

To: [Department of Planning, Industry and Environment](#)
Prepared: Michele Zornitta (Associate Water Resources Engineer -WSP)
Approved: Rob Leslie (Section Executive – Water Resources - WSP)
Subject: **Waterloo Metro Quarter OSD**
SSD-10437 Southern Precinct – Response to submission comments
Date: 17 June 2021

Introduction

This note has been prepared to respond to the comments dated 22 of April 2021 raised by the Environment, Energy and Science Group (EES) to the Department of Planning, Industry and Environment (DPIE) public exhibition period for Waterloo Metro Quarter Over Station Development (OSD).

Specifically, this note responds to the comments for the Southern Precinct detailed SSD DA (SSD-10437).

Figure 1 below represents a schematisation of Waterloo Metro Quarter OSD - areas in green identify the proposed Southern Precinct (SSD-10437).

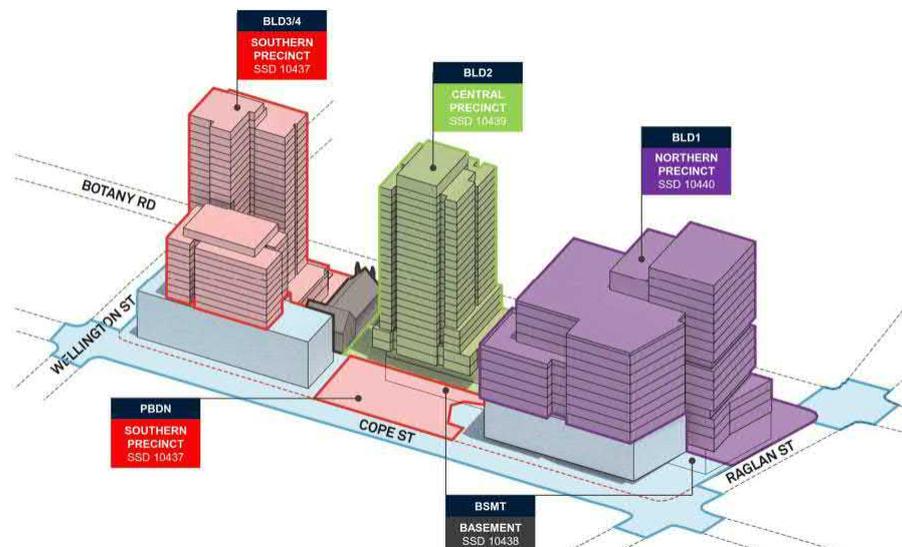


Figure 1 Waterloo Metro Quarter site, with sub-precincts identified

Comment 1

EES COMMENT

EES originally recommended that the proponent engage a suitably qualified and experienced professional to develop an appropriate strategy for flood emergency management. Neither a flood emergency management plan nor detailed emergency management procedures is required for this stage. However, a strategy is required to demonstrate that the current design allows risk to life to be managed. This includes calculation of persons and risk and consideration of suitable shelter in place. If the proponent does not investigate emergency management at this stage, the continuous flood risk may not be able to be properly managed later.

WSP RESPONSE

As noted by the EES reviewer a flood emergency management plan and a flood emergency strategy are not required at this stage. A preliminary flood emergency strategy is provided below. A flood emergency management plan will be prepared in accordance with planning conditions or relevant legislation at a later stage prior the occupancy of the building.

The flood study (i.e. *Stormwater Management Strategy and Flood Impact Assessment - SSD -10437 Southern Precinct, September 2020*) and flood response (i.e. *Waterloo Metro Quarter OSD – SSD 10437 Southern Precinct – Response to submission comments, February 2021*) previously submitted to the Department of Planning, Industry and Environment demonstrated that all occupants of the southern precinct can remain safe by sheltering in place in a flood emergency. Flood protection has been achieved by adopting FFLs above FPLs and shelter areas above PMF flood levels.

As requested by the EES reviewer further details that include the number of occupants of the building (at ground floor) and locations of the designated shelter areas are provided in this technical response.

Table 1 below shows the number of persons expected within the building at ground floor and areas that can be used as refuge (i.e. shelter area) in a flood emergency. The number of persons is based on anticipated use of each tenancy, an average split between front of house and back of house areas with the tenancy and expected occupancy of both staff and patrons.

An evacuation plan that shows the evacuation route to the shelter areas is included in Figure 2 and Appendix A.

The evacuation strategy is provided for occupants of the ground floor only; any occupants and residents located within the higher floors of the building can remain safe by sheltering in place until the end of the flood emergency.

The flood emergency response provided at this stage needs to be considered as a preliminary strategy that aims to demonstrate in principle that occupants of the building can be safe and protected in a flood emergency. Both the evacuation strategy and the emergency response will be further investigated at a later stage in consultation with the State Emergency Service (SES).

Table 1: Emergency response – occupants of the building (refer to Figure 2, Figure 3 and Appendix A for emergency strategy)

Area	Classification	Number of occupants	FFL	Shelter
1	Community space	50 – 100 persons	FFL 16.38 m AHD FFL is above the 1% AEP flood level (i.e. 15.67 m AHD)	Shelter area provided at a higher floor. Shelter area is provided above PMF flood level.

Area	Classification	Number of occupants	FFL	Shelter
			PMF flood level is at 16.56 m AHD	Evacuation is necessary only for flood event greater than the 1% AEP.
2	Lobby	5-10 persons	FFL 16.38 m AHD FFL is above the 1% AEP flood level (i.e. 15.67 m AHD)	Shelter area provided at a higher floor. Shelter area is above PMF flood level. Evacuation is necessary only for flood event greater than the 1% AEP.
3	Gym Lobby	10-20 persons	FFL 16.38 m AHD FFL is above the 1% AEP flood level.	Shelter area provided at a higher floor. Shelter area is above PMF flood level. Evacuation is necessary only for flood event greater than the 1% AEP.
4	Loading dock	2-5 persons	FFL 16.38 m AHD FFL is above the 1% AEP flood level.	Shelter area provided at a higher floor. Shelter area is above PMF flood level. Evacuation is necessary only for flood event greater than the 1% AEP.
5	Lobby	2-5 persons	FFL 15.33 m AHD FFL is above the 1% AEP flood level	Shelter area is provided in a stepped in area above the PMF flood level.
6	Substation	Nil – only authorised personal is	NA	NA
7	Waste loading	Nil	FFL 16.38 m AHD	Shelter area provided at a higher floor. Shelter area is above PMF flood level. Evacuation is necessary only for flood event greater than the 1% AEP.
8	Fire control room	Nil – only authorised personal is	FFL 16.38 m AHD	Shelter area provided at a higher floor. Shelter area is above PMF flood level.

