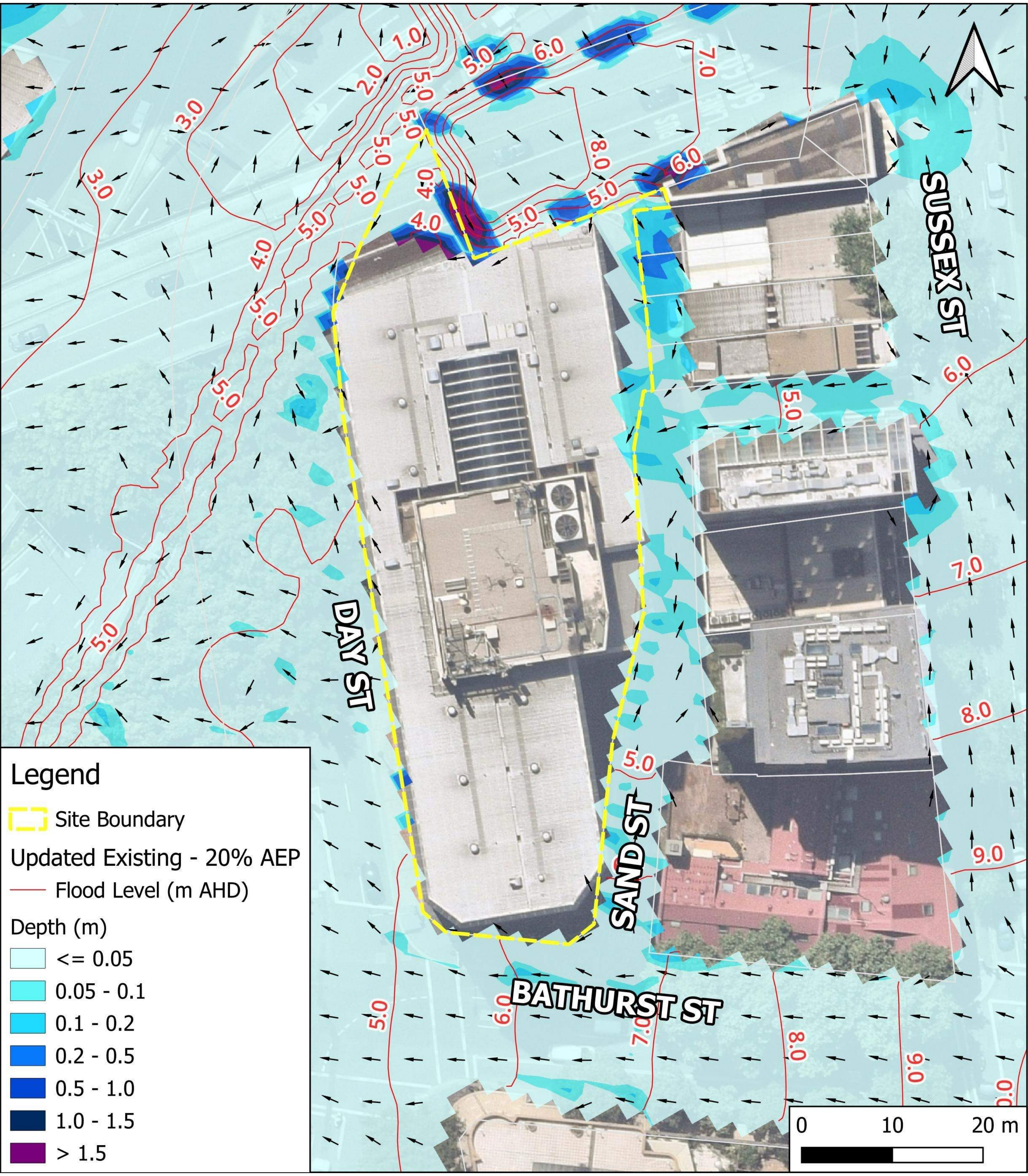
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Legend
Site Boundary
Updated Existing - 20% AEP
Flood Level (m AHD)
Depth (m)
<= 0.05
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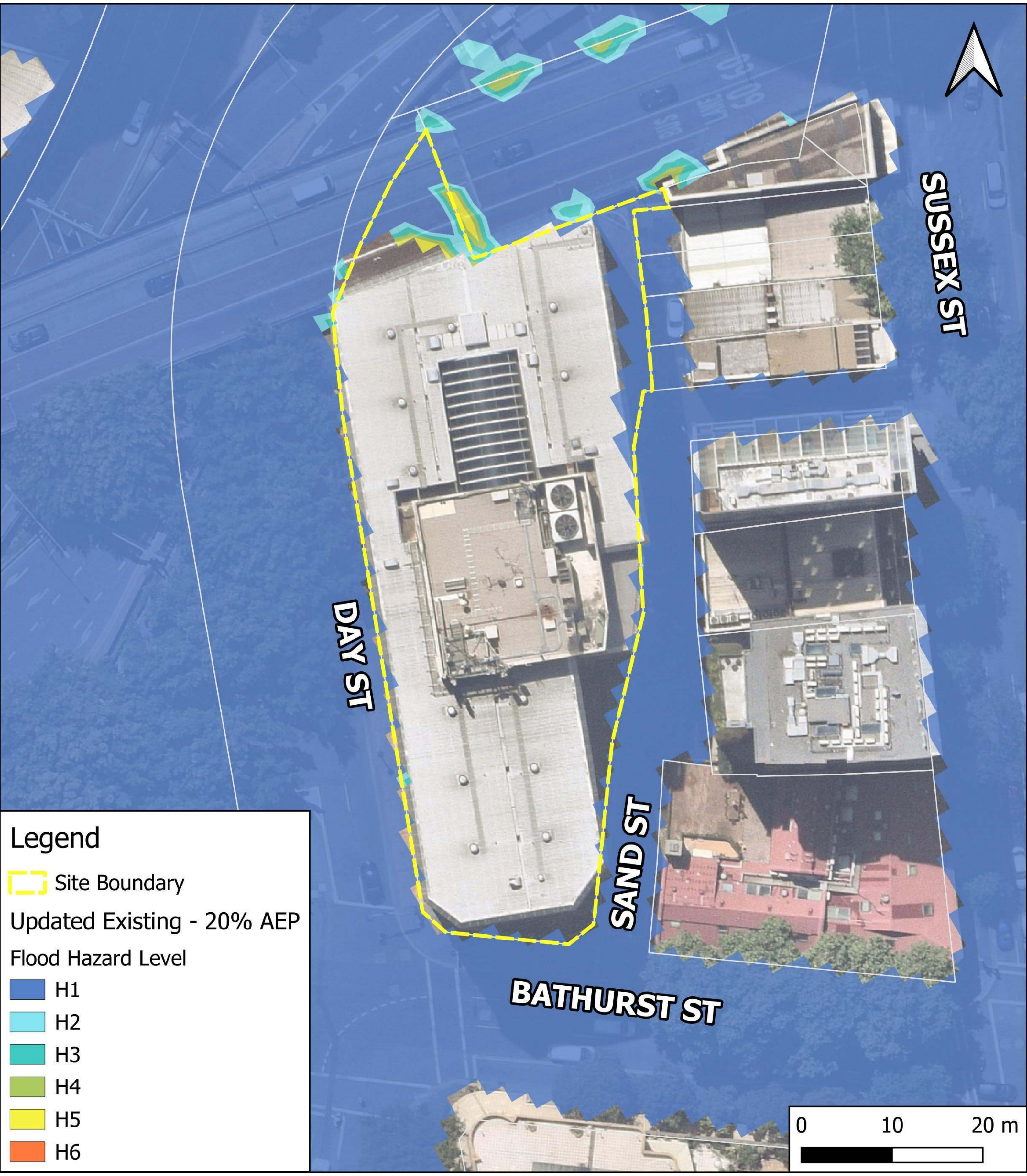
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Flood Hazard Level
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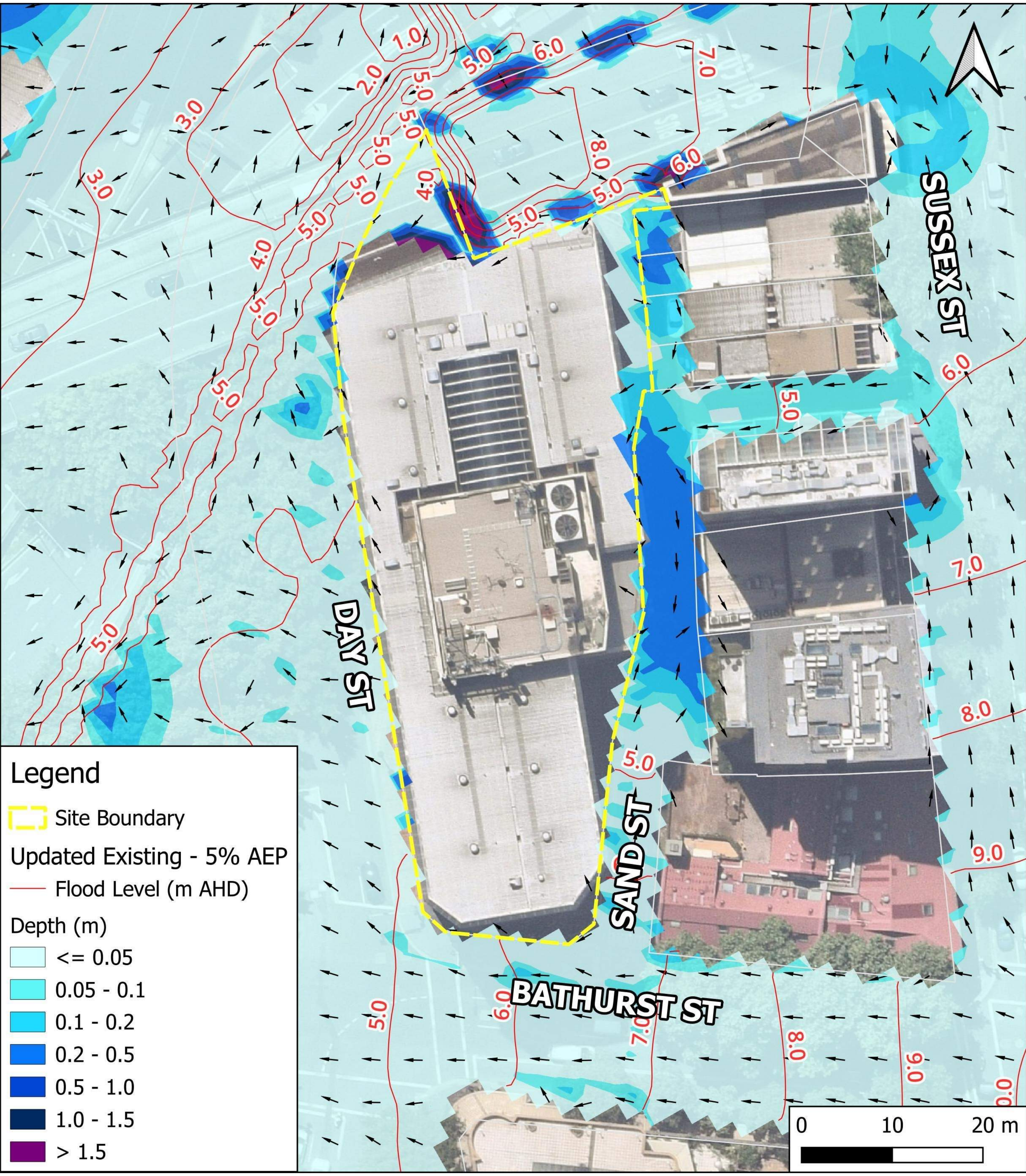
