

28-32 BOURKE ROAD ALEXANDRIA CIVIL ENGINEERING FLOOD REPORT



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28-32 BOURKE ROAD ALEXANDRIA

CIVIL ENGINEERING FLOOD REPORT

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Executive Summary

enstruct have been engaged by Alexandria Property Development to provide civil engineering flooding advice for the proposed "Alexandria Health Centre" comprising medical centre uses and anchored by a mental health hospital, located at 28-32 Bourke Road, Alexandria (the site). This report meets the requirements of a Flood Impact and Risk Assessment – Flood Risk Management Guide LU01 (NSW Department of Planning and Environment), and relates to the flooding characteristics relevant to the site, as well as the concept grading of the future laneway network between Bourke Road and O'Riordan Street. It considers the flood impact of the future laneways in order to consider any likely cumulative impacts from surrounding development. It also addresses flood risk management.

The TUFLOW model indicates that the proposed hospital site is subject to flooding. The PMF level of 10.40 mAHD on Bourke Road informs the flood planning level of 10.40 mAHD on the site. The 1% AEP flood level of 8.80 mAHD is indicated in the same location. To mitigate the flood planning levels, the ground floor is above the flood planning level, and the basement protected from flooding during a PMF, with all basement entries above the PMF level.

The proposed development does not have any impact on flooding in a 1% AEP event.

In response to previous comments by the City of Sydney (CoS), the future flooding conditions, specifically including the surrounding laneway concept grading, was modelled in TUFLOW and shows the laneways are generally flood free during a PMF event. This outcome is beneficial to all properties in the precinct, and considers the cumulative impact of surrounding developments.

This report includes long duration PMF events, and shows that the site may be isolated for a period of less than 12 hours during a long duration PMF, and approximately 20 minutes during the peak of a 1% AEP event. During a medium and long duration 5% AEP events, the site is not isolated with access via Bowden Street. A separate Operation Flood Emergency Management Plan has been prepared.

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1 Introduction

This Flood Report is a Flood Impact and Risk Assessment (FIRA) that has been prepared by enstruct for the proposed “Alexandria Health Centre” development located at 28-32 Bourke Road, Alexandria (the site).

1.1 Site Description

The land to which this flood management report relates to is known as 28-32 Bourke Road, Sydney. The site is situated on the southern side of Bourke Road.

The site occupies two land allotments and is legally described as follows:

- Lot 1-3 DP324707.

The site has a regular rectangular shape allotment with a frontage to Bourke Road of approximately 40.6 metres and an overall depth of approximately 73 metres, yielding a total site area of approximately 2,972 sqm.

Bourke Road forms a low point east of the subject site and is a two-way and two lane carriage way road.

A Location Plan including the site is provided in Figure 1



Figure 1 Location Plan (Source: Six Maps)

The site is currently occupied by a single storey rendered industrial building focusing on car tyre repairs. There are two driveways along the northern western boundary of the site.

The surface level is approximately 8.41 mAHD on the Bourke Road frontage.

1.2 Development Consent Conditions

The development has been granted conditional approval (SSD-38600121). This report addresses the following conditions:

Consent Condition	Response
<p>B8. Future development applications(s) must address the following:</p> <p>(a) the location of any lifts adjoining the public domain must comply with the City’s Interim Floodplain Management Policy.</p> <p>(b) the concept grading for the laneways must be in accordance with the requirements of the City’s Interim Floodplain Management Policy (regarding impact on the new development and the adjoining buildings), Public Domain Manual, Sydney Streets Technical Specifications & Standard Drawings and the SDCP’s public domain design for the entire precinct.</p>	<p>(a) Lift wells adjoining the public domain open above the PMF level (refer to section 4.1)</p> <p>(b) The concept grading is included in Appendix A</p>
<p>B17. Prior to the submission of any subsequent development application, the Applicant must consult with Council to finalise the grading and levels of the surrounding future laneway network.</p>	<p>Draft grading was provided to council in previous versions of this report. The grading is shown in Appendix A</p>
<p>B29. Future development application(s) must be accompanied by a detailed Flood Impact Assessment (FIA), prepared by a suitably qualified Engineer (who is included in the National Professional Engineers Register, administered by the Institution of Engineers Australia), including management and mitigation measures and emergency response plan(s). The FIA, including the recommended PMF level must:</p> <p>(a) be prepared in accordance with the NSW Floodplain Development Manual, existing Council and Government studies and guidance;</p> <p>(b) identify and assess pre and post development scenarios for the most critical flood behaviour such as peak flood depth, velocity, flood hazards and rate of rise, including flood constraints and risks on the site, new streets and adjoining properties and the potential impacts of climate change for the full range of events, up to and including the PMF;</p>	<p>(a) This report constitutes an FIA prepared by a suitably qualified engineer, and prepared in accordance with the Floodplain Development manual, Flood Impact and Risk Assessment – Flood Risk Management Guide LU01, Council and Government studies and guidance.</p> <p>(b) Sections 4 and 5.4 provide this information</p>

<p>(c) propose management and mitigation measures including emergency management and evacuation; and</p> <p>(d) include a preliminary detailed Operational Flood Emergency Management Plan prepared in accordance with the Floodplain Development Manual (FDM) to manage the risk to life and property damage during the full range of flood events, emergency evacuation to the nearest hospital and procedures for site isolation.</p>	<p>(c) Refer to sections 5.2, 5.4, 5.5, and 6</p> <p>(d) Refer to the separately prepared Operational Flood Emergency Management Plan (OFEMP)</p>
<p>B30. Future development application(s) must demonstrate that the development has been designed to incorporate the following requirements:</p> <p>(a) no habitable hospital or medical facility floorspace (including lifts and relevant electrical equipment) is provided below the PMF level;</p> <p>(b) all entrance levels to the basement, including the vehicle ramp, stairwells, ventilation, lifts, and fire exits etc are protected from flooding during a PMF event;</p> <p>(c) all entrances to the building are equal to or higher than the PMF;</p> <p>(d) any structure located below the PMF comprises flood compatible materials; and</p> <p>(e) essential services infrastructure is located above the flood planning level.</p>	<p>(a) refer to section 4.1</p> <p>(b) refer to section 4.1</p> <p>(c) refer to section 4.1</p> <p>(d) refer to the structural design report</p> <p>(e) refer to section 6</p>
<p>B31 A preliminary detailed Operation Flood Emergency Management Plan must be submitted</p>	<p>Refer to the separately prepared Operational Flood Emergency Management Plan (OFEMP)</p>

2 Proposed Development

Development consent is sought for the 'Alexandria Health Centre' comprising medical centre uses and anchored by a mental health hospital. The application seeks consent for the following in accordance with the Concept SSDA approval:

- Site establishment including earthworks.
- Construction of the Alexandria Health Centre:

- Total GFA of 11,436sqm
- Maximum FSR of 3.85:1
- Maximum height of 34.95m, Max RL. 45.4
- Ancillary development including:
 - Car parking – 77 car parking spaces distributed across basement, ground, and ground mezzanine levels.
 - Utility infrastructure and services connections.
 - Building identification signage and wayfinding signage.
 - Stormwater management
 - Landscaping
- Laneway for vehicle and pedestrian access along with western boundary of the site
- Operation of the Alexandria Health Centre as a mental health hospital and medical centre with ancillary uses.



