AMP Capital

AMP Shopping Centres

Marrickville Metro
Stage 1B Development

Proposed Childcare Centre
Flood Assessment and Emergency Response Plan

HydroStorm Consulting

Marrickville Metro – Stage 1B
Proposed Childcare Centre

Flood Assessment and
Emergency Response Plan

Client:	AMP Capital Investments 50 Bridge Street Sydney NSW 2000
Contact:	Robert Lewis
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Cover Photo: A view of the proposed Stage 1B from Smidmore St/Murray St intersection

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1 Introduction

The proposed Stage 1B development of Marrickville Metro shopping centre is currently under way. The development comprises an extension of the existing shopping centre to the south at 13-55 Edinburgh Road , Marrickville. The proposed development lies in a flood prone area and as part of the development consent, a comprehensive Flood Emergency Response Plan (FERP) was prepared.

The manager of the shopping centre, AMP Capital Investors (AMP), has initiated a process to investigate the feasibility of a childcare centre in the Stage 1B development. The development being flood prone, an assessment of the proposed childcare centre is required with respect to the flood risk.

This report presents the flood risk assessment for the proposed childcare centre and provide details of the Flood Emergency Response Plan (FERP) required for the centre. It should be read in conjunction with the previously prepared FERP for the entire Stage 1B development. A copy of this FERP is provided in Appendix A.

2 The Site

Marrickville Metro is a sub-regional shopping centre, approximately 7km from the Sydney CBD. Located at 34 Victoria Road, Marrickville, the shopping centre consists of the major tenants of Kmart, Woolworths and Aldi and a range of specialty stores. The shopping centre is the largest retail shopping centre in the local region and attracts in the order of five million visitations per annum.

The proposed expansion to the shopping centre is on the 13-55 Edinburgh Road site, which is located on the opposite side of Smidmore Street to the south.

An aerial view of the site is shown in Figure 1.

Figure 1. Aerial View of the Site (source AMP Capital)

3 Stage1B Development

The proposed development consists of a new retail centre over two levels with three levels of car park on top, comprising of new supermarket, specialty shops and kiosks with associated dock facilities and car parking. It also includes an external pedestrian link between the existing centre and the new building. This link is via a new pedestrian bridge, spanning the Smidmore Street and connecting the proposed development with the existing shopping centre.

3.1 Access

The access to the car park of the proposed Stage 1B development is via Edinburgh Road. The parking is located at the roof top and provides for 455 car spaces. This is in addition to the 1018 car spaces available in the existing shopping centre. Pedestrian access is available at several locations along Smidmore Street, Murray Street and Edinburgh Road. Pedestrian access is also available via the new pedestrian bridge connecting the existing shopping centre with the proposed Stage1B development.

In addition, access is available through the loading docks. However, this access is likely to be limited to the loading dock staff only.

3.2 Operation

The shopping centre is likely to operate for typical hours between 8 am to 6 pm throughout the week, with some stores open till late in the evening, up to 12 midnight.

4 Flood Risk

The Stage1B development is located in a flood prone area. The flood hazard increases with the severity of flooding with consequent increase in the flood risk. In an extreme flood event, such as the Probable Maximum Flood (PMF), the Stage1B development is surrounded by floodwaters with high flood hazard. Figure 2 shows the provisional flood hazard for the PMF event.

The existing shopping centre is affected by flooding from Victoria Road and is subject to inundation in a significant flood event.

Further details of the flood risk for the Stage1B development are available in the FERP prepared for that development (Appendix A).

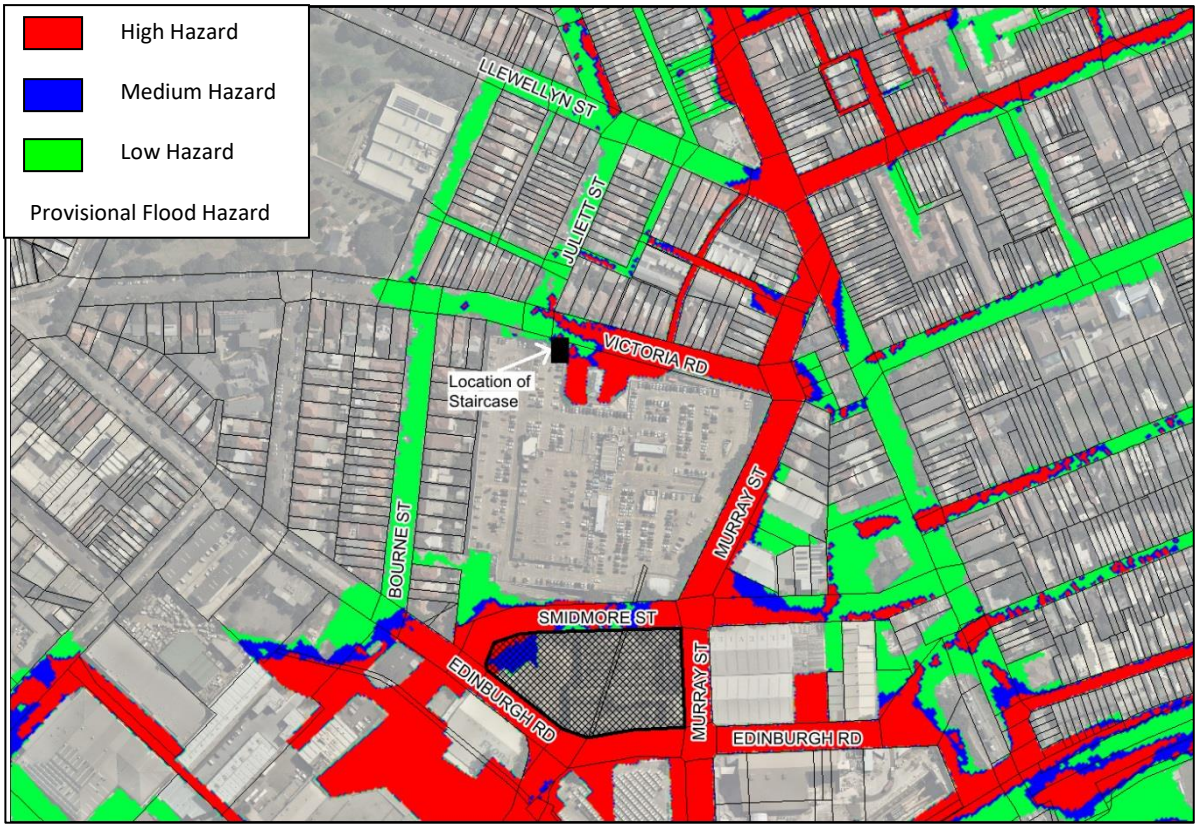

Figure 2. Provisional Flood Hazard – PMF – Developed Conditions

4.1 Accessibility during Flood

All pedestrian and vehicular entrances to the Stage1B development are subject to high hazard in a PMF event. Access through these entrances is temporarily cut-off during an extreme flood event. However, a staircase located to the west of the Victoria Road entrance of the existing shopping centre can potentially provide access to the Stage 1B shopping centre via the proposed pedestrian bridge between the two buildings. Details of this access are provided in the FERP for Stage 1B development (Appendix A).

4.2 Flood Risk Exposure

Customers of the shopping centre would be exposed to the flooding risk, not only within the centre but also outside, in case they try to leave the centre during flooding. Most of this exposure would be limited to the day shopping hours for the centre, however, customers of the large retail stores such as the Coles Supermarket, would potentially be exposed till late evening. Customers of some food retail shops fronting Smidmore Street would also be exposed during the night hours.

The property within the shopping centre, including all the shops and their stock, would also be exposed to the flood risk. If the stock is not properly stored, there is potentially a higher risk of damage to the stock when the shopping centre is closed. During opening hours, some damage reduction can be achieved by the shop owners/employees by moving the stock to a higher level.

5 Flood Emergency Management

A detailed discussion regarding flood emergency management was provided in the Stage1B FERP (Appendix A). The pros and cons for evacuation and shelter-in-place strategies were discussed in detail. Given the nature of

flooding and availability of suitable space for sheltering the shopping centre customers during a flood event, the shelter-in-place strategy for flood emergency management was found suitable and recommended for the development.

5.1 Current Emergency Management Plan for Marrickville Metro

A comprehensive Emergency Management Plan (EMP) for the existing Marrickville Metro Shopping Centre is in place. AMP Capital Investors has advised that the same EMP would be applicable to the Stage1B development.

A detailed review of the EMP was undertaken previously and the Plan was found to have the necessary management structure for providing support for implementation of the FERP. The required management structure for managing flood emergencies was established in the FERP for Stage 1B development (Appendix A).

It was recommended that a Flood Emergency Guideline should be prepared for inclusion in the current EMP of the shopping centre, based on the information provided in the FERP.

6 Assessment for the Provision of a Childcare Centre

6.1 The Planning Context

Establishing a childcare centre in New South Wales is governed by National, State and Local Government laws. The National Regulations (Education and Care Services National Regulations) provide the overarching framework for the state regulations. The NSW governments State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 (the Education SEPP) governs the establishment of childcare centres in NSW. An accompanying guideline, *Child Care Planning Guideline – Delivering Quality Childcare for NSW* (Guidelines*)* provides guidance on the design and operation of a childcare centre. The Education SEPP stipulates that these guidelines take precedence over any Development Control Plan (DCP) and a consent authority must take into consideration the Guidelines when assessing a development application (DA) for a centre-based childcare facility.

The Guidelines require that a childcare centre must have procedures for emergency and evacuation. The Guidelines note:

….. procedures must cover including:

- *instructions for what must be done in the event of an emergency*
- *an emergency and evacuation floor plan, a copy of which is displayed in a prominent position near each exit*
- *a risk assessment to identify potential emergencies that are relevant to the service.*

With respect to the design for evacuation during an emergency, the Guidelines further note:

Facility design and features should provide for the safe and managed evacuation of children and staff from the facility in the event of a fire or other emergency. Multi-storey buildings with proposed childcare facilities above ground level may consider providing additional measures to protect staff and children. For example:

- *independent emergency escape routes from the facility to the ground level that would separate children from other building users to address child protection concerns during evacuations*
- *a safe haven or separate emergency area where children and staff can muster during the initial stages of a fire alert or other emergency. This would enable staff to account for all children prior to evacuation.*

And finally, for preparing an emergency and evacuation plan, the Guidelines require:

An emergency and evaluation plan should be submitted with a DA and should consider:

- *the mobility of children and how this is to be accommodated during an evacuation*
- *the location of a safe congregation/assembly point, away from the evacuated building, busy roads and other hazards, and away from evacuation points used by other occupants or tenants of the same building or of surrounding buildings*
- *how children will be supervised during the evacuation and at the congregation/assembly point, relative to the capacity of the facility and governing child-to-staff ratios.*

6.2 Childcare Centre Assessment

There are primarily two considerations for flood risk management of the proposed childcare centre. Firstly, the location and design of the facility should ensure that a shelter is available away from the flood hazard and secondly an evacuation route is available.

As discussed above, the FERP for Stage 1B development has identified that shelter-in-place is a suitable measure during a flood emergency. Therefore, the childcare centre can be located in the Stage 1B building, provided that it is located no lower than the first floor (i.e. not on the ground floor) and the facility is designed and equipped to act as a shelter-in-place during a flood emergency. This may require a room/space in the facility away from the glass windows to prevent injury from a broken glass during a storm event. An emergency kit, including torch, blankets, children's necessities and other necessary items should be available during the flood emergency.

Evacuation would generally be not required during the short duration of flooding likely during a flood event. However, a child may develop a medical emergency and require evacuation from the centre during a flood event. This scenario has been discussed in detail in the FERP for Stage 1B and evacuation by paramedics via an ambulance is found feasible through the staircase access as discussed in Section 4.1.

The flood evacuation route is shown in Figure 3.

It is noted that a medical centre may also operate in the Stage 1B development. Any medical emergency at the childcare can potentially be managed at the medical centre by providing immediate medical attention and facilitating the medical evacuation.

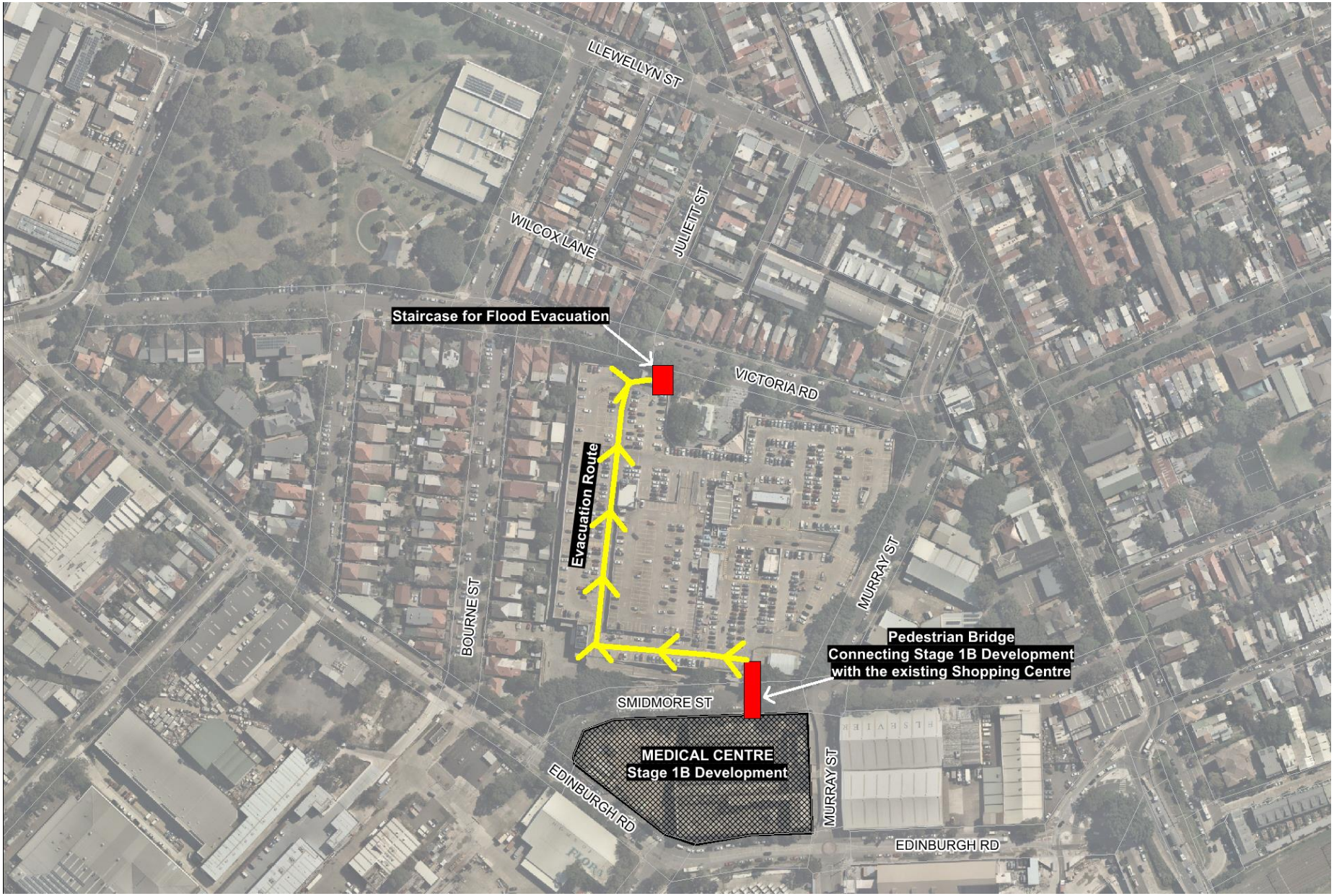

Figure 3. Flood Evacuation Route

7 Emergency Management Plan

The proposed childcare centre would require a comprehensive emergency plan as required by the planning Guidelines. Among other requirements the plan should ensure:

- appropriate training of the staff to manage the flood emergency
- regular rehearsals for effective implementation of the plan during flood emergency
- liaison with the shopping centre management's emergency management committee
- integration with the shopping centre emergency management plan
- coordinating with and seeking assistance from the centre management for medical evacuation
- awareness of the childcare centre staff of the evacuation route via the staircase as shown in Figure 3
- inclusion of the evacuation drills for evacuation via the stairs (see Figure 3), conducted by the shopping centre management for the childcare centre staff
- the existence of evacuation route via the stairs is communicated to the emergency agencies such as Ambulances, Police and SES.

The plan should be reviewed by the shopping centre management and should be made part of the Emergency Management Plan for the shopping centre.

7.1 Parent/Guardian Notification

An important element of flood risk related to the childcare centre is the panic arrival of a parent/guardian during flooding, to enquire after and ensure safety and welfare of the child. It is important that this behaviour is discouraged as it would create a risk for the parent/guardian. This can be achieved by notifying the parents of the flood emergency management procedures at the time of admission to the childcare centre. In addition, the required emergency plan for the childcare centre should also include notification of the parents via SMS or phone calls, advising parents about the safety of their children. Sending of SMS messages can be automated and can potentially be incorporated in the emergency management plan of the shopping centre.

8 Recommendation

The feasibility for the provision of a childcare centre in Stage 1B development of Marrickville Metro shopping centre has been assessed with regard to exposure of this facility to the flood risk. A risk management approach based on a Flood Emergency Response Plan has been developed for the childcare centre.

In a flood emergency, the proposed childcare centre would provide shelter-in-place for the children and the staff. In the unlikely event of a medical emergency, the ambulance can be facilitated to arrive at the centre to transfer the patient to a hospital.