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SUSSEX ST
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BATHURST ST
Legend
Site Boundary
Updated Existing - 5% AEP
Flood Level (m AHD)
Depth (m)
<= 0.05
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1.0 - 1.5
> 1.5
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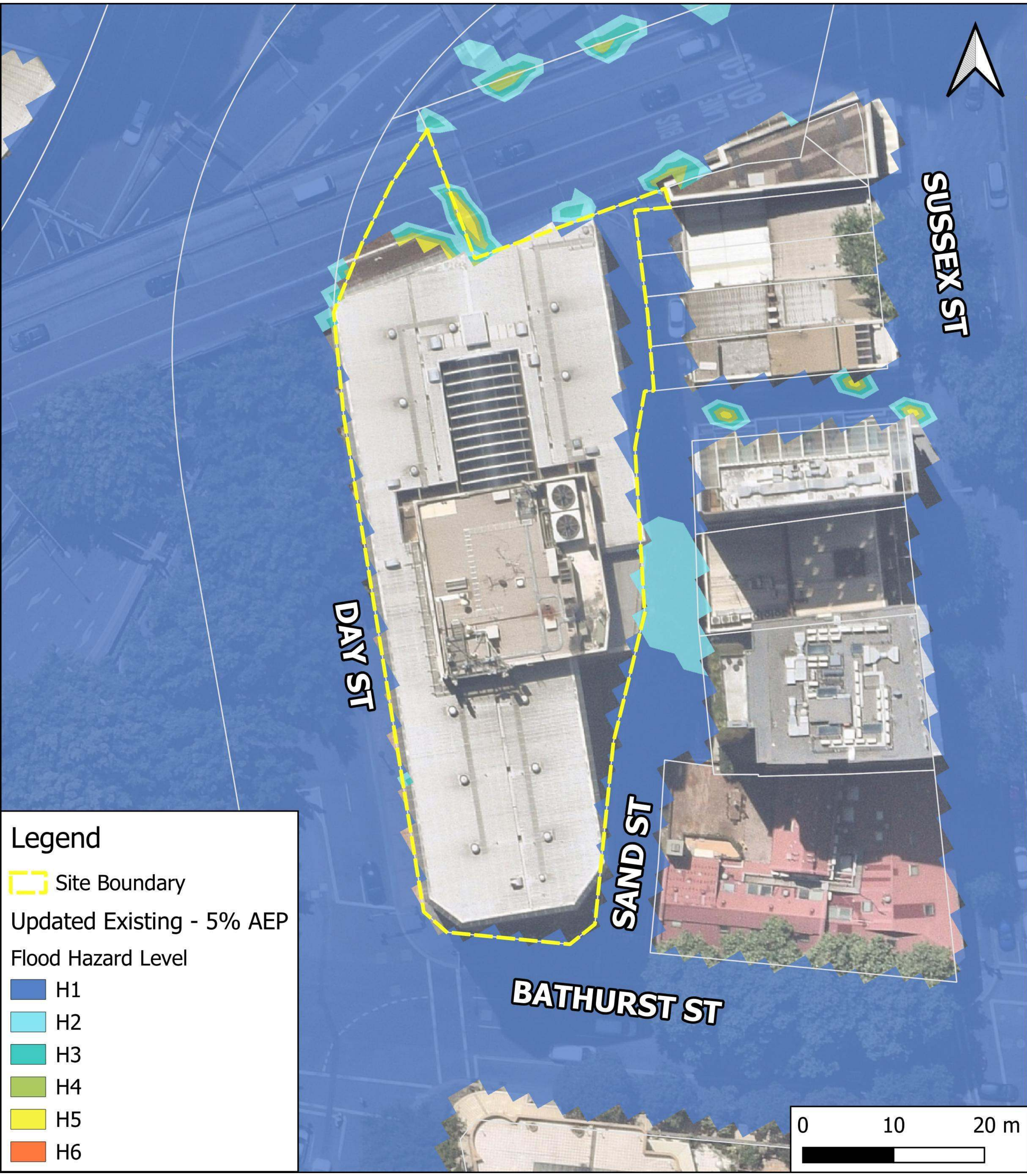
