

# Flood Evacuation Emergency Management Plan

40 Memorial Avenue,  
Bella Vista

Prepared by Orion Group

**Landen Dev No. 8 Pty Ltd**

**March 2026**

**ORION**

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## Document Control

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# Contents

<b>1.</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Site Description .....	1
1.2	Flood Risk Terminology .....	2
<b>2.</b>	<b>Flood Behaviour .....</b>	<b>4</b>
2.1	Model Updates .....	4
2.2	Flood Impact Assessment .....	4
<b>3.</b>	<b>Emergency Management .....</b>	<b>5</b>
3.1	Emergency Plan .....	6
<b>4.</b>	<b>Community Information .....</b>	<b>7</b>
4.1	Emergency Contacts .....	7
4.2	Flood Hazards .....	7
4.3	Flood Warning .....	7
4.4	Internet Resources .....	8
<b>5.</b>	<b>Conclusion .....</b>	<b>9</b>

## Executive Summary

This Flood Evacuation Emergency Management Plan (FEEMP) has been prepared for the Department of Climate Change, Energy, the Environment and Water (DCCEEW) in response to a 'Request for Information around the proposed State Significant Development of 40 Memorial Avenue, Bella Vista. A FEEMP is required for 'any lots are affected by the Probable Maximum Flood (PMF)'.

To map and measure the flood impact to the proposed development, a 2D TUFLOW model for the development site was created from the Rouse Hill Flood Study (RHFS). This report is to be read in conjunction with the Flood Impact and Risk Assessment Report (FIRA) for the 2D Hydraulic analysis and flood mapping. Model results show impacts on the lower ground floor of the proposed structures in the PMF event only; these impacts are confined to H3 or below levels for the critical event and do not exceed a depth of 600mm. There is no other impact in any of the lower order modelled events. Given the extremely short duration of the critical event, extremely short nature of the PMF inundation and the limited H3 hazard rating a localised shelter-in-place strategy will be the most appropriate.

Yours Sincerely,



**Orion Group** | Christopher Scholes – Principal Engineer

# 1. Introduction

Orion has been engaged by Landen Dev No. 8 Pty Ltd to prepare the civil engineering and stormwater management documentation for the development application for the proposed buildings in 40 Memorial Avenue, Bella Vista.

This Flood Evacuation Management Plan is to be read in conjunction with the accompanying Flood Impacts and Risk Assessment Report (Orion ref 25-0016\_40 Memorial Ave and Hodges Road Bridge\_FIRA Report).

## 1.1 Site Description

The site is located at 40 Memorial Avenue and is within Hills Shire Council Local Government Area (LGA), as shown in **Figure 1**.

The site is bordered by Memorial Avenue to the North, Balmoral Road to the south, Old Windsor Rd to the west and Elizabeth MacArthur Creek to the east. The site in existing condition is predominantly greenfield with a single existing dwelling within the site boundary. The site generally slopes from 62mAHD at the southwest boundary to 56mAHD at the northeast boundary adjacent to the Elizabeth MacArthur Creek. Elizabeth MacArthur Creek flows in a northward direction, rising at Bella Vista Farm Park about 2.5km south of the development site. The catchment upstream of the development site is 167 hectares. The upstream catchment is significantly developed with R2, R3 and R4 Residential and SP4 Enterprise zonings (see **Figure 2**).



Figure 1 - Site Location Map (aerial imagery courtesy of MetroMap)