The childcare centre would be setup under the State Government planning Guidelines, which include guidelines for emergency management during natural disasters. The emergency plan prepared under these Guidelines would provide the childcare centre with appropriate means for managing the flood emergency. Along with the FERP for the Stage 1B development, the emergency plan for the childcare would provide suitable measures for managing the flood risk.

Based on the above, the usage of the childcare centre in the new Stage 1B building can be permitted provided that it is located no lower than the first floor (i.e. not on the ground floor) and its design and emergency management procedures follow the planning Guidelines and the recommendations of this report.

9 Qualifications

This report has been prepared for AMP Capital Investors Ltd to assess the feasibility of a childcare centre for Stage 1B of the Marrickville Metro Shopping Centre. The report is subject to the following qualifications:

- The exact location and size of the childcare centre in the Stage1B development is not known
- This report is based on the preliminary assessment of planning controls for the proposed childcare centre
- It is assumed that the actions proposed in the FERP for Stage1B development would be implemented along with the recommendations from the emergency plan developed by the childcare centre
- Study results should not be used for purposes other than those for which they were prepared.

HydroStorm Consulting

Habib Rehman
Principal Consultant

APPENDIX A

Flood Emergency Response Plan (FERP)
Stage 1B Marrickville Metro

AMP Capital

AMP Shopping Centres

Marrickville Metro
Stage 1B Development

Flood Emergency Response Plan

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Marrickville Metro – Stage 1B

Flood Emergency Response Plan

Client:	AMP Capital Investments 50 Bridge Street Sydney NSW 2000
Contact:	Robert Lewis
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Cover Photo: A view of the proposed Stage 1B from Smidmore St/Murray St intersection

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Appendix

1 Introduction

A Hydrology Investigation report was prepared on behalf of AMP Capital Investors (AMP) in support of a Section 75W Modification Application of the Major Project Approval MP09_0191, for the expansion of the Marrickville Metro Shopping Centre (the Site).

The hydrology report made several recommendations for managing the flood risk for the proposed development. These recommendations were included as conditions of consent by the consent authority. One of those conditions was to prepare a Flood Emergency Response Plan (FERP) for the proposed development.

This report presents the details of the FERP for the proposed development. Whilst the primary objective is to manage the flood risk to the customers and staff of the shopping centre, measures have also been proposed to protect the property and minimise the damage and recovery time.

2 The Site

The FERP has been prepared for the proposed extension of the existing shopping centre, the Marrickville Metro, located at 34 Victoria Road, Marrickville. The proposed extension is at 13-55 Edinburgh Road and is separated by the existing Centre by Smidmore Street.

Marrickville Metro is a sub-regional shopping centre, approximately 7km from the Sydney CBD. The shopping centre consists of the major tenants of Kmart, Woolworths and Aldi and a range of specialty stores. The shopping centre is the largest retail shopping centre in the local region and attracts in the order of five million visitations per annum.

The current shopping centre is a substantially enclosed and internalised with pedestrian entries from Victoria Road to the north and Smidmore Street to the south. Pedestrian access is also provided from the rooftop car parking areas down into the centre. Existing open loading dock areas exist along the frontage of Murray Street and from Smidmore Street. Two vehicle access ramps accessed off Smidmore and Murray Street provide car access to the roof top parking.

Located on site adjoining the shopping centre is the “Mill House”, which is a listed heritage item and currently used as the Centre Management Office. In addition, remnants of the ‘Old Vickers Mill’ façade remain along the Victoria Road frontage of the site.

The proposed expansion to the shopping centre is on the 13-55 Edinburgh Road site, which is located on the opposite side of Smidmore Street to the south.

An aerial photograph of the site is provided in Figure 1.

Figure 1. Aerial View of the Site (source Urbis)

AMP Capital Investors (AMP) are the managers of the Shopping Centre and 13-55 Edinburgh Road on behalf of the owners Marrickville Metro Pty Ltd.

Smidmore Street which bisects the two AMP managed properties is a public road vested in Inner West Council as the local road authority. This street is also a part of the proposed development, whereby modifications to the road layout for street activation would be carried out. A new pedestrian bridge is also proposed to span the road to connect the two parts of the shopping centre.

3 Proposed Development

The proposed development is on an Industrial Site (Smidmore Street Site) and consists of a new retail centre over two levels with three levels of car park on top, comprising of new supermarket, specialty and kiosks with associated dock facilities and car parking. It also includes an external pedestrian link between the existing centre and the new including some reconfiguration of the existing centre southern tenancies to provide street activation on Smidmore St and to establish physical relationship with and provide the pedestrian connection to the new shopping centre extension.

Following initial approval of the development, modifications were proposed through Section 75W application, which included:

- A revised retail layout within the new shopping centre building proposed under Stage 1B (Edinburgh Road site), including amended travellator locations, new food and beverage uses at ground level, reconfigured shop units and alterations to the upper floor parking layout.
- Alterations to the building façade on Smidmore Street, amendments to materials used in elevations and minor increase in height of the new shopping centre building to facilitate upper floor parking, along with rooftop plant and equipment;
- Extending operating hours for a limited number of shops on the ground floor to encourage night time activation for the food and beverage shops;
- Erection of a new pedestrian bridge linking Level one of the new shopping centre building to the existing shopping centre;
- An amended road alignment and modification to the vehicular route on Smidmore Street to implement a new one-way access off Murray Street;
- Introduction of a right-hand entry into the new building from Edinburgh Road;
- Redistribution of car space provisions across the development without increasing the overall permitted car parking numbers;
- Introduction of paid parking across the site.
- Redistribution of the GFA across the site without increasing the overall permitted GFA.
- Introduction of signage / signage zones on the development along with a potential zone for mural(s) on the frontage.

The development plans are presented in Appendix A.

3.1 Access

The access to the car park is via Edinburgh Road. The parking is located at the roof top and provides for 455 car spaces. This is in addition to the 1018 car spaces available in the existing shopping centre. Pedestrian access is available at several locations along Smidmore Street, Murray Street and Edinburgh Road.

In addition, access is available through the loading docks. However, this access is likely to be limited to the loading dock staff only.

3.2 Operation

The shopping centre is likely to operate for typical hours between 8 am to 6 pm throughout the week, with some stores open till late in the evening, up to 12 midnight. These operational times would cater for the customers of the shopping centre. Outside these hours, the security personnel are likely to be present permanently or intermittently, depending on the security arrangement for the centre. It is likely that one to two security staff would be deputed for this purpose.

4 Flood Risk

4.1 General

The flood risk is dependent on several factors including flood producing factors such as rainfall intensity, volume of runoff generated in a catchment, rate of rise of the floodwaters, duration of flooding etc. The other factors include the vulnerability of the population affected by flooding including the habitable areas in the floodplain, such as houses, commercial and industrial properties.

Whereas the vulnerable population can be accounted for fairly precisely, the nature of flooding is very difficult to predict. Floods can occur at any time of the day, during any season of the year, with varying degree of severity and associated flood behaviour.

For risk management purposes, historic floods are rarely used. Instead, the so-called design flood events of various probabilities are used. These events are derived from the ensemble of historic flood events but only represent 'average' conditions that are likely during a flood event in a particular catchment. The actual floods can be significantly different from these design floods.

Therefore, it is important to note that any flood risk management measure based on a design flood event would necessarily leave a residual risk for the proposed development.

4.2 Design Floods

Design floods are usually defined using probability of occurrence. For example, a 1 in 100 year Average Recurrence Interval (ARI) flood is defined as a flood that would occur, on average, once every 100 years. However, such magnitude floods can occur in consecutive years or even a few times in the same year, as recently experienced in Queensland in 2010 and 2011.

Floods larger than the 100 yr flood can also occur and there are several floods greater than 100 yr recorded throughout Australia.

The largest flood that can possibly occur is referred to as the Probable Maximum Flood (PMF). Such a flood is not assigned an ARI, but for practical purposes, it is assigned an ARI ranging from 1 in 10,000 to 1 in 1,000,000. However, flood events approaching the PMF has also been recorded.

4.3 Proposed Development Catchment

The proposed development lies in the floodplain of EC East sub-catchment, which is one of the designated catchment management areas by the Marrickville Council. Sydney Water drainage infrastructure carries the floodwaters through the catchment and ultimately discharges into the Eastern Channel. Figure 4 shows the layout of the catchment and major drainage lines relevant to the study area.

In a major flood event, the overland flow from the upstream catchment travels down Edgeware Road and diverts onto Victoria Road towards Marrickville Metro. The flow then continues down Murray Street, along the eastern boundary of the existing as well as the proposed shopping centre buildings and ultimately discharges to the eastern Channel.

A significant flow also travels along Victoria Road from the west and arrives at the low point on this road opposite the existing Marrickville Metro entrance. In addition, some of the flow along Murray Street also diverts into Victoria Road from the east. Lastly, overtopping of the open channel at Victoria Road also contributes to flooding at the Metro entrance. The potential for flooding of the existing shopping centre from Victoria Road entrance is significant. The "Mill House", where the shopping centre management offices are located is likely to be flood free in a major flood event.

4.4 Design Flood Behaviour at the Proposed Development

Hydraulic modelling undertaken for the proposed development shows that all the streets surrounding the proposed development would be flooded in a major flood event. Figure 5 shows the flood depth for the 2 year ARI event and Figure 6 for the 100 year ARI event. Figure 7 shows the flood depth in a Probable Maximum Flood (PMF) event. Figure 8, Figure 9 and Figure 10 show the hydraulic hazard for these events.

Modelling results indicate that flooding depth increases significantly with the severity of the event and reaches a maximum of 1.6-1.7 m near the Murray Street and Edinburgh Road intersection in a PMF event.

The hydraulic hazard during the PMF event is also high almost entirely around the proposed development.

Figure 11 shows the peak flood levels during a PMF event. The PMF levels are higher than the finished floor level (5.9 m AHD) of the proposed development and therefore the floodwaters would enter the proposed development during a PMF event. The docking areas would also be flooded.

4.4.1 Accessibility

All pedestrian and vehicular entrances to the proposed development are subject to high hazard in a PMF event. Access through these entrances is temporarily cut-off during an extreme flood event.

There is however one possibility to gain access during the flood emergency. There is a staircase located near the Victoria Road entrance of the existing shopping centre that leads to the first floor of the shopping centre. The location of the staircase is shown in Figure 12. The staircase can be accessed through a low hazard road via Victoria Road to the west or from Juliette Street to the north.

Since the first floor of the existing shopping centre will be connected to the proposed development through a pedestrian bridge, access for the paramedics would be available to the proposed development if required. The flood evacuation route for medical emergencies is also shown in Figure 12.

It is noted that only a medical emergency is the most likely reason to use an emergency access. Other emergencies can potentially wait for the duration of flooding, which is likely to be short.

4.4.2 Flood Arrival Time

Along with the significant depth of flooding and medium to high flood hazard, an important aspect of flooding is the short flood arrival time i.e. the so-called “flash flooding” of the streets surrounding the proposed development is expected. Figure 2 shows a plot of flood level versus time for the PMF event. The flood level plot shows the rate of rise of floodwaters, indicating that there is likely to be insufficient warning time, once the flood event starts.

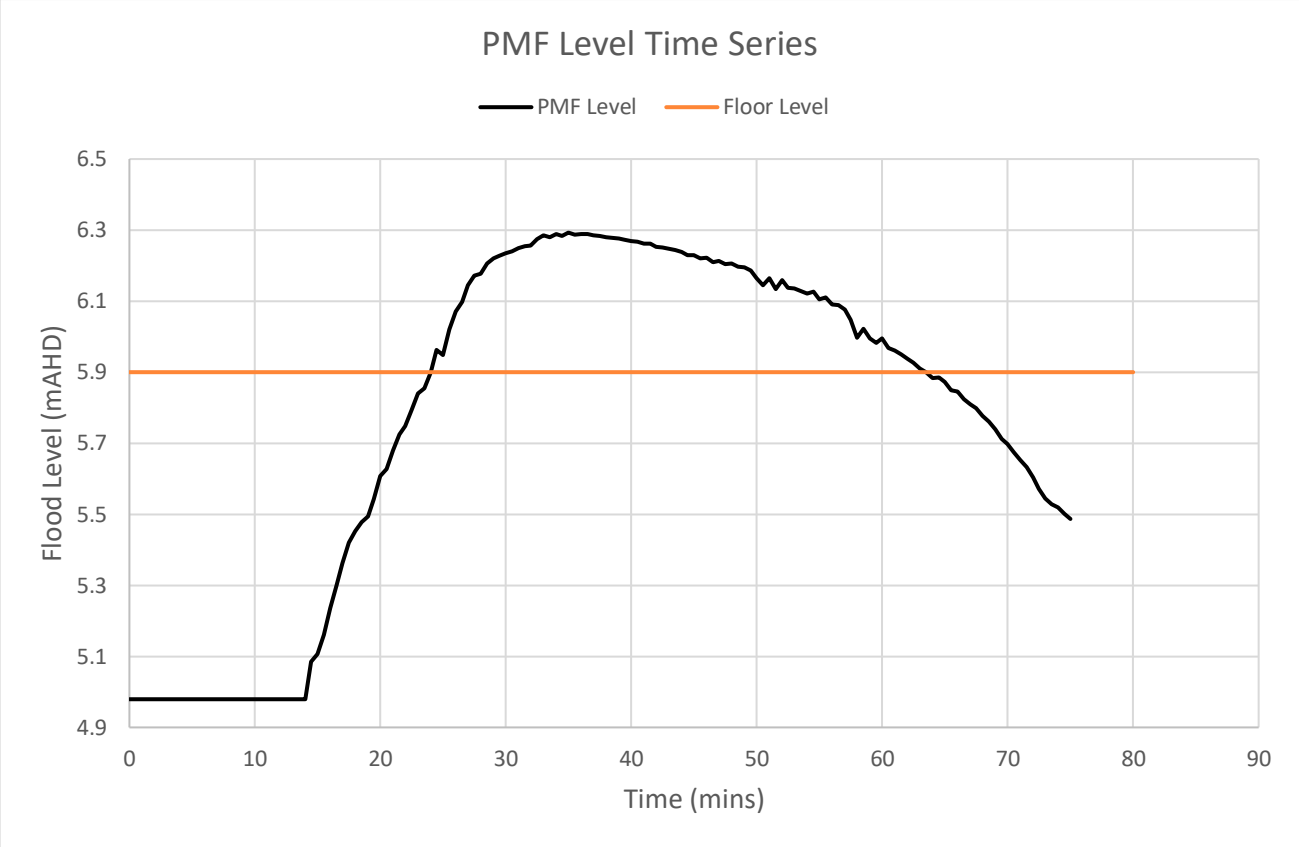


Figure 2. PMF Level at Smidmore Street

4.4.3 Duration of Flooding

Although the flood arrival time is short, the duration of flooding is also likely to be short, in the order of 1-4 hours. It is noted that the flooding surrounding the proposed development would generally subside within this time period but flooding duration in other parts of the catchment, in particular the downstream areas may last for longer periods.

4.5 Flood Risk Exposure

The customers to shopping centre would be exposed to the flooding risk, not only within the centre but also outside the centre, if they need to leave the centre for any reason. Most of this exposure would be limited to the shopping hours for the centre during the day, however, customers of the large retail stores such as the Coles Supermarket, would be exposed till late evening. Customers of some food retail shops fronting Smidmore Street would also be exposed during the night hours.

The property within the shopping centre, including all the shops and their stock, would be exposed to the flood risk. There is potentially higher risk to the stock, if not properly stored, to be damaged by flooding during the closure times of the shopping centre. During the day, when shops are open, some damage reduction can be achieved by the shop owners/employees by moving the stock to a higher level.

5 Flood Emergency Management

The State Emergency Services (SES) is the combat organisation for flood emergency in a floodplain. SES has prepared a Local Flood Plan for the Marrickville LGA and prescribed procedures for managing the flood emergency. This plan, however, does not specify the procedures for flood emergency management for areas

exposed to “flash flooding”, such as the proposed development. However, it does recommend that local businesses should prepare for flood emergency and have plans in place to manage the flood risk.

Flood emergency planning is undertaken for an extreme flood event, as under such flooding conditions, absence of a management plan is likely to increase the risk to the life and property. For the purpose of FERP for Marrickville Metro, the PMF event is considered for emergency management purposes. This approach is consistent with the State Government guidelines as presented in the Floodplain Development Manual.

5.1 Flood Emergency Management Concept

The Local Flood Plan requires that the buildings subject to significant flood risk should be evacuated after an evacuation order has been issued by the SES. The Addison Road Community Centre at 142 Addison Road, Marrickville, has been designated as the evacuation centre for the Marrickville LGA. The centre has toilet and other facilities and can shelter up to 2000 people. The centre is at approximately 5 minutes drive from the shopping centre under normal traffic conditions. However, such an evacuation is only possible where sufficient warning time is available to allow for the people to evacuate to a safe place, away from the floodplain. The time from the receipt of severe weather warning to actual evacuation of the customers is likely to be in the order of several hours.

The flood behaviour at the proposed development site is such that there would be insufficient warning before the floods arrive and although the time required for evacuating a shopping centre may be smaller than compared to an equivalent number of household, the traffic leading out of the shopping centre is likely to cause congestion on the surrounding roads and hinder the quick movement of traffic. Also, the flood arrival times are short and if there are traffic jams, the customers are likely to be stuck in rising floodwaters on the road, thereby increasing significantly the flood risk. It is also likely that even if the customers are able to travel away from the vicinity of the shopping centre, they are exposed to flood hazard elsewhere in the catchment.