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BATHURST ST
Legend
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Flood Hazard Level
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H2
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H5
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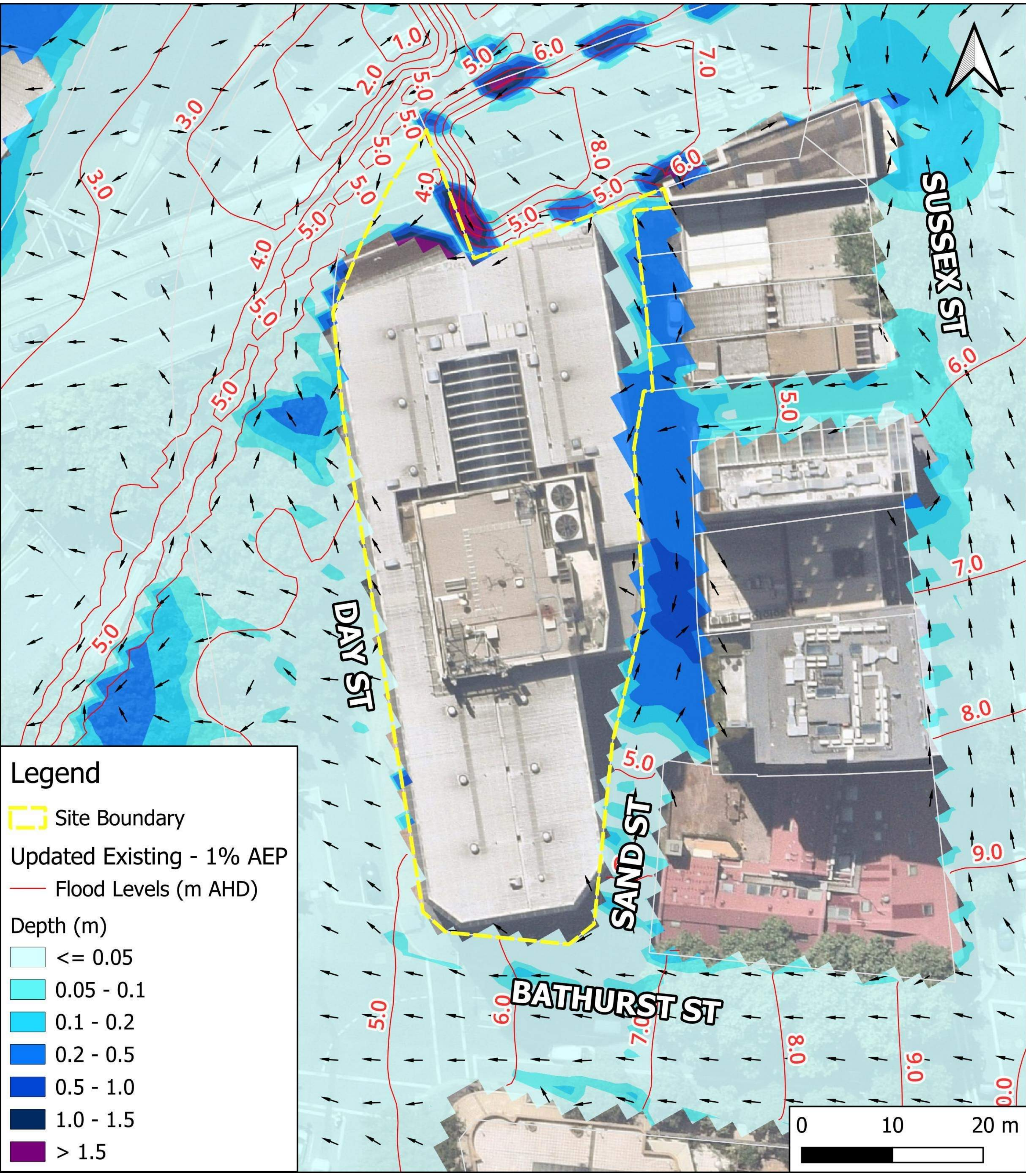
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Legend
Site Boundary