Figure 2 Proposed Basement and Ground Floor Plan (Source: Warren and Mahoney Architects)

3 City of Sydney proposed laneways

A network of laneways is proposed between Bourke Road, O’Riordan Street and the future Ashmore Connector. The following extract from the DCP2012 Section 5 (figure 5.200) (Figure 3) includes laneways on the south and east boundaries of the site.

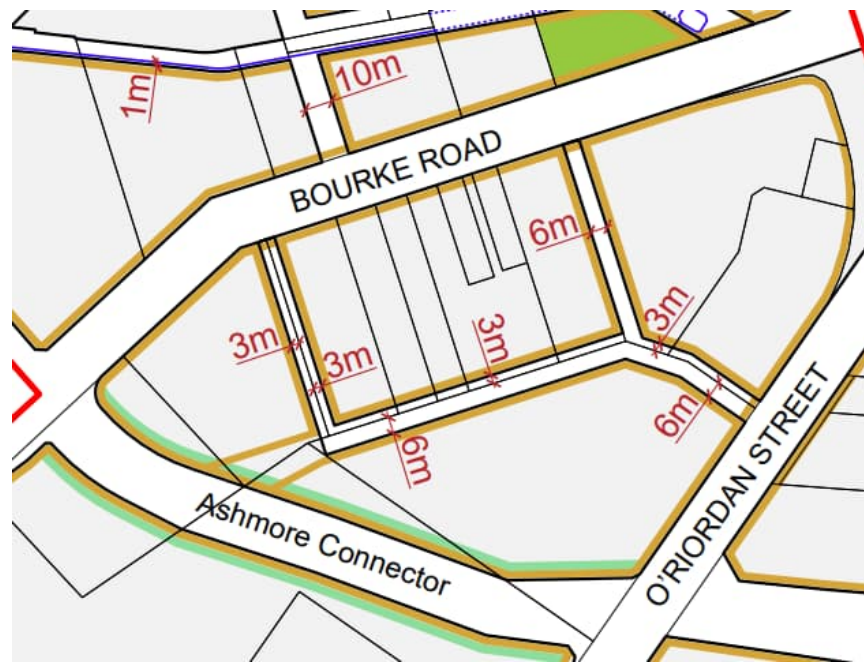


Figure 3 Proposed laneway network

As part of the proposed development, 3m along the west and south boundaries will be dedicated to Council.

A site-specific Flood Study and master grading is required to be undertaken prior to the development of the design, as the flood study may fundamentally affect the design of the future building and the laneway.

The following section of this report addresses the impact of opening the laneway network with respect to flooding.

4 Flood Planning

4.1 Flood Conditions and Requirements

Enstruct has obtained a copy of TUFLOW model from the Alexandra Canal Model Conversion 2020 by WMAwater Pty Ltd under a data access agreement with Council.

The site is located near a sag point on Bourke Road and is located in a high flood risk zone with major overland flow expected at or near the site. After investigating the Council flood model results, it was found that the 1% AEP flood level at the site was at 8.8 mAHD, while the Probable Maximum Flood (PMF) level varies from 10.3 mAHD to 10.4 mAHD.