Above all, orderly evacuation without the help of SES is not likely, as the staff of the shopping centre, who would be managing the emergency, would not be trained to the level of SES staff for this purpose. Since the SES is unlikely to arrive in time and start evacuation, any such attempt by the shopping centre staff is likely to be disorderly.

5.1.1 Evacuation Vs Shelter in Place

Timely evacuation of customers is only feasible if the warning from BOM provides sufficient lead time. Given the steep rate of rise of floodwaters (Figure 2 shows that in approximately 10 minutes the flood levels would rise to overtop the floor level of the proposed development, in a PMF event), the roads surrounding the development would be cutoff within minutes of the onset of flooding. This means that the evacuation must take place before the onset of flooding. The time from receipt of BOM warning to full evacuation of the site is likely to be in the order of 1-2 hours.

Thus, evacuation presents a significant decision making challenge, as the decision to evacuate would need to be undertaken before even the onset of flooding. This has the potential to significantly disrupt the shopping centre business as all sever weather warnings are not likely to materialize, and even if they do materialize, the likelihood of an extreme event occurring is low.

Based on the above, evacuation of the shopping centre for flood emergency purposes is not likely to be used as part of FERP.

The other option for FERP is shelter in place. This option carries much lower risk than attempting to evacuate at the onset of flooding. However, there are risk involved in pursuing this option.

One of the major risks is that the customers will be exposed to floodwaters within the building. This can create panic and ensuing public disorder. The customers may also become impatient and try to leave the shopping centre, especially when there is a power outage, lack of comfort and sustenance, loss of amenities and lack of flood related information. However, all these risks can be managed by

- by vertical evacuation to the first floor
- providing an emergency lighting arrangement
- ensuring amenities such as toilets are in working order
- providing updates on flooding through the emergency communication system

Another risk is that a customer may require medical attention. This risk can be managed by seeking help from the paramedics by calling an ambulance. The paramedics would need to access the proposed shopping centre building via the staircase located at the northern end of the existing building. This access point has been discussed in detail in Section 4.4.1. However, the functioning of the paramedics can potentially be hindered due to the access route difficulties, preventing movement of the affected customer back to the ambulance. The Medical Centre in the existing shopping centre can potentially assist with the handling of a medical emergency.

Another important risk associated with the shelter in place is the risk of fires. However, this risk is more prominent where the duration of shelter in place is for several hours. The duration of flooding for the proposed development is likely to be in the order of a few hours, generally ranging from 1-4 hours. Therefore, the fire risk during shelter in place is likely to be low. Also, it is understood that a comprehensive fire risk management plan is in place, as part of the Emergency Management Plan for the shopping centre.

Based on the above discussion, it is recommended that shelter in place strategy for flood emergency management be adopted for the proposed development.

5.1.2 Evacuation Under the Direction of SES

Evacuation from the proposed development in a flood emergency is not feasible, as discussed above. However, if directed by SES to evacuate, the persons present in the shopping centre would be asked to leave via the PA system or through other appropriate communication system, and seek refuge in their homes or at the Council's nominated evacuation centre at The Addison Road Community Centre at 142 Addison Road, Marrickville, which is approximately 5 minute drive from the shopping centre under normal traffic conditions.

5.2 Review of Current Emergency Management Plan for Marrickville Metro

A comprehensive Emergency Management Plan (EMP) for the existing Marrickville Metro Shopping Centre is in place (AMP, 2018). AMP Capital Investors has advised that the same EMP would be applicable to the proposed development.

The Part 1 of the EMP provides details of the administrative set-up for the management of emergencies. The main feature of this set-up is the Emergency Control Organisation consisting of the following personnel:

Chief Warden	Property / Centre Manager, Duty Manager (if applicable) when the Property / Centre Manager is unavailable or any other person, whether a Manager, Supervisor or personnel appointed by the Property / Centre Manager to take

	charge and control of the management of emergencies within, or impacting on, the Property.
Deputy Chief Warden	ECO member appointed by the Chief Warden
Communications Officer	ECO member appointed by the Chief Warden
Area Wardens	As nominated in the Evacuation Plan
Exit Wardens	As nominated in the Evacuation Plan
First Aid Officers	Suitably trained ECO members

The above administrative set-up is suitable for managing the flood emergency. However, the role of Area Wardens and Exit Wardens would be different in a flood emergency.

The Part 2 of the EMP provides guidelines for responding to various types of emergencies, including a generic response guideline. Some of the relevant guidelines for FERP are:

- GENERIC REPONSE GUIDELINE
- EVACUATION / SHELTER IN PLACE / LOCKDOWN CONSIDERATIONS GUIDELINE
- EXTREME WEATHER GUIDELINE
- FLOODING GUIDELINE

The above guidelines can be utilised in preparing for the flood emergency.

The current EMP for the shopping centre partly relies on the availability of government emergency services. These services will generally not be available in a flood emergency given the flood arrival times are short and the rate of rise of the floodwaters is very high. However, emergency services would be required immediately after the floods recede to ensure that the post flood situation is under control.

Nevertheless, the emergency services should be informed of the flood emergency to ensure a response, if those agencies deem necessary before, after or during the flood.

It is expected that a Flood Emergency Guideline would be prepared for inclusion in the current EMP of the shopping centre, based on the information provided in this FERP.

6 Flood Forecasts and Warnings

A typical flood emergency starts when a flood forecast or warning is received by the shopping centre management. An active monitoring regime for weather forecasts is therefore critical in timely implementation of measures for managing the flood emergency. A number of sources for flood forecast and warnings are available for the proposed development, as discussed in the following sections.

6.1 Bureau of Meteorology (BOM)

The BOM provides a range of forecasts and warnings to suit the requirements of interested parties, ranging from the general public to state emergency organisations. Various types of forecast and warning products are discussed below:

6.1.1 Flood Watch

A Flood Watch is an initial advice of a developing flood threat and provides information about the developing weather situation for the areas at risk. It includes forecast rainfall totals and indicative severity of flooding. It also provides links to other flood-related products from BOM and contact details of emergency services. A flood watch is generally issued up to four days in advance of the expected onset of flooding.

The purpose of the Flood Watch is to help the recipient of this advice to be better prepared in case the flooding eventuates. It is to be noted that a Flood Watch is not a warning of imminent flooding, which is covered under separate warning products, as discussed below.

6.1.2 Severe Weather Warning

A Severe Weather Warning is issued by the BOM whenever a potentially hazardous or dangerous weather is occurring in an area or is expected to develop and move into the affected area. The warning describes the severe weather phenomenon, description of the threat and the area under threat. Warnings are issued with varying lead-times, depending on the weather situation, and range from just an hour or two to 24 hours or sometimes more. The warnings are usually updated every 6 hours during the severe weather event.

The Severe Weather warning relevant to the proposed development relates to intense rainfall that can lead to flash flooding in the affected area. These warning are issued to the media and are also available on the BOM website (www.bom.gov.au/nsw/warnings/), and then following the relevant warning.

6.1.3 Severe Thunderstorm Warning

A Severe Thunderstorm Warning is issued when a severe thunderstorm is occurring or likely to occur. A severe thunderstorm can produce heavy rainfall with associated flash flooding, large/giant hail, damaging/destructive wind gusts and tornadoes.

Severe thunderstorms can be quite localised, affecting relatively small areas, and can develop quickly. The detailed warning is generally available without much lead time before the event.

Two types of thunderstorm warnings are issued by the BOM

- DETAILED, which is issued for all capital cities and surrounding areas when the severe thunderstorms are within the range of city radars. Locations of individual thunderstorms is provided with more specific information. The lead time for the thunderstorm activity is up to 60 minutes.
- BROAD-BASED STATEWIDE, which is issued for a state or territory, highlighting broad areas, such as BOM's weather forecast districts, where severe storm activity may occur. The lead time for the storm activity is generally 3 hours.

6.1.4 Rainfall Radar

Weather radars are an effective tool for the detection of rainfall. These radars show the current rainfall locations and intensities in the form of images, which are updated every 10 minutes. BOM's radar at Terry Hills can provide the necessary data for the proposed development. This radar can be accessed at the following website

http://www.bom.gov.au/products/IDR713.loop.shtml#skip

The radar viewing tool at the above website provides multiple images over time are in a loop. This is a useful feature whereby the movement of the thunderstorm can be tracked. Although this information is

approximate, but it does provide an indication of impending storm, which is heading towards the proposed development.

6.1.4.1 Approximate Rainfall Rates

The colour-coded images presented in the rainfall radar website provides an approximate estimate of the rainfall intensity. The colour coding varies from off-white, representing light drizzle to dark red , which represents heavy rain (possibly containing hailstones).

A typical image of for a severe weather situation is shown below. The image is for an approaching storm from the west on 13 October 2014. This storm caused heavy rainfall and flash flooding in various parts of the Sydney.

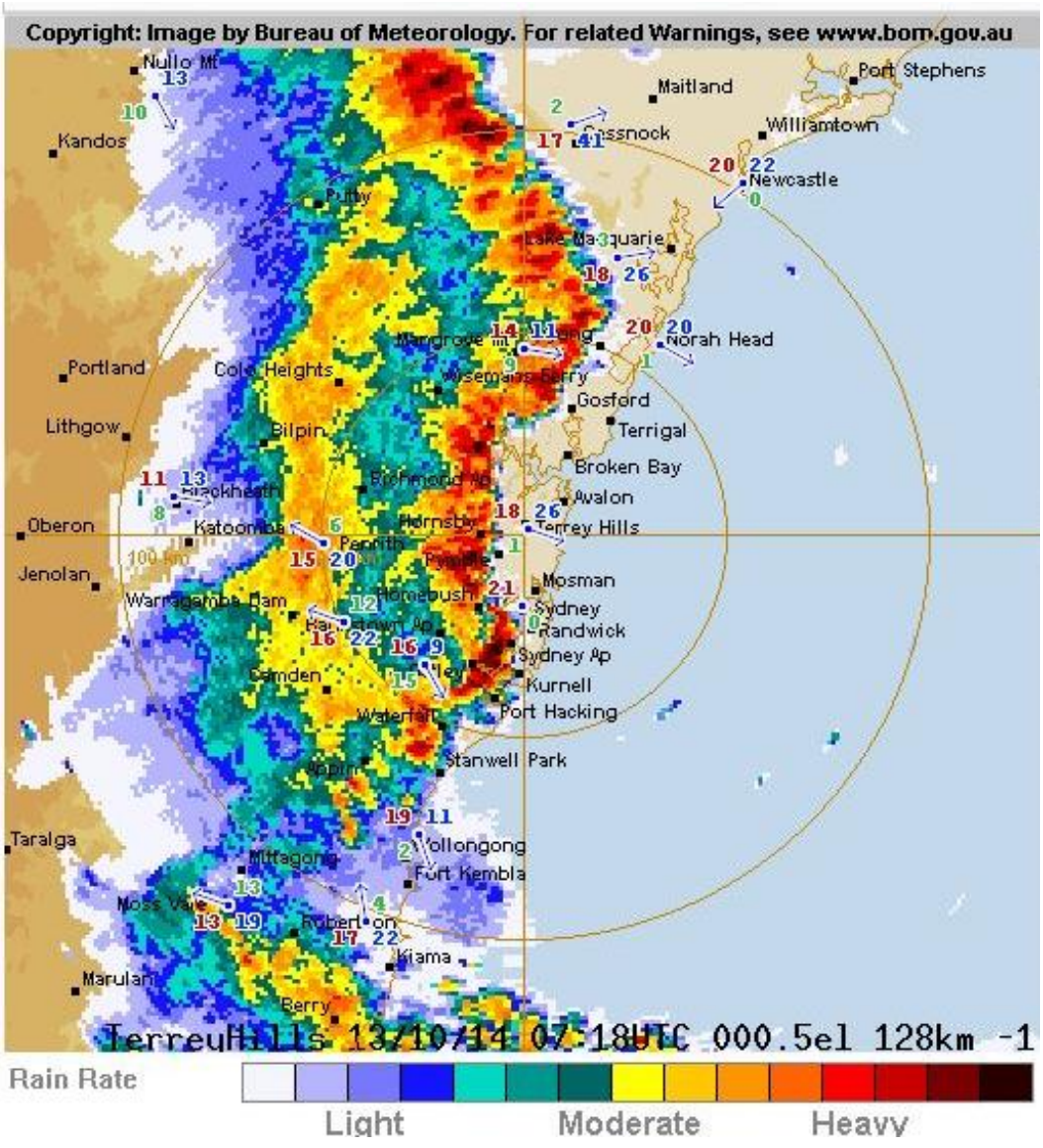


Figure 3. A Typical Image from the Rainfall Radar

There are fifteen levels of rainfall intensity shown on the images - each level provides an approximate indication of the rainfall rate in millimetres per hour.

The following values for rainfall intensity can be used as a general guide but they are not always accurate.

Level	Colour		Approx. Rainfall Intensity (mm/hr)
0	clear	Not visible	Under 0.2
1		Off-white	0.5
2		Sky-blue	1.5
3		Light Blue	2.5
4		Blue	4
5		Light Cyan	6
6		Cyan	10
7		Dark Cyan	15
8		Yellow	20
9		Yellow-orange	35
10		Orange	50
11		Orange-red	80
12		Red	120
13		Dark Red	200
14		Maroon	300
15		Dark Brown	over 360

6.1.5 Forecast Rainfall Maps

The BOM also issues forecast rainfall maps, which provide an estimate of daily totals, and chance of rain, five days ahead. Maps of 4-day totals for the next 1-4 days, and 5-8 days are also available. The 24-hour rainfall forecasts are updated twice a day at approximately 8 am and 8 pm EST. The 4-day total maps are updated at midnight. The maps are available at the following website.

http://www.bom.gov.au/jsp/watl/rainfall/pme.jsp

It is important to note that the 24 hour rainfall forecast period ends at 12 UTC (ie.10 pm EST). For example, Tuesday's rainfall will be the amount for rain expected for the period from 10 pm EST Monday evening to 10 pm EST Tuesday evening.

6.2 Visual Monitoring of Flood

The warning and alert messages from the BOM or the local Council would generally provide sufficient information of the impending flood threat. However, due to the potential for failure of the system that delivers these messages, visual inspection of the floods becomes important. The visual inspection can be carried out from the first floor of the proposed development. The access ramp for the car park also provides a suitable location to observe flooding.

Visual monitoring is also important in a "flash flooding" scenario as other warnings may not provide enough lead time for implementing the FERP recommended actions.

6.3 Severe Weather Warning from Insurance Companies

Several insurance businesses provide severe weather warning alerts through text messages on the phone. The insurers for the proposed development can be approached to explore this opportunity. If the service is available, appropriate members of the Emergency Management Committee can be set-up to receive these alerts.

6.4 Local Flood Warning System

With short flood arrival times or in a "flash flooding" scenario, a local flood warning system can provide the necessary information to prepare for a response to the flood threat. It is proposed that floodwater sensing devices be installed at the following locations. The flood warning is to be issued for three different levels of flooding for emergency planning purposes, as provided in Table 1.

Table 1. Flood Warning Levels and Flood Heights for Flood Sensors

Warning Level	Flood Height
Orange	- Entry level of the loading dock and at a flood level of 4.9 m AHD, AND near the entry level of End of Trip facility (under the carpark ramp) at a flood level of 4.35 m AHD. This corresponds to an approximate depth of 0.25 m at these locations
Red	- Minimum 0.25 m above the lowest point on Edinburgh Road along the proposed development and at an approximate flood level of 5.15 m AHD - Minimum 0.25 m above the lowest point along the proposed development at the intersection of Murray Street and Smidmore Street and at a flood level of 5.35 m AHD - Minimum 0.25 m above the lowest point along the proposed development at the intersection of Edinburgh Road and Smidmore Street and at a flood level of 5.15 m AHD
Black	- 0.2 m below the ground floor level of the building, at a level of 5.7 m AHD.

The Orange level corresponds to flooding where driving becomes hazardous. The Red level corresponds to approximately 1% AEP flood level, and the Black level indicates that the above floor flooding of the main shopping centre is imminent.

The warnings from the floodwater sensing devices should be relayed through the emergency communication system in place.

6.5 Communication Systems

Communication during an emergency is vital in providing regular information and co-ordinating safe and orderly movement of people from an area of danger to an area of safety, if required. The flow of information to and from the Property / Centre Manager / Chief Warden is essential in the co-ordination of the ECO and its ability to function at its most effective and efficient manner to safeguard life and property. Consideration should be given, where applicable, to utilise multiple communication systems in emergency response. Multiple communication systems will ensure continuity of communication in the event of a failure of the primary communication system.

6.5.1 Emergency Warning Intercommunication System (EWIS)

The EWIS panel is primarily a dedicated warning and communication system that is activated once the Fire Indicator Panel (FIP) receives a signal from a detection device or on activation of the sprinkler system. However, the feature of this system, as discussed below, can be utilised for managing flood emergency. To achieve this purpose, the EWIS would need an upgrade to receive signals from floodwater sensors.

The primary functions of the EWIS are to:

- generate the emergency tones (Alert & Evacuation)
- allow for Public Address announcements
- provide a dedicated communication system via the Warden Intercommunication Phones (WIP).

6.5.2 Warden Intercommunication Point Phones

If installed, Warden Intercom Phones (WIPs) connected to the Emergency Warning Intercommunication System (EWIS), allow direct communication between the Property / Centre Manager / Chief Warden and the Floor Area Wardens / Team Leaders during an emergency.