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Flood Levels (m AHD)
Depth (m)
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> 1.5
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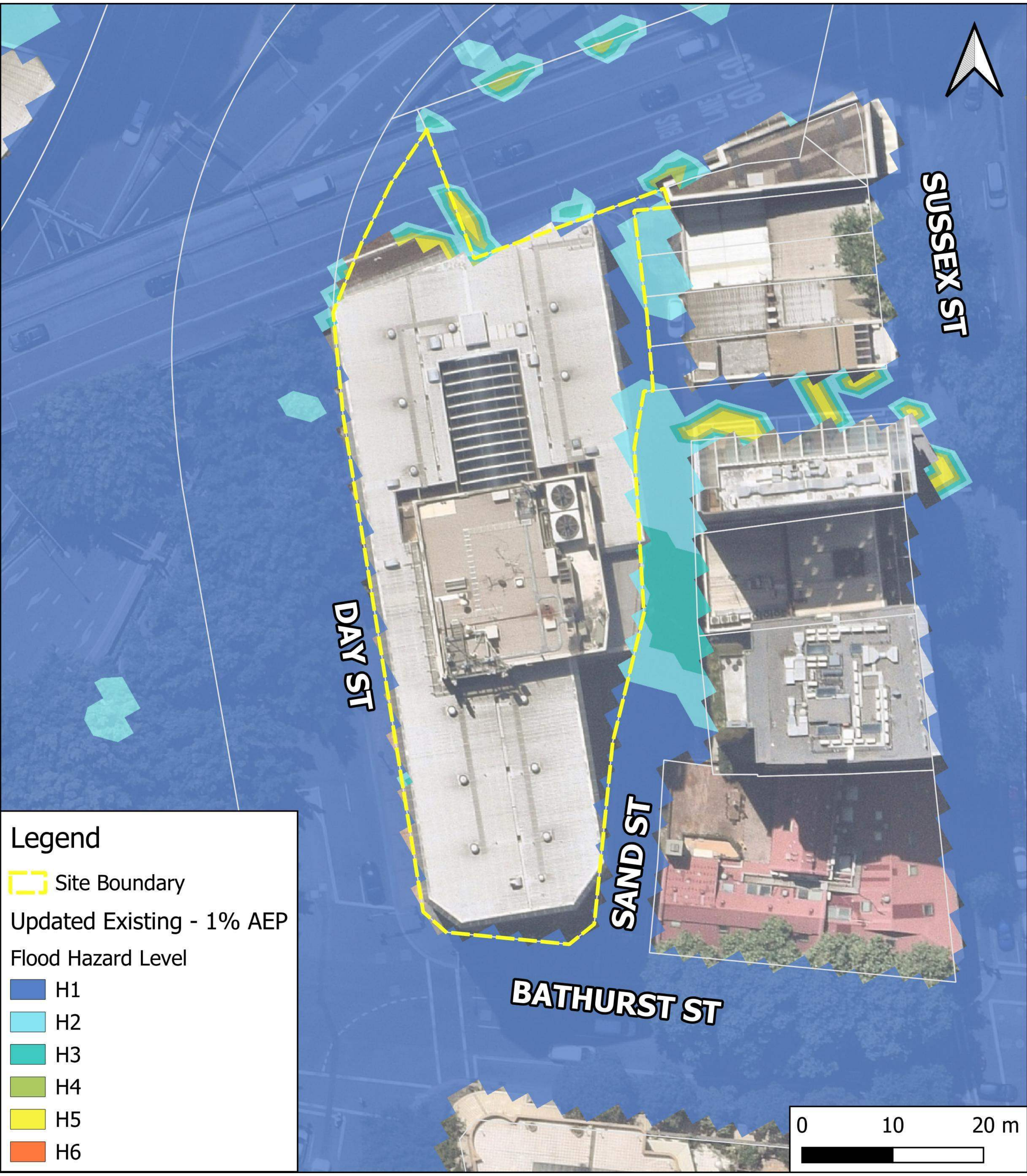
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BATHURST ST
Legend
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Flood Hazard Level
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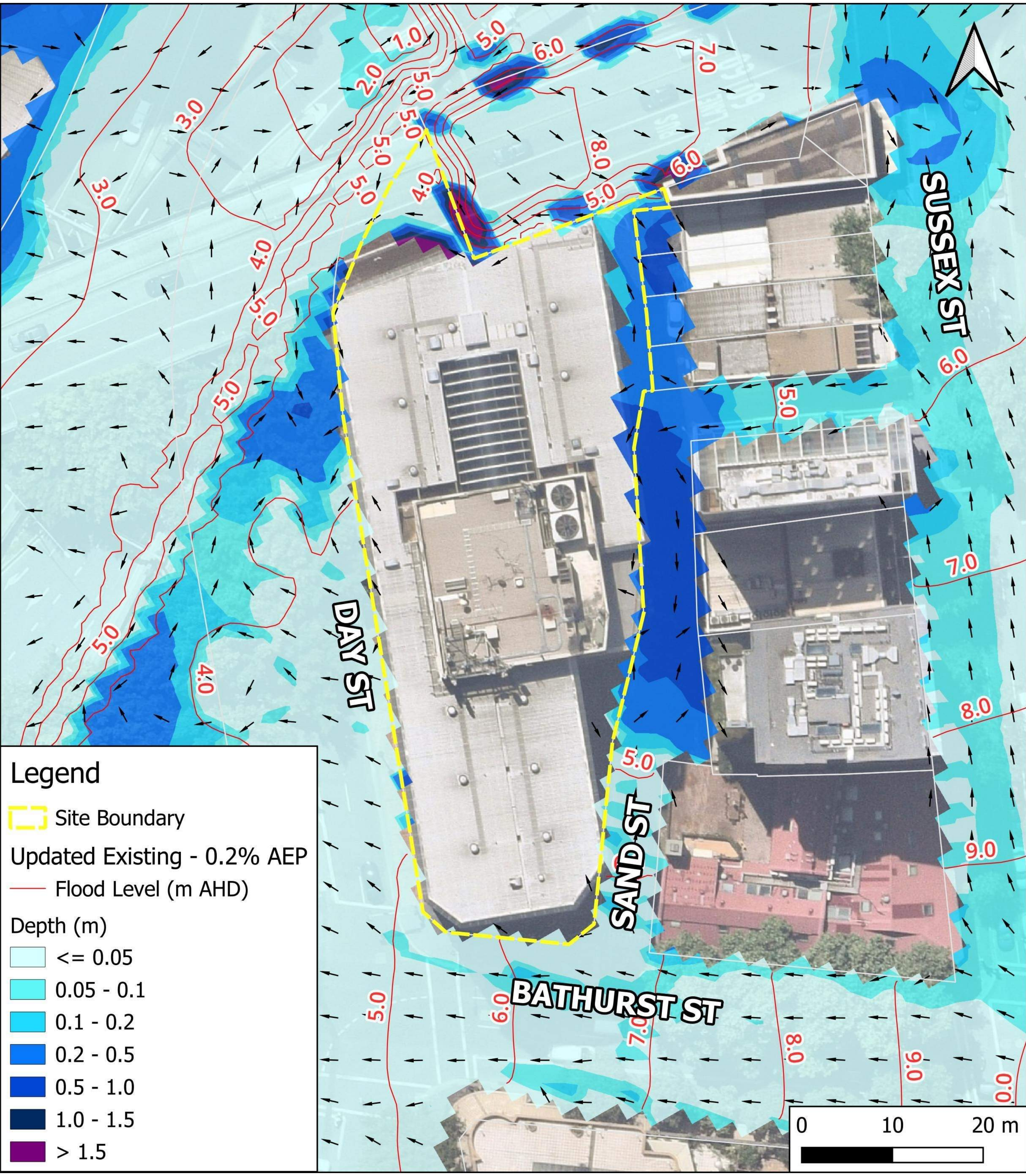