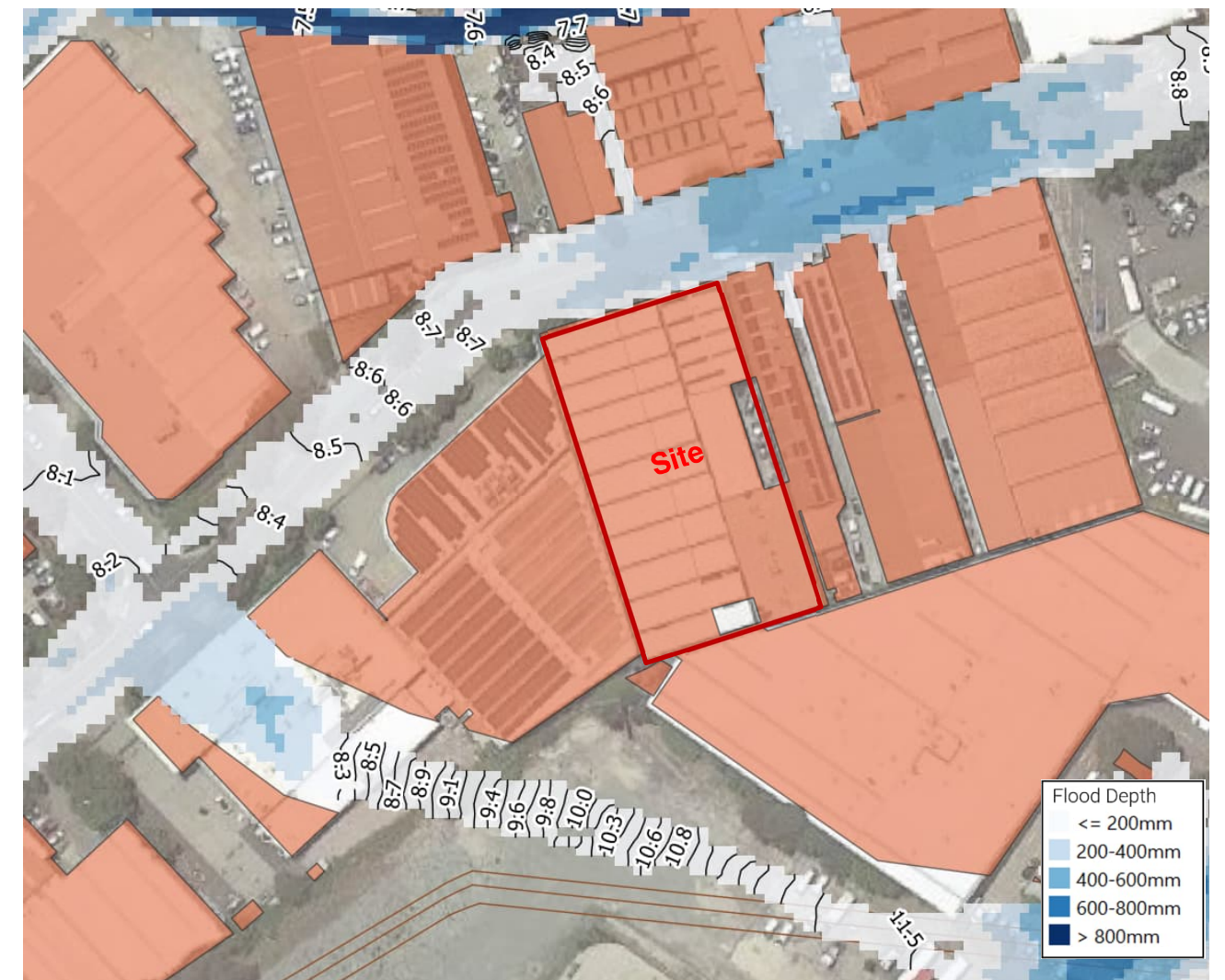


Figure 4 1% AEP Flood Map

4.3 Future Laneways flood results

The proposed laneway network geometry, coordinated with the civil design, was added to the flood model to confirm the design meets the flooding requirements and achieves flood-free laneways during a PMF for the future laneway network. In addition, the model demonstrates there is no adverse impact on surrounding properties.

The image below indicates that the new laneways are generally not flood affected during a PMF event. The proposed laneway off Bourke Rd is appropriately graded from the existing street level to the PMF level (RL 10.4), which is indicated by the gradual reduction in flood water depth along the laneway, indicated in Figure 7.

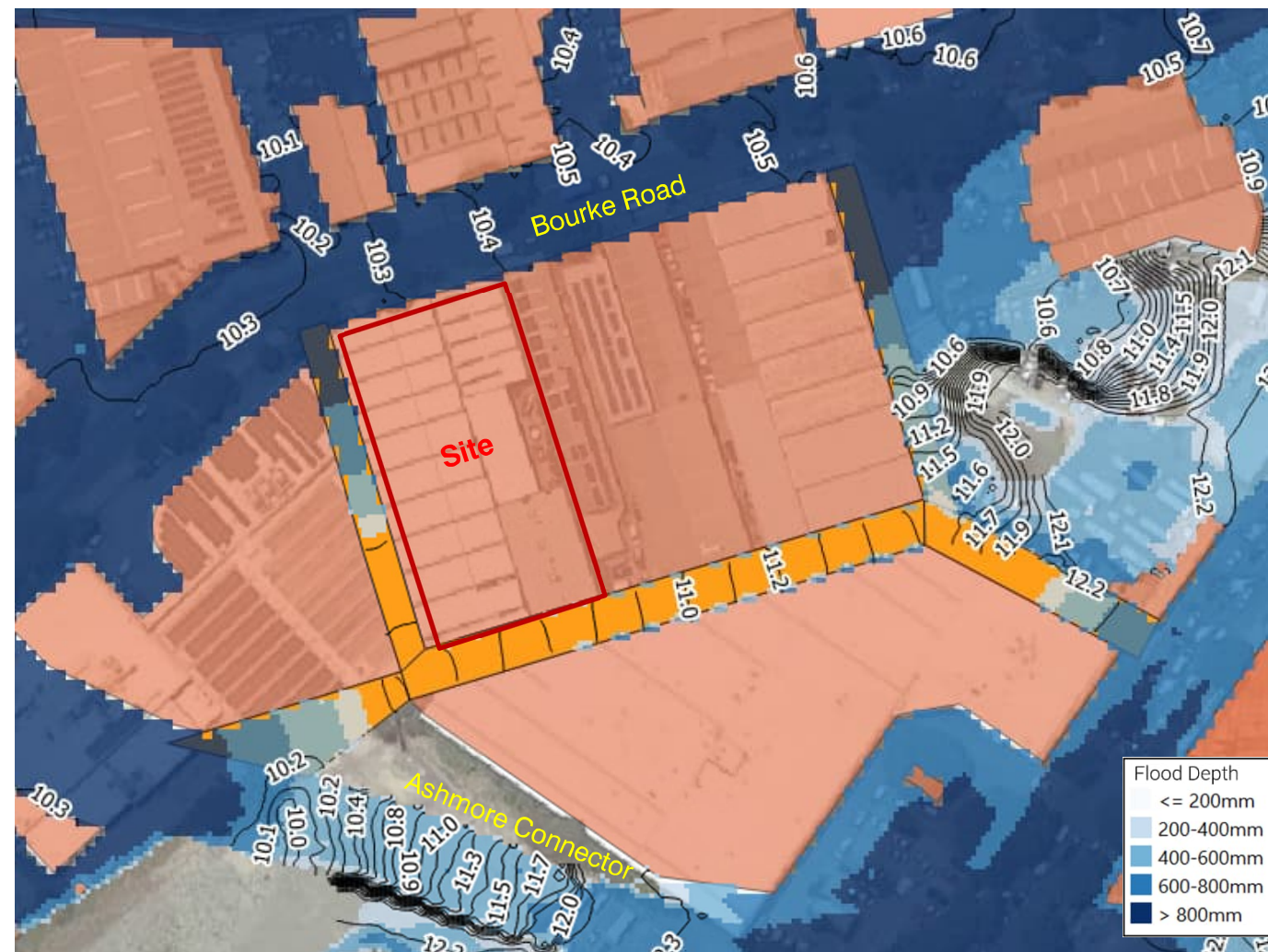


Figure 7 Flood Model Results - PMF - future conditions

The 1% AEP flood event was re-run to show the impact of the development on flooding. The impact was found to be negligible. A comparison between the existing and future conditions is made between Figures 4 & 8.