6.5.3 Two-way Radios

ECO members, where available, are to utilise two-way radios as the preferred method of communication between ECO members. During an emergency two-way radio communication can be an effective means of communication, providing flexibility and contact with Wardens. The EPC should allocate the assignment of a dedicated radio channel and call signs in the event of an Emergency.

The use of codes such as those recommended by the Australian Standard AS 3745 - 2010 is recommended and will provide discretion over the radio frequency. Broadcasting an emergency warning or providing detailed descriptions of a situation may cause panic from occupants or others who may overhear a radio announcement if earpieces are not utilised. It is recommended that ECO members should use earpieces where available.

Regular training using two-way radios should be encouraged to maintain ECO member communication competence. Care should be exercised with any equipment producing radio waves, in situations where such signals could have adverse effects on essential equipment such as medical equipment.

Care should be taken to ensure that all battery-powered equipment that is used has fully charged batteries available. If the two-way radio communication is not available, the ECO should consider the use of alternative communication options such as mobile phones, land lines and WIP phones as an alternative.

6.5.4 Mobile Telephones

Mobile telephones provide a reliable means of communication but are not recommended as the primary method, unless no two-radio coverage is available. In the event of an emergency affecting a wide area, interruption may occur to the mobile phone network causing a communications failure. Similarly, the use of a mobile phone restricts the ECO to talking to a single source at any one time. However, mobile phones are a valuable part of a multiple communication contingency and an up to date list of phone numbers should be provided to all ECO members.

6.5.5 Telephones

Telephones provide a reliable means of communication. Depending on the system that a workplace may employ, a multiple call or loudspeaker function may be available. This may provide a convenient and reliable means of contacting ECO members, but should not be the sole source of contact. In the event of an emergency affecting a wide area, interruption may occur to the phone network causing a communication failure. An up to date list of phone numbers should be provided to all ECO members.

6.5.6 Public Address Systems

Public Address Systems (PA) allows the broadcasting of voice messages to specific areas, or the whole of premises. Generally, the PA is a feature of the EWIS and will be utilised by the Property / Centre Manager / Chief Warden for the broadcasting of emergency messages and providing evacuation directions or warnings. The PA feature will only work whilst the EWIS is operating in the 'manual' mode. The ECO should ensure that the PA system is available during the flood emergency.

Persons making announcements via the PA should speak slowly and clearly so as to provide specific and clear instructions to the areas being addressed. It is recommended that prearranged verbal announcements be scripted for use by the Property/Centre Manager/Chief Warden or suitable replacement.

6.5.7 Portable Emergency Warning System

Not all Emergency Warning Systems are integral to a building or structure. Portable devices such as megaphones / loudhailers may suffice or be more appropriate than other systems / devices in certain situations.

6.5.8 Runners

In situations where the normal communication methods are compromised or out of action, the use of Runners' is an alternative option. Runners physically deliver messages between the Property / Centre Manager / Chief Warden and the ECO members via a person to person communication process. Runners should not endanger themselves in the process.

7 Flood Emergency Preparedness

A thorough preparation for flood emergency is important for implementing the FERP. The proposed development is subjected to "flash flooding" and the emergency response times are likely to be short, in the order of minutes. All preparation measures should address this critical feature of flooding at site.

In addition, the severe weather warnings may not provide enough lead time to prepare for flooding and therefore information about impending flood needs to be obtained from various sources to make a timely decision. Processing of all the information and decision making processes also need to be streamlined in preparing for the flood emergency.

7.1 Responsibilities

The management team for the proposed shopping centre would be responsible for the implementation of the FERP for the site. The existing Emergency Management Plan – Part 1 (AMP, 2015) provides the necessary organizational structure and administrative set-up for the implementation of FERP. The responsibilities assigned to various members of the Emergency Control Organisation are suitable for the implementation of FERP. Specific actions required during the flood emergency are presented in Section 8.

7.1.1 NSW State Emergency Services

The NSW State Emergency Services is the lead combat agency for flooding in NSW. Under the State Emergency and Rescue Management Act. 1989, the SES has the power to direct any organisation or citizen to take prescribed actions in response to flooding. As such, any directive issued by SES would override any decision made under this FERP and should be followed by the shopping centre management and its staff, tenants and its employees and customers of the shopping centre.

7.2 Communication

The Emergency Warning Intercommunication System as specified by the Emergency Management Plan should be modified to receive signals from the floodwater sensors. If this is not feasible a separate communication system for receiving flood level information should be installed.

Other communication options, processes and protocols as presented in the Emergency Management Plan and summarised in Section 6.5, are suitable for the implementation of FERP.

7.3 Education and Training

An educated and properly trained responders to flood emergency can successfully implement the FERP. Education and training sessions along with exercises are therefore necessary elements of a FERP. Given the short lead time available for taking appropriate actions, well trained responders would be more effective during a flood emergency. All members of Emergency Control Organisation (ECO) should be trained for the actions required under this FERP.

Appropriate ECO members should be trained as per the Extreme Weather Guidelines provided in Part 2 of the Emergency Management Plan. In particular, timely collation of extreme weather information for decision making purposes should be emphasized during the training.

The training should also include actions required for quick vertical evacuation of customers to shelter in place refuge on the first floor and managing the crowd for the period of refuge. The time for vertical evacuation is likely to be in the order of 5-10 minutes.

Drill for medical emergency evacuation via the evacuation route identified in Figure 12 should also be included in the relevant staff training.

7.3.1 Education of Shop Owners/Employees

Given the potential for “flash flooding” of the site and limited time available to respond to the flood emergency, well informed shop owners/employees can help manage the flood risk more efficiently. The

shop owners at the ground floor should be encouraged to have a simple plan in place in case the floodwaters enter the building. This plan may include

- Moving the stock to a higher level, approximately 1 m above the floor
- Switching off electrical/gas or other energy supplies
- Assisting customers present in their shops
- Assisting the ECO members, if requested to do so

In addition, all tenants in the shopping centre should be made aware of the flood evacuation route as shown in Figure 12 for the medical emergency purposes.

7.3.2 Managing Simultaneous Fire Emergency

The Shelter in Place response to flood emergency increases the risk of fire during the period of refuge in the proposed development. The staff training should include such a scenario and appropriate training be provided to manage multiple emergencies.

7.3.3 Major Retailers and Night Shops

The major retailers should prepare a business specific FERP for their tenancy, as these retailers are likely to be open for business until late in the evening, when the centre staff would not be available to respond to flooding. The employees of these major retailers would need training to respond to the flood emergency.

Similarly, the owners of the night shops should be made aware of the flood risk and asked to prepare a FERP for their business.

7.3.4 Night Security and Building Works

The security staff for the night shift needs to be informed about the flood risk and the required actions to respond to the flood emergency. Similarly, any workers undertaking building works during the night should be informed of the flood risk and actions to manage the flood emergency. This can be achieved during the site induction process.

7.4 Preparing Shelter in Place

Shelter in Place is a preferred and most feasible option for responding to flood emergency for the proposed development. The following measures should be undertaken to prepare a suitable shelter in place arrangements in the proposed development:

- The shelter would be located at the first floor of the proposed development
- The shelter should be accessible to all people on the ground floor, including customer, staff and owners/employees of the shops. The access routes to first floor should have sufficient capacity to evacuate customers/staff/employees/owners from the ground floor. The access should also be fail-safe.
- A floor space of 1 m^2 per person for the shelter in place area on the first floor. It is expected that the shelter in place area would comprise of the common areas outside the shops. Areas within the shops can also be used with permission.
- Since the proposed development building would act as a shelter in place, its structural stability should be verified by a suitably qualified structural engineer, considering flood flow, buoyancy, suction effects and debris load impact of PMF design flood depths and velocities
- The shelter in place refuge should comply with the Building Code of Australia requirements, with external components rated appropriately for storm, wind, flying debris and moisture.
- Appropriate amenities including toilet facilities should be provided.

- Emergency communication facilities should be provided for use by any person.

7.5 Medical Emergency

One of the challenges in providing Shelter in Place response to flood emergency is that a medical emergency may need to be addressed during the period of refuge. For minor medical assistance, a First Aid Officer, who will be a part of the flood emergency management team (as discussed in a subsequent section), can provide the necessary assistance. For a major medical condition, ambulance would be required. The flood evacuation route as shown in Figure 12 can be used by the ambulance staff for patient transfer.

Given that the access of paramedics during the extreme flood event is limited to a single location near the shopping centre (Figure 12) due to high hazard surrounding the site, the proposed medical centre in the shopping centre can potentially assist in attending the medical emergency.

8 Response During Flood Emergency

The flood emergency starts well before the onset of actual flooding. Receiving information about potentially intense rainfall is generally a starting point for flood emergency for the proposed development. It should also be recognized that potentially intense rainfall is not always likely to result in significant flooding. A staged flood emergency response is therefore required that is based on triggers to escalate the response to the increasing flood risk. However, it should be noted that once the flooding starts, the alert levels would escalate quickly due to 'flash flooding' nature of the flood hazard.

A system of alert levels based on the relevant triggers is proposed to manage flood emergency for the proposed development. These alert levels can be modified to suit the overall Emergency Management Plan for the site. The alert levels with the triggers presented in Table 2 are recommended. The alert levels have been colour coded for ease of reference. A qualitative assessment of the likely flooding scenario is also presented in Table 2.

Table 2. Alert Levels for Flood Emergency Response

Alert Level	Triggers	Likely Flooding
White	Not applicable (Preparedness only)	Not applicable
Yellow	- BOM severe weather warning for the Marrickville Area - Onset of intense rainfall - Visual observation of rising stormwater on surrounding streets	Rising stormwater on streets is a concern for the safety of pedestrians and traffic
Orange	- Yellow alert level triggers exceeded - Local flood warning system alert activated (Orange alert as per Section 6.4) - Direct communication from NSW SES - Visual observation of stormwater entering the loading dock	The significant depth of flooding on the surrounding streets is unsafe for pedestrians and traffic. Damage to loading dock areas likely.

Red	- Orange alert level triggers exceeded - When flood level reaches approximately 1% AEP event and the corresponding flood warning alarms are set off at any of the locations	Major flooding in the surrounding streets. Cars and pedestrians can be swept away by the fast flowing floodwaters. High risk to life and property. Areas away from the development are also likely to severely impacted by flooding
Black	- Red alert level triggers exceeded - The flood level has risen to 0.2 from the ground floor level of the building and entry of floodwaters to the ground floor is imminent.	Extreme flooding in the catchment and surrounding areas. High probability of loss of life and property. Extensive damage to existing properties surrounding the development is likely. A large amount of debris on the surrounding roads or within the development.
Green	The green level would be achieved when an alert level de-escalates. The triggers for de-escalation would be different, depending on the prevalent alert level. For de-escalation from the yellow alert level - BOM severe weather warning revoked - Rainfall ceases - No stormwater on surrounding streets For de-escalation from the orange alert level - BOM severe weather warning revoked - Rainfall ceases - No stormwater on surrounding streets For de-escalation from the Red alert level - BOM severe weather warning revoked - Rainfall ceases - No stormwater on surrounding streets - SES/Police/Council issues all clear for traffic in the area surrounding the development For de-escalation from the Red alert level - BOM severe weather warning revoked - Rainfall ceases - No stormwater on surrounding streets - SES/Police/Council issues all clear for traffic in the area surrounding the development - Chief Flood Warden with the help of SES ensures that the building is safe for evacuation of the customers detained in Shelter-in-Place arrangement - Chief Warden to undertake a Work, Health and Safety risk assessment for post flood hazards	Pedestrian and traffic safety is restored

	For de-escalation from the Black alert level - BOM severe weather warning revoked - Rainfall ceases - No stormwater on surrounding streets - SES/Police/Council issues all clear for traffic in the area surrounding the development - Chief Flood Warden with the help of SES ensures that the building is safe for evacuation of the customers detained in Shelter-in-Place arrangement - Chief Warden to undertake a Work, Health and Safety risk assessment for post flood hazards before occupying the ground floor	

The above alert levels should be escalated if any of the triggers for a particular level is reached or is exceeded.

8.1 Organisation and Responsibilities

The overall EMP for the proposed development sets an organisation structure that is well suited for managing the flood emergency. The Emergency Planning Committee (EPC) is responsible for emergency management for the proposed development. The EPC sets up the Emergency Control Organisation (ECO) that consist of the personnel managing and responding to the emergency. The EPC is also responsible for establishing appropriate emergency response measures for the site and therefore, this FERP should be presented to the EPC for review and approval. The EPC through ECO would undertake the necessary actions for managing the flood emergency for the proposed development. The EPC will be responsible for the tasks as specified in the EMP for the proposed development.

8.2 Emergency Control Organisation (ECO)

The ECO would consist of the personnel as specified in the EMP. Responsibilities for various personnel of the EPC is discussed in the following sections:

8.2.1 Chief Warden/Deputy Chief Warden

The Chief Warden would ensure that this FERP is kept up-to-date and incorporates any changes in the proposed development, its operations or management structure, in consultation with the EPC. Any new data on flood risk that may become available would also need to be incorporated in the FERP. The Chief Warden will also be responsible for

- Including this FERP in the induction and training of the site staff, including the day/night security staff.
- Ensuring that the members of ECO are aware of the flood evacuation route for medical emergencies as shown in Figure 12.
- Ensuring that all tenants of the shopping centre are aware of the flood evacuation route for medical emergencies as shown in Figure 12.
- Ensuring that the staircase nominated for medical emergency evacuation, as shown in Figure 12, is always clear from any obstruction. Appropriate sign to be provided on the staircase for this purpose.
- Providing a copy of flood evacuation route as shown in Figure 12 to emergency services including SES, local ambulance services and Police

- Ensuring that sufficient number of Wardens and Area Wardens are available to implement this FERP, when required.
- Ensuring that all members of the ECO are well aware of the flood risk and flood emergency management procedures presented in this FERP.
- Supporting all ECO personnel in their duties.
- Maintaining a register of staff and sub-contractors on site at all times, including contact details and emergency contacts.
- Conducting and leading the annual exercise of the flood emergency response procedures in accordance with this FERP or any additional procedures deemed suitable in managing the flood risk for the development, including a drill for medical emergency evacuation via the evacuation route shown in Figure 12.
- Monitoring flood warnings and alert level triggers as provided in this FERP.
- Escalating alert level in accordance with the relevant triggers provided in this FERP.
- Ensuring communication of messages to the ECO during the flood emergency.
- Establishing an Emergency Management Centre and temporary Emergency Management Centre (if relocation is required during the emergency) within the development and coordinating all tasks and procedures during the flood emergency.
- Leading review of this FERP annually or after managing the Red Alert level as defined in this FERP, whichever comes first. The review would ensure that all necessary resources are available to implement this FERP. Any update required to the FERP would be discussed and if required presented to EPC for further action and update.
- Confirming with the service providers if the services to the proposed development such as gas, electricity etc. need to be cut off during a flood emergency
- Liaison with the local Council on a yearly basis at the maximum to seek any new data on flooding that may have become available.

After review of this FERP by the EPC, additional duties may be assigned to the Chief Warden/Deputy Chief Warden

8.2.2 Floor/Area Wardens and Wardens

The primary responsibility of the area/Floor Wardens is to assist the Chief Warden in implementing the flood emergency procedures as described in this FERP. The other responsibilities include:

- Developing an understanding of flood risk and fully understanding the tasks required to be undertaken during a flood emergency
- Commencing and executing orderly evacuation in consultation with the Chief Warden
- Providing assistance to the people in the shopping centre
- Searching the floor or Area to ensure that all persons have evacuated
- Updating Chief Warden on the actions undertaken and the circumstances during the emergency
- Maintaining the lines of communication with the Chief Warden during the flood emergency
- Informing Chief Warden when the emergency has ceased
- Participating in the annual exercise for flood emergency response procedures and processes
- Participating in the annual review of this FERP or as required by the Chief Warden

8.2.3 Communication Officer

The primary responsibility of the communication officer is to manage the emergency communication system and provide necessary advice to the people within the shopping centre through the PA system. The Communication Officer is also responsible for:

- Developing an understanding of flood risk and fully understanding the tasks required to be undertaken during a flood emergency
- Assisting the Chief Warden in managing the flood emergency
- Transmitting and record communication among the ECO members
- Participating in the annual exercise for flood emergency response procedures and processes
- Participating in the annual review of this FERP or as required by the Chief Warden

8.2.4 First Aid Officer

The First Aid Officer will

- Provide assistance to the injured person/s
- Potentially seek assistance from the proposed Medical Centre
- Assist in transporting the patient to the ambulance, if required
- Participate in the annual exercise for flood emergency response procedures and processes
- Participate in the annual review of this FERP or as required by the Chief Warden

8.3 Actions During the Flood Emergency

The proposed actions during a flood emergency would depend on the Alert Level. The actions by various members of the ECO for various Alert Levels are presented in Table 3.

It should be noted that the floodwaters would rise quickly in the surrounding streets of the proposed development and alert levels are likely to escalate quickly.