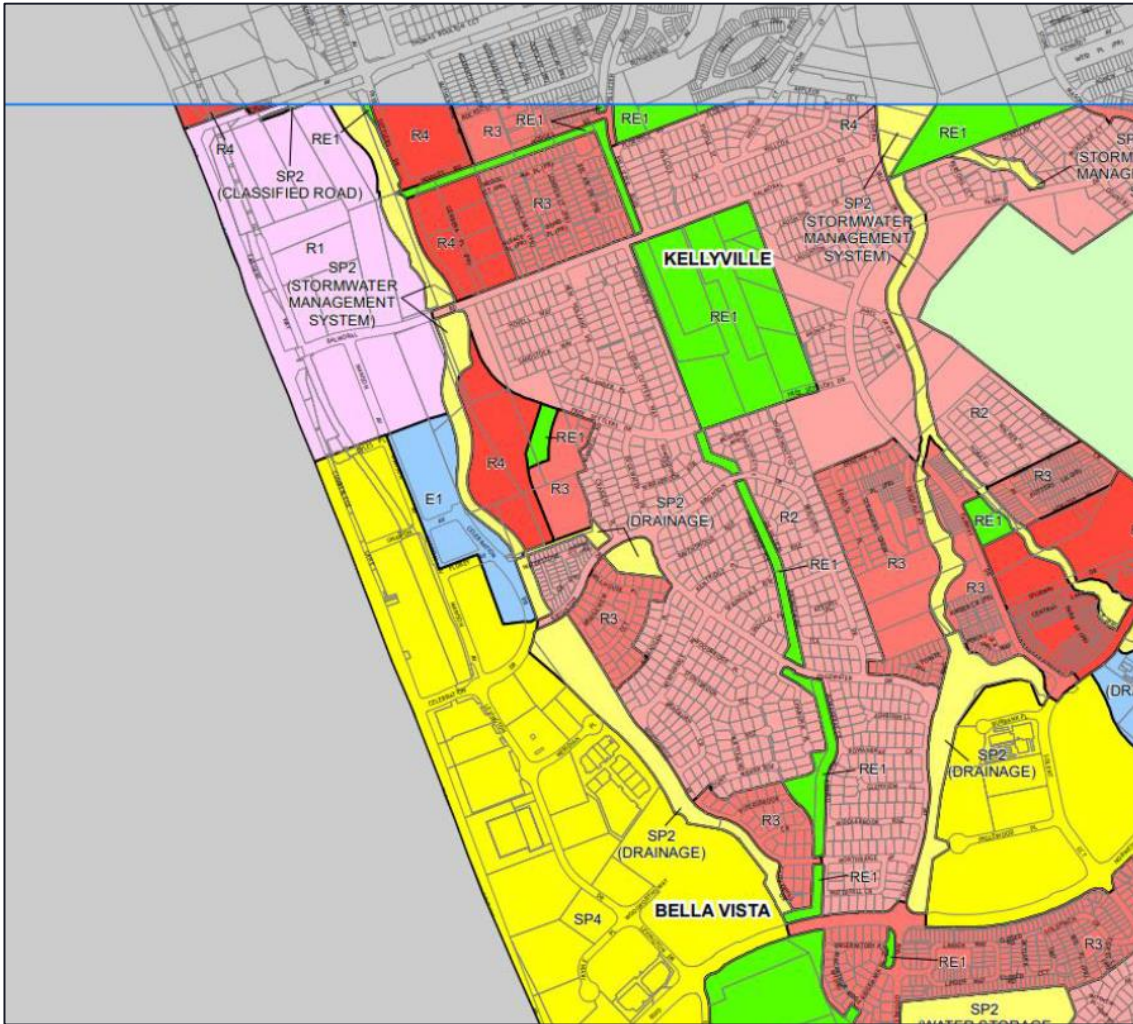


Figure 2 - Zoning of catchment upstream from 40 Memorial Avenue, Bella Vista (extracted from The Hill Shire Council Interactive Map – Local Environmental Plan 2019 Land Zoning Map)

## 1.2 Flood Risk Terminology

To quantify and classify the flood risk hazard to people and property, the flood risk hazard curves and associated Hazard Vulnerability Classifications are adopted from the Flood Hazard technical report prepared by Smith et al. 2014. These vulnerability classifications are outlined in both the Australian Institute of Disaster Resilience, Flood Hazard Guidelines 2017, and Australian Rainfall and Runoff 2019 (ARR19). These hazard classifications incorporate stability curves for different vehicle classes and pedestrian ages groups with defined limiting conditions for both water velocity and depth profiles.