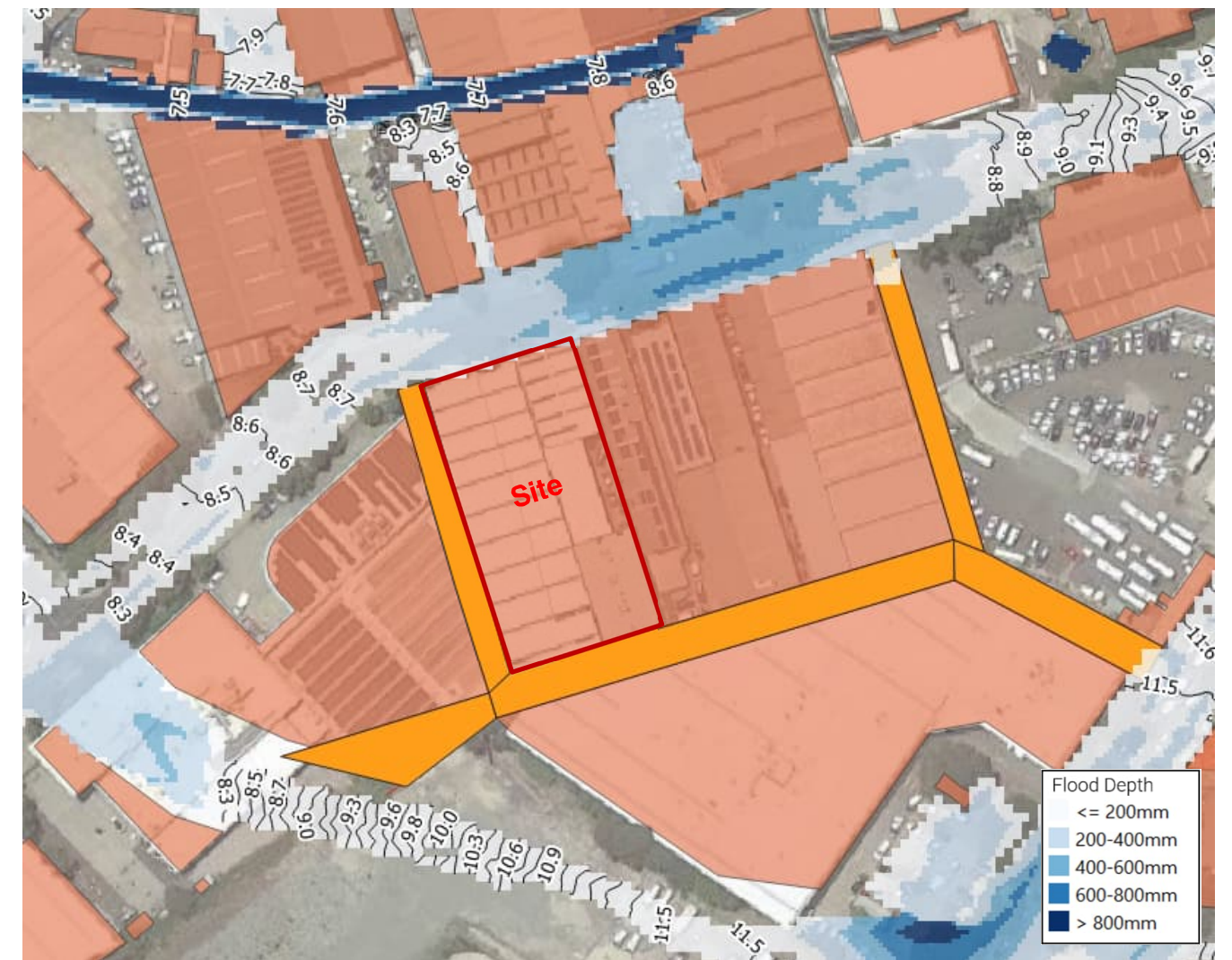


Figure 8 1% AEP flood model results - future conditions

4.4 Climate Change

The proposed development has adopted flood planning levels based on the PMF as required by Council's flood policy. Climate change is not considered when determining PMF, so there are no changes to the site planning in this respect.

While climate change impact has not been included in the provided flood model, the 500-year storm event provides an approximation for a future climate scenario with increased rainfall intensity. During a 500-year storm event, the flood level on Bourke Road is 8.90mAHD, 100mm higher than the 100-year flood level.

The site is resilient to increased rainfall intensity due to climate change given the flood planning level for the site is based on the PMF level.

5 Flood Risk: Access, Egress and Isolation

5.1 Site Use

It is noted that the proposed hospital is not for surgeries and high-acuity care, and the model of care is primarily targeted at privately insured patients aged 18+ with mood disorders, anxiety disorders, and those with comorbid drug and alcohol disorders.

The facility will be run 24/7 for inpatient services on the 2 upper levels (56 beds total), with the lower levels to be used for outpatient services – i.e. consultations, small group therapy sessions etc with people who are not staying within the facility overnight.

The proposed mental health hospital and medical centre is likely to cater for:

- Short stay (average 1-2 weeks), intensive inpatient hospital admission focused on assessment, treatment initiation and stabilisation or detox, and discharge planning.
- Step-down outpatient day group programs delivered either in a group setting or via telehealth
- Case management and in-home care provided by a multidisciplinary team.
- Telehealth, digital and peer support programs to provide ongoing support.

No procedures involving anaesthesia are currently planned by the private hospital component. Should future tenants seek the ability to undertake procedures involving anaesthesia, this would be subject to a separate approval.

In situations where storm events are anticipated, admissions and procedures can be rescheduled, and in-patients evacuated, to reduce the number of in-patients on the site. The majority of inpatients will be ambulant for evacuation purposes.

5.2 Site Access and Egress

Site access and egress is complicated by the sag point on Bourke Road, approximately 40m east of the site, and an additional sag point on Bourke Road 350m southwest of the site. Hazard outputs indicate that during the peak of a critical duration 5% AEP storm event, both these points are unsafe for small vehicles as per hazard curves presented in ARR (Figure 10). During these events, the access and egress route is via Bowden Street, then north towards Redfern or south towards Sydney Park (Figure 12)

Bowden Street is trafficable during the 5% AEP event (H1 category), and unsafe for small vehicles (H2 category) for a period of approximately 20 minutes during the peak of the critical duration 1% AEP storm. Analysis of longer duration events up to six hours shows both Bourke Road and Bowden Street are trafficable by all vehicles (H1 category) during a 1% AEP storm with duration of six hours, while during a 0.2% AEP (500-year ARI) event six hour event, Bowden street is trafficable but Bourke Road is not trafficable for a period of 15 minutes (Figure 11).