Table 3. Flood Emergency Response Actions

Alert Level	EPC/ECO Member	Actions
White	*This Alert Level is primarily for planning and preparing for the flood emergency. The proposed development will operate under White Alert till any of the triggers listed in Table 2 eventuate.*	
	EPC	The EPC will ensure that - This FERP is reviewed annually or after a Red Alert event and if required, undertake update of the FERP based on the lessons learnt or any other significant change in the development layout/design or management structure or any additional/new flood information becomes available - This FERP is included in induction and training of the staff, including the day/night security staff and temporary work contractors - Sufficient number of Area/Floor Wardens and Wardens are available for managing the flood emergency - Appropriate training including annual exercise is undertaken by the ECO. The training should include awareness of the flood risk for the development

Alert Level	EPC/ECO Member	Actions
	Chief Warden	- Establish mechanism to receive information for the triggers specified in Table 2 and daily monitor the sources of information for these triggers - Ensure that all Area/Floor Wardens and Wardens are aware of the flood risk and emergency management procedures provided in this FERP and the EMP - Ensure all infrastructure/equipment required during flood emergency, including the communication system, is available and in working order - Maintain a register of the staff/sub-contractors/temporary workers on site, including contact details and emergency contacts. - Conduct and lead the annual exercise of the flood emergency management procedures and processes, including evacuation for medical emergency via the route shown in Figure 12
	Area/Floor Wardens and Wardens	- Participate in the annual exercise of the flood emergency management procedures and processes - Participate in the review of this FERP and provide suggestions for improvement - Inform Chief Warden if there are any temporary changes to the site that may affect implementation of the measures specified in this FERP
Yellow	*This Alert Level would be declared by the Chief Warden when any of the trigger levels specified in this FERP eventuate. This Alert signifies that severe thunderstorm and flooding is likely in the next few hours*	
	Chief Warden	- Inform the ECO that the Alert level has been raised to Yellow and severe thunderstorm with flooding is likely in the next few hours (or as per the advisory from the source information) - At the onset of intense rainfall, communicate to Area/Floor Wardens to monitor flooding in the street. - Instruct the Communication Officer to issue a warning to the persons inside the development to avoid likely flood hazard on street - Review the flooding situation and ask Area/Floor Wardens to close the loading dock shutters, if it helps reduce the damage within the dock. - Continuously monitor the sources of information for the triggers of the higher Alert Level as provided in this FERP. - Review the management actions necessary for the Orange Alert Level, in case the threat level escalates. Also informs ECO to be ready for the next threat level. - If required, direct the evacuation for medical emergency via the evacuation route shown in Figure 12 with the help of appropriate ECO staff.
	Floor/Area Wardens, Wardens	- A warden to be stationed in the loading dock area to monitor flooding. If the floodwaters enter the loading dock area, immediately inform the Chief Warden. - A warden to be stationed at each exit of the development to warn people of likely flooding on the streets. A warden should be

Alert Level	EPC/ECO Member	Actions
		stationed at the parking exits to warn the motorists of the likely flooding on the surrounding streets. - Provide general assistance to persons inside the building. - Review and prepare for management actions necessary for the Orange Alert Level, in case the threat level escalates.
	Communication Officer	- Check the communication systems are ready to be deployed when advised of severe thunderstorms by the Chief Warden. - Use the PA system to communicate a warning to the persons inside the development about the flood hazard on the surrounding streets, when instructed by the Chief Warden. This action will be required when intense rainfall has started. The following message, or similar, can used for communication: "An important message for the customers and other persons in the shopping centre. Intense rainfall has started in the catchment of shopping centre. Please be aware of possible flooding on the surrounding streets when you walk out or drive out of the building. For your safety, we recommend that you stay inside the building till the end of this intense rainfall." - Alert people planning to visit the shopping centre about flooding and request them to avoid their visit. - Review and prepare for management actions necessary for the Orange Alert Level, in case the threat level escalates.
	First Aid Officer	- Ensure access to first aid supplies and equipment is available and ready for use if the Alert Level escalates to Orange. - Review and prepare for management actions necessary for the Orange Alert Level, in case the threat level escalates.
Orange	*This Alert Level would be declared by the Chief Warden when any of the trigger levels specified in this FERP eventuate. This Alert signifies that the flooding of the surrounding streets has reached hazardous levels following the onset of intense rainfall.*	
	Chief Warden	- Inform the ECO that the Alert level has been raised to Orange after receiving warning from the flood sensors and visual confirmation by Wardens. - Instructs the ECO to be ready for the next threat level. - Instructs Floor/Area Wardens and Wardens to prevent persons inside the building from leaving either on foot or via a vehicle. - Communicate to Area/Floor Wardens to monitor flooding in the street/loading dock area. - Instruct the Communication Officer to issue a warning to the persons inside the development to stay inside till further notice. - Continuously monitor the sources of information for the triggers of the higher Alert Level as provided in this FERP. - Alert the Medical Centre within the proposed development for potential medical emergencies. - Review and prepare for management actions necessary for the Red Alert Level, in case the threat level escalates.

Alert Level	EPC/ECO Member	Actions
		- If required, direct the evacuation for medical emergency via the evacuation route shown in Figure 12 with the help of appropriate ECO staff.
	Floor/Area Wardens, Wardens	- Monitor flooding on street and inform the Chief Warden if the flood depth reaches approximately 0.25 m. - A warden to be stationed in the loading dock area to monitor flooding. If the floodwaters enter the loading dock area, immediately inform the Chief Warden. - A warden to be stationed at each exit of the development to inform people of significant flooding on the streets and prevent them from leaving the building. A warden should be stationed at the car park exits to inform the motorists of the significant flooding on the surrounding streets and prevent them from leaving the car park. - Provide general assistance to persons inside the building. - Inform Chief Warden if any person in the building needs emergency assistance. - Review and prepare for management actions necessary for the Red Alert Level, in case the threat level escalates.
	Communication Officer	- Communicate the following message, or similar, to the persons present inside the building, when instructed by the Chief Warden: "An important message for the customers and other persons in the shopping centre. Due to intense rainfall, the local roads surrounding the shopping centre are experiencing significant flooding, which can be risk to you or your cars if you drive out. For your safety, we strongly recommend that you stay inside the building and follow the instructions of the wardens posted at various exits of the building. Further instructions would be provided if we need to take further measures for your safety if the flooding continues to increase. We will inform you when it is safe to leave the building." - Alert people planning to visit the shopping centre about flooding and request them to avoid their visit. - Review and prepare for management actions necessary for the Red Alert Level, in case the threat level escalates.
	First Aid Officer	- Be ready to provide first aid and potentially coordinate with the medical centre within the shopping centre to provide assistance in a medical emergency. - Review and prepare for management actions necessary for the Red Alert Level, in case the threat level escalates.
Red	*This Alert Level would be declared by the Chief Warden when any of the trigger levels specified in this FERP eventuate. This Alert signifies that the flooding of the surrounding streets has reached hazardous levels and a significant loss of life and property is likely.*	
	Chief Warden	- Inform the ECO that the Alert level has been raised to Red after receiving warning from the flood sensors and visual confirmation by Wardens.

Alert Level	EPC/ECO Member	Actions
		- Instructs the ECO to be ready for the next threat level. - Instruct wardens to cut off services such as gas, electricity etc., if required. - Instruct Floor/Area Wardens and Wardens to prevent persons inside the building from leaving either on foot or via a vehicle. - Communicate to Area/Floor Wardens to monitor flooding in the street/loading dock area. - Instruct the Communication Officer to issue a warning to the persons inside the development to stay inside till further notice. - Inform the local SES, Police and Council about the flooding scenario and possible requirement for assistance. - Alert the Medical Centre within the existing shopping for potential medical emergencies. - Continuously monitor the sources of information for the triggers of the higher Alert Level as provided in this FERP. - Review and prepare for management actions necessary for the Black Alert Level, in case the threat level escalates. - If required, direct the evacuation for medical emergency via the evacuation route shown in Figure 12 with the help of appropriate ECO staff.
	Floor/Area Wardens, Wardens	- Monitor flooding on street and inform the Chief Warden if the flood level reaches 0.5 m below the shopping centre ground floor level. - Cut off services such as gas, electricity etc., if instructed by the Chief Warden. - A warden to be stationed in the loading dock area to monitor flooding. Immediately inform the Chief Warden if the floodwaters continue to rise in the loading dock area. - A warden to be stationed at each exit of the development to inform people of dangerous flooding on the streets and prevent them from leaving the building. A warden should be stationed at the car park exits to inform the motorists of the dangerous flooding on the surrounding streets and prevent them from leaving the car park. - Provide general assistance to persons inside the building. - Inform Chief Warden if any person in the building needs emergency assistance. - Floor/Area Wardens and Wardens to review the management actions necessary for the Black Alert Level, in case the threat level escalates. Prepare to evacuate the people on the ground floor to the Shelter in Place on the first floor of the building.
	Communication Officer	- Communicate the following message, or similar, to the persons present inside the building, when instructed by the Chief Warden: “An important message for the customers and other persons in the shopping centre. Due to intense rainfall, the local roads surrounding the shopping centre are experiencing dangerous flooding, which can put you at a great risk if you leave the building and your car can be swept away if you drive out. For your safety, we strongly recommend that you stay inside the building and follow the

Alert Level	EPC/ECO Member	Actions
		instructions of the wardens posted at various exits of the building. Further instructions would be provided if we need to take further measures for your safety if the flooding continues to increase. We will inform you when it is safe to leave the building." - Alert people planning to visit the shopping centre about flooding and request them to avoid their visit. - Review and prepare for management actions necessary for the Black Alert Level, in case the threat level escalates.
	First Aid Officer	- Be ready to provide first aid and potentially coordinate with the medical centre within the shopping centre to provide assistance in a medical emergency. - Review and prepare for management actions necessary for the Black Alert Level, in case the threat level escalates.
Black	*This Alert Level would be declared by the Chief Warden when any of the trigger levels specified in this FERP eventuate. This Alert signifies that the flooding of the ground floor of the shopping centre is imminent, flooding of the surrounding streets is extremely hazardous and a major loss of life and property is likely.*	
	Chief Warden	- Relocate to temporary Emergency Management Centre, if required. - Inform the ECO that the Alert level has been raised to Black after receiving warning from the flood sensors and visual confirmation by Wardens. - Instruct wardens to cut off services such as gas, electricity etc., if required. - Instruct the Communication Officer to issue a warning to the persons inside the development to prepare for evacuation to the first floor. - Once the evacuation is complete, instruct the Communication Officer to issue another message related to Shelter in Place. - Instruct Floor/Area Wardens and Wardens to start evacuation of the ground floor to Shelter in Place on the first floor. - Instruct Floor/Area Wardens and Wardens to prevent persons inside the building from leaving either on foot or via a vehicle. - Inform the local SES, Police and Council about the flooding scenario and possible requirement for assistance. - Alert the Medical Centre within the existing shopping centre for potential medical emergencies. - Continuously monitor the sources of information for the duration of flooding. - Ensure all Floor/Area Wardens and other members of ECO are safe and have evacuated to the Shelter in Place. - After the flooding has receded, request SES to arrive at the site and assess the building and ground floor to ensure that the persons in Shelter in Place can safely leave the building. - Seek information for flooding situation in the larger Marrickville Area to inform the persons in Shelter in Place - Issue "All Clear" signal after inspection by the SES and instruct Communication Officer to issue a statement in this regard

Alert Level	EPC/ECO Member	Actions
		- Oversee orderly egress of the persons from the shopping centre after "All Clear" signal has been given. - If required, direct the evacuation for medical emergency via the evacuation route shown in Figure 12 with the help of appropriate ECO staff.
	Floor/Area Wardens, Wardens	- Monitor flooding on street and inform the Chief Warden if the flood level reaches 0.2 m below the shopping centre ground floor level. - Cut off services such as gas, electricity etc., if instructed by the Chief Warden. - When the flood level reaches approximately 0.2 m below the ground floor level, start evacuation of the of the ground floor to Shelter in Place on the first floor. - Ensure orderly evacuation via ramps to the first floor. - Assist persons with less ability (children, elderly, persons on wheelchair etc.) in evacuating to the first floor. - A warden should be stationed at the car park exits to inform the motorists of the dangerous flooding on the surrounding streets and prevent them from leaving the car park. - Provide general assistance to persons in Shelter in Place. - Inform Chief Warden if any person in Shelter in Place needs emergency assistance. - If asked, provide additional flooding information to the persons in Shelter in Place about the larger Marrickville Area - Assist in orderly egress of the persons from Shelter in Place and vehicles leaving the car park
	Communication Officer	- Alert people planning to visit the shopping centre about flooding and request them to avoid their visit. - Communicate the following message, or similar, to the persons present inside the building, when instructed by the Chief Warden: "An important message for the customers and other persons in the shopping centre. Due to intense rainfall, the flood levels in the surrounding streets have risen to dangerous levels and the flooding of the ground floor is imminent. For your safety, you will now be evacuated to the first floor of the building. The centre staff would assist you in this evacuation. Please follow their instructions for orderly evacuation. Please note that the local roads surrounding the shopping centre are experiencing dangerous flooding, which can put you at an extreme risk if you leave the building and your car can be swept away if you drive out. For your safety, we strongly recommend that you stay inside the building and evacuate to the first floor. We will inform you when it is safe to leave the building." - Communicate the following message, or similar, to the persons present in Shelter in Place, when instructed by the Chief Warden:

Alert Level	EPC/ECO Member	Actions
		"An important message for the customers and other persons in the shopping centre. For your safety, we had to undertake this evacuation to the first floor. The flooding is likely to last for a short duration only and you would be able to leave the shopping centre soon. Please ask the centre staff if you have any questions or need emergency attention. We will keep you informed about the flood situation." - Communicate the following message, or similar, to the persons present in Shelter in Place, after the flood have receded and when instructed by the Chief Warden: "An important message for the customers and other persons in the shopping centre. The flooding has now receded in the streets surrounding the shopping centre. However, the level of flooding we experienced was extreme and streets further away may still be flooded or blocked with debris. We recommend that you stay here till you receive further information about the flood situation of the area you are driving to. We will assist you in getting this information. Please ask centre staff for assistance."
	First Aid Officer	- Be ready to provide first aid and potentially coordinate with the medical centre within the existing shopping centre to secure assistance in a medical emergency.

9 Flood Depth Marks

The flood depths specified for various alert levels should be marked at suitable locations on the building or a nearby structure such that the depth of flooding could be judged through visual inspection. These marks should be located all around the building to facilitate visual inspection of flooding from various vantage points of the building.

The depth should be measured from the lowest point of the road near the building. The lowest point would generally be the gutter invert associated with the road kerb.

10 Actions After the Flood

If significant flooding has occurred, a hazard assessment may be required for

- Debris, including sharp debris
- Slippery surfaces
- Trips and falls
- Potentially contaminated water and sediments

Safe Work Methods statements should be prepared for managing the above hazards and appropriate Personal Protective Equipment should be supplied to the ECO members.

Flooding can also cause damage to the building and the surrounding areas and present a risk to the use of the facility as a shopping centre. A thorough inspection should be undertaken after each flood incident and the following elements of the development should be checked for damage as a minimum. If required a specialist advice should be obtained for this purpose.

- Building or ancillary elements such as the surrounding roads and the footpaths
- Supply of services such as gas, electricity etc.
- Ground floor shops, if the floodwaters enter the building
- Car park areas
- Sewerage/water supply systems
- Building and street drainage

In addition, the following tasks should also be undertaken:

- Log of actions undertaken during the flood emergency
- Noting the flood behaviour on the surrounding streets such as flood levels, speed of floodwaters, which part of the building got flooded first, where does the flood originate from, rainfall recorded at the nearest rainfall gauge etc.

The broader EMP for the shopping centre calls for a comprehensive plan of actions to re-open the business after an emergency. This plan can be prepared after a flood emergency in the light of the information presented in this FERP.

11 Building Stability

The building for the proposed development is to be used for Shelter in Place evacuation strategy. The building should therefore be able to withstand the forces of floodwaters including those of buoyancy, flood depth, suction effects, flow velocity and the moving debris, including floating cars/trucks etc. during a Probable Maximum Flood (PMF) event. The structural stability of the building should be verified by a suitably qualified structural engineer.

12 After Hours Flood Emergency Management

The flood emergency can occur after the normal closing hours of the shopping centre, when most of the ECO is not likely to be present in the proposed development. In addition, closing hour for the Coles Supermarket would be later than the closing hour of the main shopping centre and hence the ECO members are not likely to be present. It is therefore important that the Coles Supermarket has a similar FERP in place for managing the flood risk.

For other persons working in the building after the normal closing hours, such as the security personnel or temporary workers for repairs etc. should be informed about the flood risk and advised of appropriate emergency management measures.

13 Signage for Flood Evacuation Route

Appropriate signage should be provided on the staircase and along the carpark corridor to direct the ambulance paramedics or the ECO members during a flood emergency for evacuation for medical emergency.

The Chief Warden is to ensure that the above signage is maintained in a good working order.

14 Important Contacts

The following list of organisation would provide useful information and support in undertaking the management actions of the FERP. The contact details of these organisations are also provided.

Table 4. List of Important Contacts

Organisation	Contact Number
State Emergency Services	132 500
Bureau of Meteorology (recorded information)	1300 657 209
Police/Fire/Ambulance	000
Inner West Council (normal hours)	02 9392 5000
Inner West Council (after hours)	02 9392 5000
Road Closures	131 700
Royal Prince Alfred Hospital (Emergency Department)	02 9515 6111
Ausgrid – Power failure, power lines down	131 388
Jemena Gas	131 909
Sydney Water	132 090
Telstra	132 203
Optus	131 344

The above contact details should be checked quarterly and updated if necessary.