The following figure shows the flood hazard curves adopted from H1 to H6:

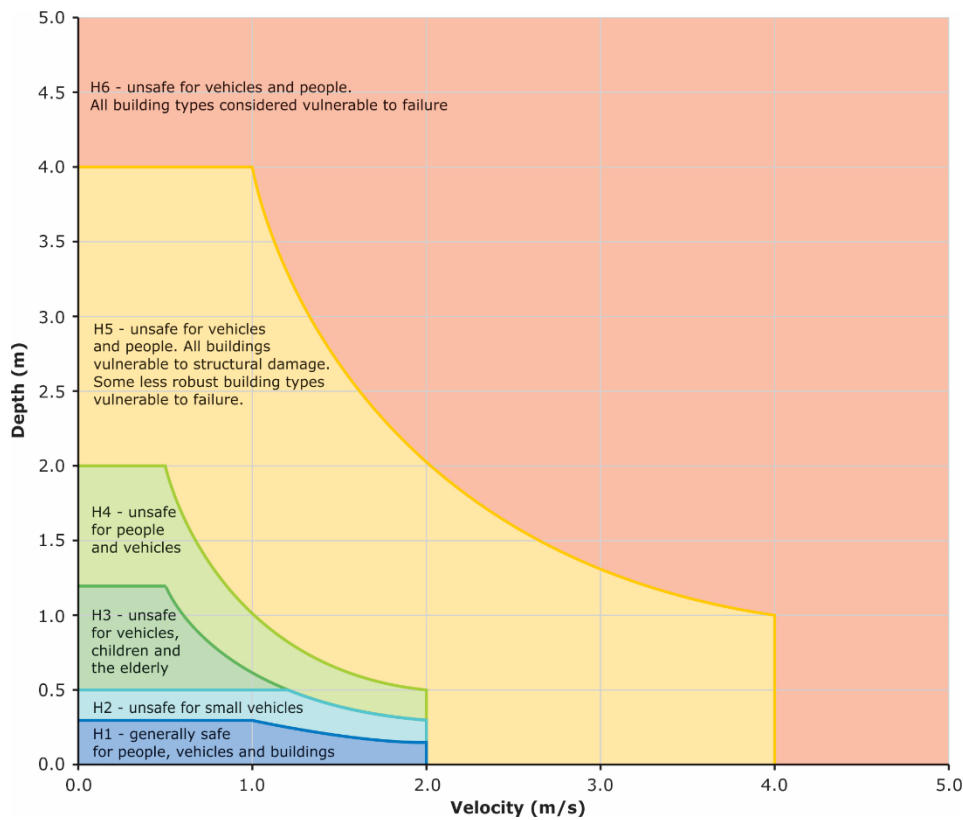


Figure 3 - Flood Hazard Curves (Smith et al 2014 in Australian Rainfall and Runoff Book 6, cl 7.2.7)

Table 1 - Hazard Vulnerability Classifications

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings
H2	Unsafe for small vehicles
H3	Unsafe for vehicles, children and the elderly
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure

## 2. Flood Behaviour

To ascertain the flood impacts for the events up to PMF, the 2D TUFLOW hydraulic model was run and flood hazard, time to inundation and time of inundation for all flood events have been assessed.

### 2.1 Model Updates

The following modifications were made to the RHFS model with the addition of 3 new model scenarios:

1. Updated existing surface data with the latest LiDAR and survey information available around the proposed site.
2. Added the proposed design DTM for the proposed development and separately approved bridge.
3. Added materials mapping for the adjoining subdivision and proposed development to consider the roads, road reserves and residential lots.
4. Application of a 50mm mapping cutoff depth per industry standard practice and other development applications within the Hills Shire LGA.

### 2.2 Flood Impact Assessment

The critical PMF event identified in the hydrological modelling was the 60-minute duration event. This worst-case storm resulted in significant flooding across the creek corridor and reserve with backwater effects caused by existing and proposed culvert and bridge crossings along Elizabeth Macarthur Creek.

Running the TUFLOW Model for the development scenarios shows that the lower ground floors are affected by the PMF flooding within the creek reserve. Observations from the model show that water within the Elizabeth Macarthur Creek builds up behind the existing Memorial Avenue culverts flooding the reserve and overtopping Memorial Avenue. The DA approved Hodges Road bridge (DA:563/2024/ZB) that will provide access to the proposed development floods in the PMF event limiting access to the site for the short duration PMF event.

The duration of inundation mapping provided in Appendix A highlight that the bridge access is only cut off for approximately 60 minutes allowing for emergency access/evacuation routes to be restored. The PMF flood behaviour results in flooding of the lower ground floor of less than 600mm in depth and of up to a H3 hazard category. Additional flood mapping completed for the subject site show that the site is flood free for all events up to the 0.2% AEP. As a result, only the PMF impacts have been considered in this management plan.