Area	Classification	Number of occupants	FFL	Shelter
				Evacuation is necessary only for flood event greater than the 1% AEP.

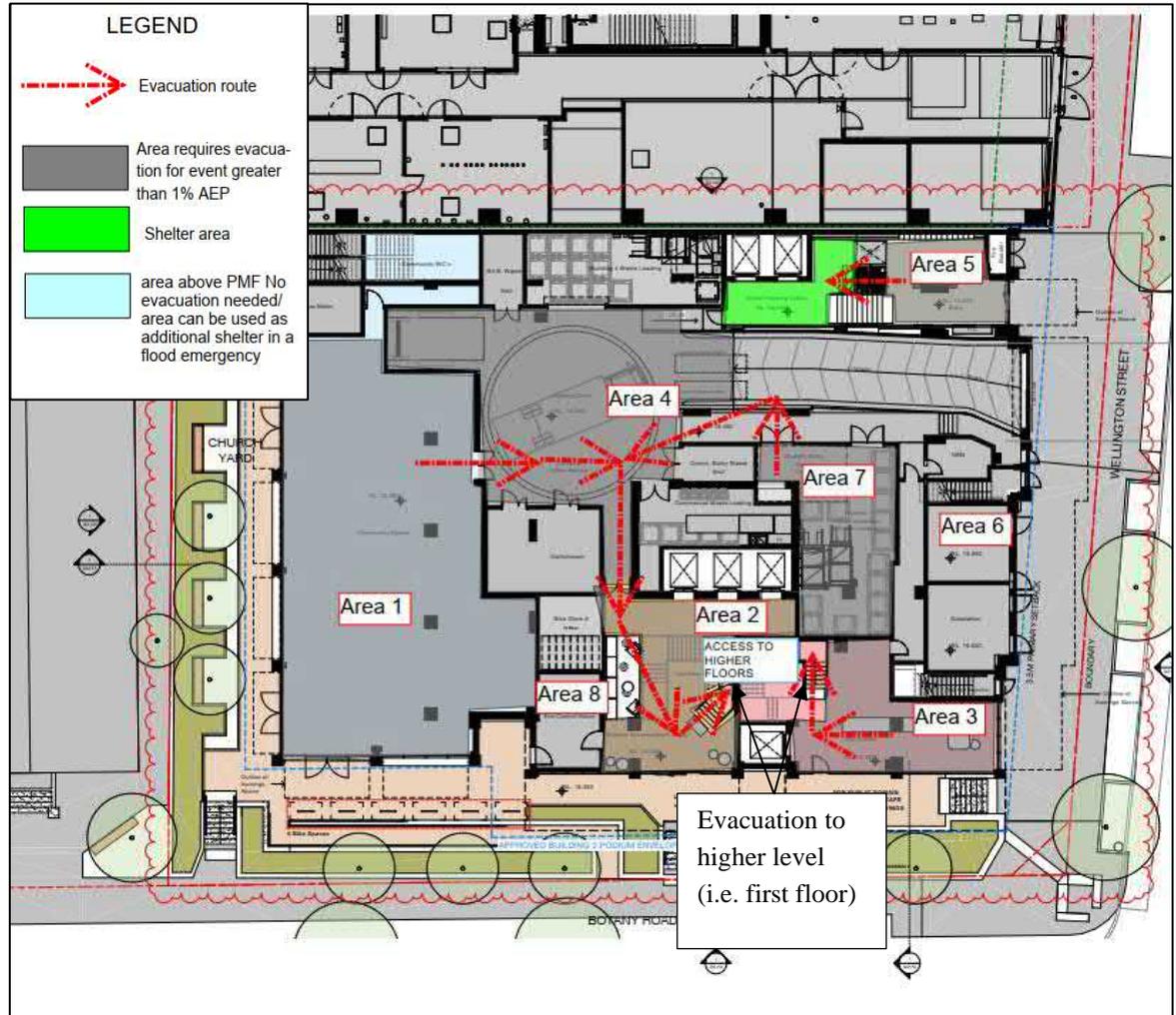


Figure 2. Shelter areas and evacuation route – southern precinct (ground level)



Figure 3. Shelter areas and evacuation route – southern precinct (first floor)

Occupants of the southern building can remain safe in a flood emergency for the following reasons:

- 1) Shelter areas that can be use as safe refuge are provided at ground and first floor (i.e. green areas in Figure 2, 3, and Appendix A);
- 2) Shelter areas have FFLs above the PMF flood level; and,
- 3) Safe evacuation routes have been provided from areas that have FFLs below the PMF flood level to the evacuation area with FFLs above PMF flood level.

Comment 2

EES COMMENT

EES concurs with the consultant’s assertion that the industry standard approach is to set finished floor levels using the critical storm duration for each flood event. However, in flood emergency response management, the industry standard approach is to consider also other storm durations. For example, shorter duration storm events may be needed to calculate effective warning time and longer durations to understand the duration of isolation. EES repeats its original comment that the discussion regarding timing of flooding in relation to evacuation has not demonstrated an understanding of the principals involved in flood emergency response management. Further, the RtS now also claims that only short duration storms are relevant, because the site is at the top of the catchment.

WSP RESPONSE

As noted by the EES reviewer the industry standard approach is to set finished floor levels (FFLs) using the critical storm duration for the relevant flood events (i.e. 1% AEP and PMF flood event); the reason for this approach is that only critical storm durations generate maximum flood levels. Thus, testing different storm durations is irrelevant for assessing maximum flood levels.

Southern precinct FFLs have been designed to provide adequate protection for all occupants of the building. All building FFLs are above the 1% AEP flood level. Thus, no evacuation is necessary up to and including the 1% AEP flood event.

Discussion regarding time of inundation/flooding and duration of isolation have been presented below. As previously anticipated time of inundation/flooding and duration of isolation will be discussed in detail in the flood emergency management plan and flood emergency strategy as per planning requirements.

Flood hydrographs and time to peak flood level.