15 Maintenance of the FERP

This FERP would remain effective if revised and updated regularly or as the need arise. Some of the FERP maintenance triggers are provided below:

- Revise/update if the shopping centre management processes change, unusual tenants are leased space, customer demographics changes significantly, state and local government laws/regulations change and any other changes that may impact the recommendations of the FERP
- Review design flood information presented in the FERP annually. The Inner West Council can be contacted to find out if the flood information of the local area has been updated.
- Ensure the contact details for various organisations provided in the FERP are correct. Review quarterly for the update.

The local SES should be contacted and invited to be part of the EPC, to ensure the FERP can be updated as SES undertakes further flood management planning in the shopping centre catchment.

16 Qualifications

This report has been prepared for AMP Capital Investors Ltd to outline the Flood Emergency Response Plan for Stage 1B of the proposed upgrade of the Marrickville Metro Shopping Centre. The report is subject to following qualifications:

- The investigations undertaken in preparing this Flood Emergency Response Plan have been based on the development plan as shown on the Drawing No. AR-1BNB-A20005, Rev 2, dated xx/02/2019, titled " Master Lease Plan – Ground Floor", prepared by Hames Sharley Architects.
- It is assumed that the relevant actions of the overall Emergency Management Plan prepared by AMP Capital that support this Flood Emergency Response Plan would be implemented during a flood emergency
- Study results should not be used for purposes other than those for which they were prepared.

HydroStorm Consulting

Habib Rehman
Principal Consultant

REFERENCES

AMP Capital Investors, May 2018, “AMP Capital Emergency Management Plan Part 1 - Administration”, Version 3.0

AMP Capital Investors, May 2018, “AMP Capital Emergency Management Plan Part 2 - Guidelines”, Version 3.0

GLOSSARY

Annual Exceedance Probability (AEP)	Refers to the probability or risk of a flood of a given size occurring or being exceeded in any given year. A 90% AEP flood has a high probability of occurring or being exceeded each year; it would occur quite often and would be relatively small. A 1%AEP flood has a low probability of occurrence or being exceeded each year; it would be fairly rare, but it would be relatively large.
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Recurrence Interval (ARI)	The average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration. It is implicit in this definition that the periods between exceedances are generally random. For example, a 1 in 100 year Average Recurrence Interval (ARI) flood is defined as a flood that would occur, on average, once every 100 years. However, such magnitude floods can occur in consecutive years or even a few times in the same year. **NOTE:** In the current practice, this term for specifying a design flood event has now been replaced with the term Annual Exceedence Probability (AEP) as described above.
Cadastre, cadastral base	Information in map or digital form showing the extent and usage of land, including streets, lot boundaries, water courses etc.
Catchment	The area draining to a site. It always relates to a particular location and may include the catchments of tributary streams as well as the mainstream.
Critical Duration	Usually used with a storm event and specifies the storm duration that would produce highest flood levels at a particular location in the catchment
Design flood	A significant event to be considered in the design process; various works within the floodplain may have different design events. e.g. some roads may be designed to be overtopped in the 1 in 1 year or 100%AEP flood event.
Development	The erection of a building or the carrying out of work; or the use of land or of a building or work; or the subdivision of land.

Discharge	The rate of flow of water measured in terms of volume over time. It is to be distinguished from the speed or velocity of flow, which is a measure of how fast the water is moving rather than how much is moving.
Flash flooding	Flooding which is sudden and often unexpected because it is caused by sudden local heavy rainfall or rainfall in another area. Often defined as flooding which occurs within 6 hours of the rain which causes it.
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or overland runoff before entering a watercourse and/or coastal inundation resulting from elevated sea levels and/or waves overtopping coastline defences.
Flood hazard	Potential risk to life and limb caused by flooding.
Flood-prone land	Land susceptible to inundation by the probable maximum flood (PMF) event, i.e. the maximum extent of flood liable land. Floodplain Risk Management Plans encompass all flood-prone land, rather than being restricted to land subject to designated flood events.
Floodplain	Area of land which is subject to inundation by floods up to the probable maximum flood event, i.e. flood prone land.
Floodplain management measures	The full range of techniques available to floodplain managers.
Floodplain management options	The measures which might be feasible for the management of a particular area.
Flood planning area	The area of land below the flood planning level and thus subject to flood related development controls.
Flood planning levels	Flood levels selected for planning purposes, as determined in floodplain management studies and incorporated in floodplain management plans. Selection should be based on an understanding of the full range of flood behaviour and the associated flood risk. It should also take into account the social, economic and ecological consequences associated with floods of different severities. Different FPLs may be appropriate for different categories of land use and for different flood plains. As FPLs do not necessarily extend to the limits of flood prone land (as defined by the probable maximum flood), floodplain management plans may apply to flood prone land beyond the defined FPLs.

Flood storages	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.
Floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often, but not always, aligned with naturally defined channels. Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow, or significant increase in flood levels. Floodways are often, but not necessarily, areas of deeper flow or areas where higher velocities occur. As for flood storage areas, the extent and behaviour of floodways may change with flood severity. Areas that are benign for small floods may cater for much greater and more hazardous flows during larger floods. Hence, it is necessary to investigate a range of flood sizes before adopting a design flood event to define floodway areas.
Geographical Information Systems (GIS)	A system of software and procedures designed to support the management, manipulation, analysis and display of spatially referenced data.
High hazard	Flood conditions that pose a possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty wading to safety; potential for significant structural damage to buildings.
Hydraulics	The term given to the study of water flow in a river, channel or pipe, in particular, the evaluation of flow parameters such as stage and velocity.
Hydrograph	A graph that shows how the discharge changes with time at any particular location.
Hydrology	The term given to the study of the rainfall and runoff process as it relates to the derivation of hydrographs for given floods.
Low hazard	Flood conditions such that should it be necessary, people and their possessions could be evacuated by trucks; able-bodied adults would have little difficulty wading to safety.

Mathematical/computer models	The mathematical representation of the physical processes involved in runoff and stream flow. These models are often run on computers due to the complexity of the mathematical relationships. In this report, the models referred to are mainly involved with rainfall, runoff, pipe and overland stream flow.
Probable Maximum Flood (PMF)	The flood calculated to be the maximum that is likely to occur in a given catchment
Probability	A statistical measure of the expected frequency or occurrence of flooding. For a fuller explanation see Annual Exceedence Probability.
Risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. For this study, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
Runoff	The amount of rainfall that actually ends up as stream or pipe flow, also known as rainfall excess.
Stage	Equivalent to 'water level'. Both are measured with reference to a specified datum.
Stage hydrograph	A graph that shows how the water level changes with time. It must be referenced to a particular location and datum.
Stormwater flooding	Inundation by local runoff. Stormwater flooding can be caused by local runoff exceeding the capacity of an urban stormwater drainage system or by the backwater effects of mainstream flooding causing the urban stormwater drainage system to overflow.
Topography	A surface which defines the ground level of a chosen area.