Figure 9 5% AEP flood hazard plot showing Bowden Street trafficable

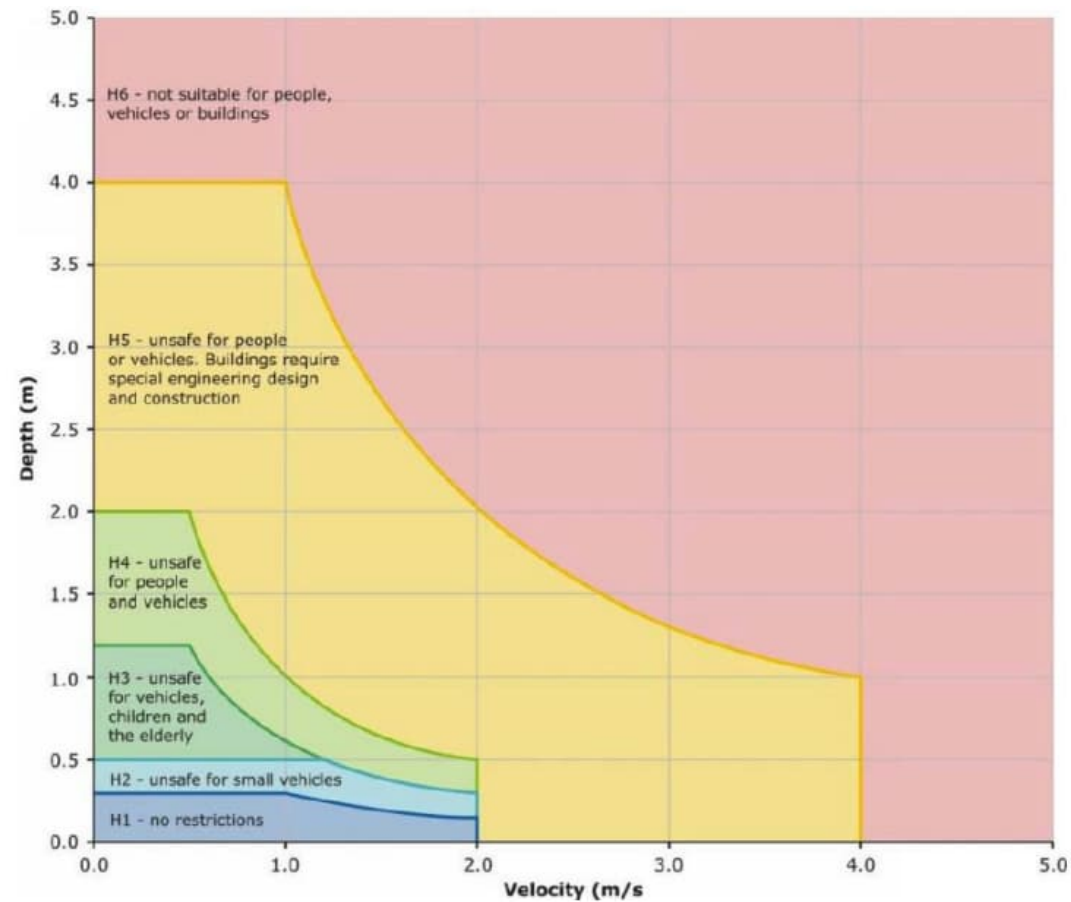


Figure 10 Flood hazard categories

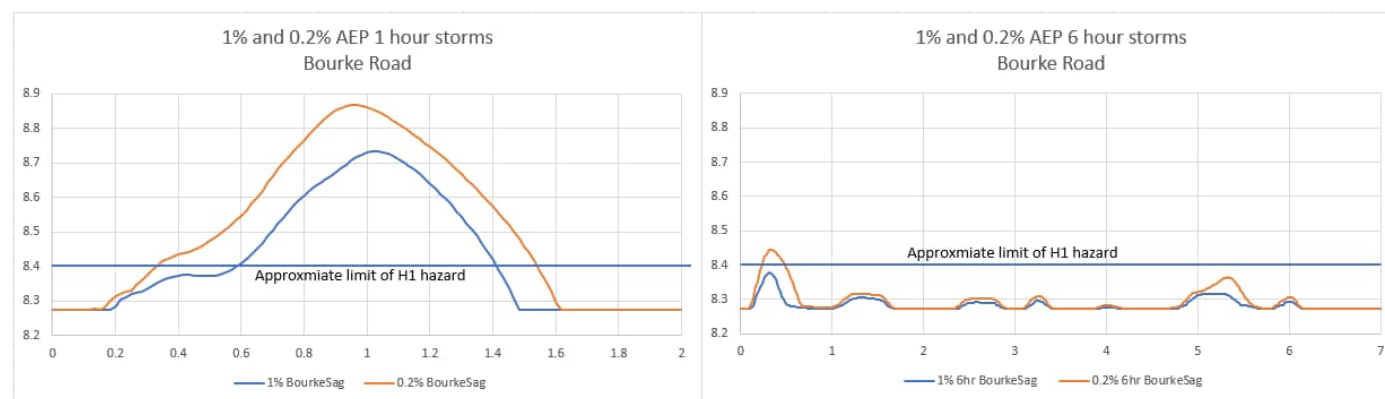


Figure 11 Bourke Street flood level for short and long duration 1% and 0.2% AEP storms

Under the future development scenario where the laneway network is complete, additional access and egress will be available via the laneway network to O’Riordan Street and then north-east to Bourke Street (Figure 12). The route is trafficable for all events up to and including the critical duration 1 in 500 (0.2%) AEP, however O’Riordan Street is not safe during a PMF. Note that this route will not be available until surrounding properties are developed and the DCP enacted to enable the laneway network, and the proposed development of the subject site does not rely on this access/egress route.