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0.2 - 0.5
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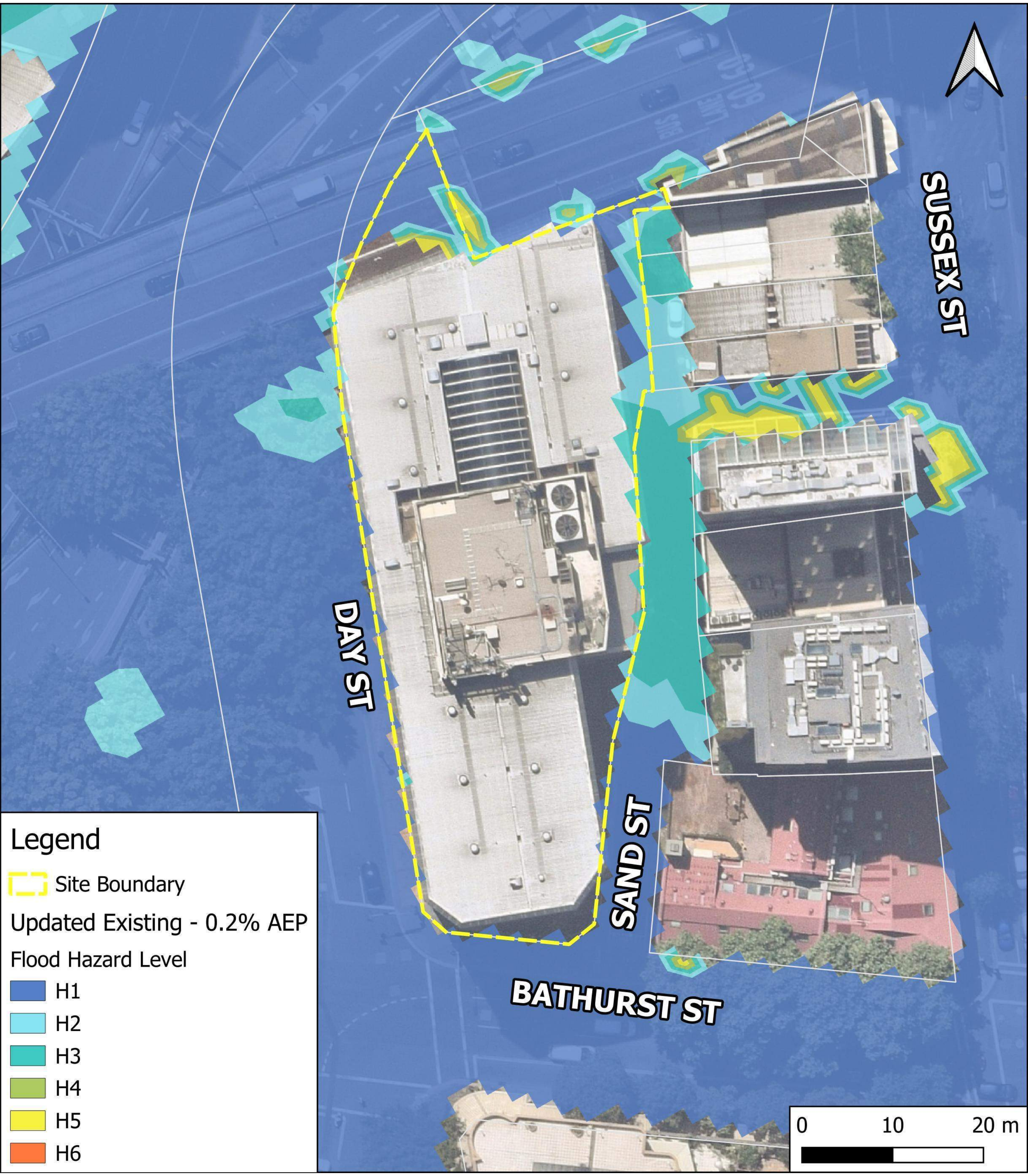
SUSSEX ST
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Site Boundary
Updated Existing - 0.2% AEP
Flood Hazard Level
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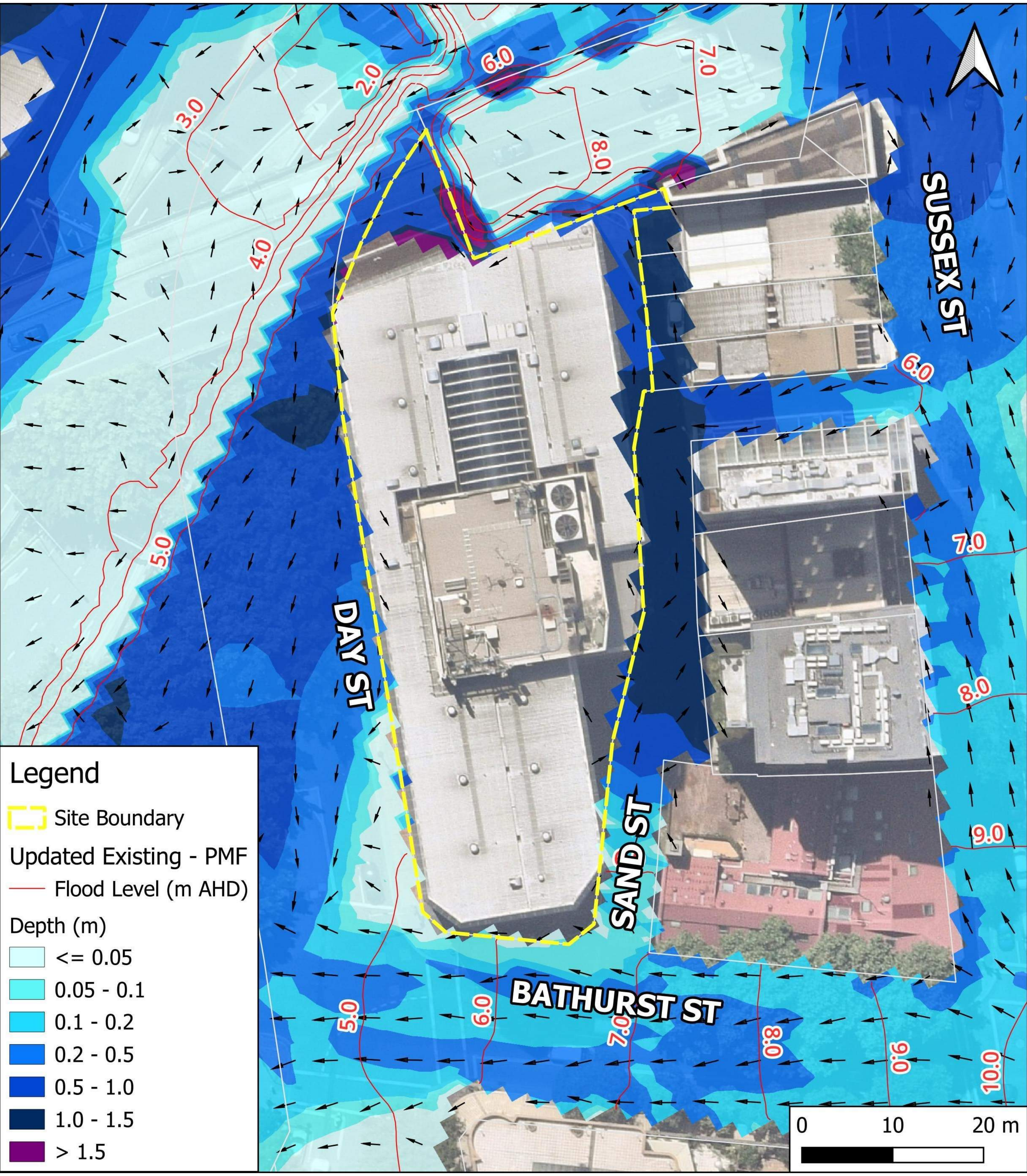