FIGURES

Figure 4. Study Area Catchment

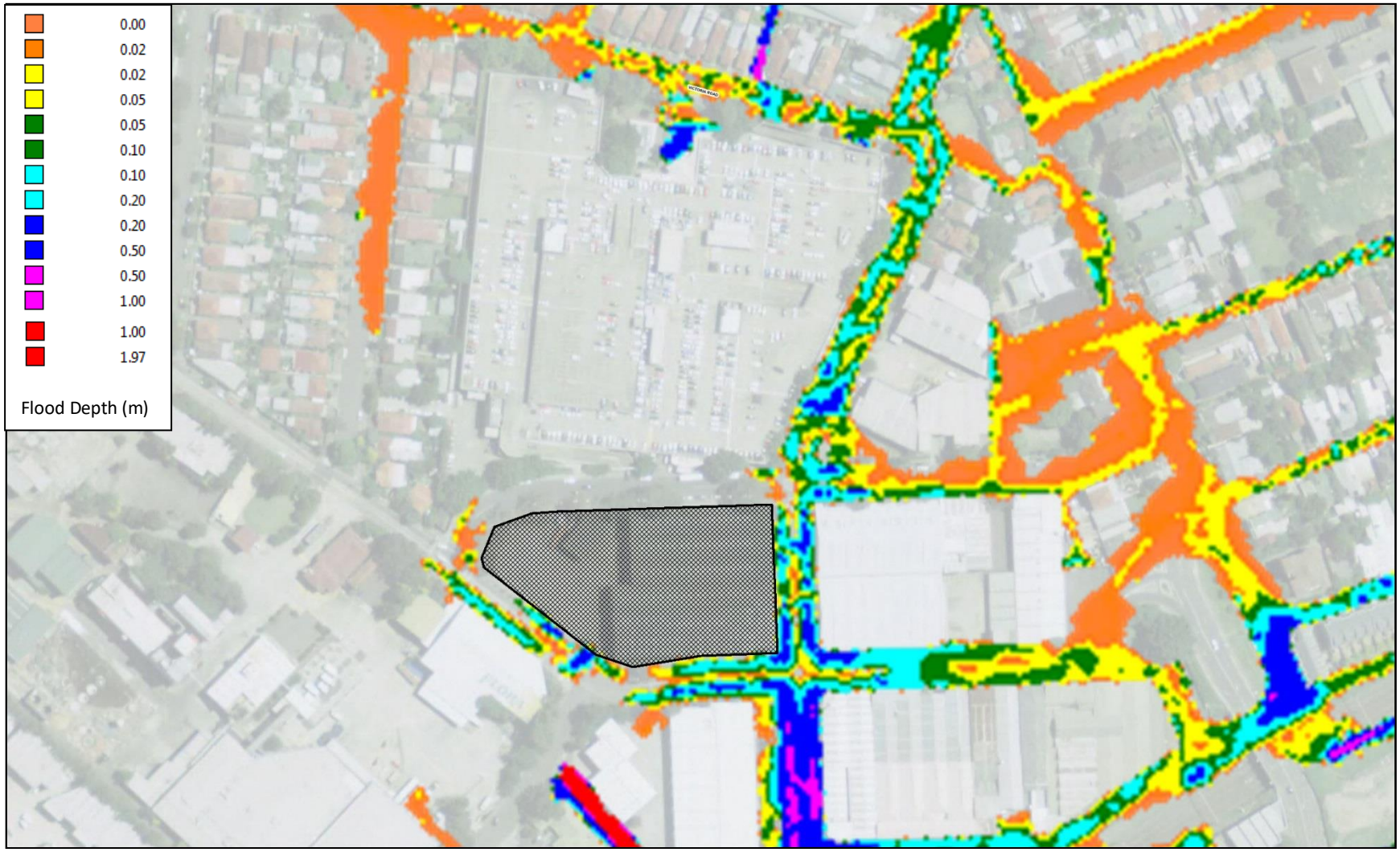


Figure 5. Existing Flood Depth - 2 Year ARI

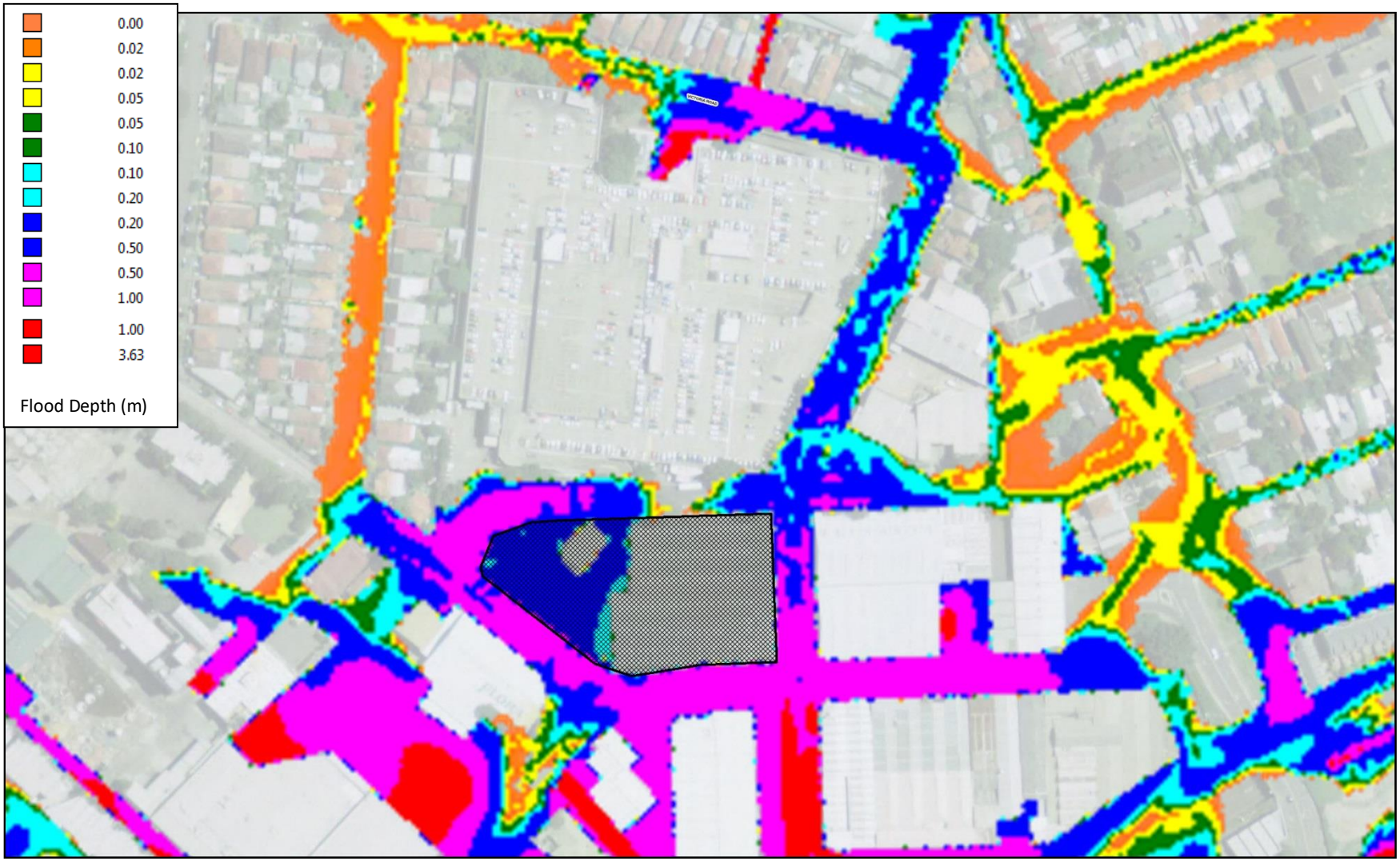


Figure 6. Existing Flood Depth - 100 year ARI

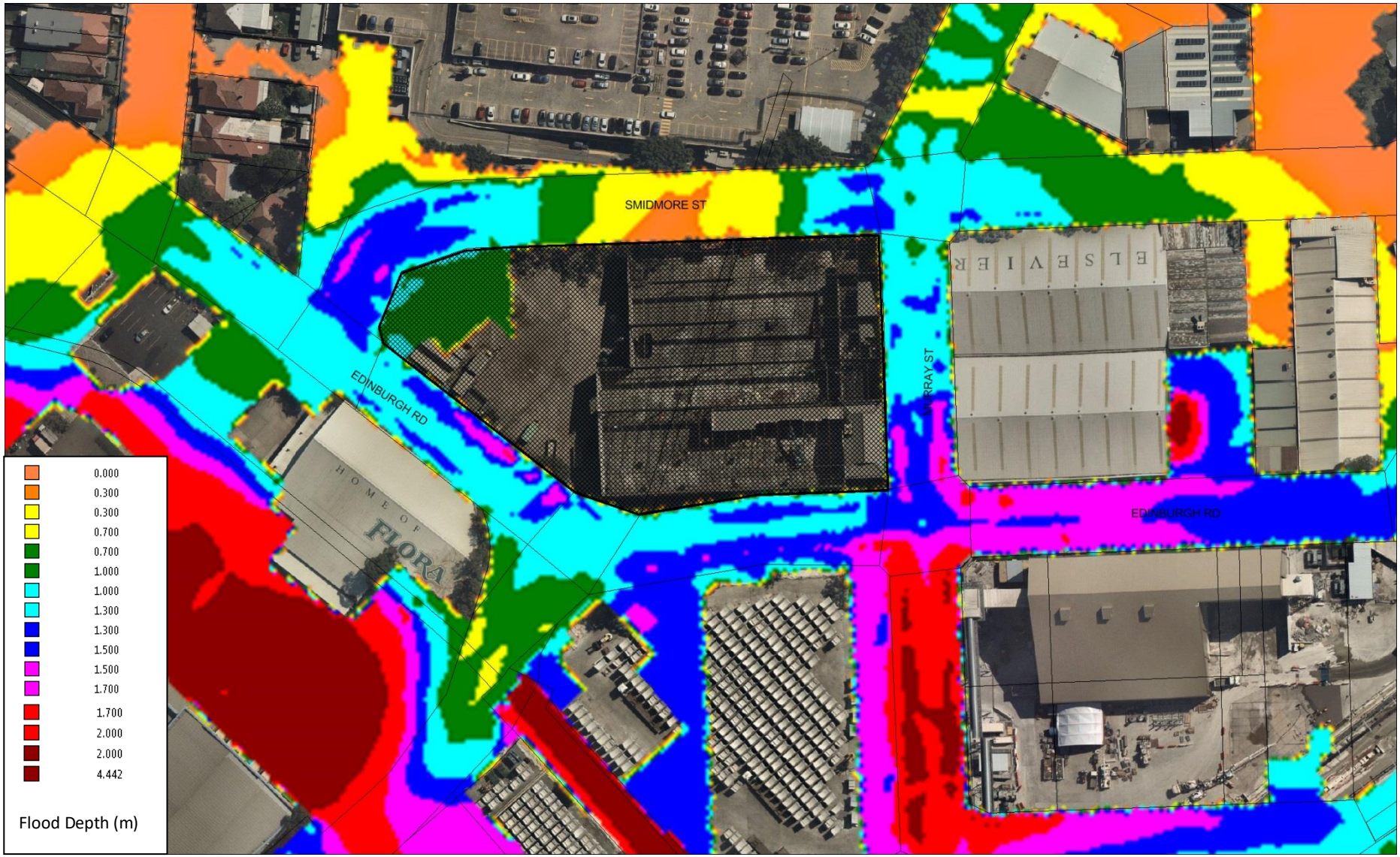


Figure 7. PMF Flood Depth

Figure 8. Existing Provisional Flood Hazard - 2 Year ARI

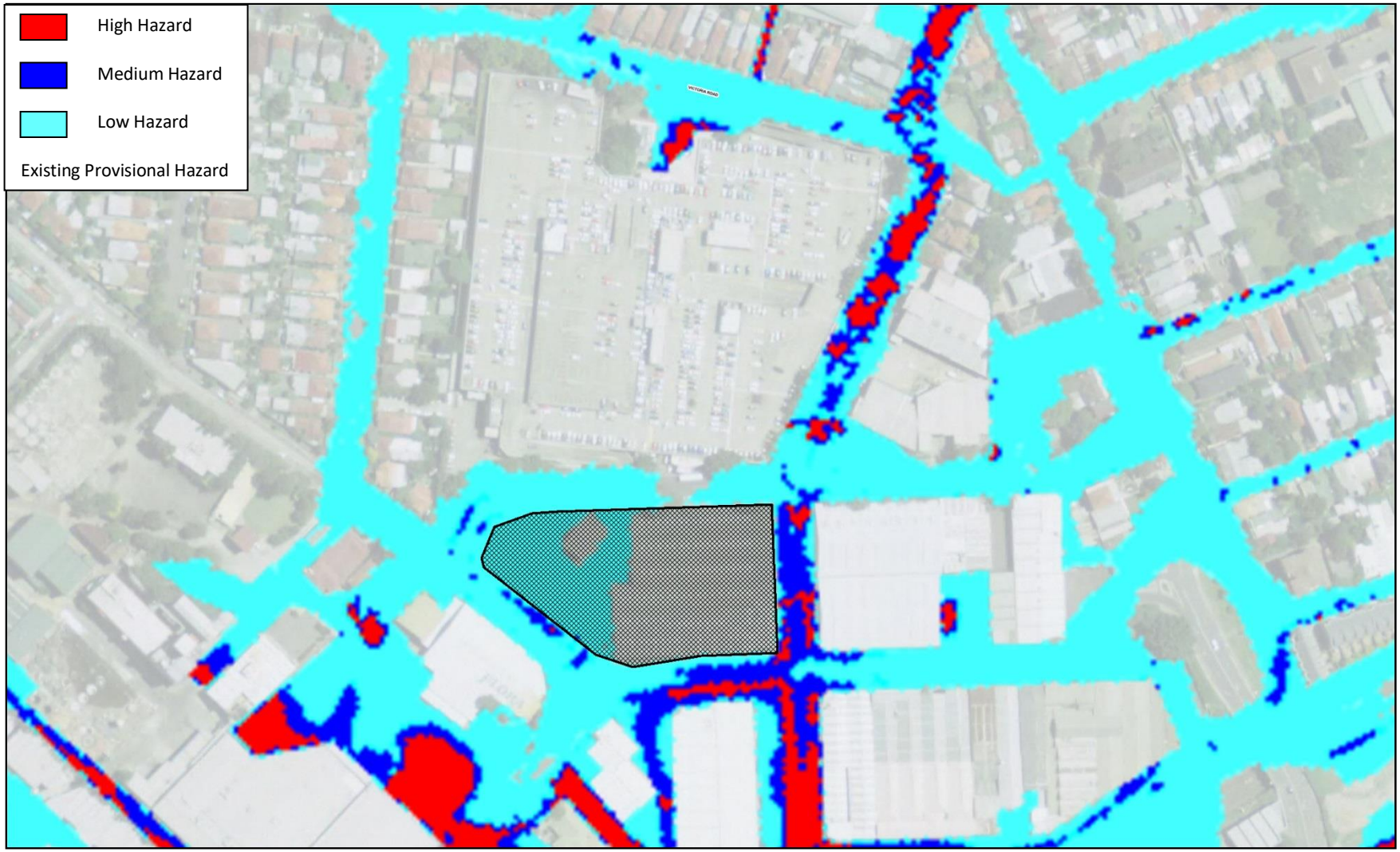


Figure 9. Existing Provisional Flood Hazard - 100 year ARI

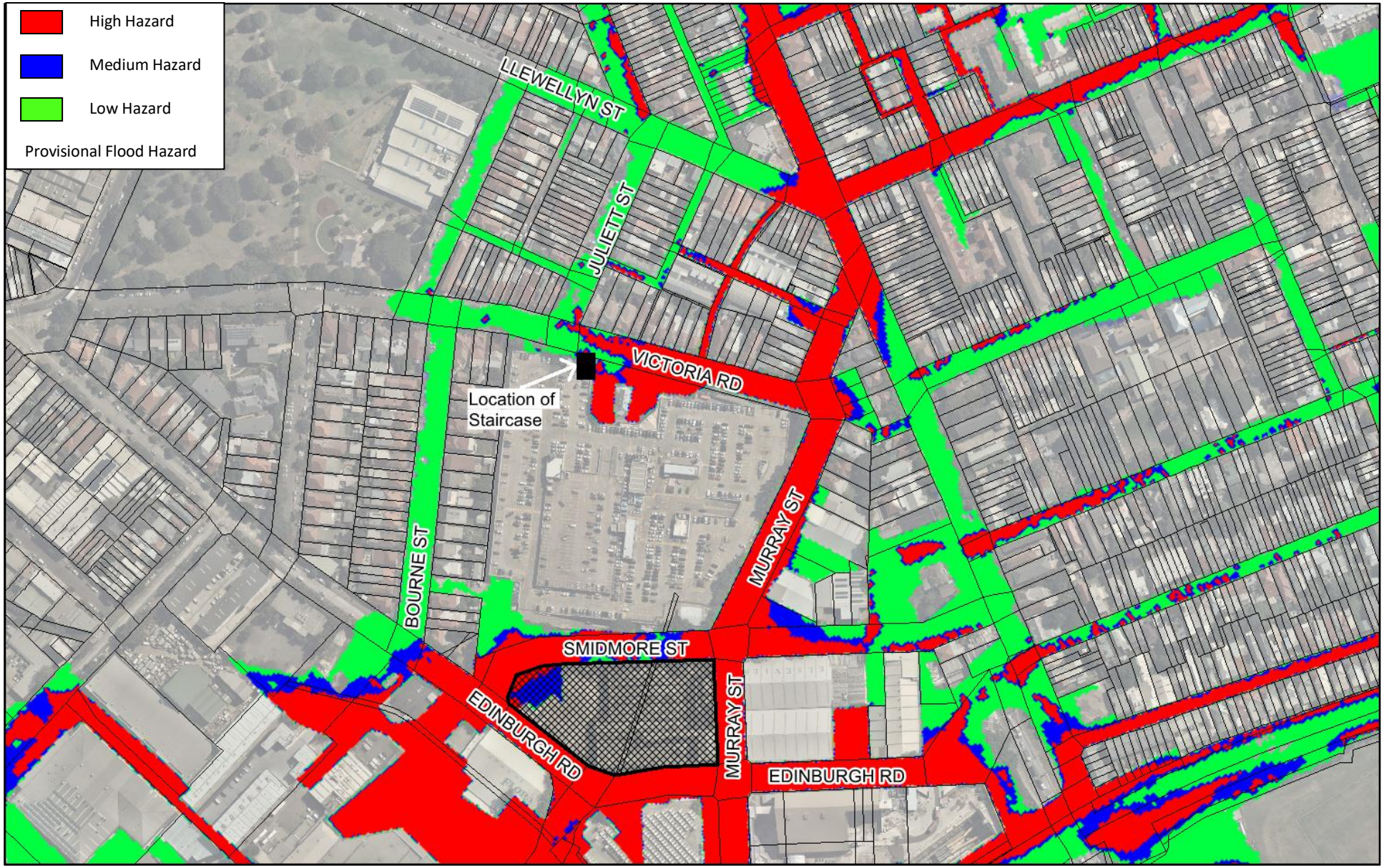


Figure 10. Provisional Flood Hazard – PMF – Developed Conditions

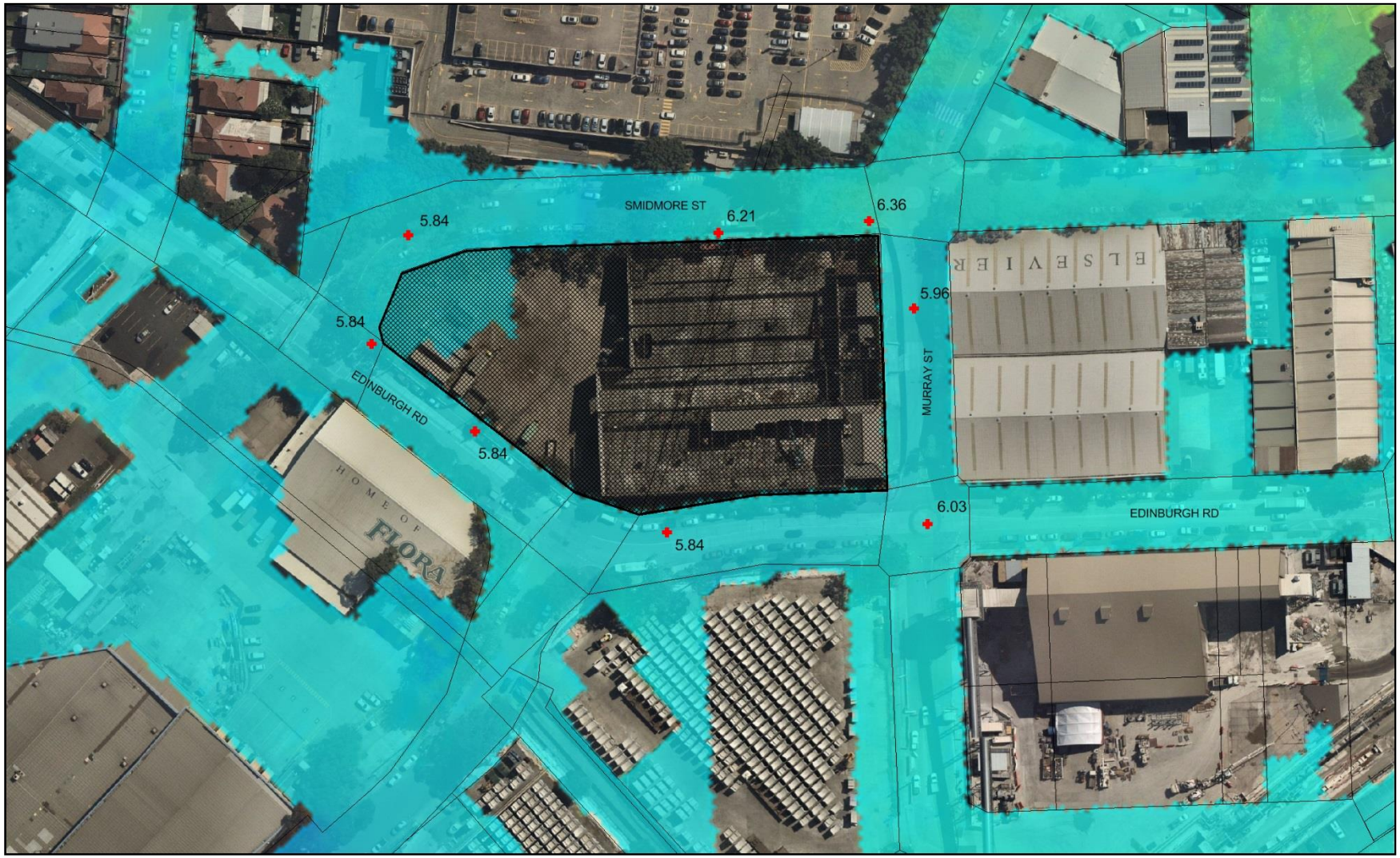


Figure 11. PMF Levels (m AHD)

Figure 12. Flood Evacuation Route for Medical Emergency

APPENDIX A

Development Plans

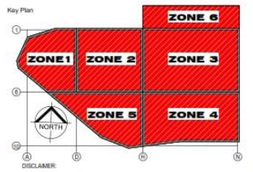
GLA SCHEDULE-GROUND (A)

Name	Level	Area	Comments	Occupancy
G001	GROUND FLOOR	120 m²	GLFA	FOOD & BEVERAGE
G002	GROUND FLOOR	114 m²	GLFA	FOOD & BEVERAGE
G003	GROUND FLOOR	114 m²	GLFA	FOOD & BEVERAGE
G004	GROUND FLOOR	115 m²	GLFA	FOOD & BEVERAGE
G005	GROUND FLOOR	113 m²	GLFA	FOOD & BEVERAGE
G006	GROUND FLOOR	78 m²	GLFA	FOOD & BEVERAGE
G007	GROUND FLOOR	101 m²	GLFA	FOOD - PROVIDORE
G008	GROUND FLOOR	100 m²	GLFA	FOOD - PROVIDORE
G009	GROUND FLOOR	209 m²	GLFA	FOOD & BEVERAGE
G010	GROUND FLOOR	151 m²	GLFA	FOOD & BEVERAGE
G011	GROUND FLOOR	50 m²	GLFA	FOOD - PROVIDORE
G012	GROUND FLOOR	39 m²	GLFA	FOOD - PROVIDORE
G013	GROUND FLOOR	165 m²	GLFA	FOOD & BEVERAGE
G014	GROUND FLOOR	81 m²	GLFA	FOOD & BEVERAGE
G015	GROUND FLOOR	603 m²	GLFA	SPECIALTY
G016	GROUND FLOOR	230 m²	GLFA	FOOD - PROVIDORE
G017	GROUND FLOOR	40 m²	GLFA	FOOD - PROVIDORE
G018	GROUND FLOOR	40 m²	GLFA	FOOD - PROVIDORE
G019	GROUND FLOOR	40 m²	GLFA	FOOD - PROVIDORE
G020	GROUND FLOOR	40 m²	GLFA	FOOD - PROVIDORE
G021	GROUND FLOOR	162 m²	GLFA	FOOD - PROVIDORE
G023	GROUND FLOOR	996 m²	GLFA	MINI MAJOR
KG001	GROUND FLOOR	20 m²	GLFA	KIOSK
KG002	GROUND FLOOR	15 m²	GLFA	KIOSK
KG003	GROUND FLOOR	20 m²	GLFA	KIOSK
KG004	GROUND FLOOR	20 m²	GLFA	KIOSK
LSG01	GROUND FLOOR	13 m²	GLFA	LICENSED SEATING
LSG02	GROUND FLOOR	15 m²	GLFA	LICENSED SEATING
LSG03	GROUND FLOOR	15 m²	GLFA	LICENSED SEATING
LSG04	GROUND FLOOR	24 m²	GLFA	LICENSED SEATING
LSG05	GROUND FLOOR	20 m²	GLFA	LICENSED SEATING
LSG06	GROUND FLOOR	21 m²	GLFA	LICENSED SEATING
LSG07	GROUND FLOOR	20 m²	GLFA	LICENSED SEATING
LSG08	GROUND FLOOR	14 m²	GLFA	LICENSED SEATING
LSG09	GROUND FLOOR	39 m²	GLFA	LICENSED SEATING
LSG10	GROUND FLOOR	36 m²	GLFA	LICENSED SEATING
LSG11	GROUND FLOOR	37 m²	GLFA	LICENSED SEATING
LSG12	GROUND FLOOR	25 m²	GLFA	LICENSED SEATING
LSG13	GROUND FLOOR	41 m²	GLFA	LICENSED SEATING
LSG14	GROUND FLOOR	26 m²	GLFA	LICENSED SEATING
LSG15	GROUND FLOOR	31 m²	GLFA	LICENSED SEATING
MJG001-1001	GROUND FLOOR	303 m²	GLFA	MAJOR
Grand total: 42		4456 m²		

GLA SCHEDULE- LEVEL 1

Name	Level	Area	Comments	Occupancy
1001	LEVEL 1	191 m²	GLA	SPECIALTY
1002	LEVEL 1	136 m²	GLA	FOOD - PROVIDORE
1003	LEVEL 1	142 m²	GLA	FOOD - PROVIDORE
1004	LEVEL 1	112 m²	GLA	FOOD - PROVIDORE
1005	LEVEL 1	204 m²	GLA	FOOD & BEVERAGE
1006	LEVEL 1	120 m²	GLA	SPECIALTY
1007	LEVEL 1	168 m²	GLA	SPECIALTY
1008	LEVEL 1	273 m²	GLA	SPECIALTY
1009	LEVEL 1	270 m²	GLA	FOOD - PROVIDORE
1010	LEVEL 1	128 m²	GLA	FOOD - PROVIDORE
1011	LEVEL 1	126 m²	GLA	SPECIALTY
1012	LEVEL 1	128 m²	GLA	SPECIALTY
1013	LEVEL 1	127 m²	GLA	SPECIALTY
1014	LEVEL 1	107 m²	GLA	SPECIALTY
K1001	LEVEL 1	20 m²	GLA	KIOSK
K1002	LEVEL 1	30 m²	GLA	KIOSK
MJ1001	LEVEL 1	3951 m²	GLA	MAJOR
ST 1001	LEVEL 1	9 m²	GLA	STORE
ST-1002	LEVEL 1	19 m²	GLA	STORE
ST-1003	LEVEL 1	19 m²	GLA	STORE
ST-1004	LEVEL 1	10 m²	GLA	STORE
ST-1005	LEVEL 1	19 m²	GLA	STORE
ST-1006	LEVEL 1	19 m²	GLA	STORE
ST-1007	LEVEL 1	15 m²	GLA	STORE
ST-1008	LEVEL 1	25 m²	GLA	STORE
Grand total: 25		6368 m²		

Key Plan



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- POTENTIAL SHORT TERM SITE. TBC
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Rev.	Date	Initial	Description
2	XX/02/19	HS	CASUAL LEASING SITES AND DIGITAL OFFERS SHOWN
1	21/12/18	HS	ISSUE FOR CONSTRUCTION MLP

Client
AMP CAPITAL

Hames Sharley
hamessharley.com.au +61 2 8240 8900
nsw registered architect: ddo raadk 5987

In Partnership With

Project
MARRICKVILLE METRO REDEVELOPMENT
13 - 55 EDINBURGH ROAD,
MARRICKVILLE NSW 2204

Drawing Title
MASTER LEASE PLAN - LEVEL 1

Drawn By	Checked By	Scale @ A1
CP	CB	1 : 250

Project No.	Drawing No.	Revision
50980	AR-1BNB-A20006	2

Status
FOR CONSTRUCTION

SERVICES C0-ORDINATION NOTES
THIS MASTER LEASE PLAN IS SUBJECT TO STRUCTURAL AND SERVICES CO-ORDINATION WHICH MAY AFFECT FLOOR AREAS, TENANCY WALLS, COLUMNS, FLOORS AND CEILING SERVICES ZONES.