### 3. Emergency Management

Typically, two types of emergency management responses to a flood emergency are:

1. Early warning and evacuation to an area of safe refuge above the reach of all floodwaters up to PMF Event.

Evacuation routes need to be generally accessible with a flood hazard category of no greater than H1 and with enough warning time to safely evacuate in such an event.

2. Shelter in place within the site (within the future dwellings) until flood waters receded. This is generally in accordance with the requirements for Shelter in Place guidelines for flash flooding (DPHI,2025).

The relatively short time to peak inundation (<60 minutes) in the PMF event would result in a higher risk to life if the property was attempted to be evacuated in such a large, extremely rare 'flash flooding' type of event. As such, a localised shelter in place approach would be more appropriate for residents with cutoff times to the primary road access via the Hodges Road bridge being less than 1 hour. Residents can safely shelter in place with only residents on the lower ground floor partially impacted by PMF inundation. These residents can safely self-evacuate to the next level (which is above the PMF) if such a rare event was to occur. To manage any residual risk, the lower ground floor levels have been lifted to limit the over-floor flood hazard category to H3 or less to mitigate any latent risk to life in any unforeseen circumstances that preclude self-evacuation to a higher floor. To improve flood resilience, all primary entry points to the basement levels have been lifted to be above the PMF water surface levels.

As such, discussion around early warning and trigger levels has not been included in this management plan. Warning and evacuation are deemed impractical immediately before or during an extreme PMF type weather event of such a short duration.

Residents are encouraged to be prepared for any emergency event including extreme rainfall. This will include the preparation of an emergency kit in accordance with the educational advice provided by the SES with spare shelf stable food, bottled water and personal medication as required. This is discussed further in the following section on Community Information.

In the unlikely need to evacuate or if a secondary emergency occurs within the development, vehicle access via the Hodges Road bridge will be available as flood waters recede after approximately 60 minutes, Refer to Appendix A for time and duration of inundation mapping. In the interim scenario prior to completion of all local adjoining roads, secondary evacuation can be achieved on foot after 20-30 minutes via Memorial Avenue, Noting that the TUFLOW modelling does not include the existing 1D road drainage network that could improve the road drainage. Additional future access roads are proposed to the Southwest of the site for connection to the existing roadway infrastructure adjacent to Old Windsor Road.

## 3.1 Emergency Plan

In the event of a PMF Flash Flood residents should remain on the premises as extreme flood waters would constitute a significant threat to life if evacuation was attempted.

### 1. Flood Emergency Responsibilities & Requirements

- i. The flood evacuation management plan shall be made available to all residents of all building and there shall be clear signage provided for the egress routes on the lower ground floor to show clear signage and guidance to stairwells for safe shelter.
- ii. In the event of a PMF event causing partial flooding of the Lower Ground Floor, residents shall immediately contact the building manager along with emergency services.
- iii. The building manager is responsible for ensuring clear warning and shelter-in-place signage is maintained on the Lower Ground Floor, is legible and current with respect to the latest FEEMP.
- iv. The building manager is responsible for ensuring any new owners or occupants of the lower ground floor units have a copy of the most current FEEMP available for the building and are made aware of the shelter-in-place emergency management strategy for the extremely rare PMF type-event.
- v. The building manager is responsible for reviewing the FEEMP every 5 years and is to action an update of the management plan if deemed required due to either; significant changes to the development of the sub catchment (i.e. after practical completion of the Elizabeth Macarthur Creek Trunk Drainage Upgrade Works), or, changes to climate change projection guidance and literature, or, a significant deviation or change in the underlying NSW flood risk management standards.

### 2. Internal Evacuation

- i. In the event of a significant or extreme rain event residents of the lower ground floor should be prepared to evacuate internally within the building. The evacuation areas below provide a comfortable place of refuge with the required amenities.
- ii. The residents of the lower ground floor in buildings A & B should self-evacuate to the communal room (RL 62.2) on the ground floor should be undertaken when flood waters reach the outer terrace of the building. Refer to Appendix B for Evacuation plan. The PMF Water surface level is between RL 58.70 and 59.10.
- iii. The residents of the lower ground floor in buildings C & D should self-evacuate to the function room (RL 61.6) on the ground floor should be undertaken when flood waters exceed the nature play park neighbouring the building. Refer to Appendix C for Evacuation plan. The PMF Water surface level is between RL 59.0 and 59.20.