Flood hydrographs have been assessed in two key locations (i.e. F and G in Figure 4 below) for the 1% AEP and PMF flood events (with different storm durations).

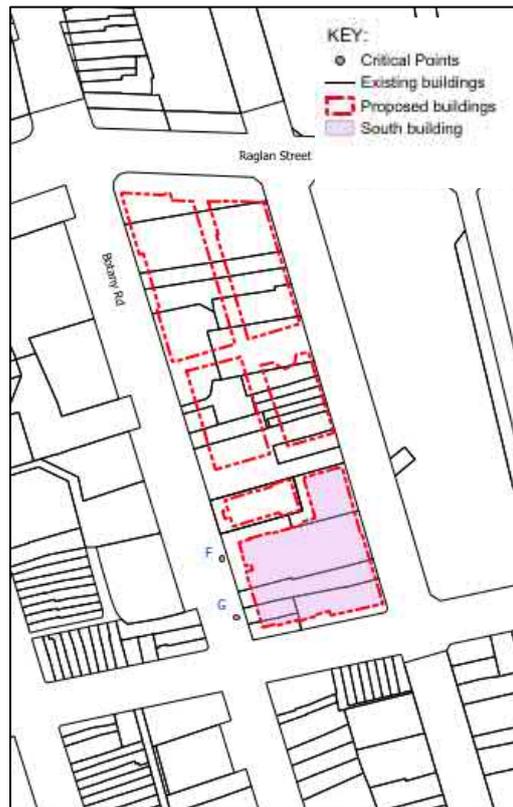


Figure 4: Flood hydrographs location assessment

1% AEP flood event

1% AEP flood hydrographs for the 25, 60, 90 and 120-minutes storm events have been considered for point F and G.

Figure 5 below shows flood hydrographs for different storms duration at point F. As shown in Figure 5 the building is not affected by flooding up to and including the 1% AEP flood event.

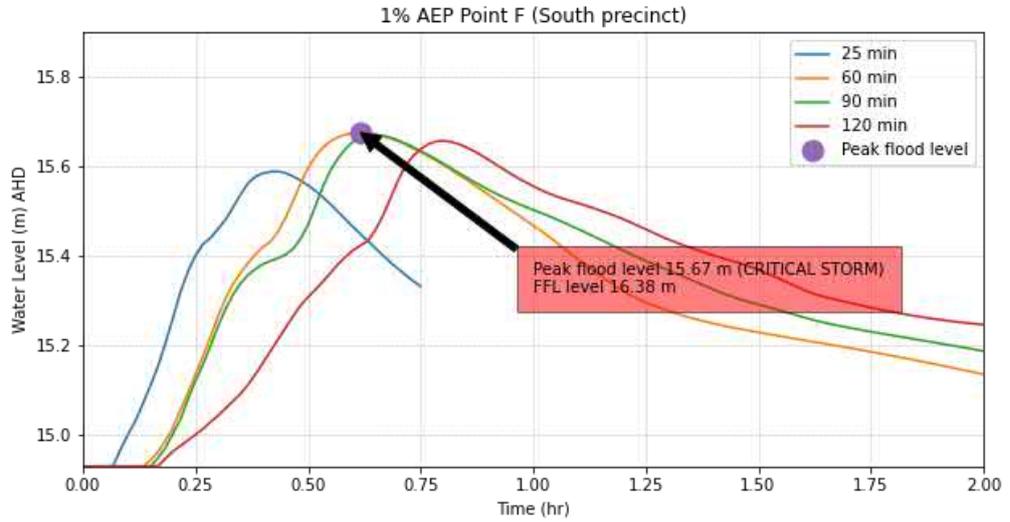


Figure 5 Flood hydrograph at point F: 1% AEP - 25 min, 60 min, 90 min and 120 min.

Figure 6 below shows flood hydrographs for different storm duration at point E. As shown in Figure 6 the building is not affected by flooding up to and including the 1% AEP flood event.

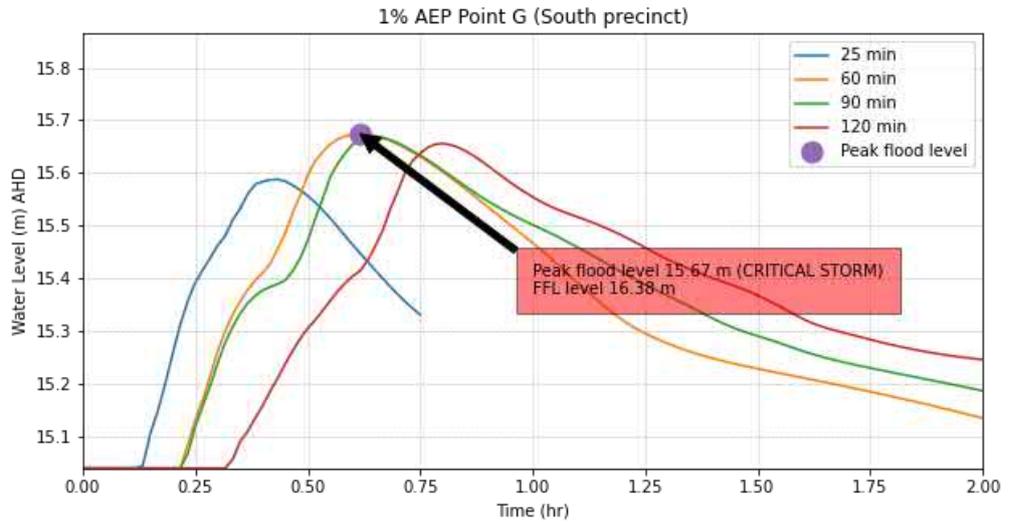


Figure 6 Flood hydrograph at point G: 1% AEP - 25 min, 60 min, 90 min and 120 min.

PMF flood event

PMF flood hydrographs for the 30, 45- and 90-minutes storm events have been considered for point F and G.

Figure 7 below shows flood hydrographs for different storm duration in correspondence of point F.