Legend
Site Boundary
Updated Existing - PMF
Flood Level (m AHD)
Depth (m)
<= 0.05
0.05 - 0.1
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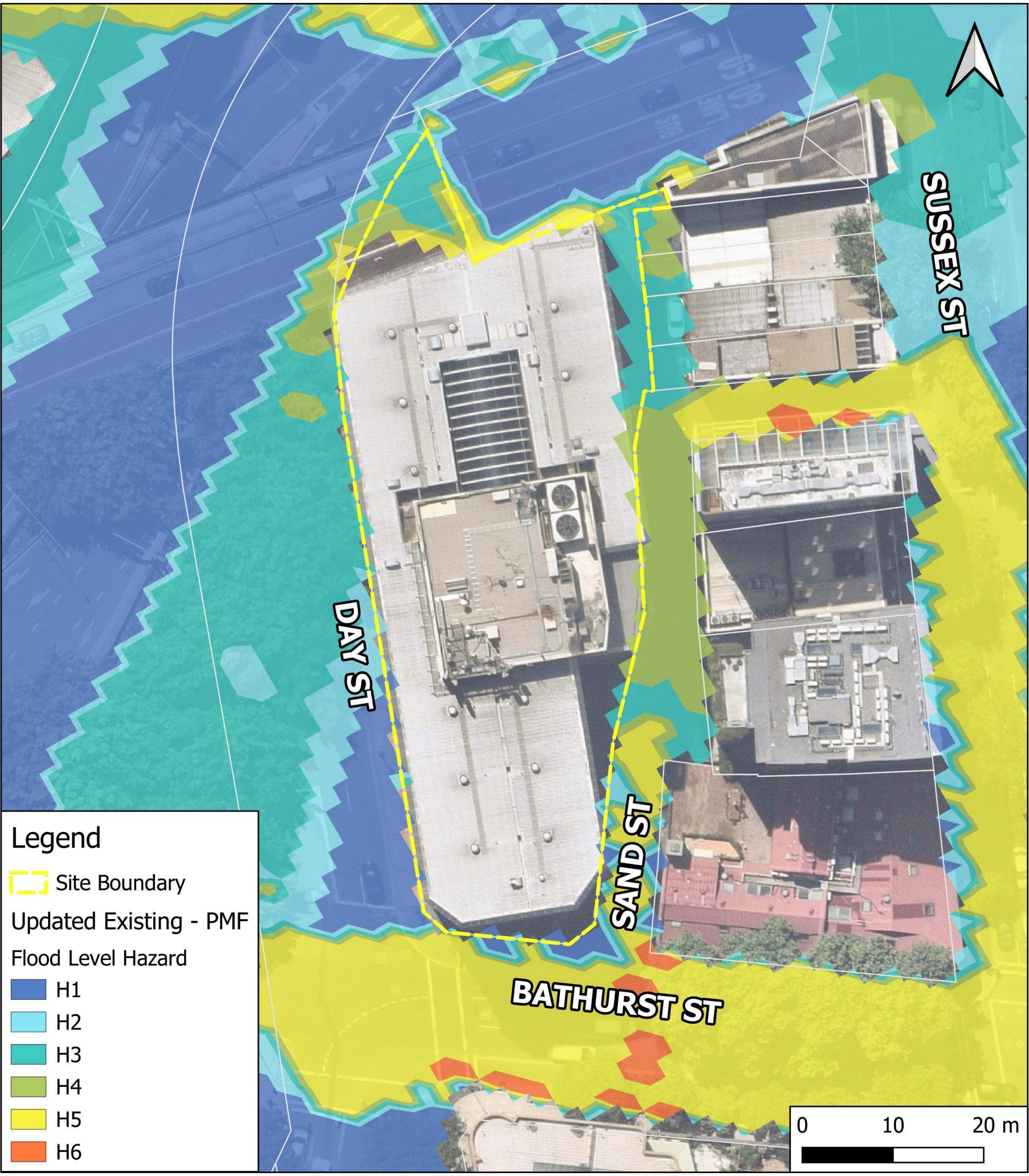
SUSSEX ST
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Legend
Site Boundary
Updated Existing - PMF
Flood Level Hazard
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Appendix 2
Constraints and Adaptive Reuse Statement