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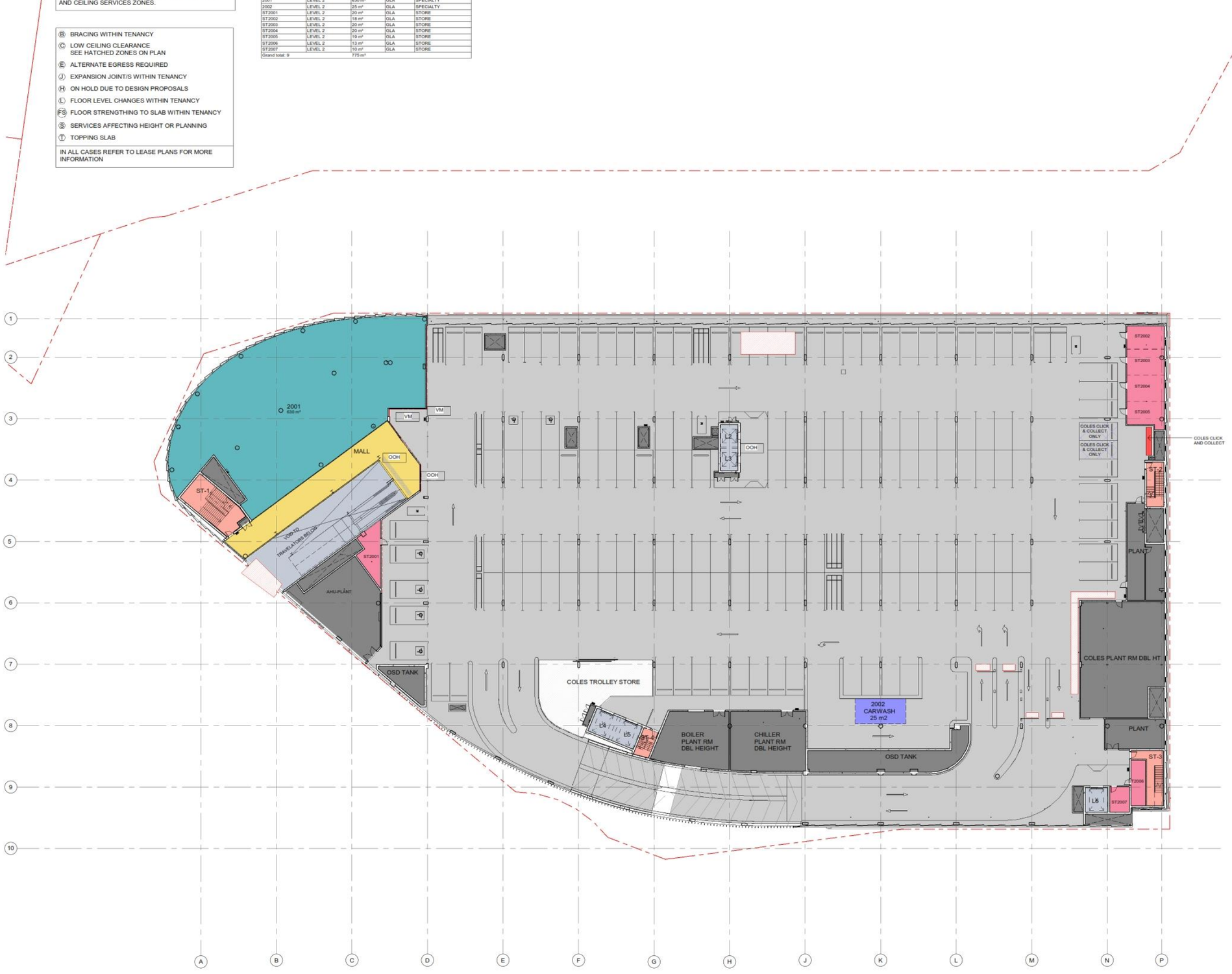
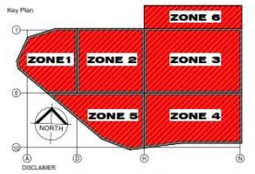
GLA SCHEDULE- LEVEL 2

Name	Level	Area	Comments	Occupancy
2001	LEVEL 2	630 m²	GLA	SPECIALTY
2002	LEVEL 2	25 m²	GLA	SPECIALTY
ST2001	LEVEL 2	20 m²	GLA	STORE
ST2002	LEVEL 2	18 m²	GLA	STORE
ST2003	LEVEL 2	20 m²	GLA	STORE
ST2004	LEVEL 2	20 m²	GLA	STORE
ST2005	LEVEL 2	19 m²	GLA	STORE
ST2006	LEVEL 2	13 m²	GLA	STORE
ST2007	LEVEL 2	10 m²	GLA	STORE
Grand total: 9		775 m²		



Key Plan



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2	XX/02/19	HS	CASUAL LEASING SITES AND DIGITAL OFFERS SHOWN
1	21/12/18	HS	ISSUE FOR CONSTRUCTION MLP

Client
AMP CAPITAL

Hames Sharley
hamesSharley.com.au +612 8240 8500
nsw registered architect: aldo raadik 5987

In Partnership With

Project
MARRICKVILLE METRO REDEVELOPMENT
13 - 55 EDINBURGH ROAD,
MARRICKVILLE NSW 2204

Drawing Title
MASTER LEASE PLAN - LEVEL 2

Drawn By	Checked By	Scale @ A1
CP	CB	1 : 250

Project No.	Drawing No.	Revision
50980	AR-1BNB-A20007	2

Status
FOR CONSTRUCTION

SERVICES CO-ORDINATION NOTES
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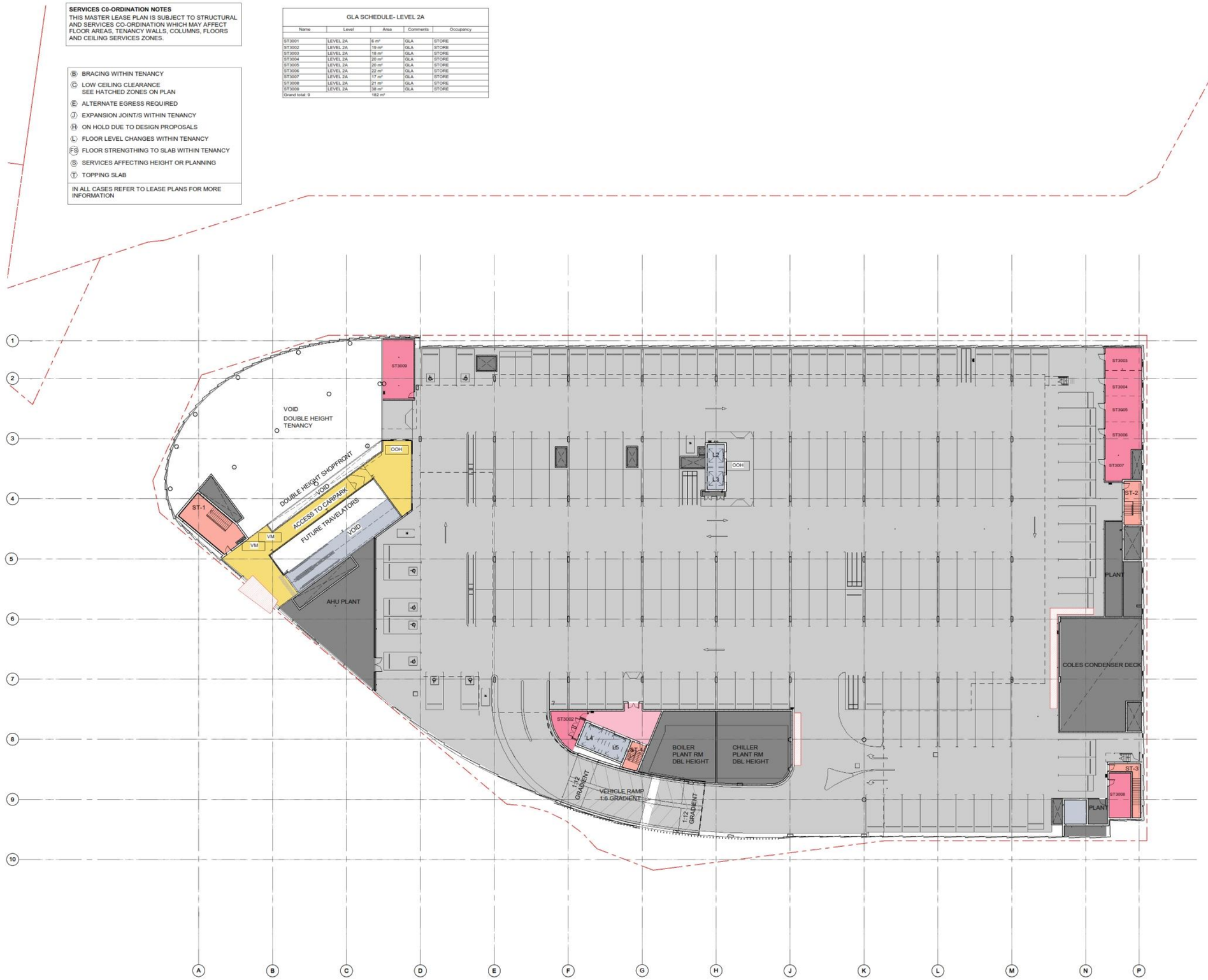
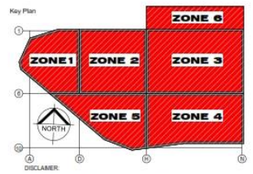
GLA SCHEDULE- LEVEL 2A

Name	Level	Area	Comments	Occupancy
ST3001	LEVEL 2A	6 m²	GLA	STORE
ST3002	LEVEL 2A	19 m²	GLA	STORE
ST3003	LEVEL 2A	18 m²	GLA	STORE
ST3004	LEVEL 2A	20 m²	GLA	STORE
ST3005	LEVEL 2A	20 m²	GLA	STORE
ST3006	LEVEL 2A	22 m²	GLA	STORE
ST3007	LEVEL 2A	17 m²	GLA	STORE
ST3008	LEVEL 2A	21 m²	GLA	STORE
ST3009	LEVEL 2A	38 m²	GLA	STORE
Grand total: 9		182 m²		



Key Plan



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2	XX/02/19	HS	CASUAL LEASING SITES AND DIGITAL OFFERS SHOWN
1	21/12/18	HS	ISSUE FOR CONSTRUCTION MLP

Client
AMP CAPITAL

Hames Sharley
hamessharley.com.au +61 2 8240 8900
nsw registered architect: aldo raadik 5987

In Partnership With

Project
MARRICKVILLE METRO REDEVELOPMENT
13 - 55 EDINBURGH ROAD,
MARRICKVILLE NSW 2204

Drawing Title
MASTER LEASE PLAN - LEVEL 2A

Drawn By	Checked By	Scale @ A1
CP	CB	1 : 250

Project No.	Drawing No.	Revision
50980	AR-1BNB-A20008	2

Status
FOR CONSTRUCTION

SERVICES C0-ORDINATION NOTES
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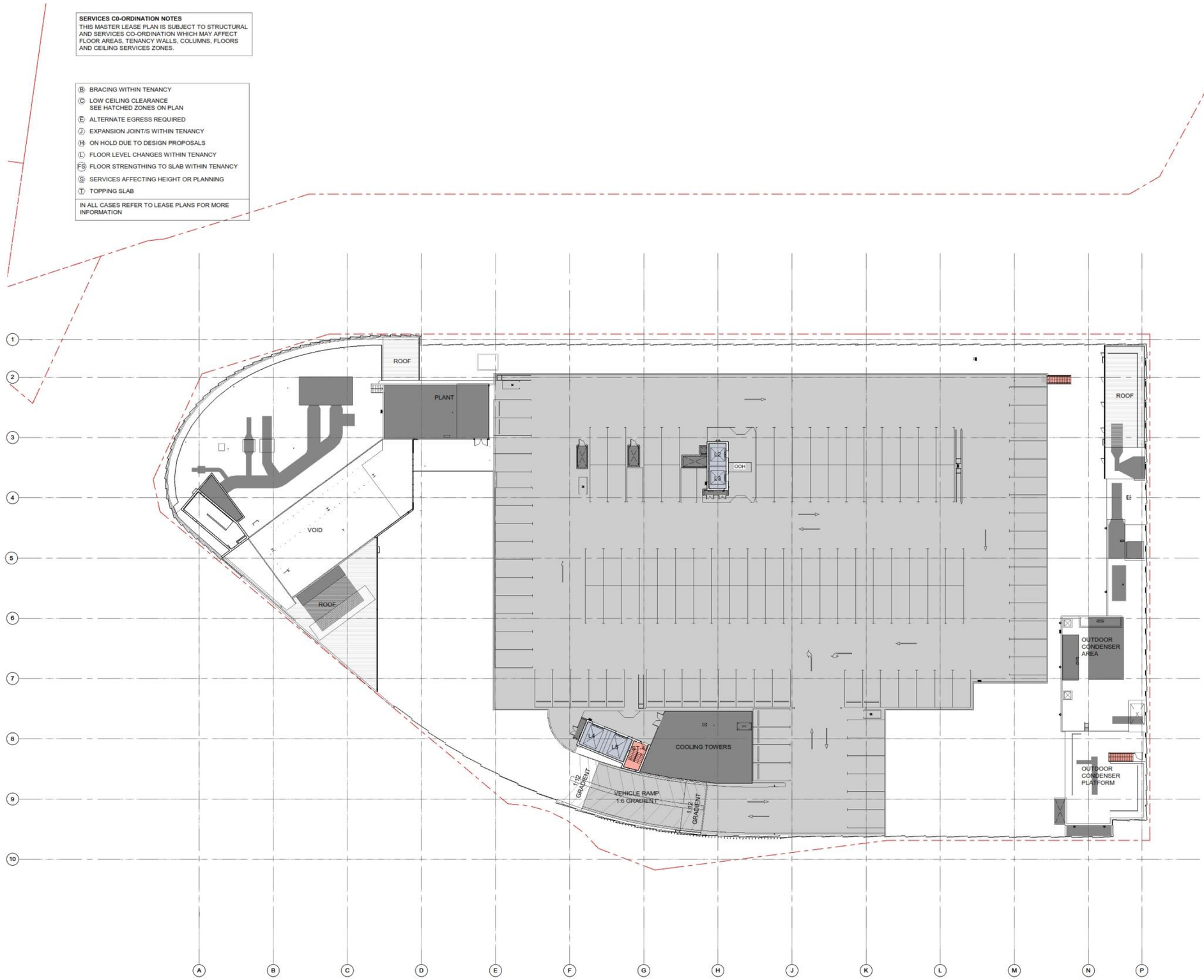

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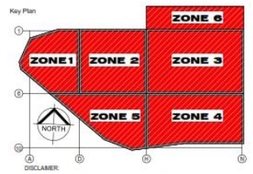

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AMP CAPITAL

Hames Sharley
hamessharley.com.au +61 2 8240 8900
new registered architect: aldo raadik 5987

In Partnership With

Project
MARRICKVILLE METRO REDEVELOPMENT
13 - 55 EDINBURGH ROAD,
MARRICKVILLE NSW 2204

Drawing Title
MASTER LEASE PLAN - LEVEL 2B

Drawn By	Checked By	Scale @ A1
CP	CB	1 : 250
Project No.	Drawing No.	Revision
50980	AR-1BNB-A20009	2

Status
FOR CONSTRUCTION