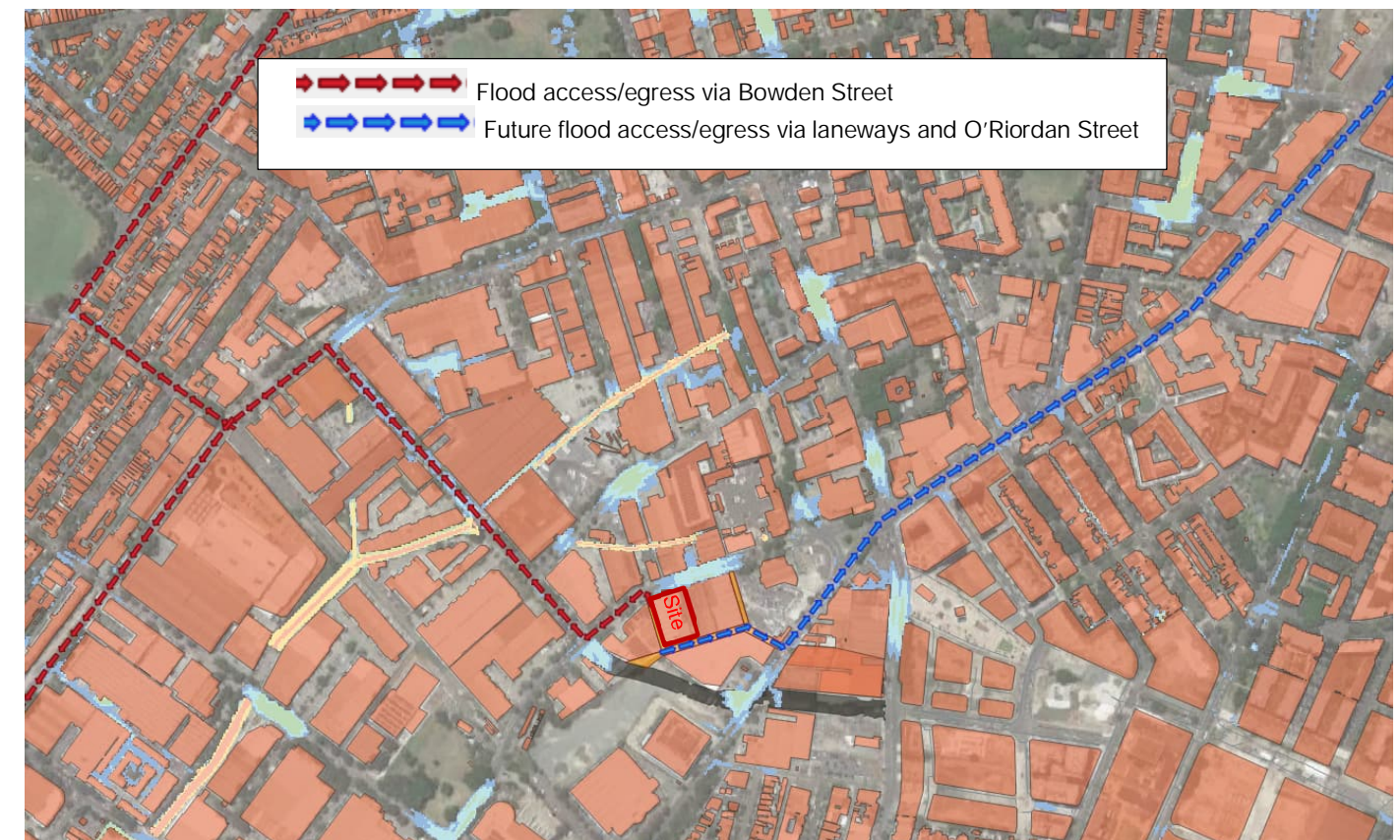


Figure 12 Access/egress routes

5.3 PMF

Following discussions with the Department of Planning and Environment (DPE) and the State Emergency Service (SES) regarding potential isolation periods for the site, it was requested that enstruct undertake additional flood modelling to include long duration PMF events to establish flood inundation during for the access/egress roads around the site.

The CoS flood model includes PMF storms up to a 5-hour duration, with the 90 minute duration PMF providing highest local flood levels, making this the critical duration storm. Longer duration storms produce lower peak flood levels, but a longer period of inundation. These longer duration events may result in the more challenging conditions for the site from a flood planning and emergency response perspective.

In order to model the long duration events, the PMP was estimated using the Generalised Southeast Australia Method (GSAM). The DRAINS hydrological models provided with the flood model were updated to include the long duration events. The results were exported for use in the hydraulic (TUFLOW) model.

12, 24 and 48 hour storms were run in addition to the previous 90 minute and 5 hours storms in order to review a broad spectrum of storm durations and determine periods of isolation. Each of these runs was undertaken using the proposed geometry discussed in section 4.3 of this report.

5.4 Isolation During PMF Events

During a PMF, the site is isolated. While the ground floor and basement entries have been designed to be above the peak PMF level, access and egress from the site is not possible.

Long duration storm event analysis provides the duration of isolation for various durations of PMF events reviewing critical points on the access/egress routes. Figure 13, Figure 14, and Table 1 provides a summary of the flood results at key locations for access and egress.