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ROSS DE LA MOTTE 7398

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Proposal for Adaptive Reuse development of a Flood-Affected Site at 150 Day Street, Sydney

Introduction

As Sydney continues to grow as a global city, the efficient use of scarce inner-urban land becomes increasingly critical. Flood-affected sites, when redeveloped intelligently, can make a significant contribution to the city's economic, social, and urban vitality. This proposal supports an increase in hotel room yield and loading capacity for a flood-affected site at 150 Day Street, advocating for increased density and active ground-level frontages. It demonstrates how resilient, adaptive, and future-facing design can enable sustainable urban development, even in challenging conditions. It is important to note that this proposal looks at co-locating two hotels at the one site, rather than hotels at two separate sites, thus enabling an overall reduction in densification impacts to the city (such as reduced loading and traffic impacts, reduced waste generation etc).

Justification for Increased Density

1. Strategic Land Use and Urban Optimization

The subject site is located in a high-value central area where underutilisation undermines Sydney's broader goals of compact, transit-oriented growth. Co-locating two hotel operations on this site achieves a more efficient land use model, significantly boosting the site's contribution to Sydney's tourism economy and urban vibrancy.
Increased hotel room yield delivers a more sustainable, inner-urban accommodation model, avoiding the emissions and sprawl associated with distributed development on the city's outskirts.

2. Efficient Logistics and Shared Infrastructure

The co-location of two hotels enables efficient back-of-house operations and enhanced loading capacity. Urban hotels typically generate substantial volumes of waste, linen, and food logistics. The proposal centralises these functions, reducing reliance on surrounding streets and easing congestion, which in turn enhances the public realm. Rather than duplicating logistics infrastructure across two separate sites, this approach streamlines servicing and minimises the cumulative urban impact of hotel-related operations.

3. Resilience Through Adaptive Design

Increased density does not necessarily imply increased risk. When underpinned by robust flood mitigation strategies, intensified land use can proceed safely. This building was constructed over 30 years ago, and thus the proposed refurbishment significantly upgrades its flood resilience. By embedding adaptability into the design, the development can thrive within its environmental context rather than retreating from it.

Urban Design: Active Frontages over Impenetrable Facades

1. Public Realm and Street Activation

Active frontages are essential to achieving high-quality urban design outcomes. They encourage street-level engagement, promote pedestrian safety through passive surveillance, and contribute to a lively, walkable environment. These characteristics align strongly with Sydney's place-based planning and urban design principles.
Conversely, impermeable facades create visual and functional dead zones, diminishing the pedestrian experience and undermining place-making initiatives, particularly in high-traffic inner-city locations.

2. Economic and Social Benefits

Ground-level activation through cafes, retail, and hotel lobbies drives foot traffic, supports local business ecosystems, and enhances guest experience. These uses directly benefit hotel operations while also fostering Sydney's night-time economy and social cohesion through diverse, mixed-use interactions.

3. Adaptive Design vs. Defensive Architecture

Flood risk does not necessitate permanent disengagement from the street. Adaptive design—incorporating flood-resistant materials, flexible floor levels, and barrier systems—allows for continued civic interface even in challenging flood environments. This design philosophy aligns with Sydney's goals for inclusivity, resilience, and adaptability in the face of climate change.

Flood Level Management and Site Constraints at 150 Day Street

1. Flood Planning Context

The site is subject to flooding, with the existing ground floor Finished Floor Level (FFL) and basement entries located below the 1% Annual Exceedance Probability (AEP) flood level. Due to structural constraints and the adaptive reuse nature of the project, raising the FFL to the Council of Sydney's (COS) flood planning level is not feasible. Instead,

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the redevelopment employs a suite of mitigation measures that significantly improve upon the site's current performance.
Notably, the proposed works will not adversely affect flood behaviour or pose risks to neighbouring properties. Post-development flood modelling confirms the efficacy of the adopted mitigation strategy.

2. Site-Specific Mitigation Measures

a. Ground Floor Active Frontages

The Day Street frontage, although below the 1% AEP level, will remain active. Proposed measures include:

- Use of flood-resistant materials within tenancies below the flood level.
- Installation of flood-proof doors at all ground-level entry and exit points.
- Automated, internally hinged flood barriers and flood-rated windows capable of withstanding hydrostatic pressure.
- Reconfiguration of fire stairs to enable safe egress during flood events.