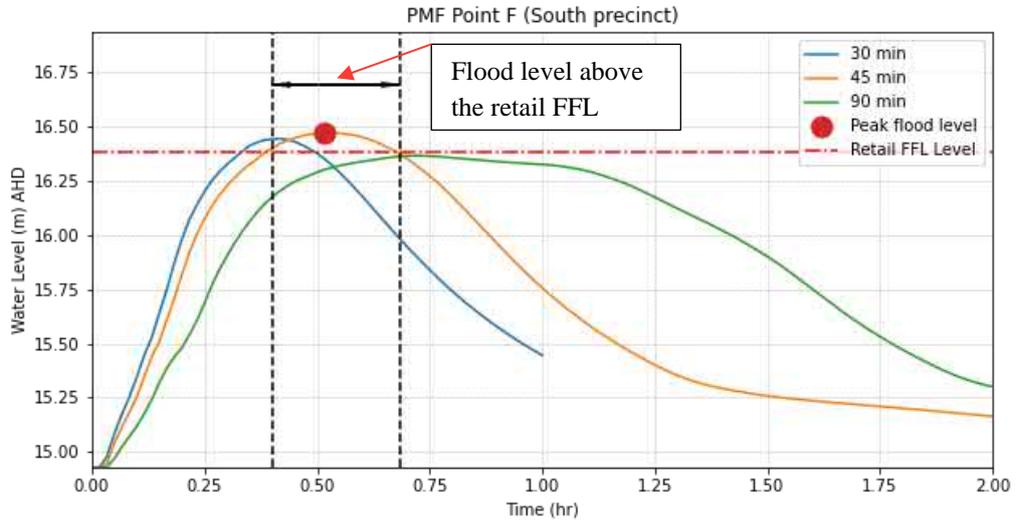


Figure 7 Flood hydrograph at point F: PMF 30, 45- and 90-min storms.

Figure 8 below shows flood hydrographs for different storm duration in correspondence of point G (refer to Figure 4 for point location).

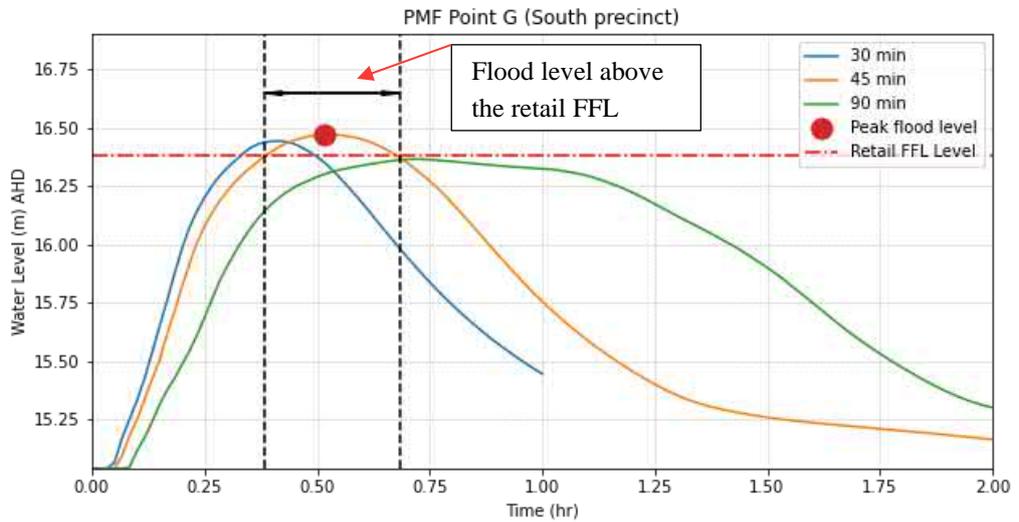


Figure 8 Flood hydrograph at point G: PMF 30, 45- and 90-min storms.

Table 2 below summarises the timing to reach critical consequence height at the building.

Table 2: Time to reach critical consequence height

Flood Event	Peak Flood Level (m AHD)	Time to Peak (hrs)	Time to reach FFL (after the storm)	Time above FFL (after the storm)
1% AEP – 25 minutes (point F ~ G)	15.58	0.43	NA – FFL above 1% AEP flood level	Nil

Flood Event	Peak Flood Level (m AHD)	Time to Peak (hrs)	Time to reach FFL (after the storm)	Time above FFL (after the storm)
1% AEP – 60 minutes (point F ~ G)	15.67	0.62	NA – FFL above 1% AEP flood level	Nil
1% AEP – 90 minutes (point F ~ G)	15.67	0.65	NA – FFL above 1% AEP flood level	Nil
1% AEP – 120 minutes (point F ~ G)	15.65	0.80	NA – FFL above 1% AEP flood level	Nil
PMF – 90 minutes (point F ~ G)	16.35	0.72	NA – FFL above PMF flood level for 90 minutes storm durations	Nil
PMF – 30 minutes (point F ~ G)	16.44	0.42	0.33	0.13 (~ 8 minutes)
PMF – 45 minutes (point F ~ G)	16.47	0.51	0.4	0.28 (~16 minutes)

As shown in Table 2 above only the PMF flood event with 30- and 45-minutes storm duration is expected to generate flooding at the building. Longer PMF storm durations (i.e. >+ 90 minutes) are not expected to generate flooding at the building as FFLs are above the maximum flood levels.

In the PMF flood event for the 30 and 45 minutes storms flood level is expected to be above the building FFLs for not more than 16 minutes.

The minimum time for flood level to raise to the building FFLs in a PMF flood event (30 minutes storm) is 20 minutes.

Time of inundation / time of isolation

As requested by the EES reviewer time of isolation map have been prepared for the 1% AEP and PMF flood events for the areas surrounding the site. Time of isolation maps have been prepared assuming a cut-off depth of 10 cm.

1% AEP flood event

Figure 9 shows time of isolation map for the 1% AEP flood event; refer to Appendix B for high resolution map.



Figure 9: Time of inundation for the 1% AEP (25,60, 90- and 120-minutes storms) flood event

Inundation map for the 1% AEP flood event shows that:

- The area at the north of the site is affected by flooding for 15 minutes; after 15 minutes flood depths decrease below 10 cm;
- Flooding affects the area at the south of the site (Wellington street, Botany Road and Cope Street) for 1.5 hours. After 1.5 hours flood depths decrease below 10 cm.
- Maximum time of isolation for the site area is considered 15 minutes for the 1% AEP flood event.
- Storm duration longer than 120 minutes are not expected to generate significant flood depths and flood hazard at each location.

PMF flood event

Figure 10 shows time of isolation map for the PMF flood event; refer to Appendix B for high resolution map.