### 3. Secondary Evacuation

- i. In the event of a secondary emergency vehicle access to the premises can be restored within 1 hour of Hodges Road bridge flooding, alternate egress on foot is available to Memorial Avenue within 30 minutes of flood affectation. Refer to Appendix D for Site Evacuation plan.

## 4. Community Information

The following information is provided as a reference for the community for some useful resources to aid in the preparation for and during a flood emergency.

### 4.1 Emergency Contacts

Department	Contact Number
State Emergency Service (SES)	132 500
Police, Ambulance, Fire (Emergency)	000
Local Police Station (Castle Hill)	(02) 9680 5399
Norwest Private Hospital	(02) 8882 8555
The Hills Shire Council	(02) 9843 0555
Bureau of Meteorology (BOM) – latest warnings	1300 659 210
24 Hour Live Traffic Updates	132 701

### 4.2 Flood Hazards

Other than the risks of rising floodwaters (immediate risk of drowning), other risks during a flood event can include:

1. Electricals hazards may be present because of fallen powerlines or electrical lines/power points within the property itself.
2. Flood waters may contain strong currents that have the potential to overpower people, especially infants and the elderly.
3. Flood waters may have resulted in damage to the ground resulting in unpredictable water depths.
4. Snakes, spiders and other animals which are harmful to humans may be present in the shallow waters
5. Flood waters may be contaminated with hazardous material, sewage or floating debris.

### 4.3 Flood Warning

Warnings for any significant weather event that could result in flooding within the region will come from the following sources:

1. Local news sources including television and radio
2. Bureau of Meteorology website and phone applications
3. State Emergency Services website
4. Automated telephone or SMS
5. Local weather/site observations by residents/community members

## 4.4 Internet Resources

Numerous tools exist within the public domain on the internet for residents and community members to freely access. Notable links are included below:

1. The Hills Shire Council Local Emergency Management Dashboard – provides a consolidated list of links and tools for local traffic and emergency status and information:

<https://www.thehills.nsw.gov.au/Community/Health-Safety-Compliance/Emergency-Management>

2. The Australian Red Cross and NRMA Insurance 'Get Prepared' App – provides a link to create a free personal emergency plan to prepare prior to an emergency:

<https://www.redcross.org.au/emergencies/prepare/get-prepared-app/>

3. The State Emergency Services local Hills Shire information page – includes a link to the Hills Shire local emergency sub plan and information about local flooding insights:

<https://www.ses.nsw.gov.au/local-information/hills-shire>

4. The State Emergency Services emergency kit information page – provides educational information around items to pack in preparation for an emergency:

<https://www.ses.nsw.gov.au/plan-and-prepare/emergency-kit>

This should include (but not limited to):

- i. Food, water and essentials
- ii. Important Documents
- iii. Items to help you get away quickly (recommended but not formally required under this FEMP due to the recommended approach of shelter in place)
- iv. Personal Items
- v. Light sources (Torch with batteries, candles and matches) in the event of a power outage
- vi. Items for health and wellbeing
- vii. Pet Supplies

5. The State Emergency Services Emergency Planning Tool – a tool providing guidance to produce a basic personalised emergency plan for your household:

<https://www.ses.nsw.gov.au/emergency-planning-tool>

## 5. Conclusion

The hydrological and flood emergency assessment demonstrates that while the Probable Maximum Flood presents short-duration but intense inundation across the Elizabeth Macarthur Creek corridor, the proposed development can safely accommodate this extreme and highly improbable event through appropriate design and management measures. Modelling confirms that only the PMF affects the site, with all events up to the 0.2% AEP remaining flood-free. The 60-minute PMF storm results in temporary isolation of the Hodges Road bridge and shallow inundation of lower ground-floor areas; however, these impacts are brief and manageable.

A shelter-in-place strategy is the safest and most practical emergency response for residents, given the rapid rise and fall of floodwaters and the limited warning time associated with flash-flooding PMF conditions. By elevating lower ground-floor levels to maintain a maximum H3 hazard category and lifting all primary entry points above PMF levels, the development incorporates robust resilience measures that minimise risk to life and property. Residents can safely relocate internally to upper levels during the short inundation period, with external access restored within approximately one hour.