These measures allow for a transparent, open ground floor experience while ensuring safety and compliance.

b. Basement Risk Management

The proposal eliminates one of the existing basement ramps along Day Street, which currently presents a high flood hazard. This ramp will be replaced with internal space and active frontage, reducing risk and increasing amenity.
The remaining basement entry ramp will be equipped with a top-down automated flood barrier to prevent water ingress.
Additionally:

- No hazardous materials will be stored in flood-prone areas.
- Emergency management protocols will guide occupants to upper floors during extreme events.

c. Flood-Compatible Construction

Throughout the building, the following flood-resilient specifications will be implemented:
Raised power outlets and waterproof conduits below the flood planning level.
Galvanised or stainless steel hardware, with hinges featuring removable pins.
Use of solid concrete finishes in areas susceptible to inundation (e.g., Sands Street loading dock).
Designated storage areas for hazardous materials above the flood level.
These features ensure both safety and longevity for all flood-affected spaces.

Conclusion

Flood-affected land within Sydney's urban core should not be excluded from contributing to the city's future. Through intelligent, adaptive design, it is possible to deliver increased hotel yield and efficient logistics infrastructure while enhancing urban vibrancy. Active ground-level frontages should be preserved—not sacrificed—by adopting innovative flood mitigation techniques such as deployable barriers.
This approach supports Sydney's objectives of sustainable density, resilient infrastructure, and inclusive place-making. The proposed redevelopment at 150 Day Street demonstrates how strategic adaptation can unlock the potential of constrained sites, balancing growth with long-term environmental resilience.

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Image: The ramp that will be removed and become internal space with active frontage to day street:

DCP Extracts:

3.2.3 Active frontages

A diverse range of activities should be provided at street level to reinforce the vitality and liveliness of the public domain.

Active frontages to streets are encouraged so activities within buildings can positively contribute to the public domain. Such uses include retail, customer service areas, cafes and restaurants, and other uses that involve pedestrian interest and interaction. Outdoor dining areas may also contribute to active street frontages in appropriate circumstances.

A well designed street frontage is important for pedestrian amenity and includes attractive building entries, window displays, display cases, artworks, well detailed architecture, facade modulation, clear glazed windows, and recessed visually permeable security screens.

Objectives

(a) Ensure ground floor frontages are pedestrian oriented and of high design quality to add vitality to streets.

(b) Provide fine grain tenancy frontages at ground level to street frontages.

(c) Provide continuity of ground floor shops along streets and lanes within Central Sydney and other identified locations.

(d) Allow for active frontages in other non-identified locations to contribute to the amenity of the streetscape.

(e) Encourage frequent building entries that face and open towards the street.

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Provisions

(1) Active frontages are to be provided in the locations nominated on the *Active frontages map*.

(2) Active frontages are to contribute to the liveliness and vitality of streets by:

- (a) maximising entries and display windows to shops and/or food and drink premises or other uses, customer service areas and activities which provide pedestrian interest and interaction. Generally, active frontages on the ground floor of a property boundary are to be provided in accordance with Table 3.1 Ground floor active frontages;
- (b) minimising blank walls (with no windows or doors), fire escapes, service doors, plant and equipment hatches;
- (c) providing elements of visual interest, such as display cases, or creative use of materials where fire escapes, service doors and equipment hatches cannot be avoided.
- (d) in Central Sydney, providing three floors of retail (basement, ground and first floor) in the blocks bounded by George, Market, King and Castlereagh Streets as shown in Figure 3.7 *Central Sydney retail core*. Where this is not practicable, the design of new buildings should enable the conversion of these floors to retail at a later stage; and
- (e) providing a high standard of finish and appropriate level of architectural detail for shopfronts.

(3) Generally, a minimum of 70% of the ground floor frontage is to be transparent glazing with a predominantly unobstructed view from the adjacent footpath to at least a depth of 6m within the building.

(4) Generally, foyer spaces are not to occupy more than 20% of a street frontage of a building in Central Sydney and no more than 8m of a street frontage elsewhere.

(5) Active frontages are to be designed with the ground floor level at the same level as the footpath.

(6) Driveways and service entries are not permitted on active frontages, unless there is no alternative.

(7) Enclosed glazed shopfronts are preferred to open shopfronts, except for food and drink premises which are encouraged to provide open shopfronts.

(8) Security grilles may only be fitted internally behind the shopfront and are to be fully retractable and at least 50% transparent when closed.

(9) Through-site links or arcades are to have a clear width of 3-6m and a minimum clear height of 1.5 times the width or 6m, whichever is greater.

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6 Flood Compatible Materials

Where required for development, the following materials are to be applied. Materials not listed may be accepted by Council subject to certification of the suitability of the material of the manufacturer.

Component	Flood Compatible Material
Flooring and Sub-floor	▪ Concrete slab-on-ground monolith construction ▪ Suspended reinforced concrete slab
Wall Structure	▪ Solid brickwork, blockwork, reinforced concrete or mass concrete
Wall and Ceiling Linings	▪ Fibro-cement board ▪ Brick, face or glazed ▪ Clay tile glazed in waterproof mortar ▪ Concrete ▪ Concrete block ▪ Steel with waterproof applications ▪ Stone, natural solid or veneer, waterproof grout ▪ Glass blocks ▪ Glass ▪ Plastic sheeting or wall with waterproof adhesive
Roof Structure	▪ Reinforced concrete construction ▪ Galvanised metal construction
Doors	▪ Solid panel with water proof adhesives ▪ Flush door with marine ply filled with closed cell foam ▪ Painted metal construction ▪ Aluminium or galvanised steel frame
Insulation	▪ Closed cell solid insulation ▪ Plastic/polystyrene boards
Windows	▪ Aluminium frame with stainless steel rollers or similar corrosion and water resistant material.
Nails, Bolts, Hinges and Fittings	▪ Brass, nylon or stainless steel ▪ Removable pin hinges ▪ Hot dipped galvanised steel wire nails or similar
Main Power Supply	▪ Subject to the approval of the relevant authority the incoming main commercial power service equipment, including all metering equipment, shall be located above the designated flood planning level. Means shall be available to easily disconnect the dwelling from the main power supply.
Wiring	▪ All wiring, power outlets, switches, etc., should be located above the designated flood planning level. All electrical wiring installed below this level should be suitable for continuous underwater immersion and should contain no fibrous components. This will not be applicable for below-ground car parks where the car park complies with flood planning level requirements. ▪ Earth leakage circuit-breakers (core balance relays) or Residual Current Devices (RCD) must be installed. ▪ Only submersible type splices should be used below maximum flood level. ▪ All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding.
Electrical Equipment	▪ All equipment installed below or partially below the designated flood planning level should be capable of disconnection by a single plug and socket assembly.