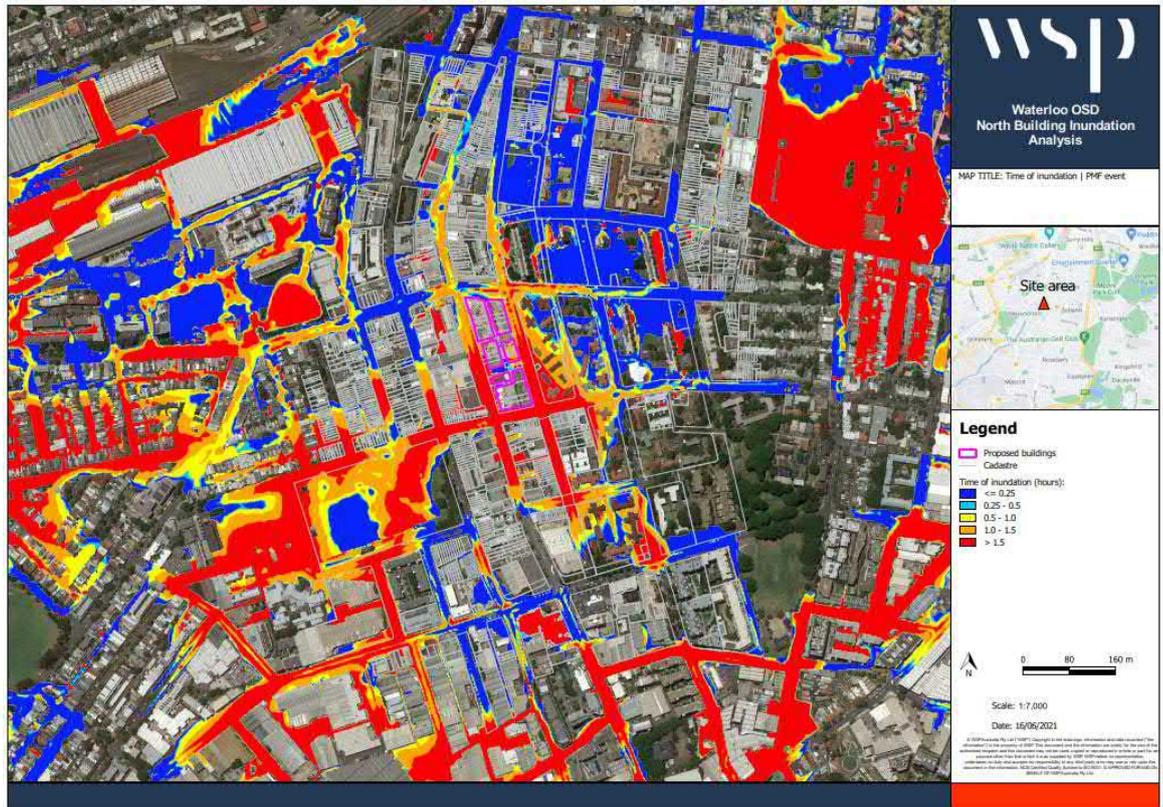


Figure 10: Time of inundation for the PMF (30,45- and 90-minutes storms) flood event

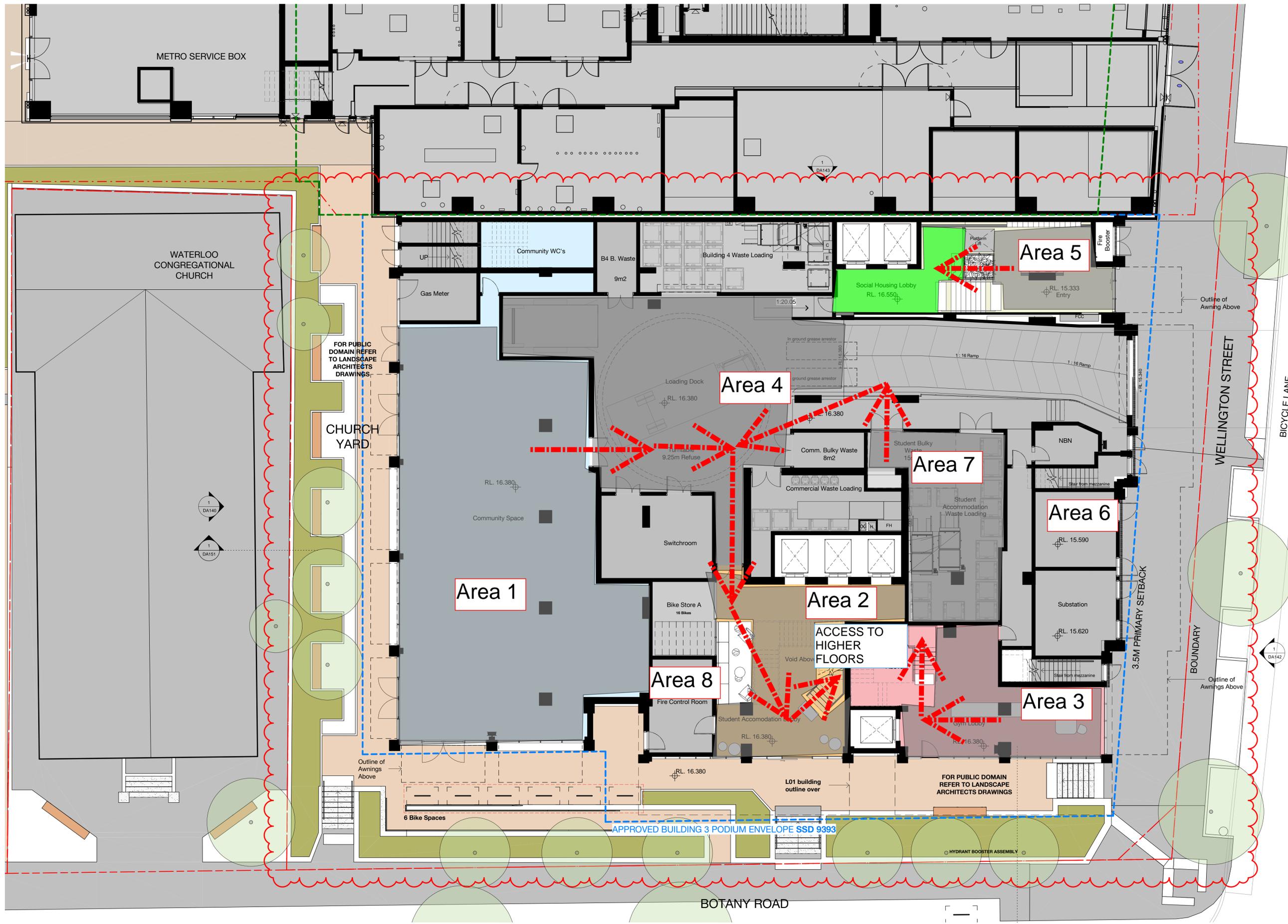
Inundation map for the PMF flood event shows that:

- The area at the north of the site is affected by flooding for 1.5 hours; after 1.5 hours flood depths decrease below 10 cm and the street access can be reactivated;
- Flooding affects the area at the south of the site (Wellington street, Botany Road and Cope Street) for more than 1.5 hours. Most of the streets at the south of the site are expected to be flooded for longer than 1.5 hours in a PMF flood event.
- The streets at the north of site (top of the catchment) are expected to be reactivated after 1.5 hours in a PMF flood event; thus, maximum time of isolation for the site area is considered 1.5 hours for the PMF flood event.

As already demonstrated in a PMF flood event occupants of the building can remain safe within the precinct by sheltering in place until the end of the flood emergency.



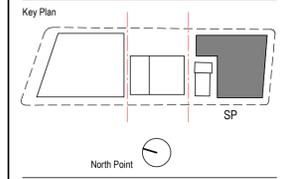
APPENDIX A – EVACUATION ROUTE MAP



#	Status	Description	Date
C	ISSUE FOR INFORMATION		24.04.20
D	ISSUE FOR INFORMATION		15.05.20
E	ISSUE FOR INFORMATION		01.06.20
F	DRAFT SSDA ISSUE		15.06.20
G	SSDA ISSUE - FOR LANDOWNERS CONSENT		27.07.20
H	SSDA ISSUE - FOR LANDOWNERS CONSENT		30.07.20
I	SSDA ISSUE		26.08.20
J	RTS draft		08.02.21
K	RTS		10.02.21
L	RTS		15.02.21

Notes
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 Contractor must verify all dimensions on site before commencing work or preparing shop drawings.
 Do not scale drawings.

- RTS Changes**
- Allowance for B99 Vehicle
 - Reconfiguration of Community Space
 - Student Accommodation Bike Store location change
 - Allowance for BOH corridor from Gym lobby to the Loading Dock
 - Allowance for pedestrian corridor from street level to the Loading Dock
 - Fire control room relocated
 - NBN room relocated
 - Relocation of Student comms room to Level 2
 - Reconfiguration of Waste room facilities
 - Relocation of Social bicycle spaces to Level 2
 - Additional detail shown on Student Accommodation Lobby fitout
 - Revised driveway ramp grading
 - In ground Tanks removed
 - Revised Landscaping along Botany Rd frontage
 - Social Housing Lobby reconfiguration
 - Reconfiguration of Ground Floor to accommodate above changes
 - Refer to Landscape Plan for further detail



Client

NSW GOVERNMENT | M sydney METRO

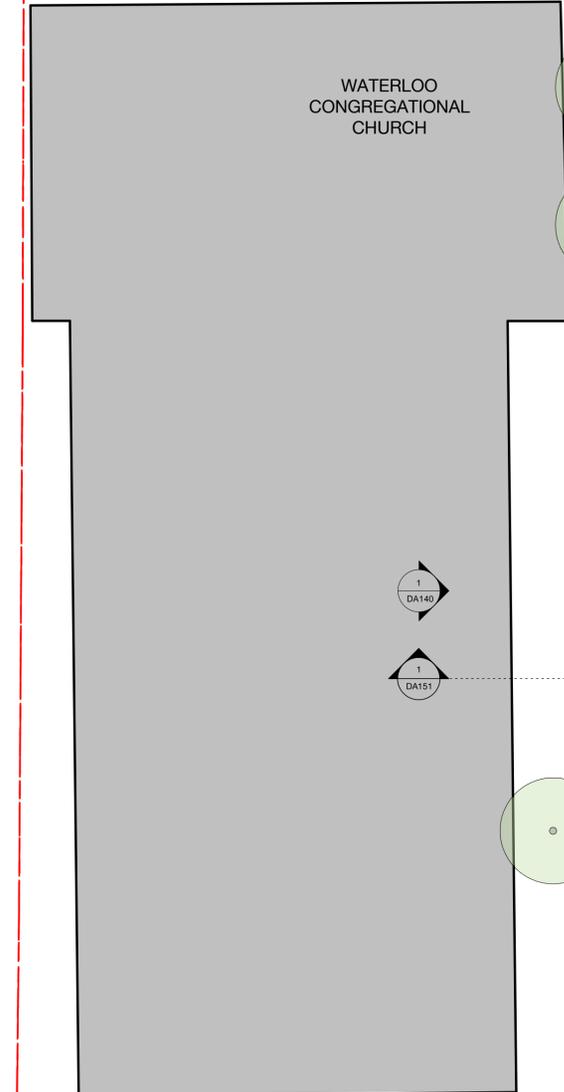
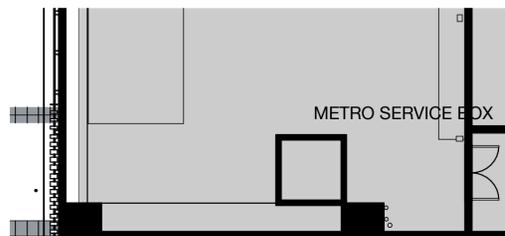
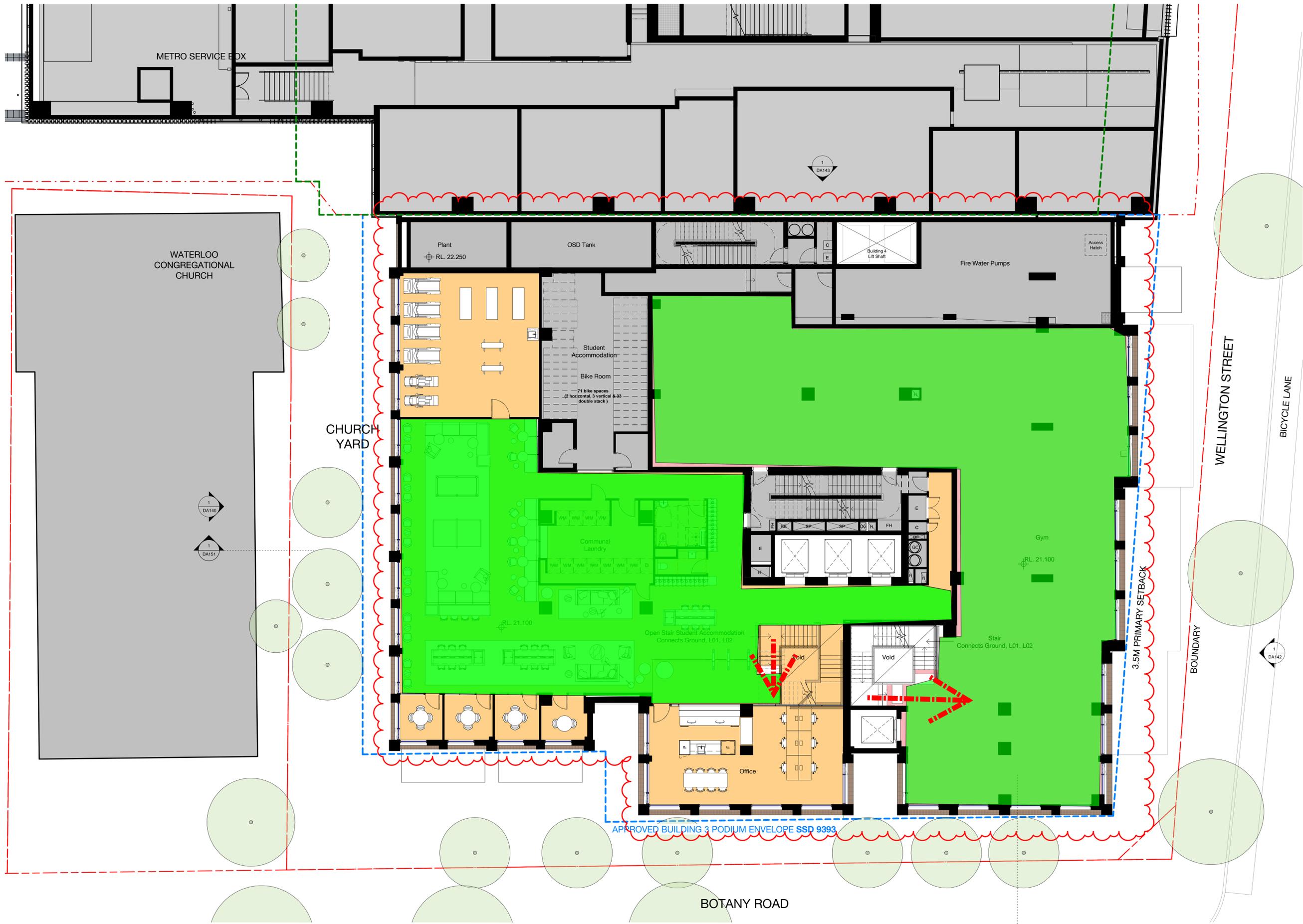
Consultant
BATESSMART