With appropriate community preparedness, clear communication of emergency procedures, and the future availability of multiple access routes as surrounding infrastructure is completed, the development can operate safely under even the most extreme flood scenarios. The findings confirm that the residual flood risk is low and can be effectively managed through the adopted design and emergency management framework.

## Appendix A – Inundation Maps

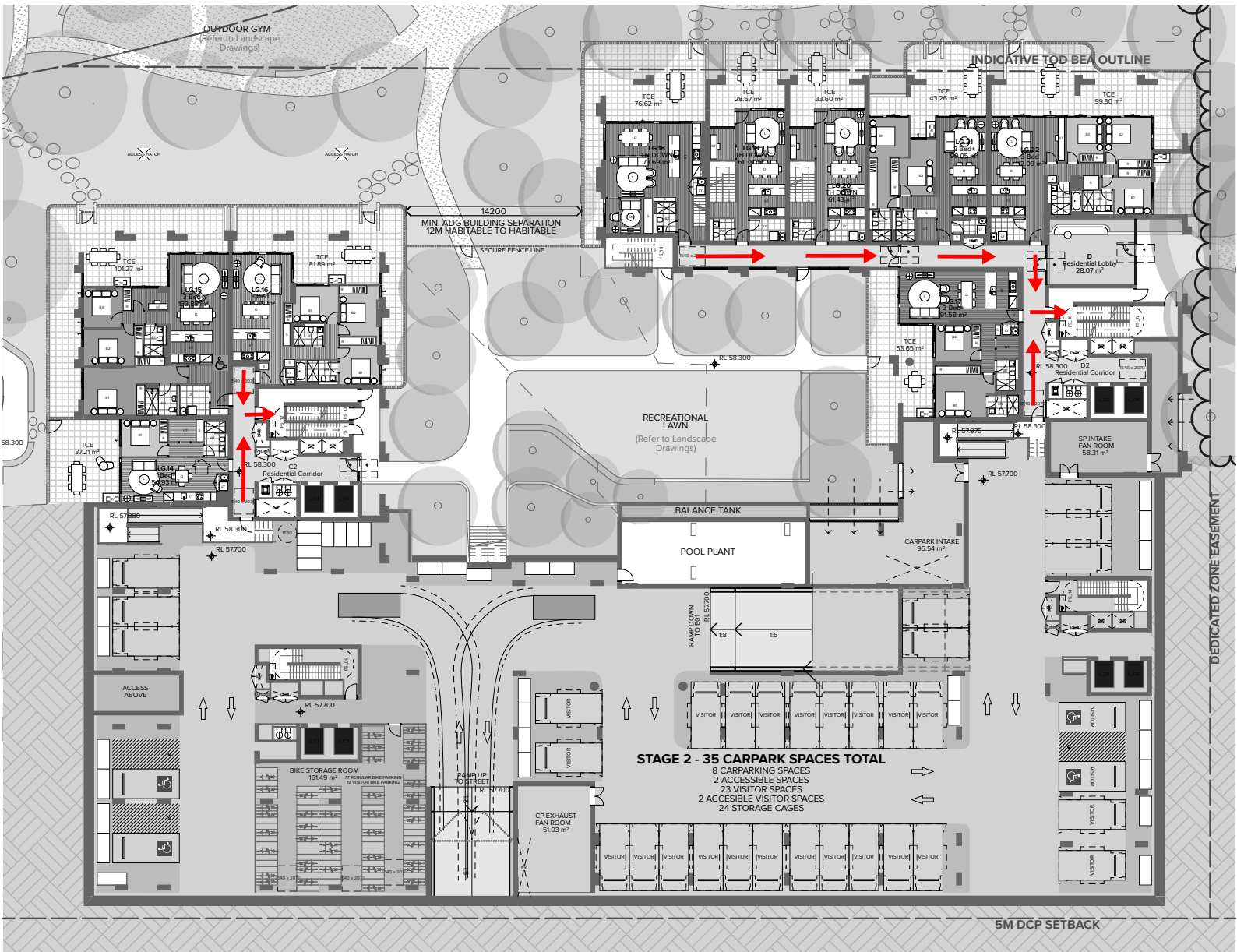




## **Appendix B – Buildings A and B Lower Ground Floor Shelter-in-Place Egress Route**

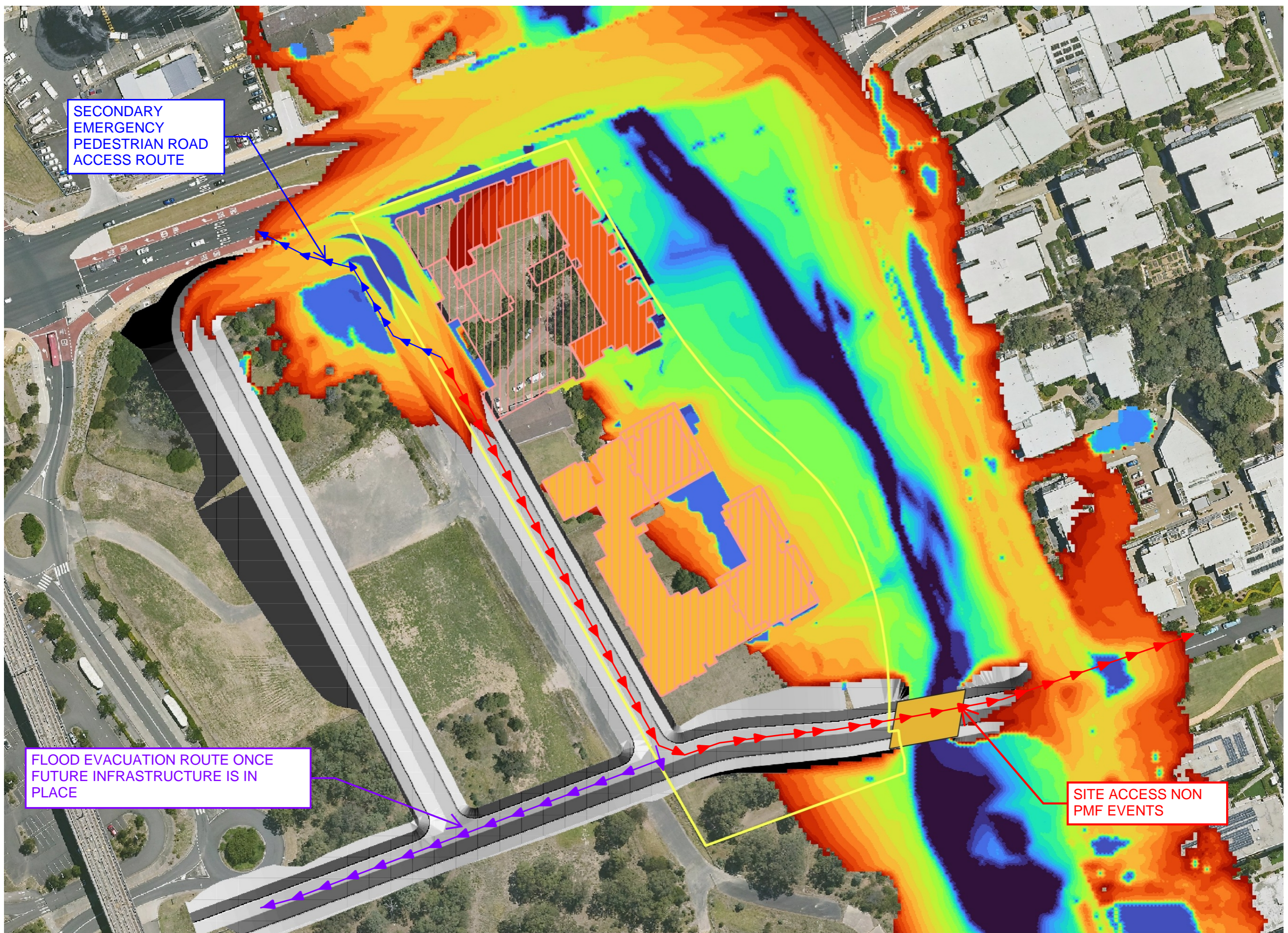


## **Appendix C – Buildings C and D Lower Ground Floor Shelter-in-Place Egress Route**



## FLOOD EVACUATION PLAN BUILDING C & D

## Appendix D – Primary and Secondary Evacuation Routes



EMERGENCY VEHICULAR SITE ACCESS MAP