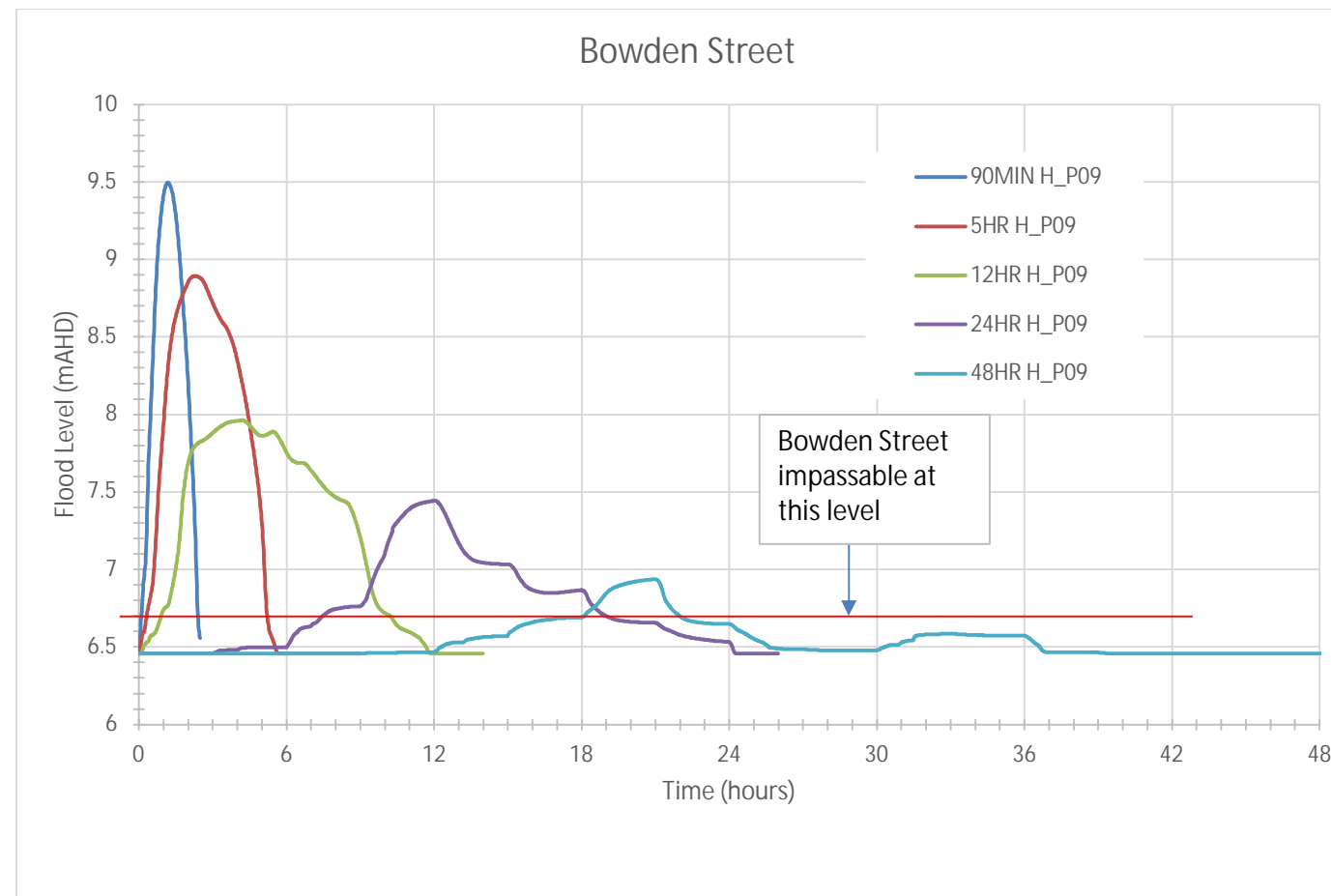


Figure 13 Bowden Street sag point PMF levels

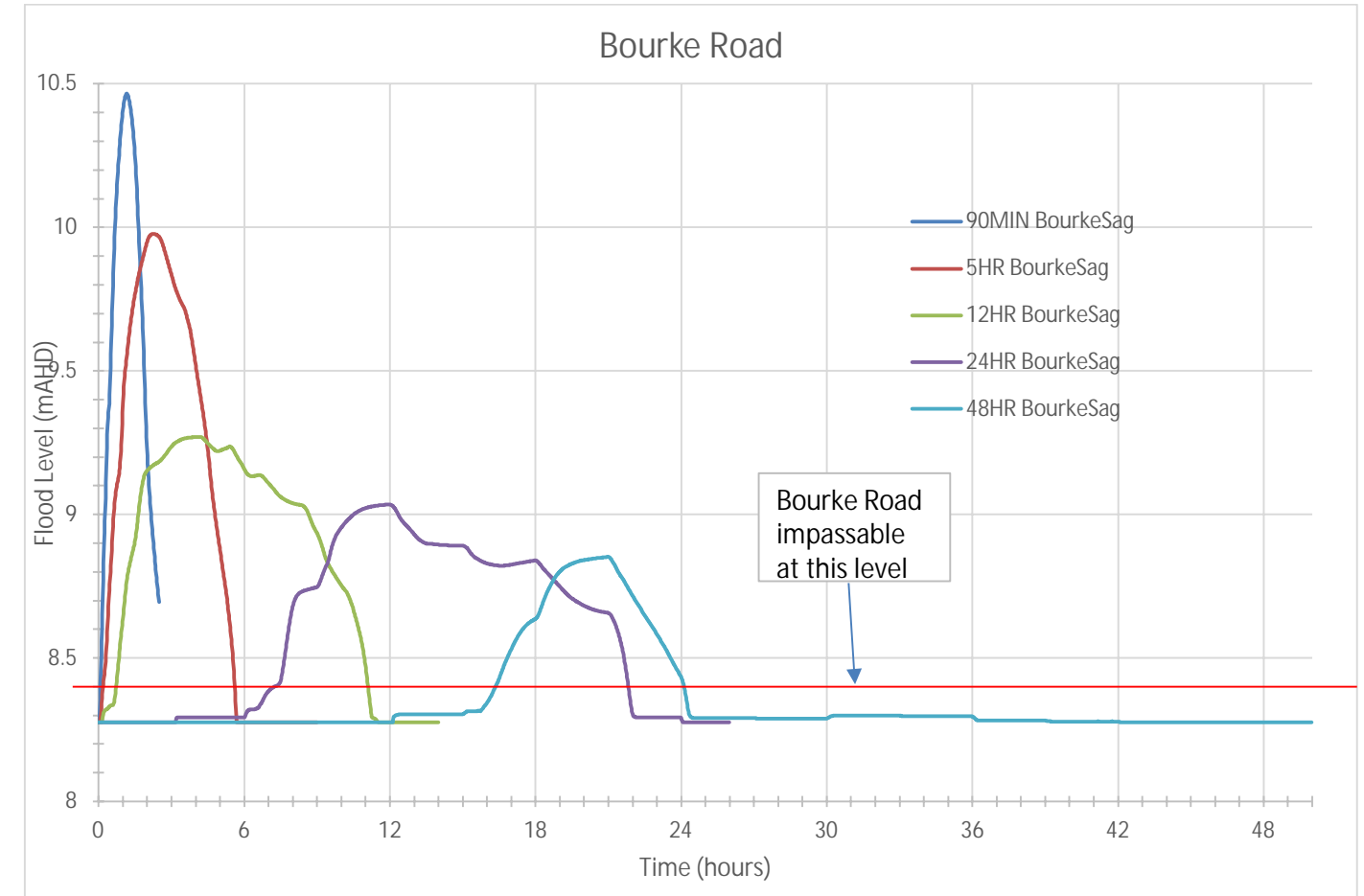


Figure 14 Bourke Road sag point PMF levels

Table 1 PMF peak levels and isolation duration

PMF Storm duration	Bourke Road (un-trafficable flood level 8.4mAHD)		Bowden Street (un-trafficable flood level 6.7mAHD)	
	Peak level (mAHD)	Un-trafficable duration (hours)	Peak level (mAHD)	Un-trafficable duration (hours)
90 minutes	10.45	3	9.5	2.3
5 hours	9.96	5.4	8.9	4.9
12 hours	9.27	10.4	7.95	9.3
24 hours	9.04	14.55	7.44	11.5
48 hours	8.85	7.75	6.93	3.85

Table 1 shows that the maximum period of isolation for the site is 11.5 hours during a 24 hour PMF event where access via Bowden Street is unsafe for this period. Table 2 summarises the isolation periods for the various storm events studied.

Table 2 Potential periods of isolation for various storm events

Storm event	5% AEP	1% AEP	0.2% AEP	PMF
Short duration (60-90 minutes)	Nil	20 minutes	50 minutes	2.3 hours
Medium duration (5-6 hours)	Nil	Nil	Nil	4.9 hours
Long duration (12-48 hours)	Nil	Nil	Nil	11.5 hours

5.5 Isolation management

During 1% AEP storm event, site may be isolated for a period of approximately 20 minutes. This is considered an inconvenience to site users (patients and staff) and should be managed similarly to other occurrences such as bad traffic, public transport delays and the like.

During a PMF event, the isolation period has shown to vary up to approximately 12 hours. In this instance, staff and patients will remain on site for the duration of the site being isolated. The proposed hospital has an on site kitchen, which will have adequate supplies of food and water for the isolation period. There will be reserve supplies of linen and consumables. Any procedures involving anaesthetic should be postponed to minimise the risk of medical emergencies on site.

Refer to the separately prepared Operational Flood Emergency Management Plan (OFEMP) for additional information on emergency and isolation management.

It is worth noting that a PMF event has a likelihood in the order of 1 in 1,000,000 years.

6 2022 Flood Inquiry

NSW experienced major flooding in February, March and, most recently, July 2022. In March 2022, the NSW Premier established a Flood Inquiry. The 2022 Flood Inquiry was published on 29 July 2022.

Relevant findings and recommendations of the Inquiry are presented below:

W. Finding – essential services and floodplain infrastructure

- Essential services disruption in the floods was exacerbated by critical infrastructure being situated in low-lying areas and consequently being flooded.
- Many hospitals, medical centres, nursing homes, aged care facilities and police stations are situated below the flood planning level. Several of these were affected in the recent floods.
- Some detrimental impacts of floods come from built structures which are supposed to provide flood mitigation not being maintained and consequently malfunctioning after heavy rain, making floods worse at a local level. Many are the responsibility of several agencies and are maintained by none.