Project
 WATERLOO METRO QUARTER DEVELOPMENT

Project number	Size check
WMQ-BLD3-BSA	25mm
Checked JC	Approved JC
Sheet size A1	Scale 1:100

Sheet title
 General Arrangement Plan
 Ground Floor Plan

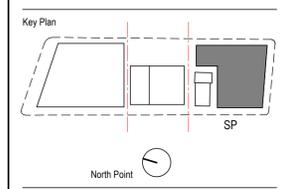
Status
 Phase 04
 Sheet number
 WMQ-BLD3-BSA-AR-DRG-DA100



#	Status	Description	Date
B	ISSUE FOR INFORMATION	ISSUE FOR INFORMATION	24.04.20
C	ISSUE FOR INFORMATION	ISSUE FOR INFORMATION	15.05.20
D	ISSUE FOR INFORMATION	ISSUE FOR INFORMATION	01.06.20
E	DRAFT SSDA ISSUE	DRAFT SSDA ISSUE	15.06.20
F	SSDA ISSUE - FOR LANDOWNER'S CONSENT	SSDA ISSUE - FOR LANDOWNER'S CONSENT	27.07.20
G	SSDA ISSUE - FOR LANDOWNER'S CONSENT	SSDA ISSUE - FOR LANDOWNER'S CONSENT	30.07.20
H	SSDA ISSUE	SSDA ISSUE	26.08.20
I	RTS draft	RTS draft	08.02.21
J	RTS	RTS	10.02.21
K	RTS	RTS	15.02.21

Notes
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 Do not scale drawings.

- RTS Changes**
- Relocation of OSD tank to North-East corner of building
 - Additional detail on Iglu Fitout
 - Fire plant in location of old OSD tank



Consultant
BATESSMART

Project
 WATERLOO METRO QUARTER DEVELOPMENT

Project number	Size check
WMQ-BLD3-BSA	25mm
Checked JC	Approved JC
Sheet size A1	Scale 1:100

Sheet title
 General Arrangement Plan
 Level 1 Plan

Status	Revision
Phase 04	
Sheet number	Revision
WMQ-BLD3-BSA-DRG-DA101	K

PRELIMINARY

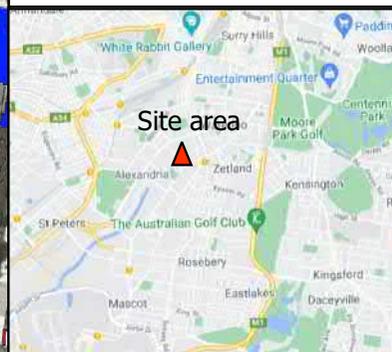


APPENDIX B – TIME OF ISOLATION MAP



Waterloo OSD North Building Inundation Analysis

MAP TITLE: Time of inundation | 1% AEP flood event



Legend

- Proposed buildings
- Cadastre
- Time of inundation (hours):
 - <= 0.25
 - 0.25 - 0.5
 - 0.5 - 1.0
 - 1.0 - 1.5
 - > 1.5



Scale: 1:7,000

Date: 16/06/2021

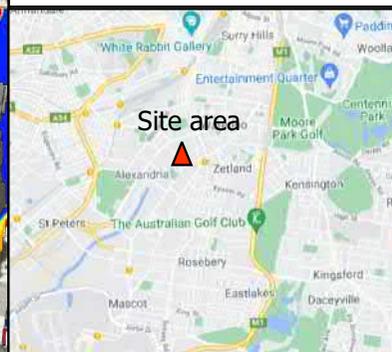
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Waterloo OSD North Building Inundation Analysis

MAP TITLE: Time of inundation | PMF event



Legend

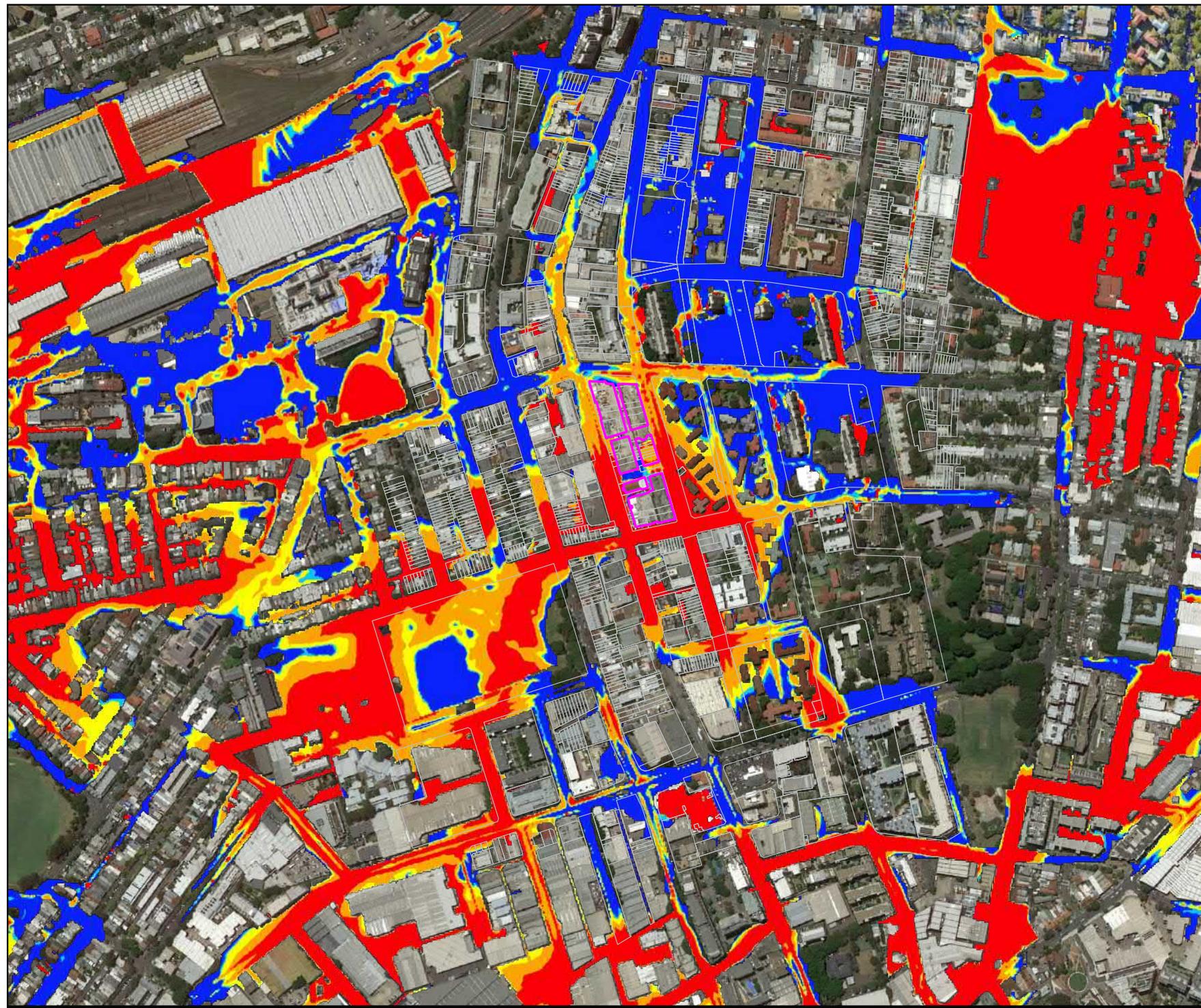
- Proposed buildings
- Cadastre
- Time of inundation (hours):
 - <= 0.25
 - 0.25 - 0.5
 - 0.5 - 1.0
 - 1.0 - 1.5
 - > 1.5



Scale: 1:7,000

Date: 16/06/2021

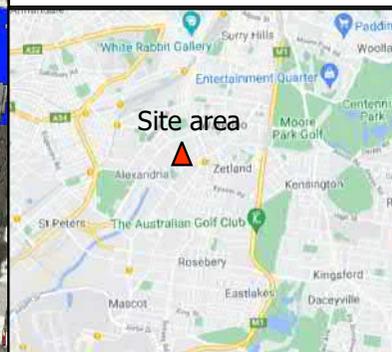
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Waterloo OSD North Building Inundation Analysis

MAP TITLE: Time of inundation | 5% AEP flood event



Legend

- Proposed buildings
- Cadastre
- Time of inundation (hours):
 - <= 0.25
 - 0.25 - 0.5
 - 0.5 - 1.0
 - 1.0 - 1.5
 - > 1.5



Scale: 1:7,000

Date: 16/06/2021

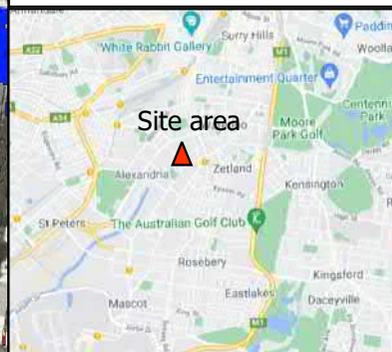
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Waterloo OSD North Building Inundation Analysis

MAP TITLE: Time of inundation | 20% AEP flood event



Legend

- Proposed buildings
- Cadastre
- Time of inundation (hours):
 - <= 0.25
 - 0.25 - 0.5
 - 0.5 - 1.0
 - 1.0 - 1.5
 - > 1.5



Scale: 1:7,000

Date: 16/06/2021

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