28. Recommendation – essential services and floodplain infrastructure

That, to minimise disruption to essential services (power, communications, water, sewerage) and to ensure flood infrastructure is fully serviceable before flooding, Government ensure:

- essential services infrastructure (communications, water, power and sewerage) is situated as much as possible above the flood planning level. And to minimise disruption to medical services, aged care services and the police, Government ensure hospitals, medical centres, nursing homes, aged care facilities and police stations are situated above the probable maximum flood level
- floodplain infrastructure (drains, levees, flood gates) items are all assigned to an appropriate lead agency which has responsibility for ensuring they are fully maintained and functioning especially when floods are likely.

The proposed site responds to these findings. The local sewerage system is typically designed to overflow to the stormwater system in the event this is inundated by flooding, and not back up into properties. Water supply will continue to operate during flood events. The proposed development has diesel generator backup system to supply electricity in the event the local distribution network is not operating due to flooding, with substation and backup generators located above the PMF.

GHD has prepared a memorandum “Proposed development 28 – 32 Bourke Rd, Alexandria Reticulated sewer network performance during dry and wet weather operation” (17/02/2023), concluding:

It is expected that the proposed development wastewater services will continue to operate effectively during wet weather events. This is based on engineering design principals for sewer network design and the that the FFL of the proposed development is at 10.4 mAHD (6 m higher than the recorded overflow weir level of 4.26 mAHD)

Sydney Water’s drinking water system is designed to meet system demand and can be reasonably expected to continue to operate effectively during wet weather events.

7 Conclusion

This report has identified and analysed the impact of the proposed development, the risks to the development and its users, and outlined how these risks can be managed. Thus it meets the requirements of a Flood Impact and Risk Assessment (FIRA) as outlined in the Flood Impact and Risk Assessment – Flood Risk Management Guide LU01.

The TUFLOW model indicates that the proposed hospital site is subject to flooding. The PMF level of 10.40 mAHD on Bourke Road informs the flood planning level of 10.40 mAHD. The 1% AEP flood level of 8.80 mAHD in the same location. This is the primary mitigation measure against the impact of flooding at the site.

The proposed development does not have any impact on flooding in a 1% AEP event.

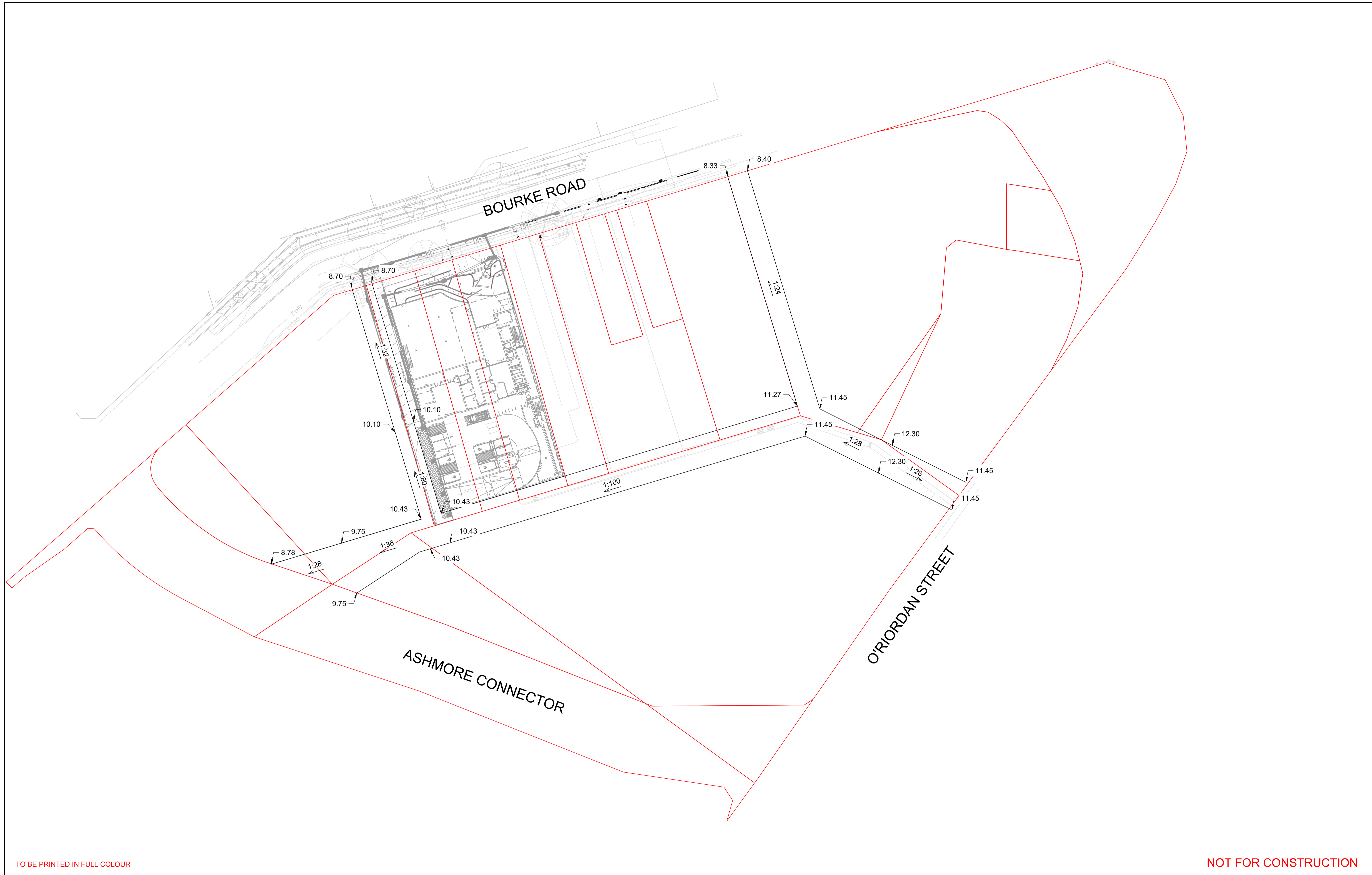
In direct response to Section 3.1 of the City of Sydney (CoS) letter [Ref: R/2022/2/B] dated 10/11/22, the future flooding conditions, specifically including the surrounding laneway concept grading, was modelled in TUFLOW and shows the laneways are generally flood free during a PMF event. This outcome is beneficial to all properties in the precinct, and considers future impacts from surrounding developments.

Site access and egress is limited during the peak of short, intense storms larger than a 5% AEP event. The site is accessible during long duration storm events of more than 6 hours when local roads remain trafficable. Site access and egress is closed for a period of less than 12 hours during a long duration PMF events. A separate Operation Flood Emergency Management Plan has been prepared.

APPENDIX A

EXTERNAL PATHWAY GRADING SKETCH

enstruct



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project	ALEXANDRIA HEALTH CENTRE EARLY WORKS
	28-32 BOURKE ROAD ALEXANDRIA

drawing title	EXTERNAL PATHWAY GRADING SKETCH
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