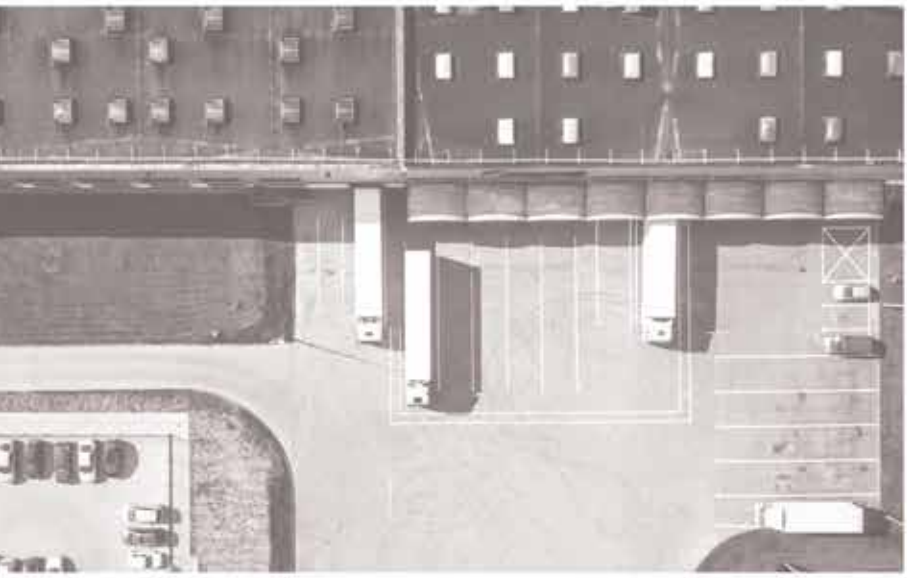
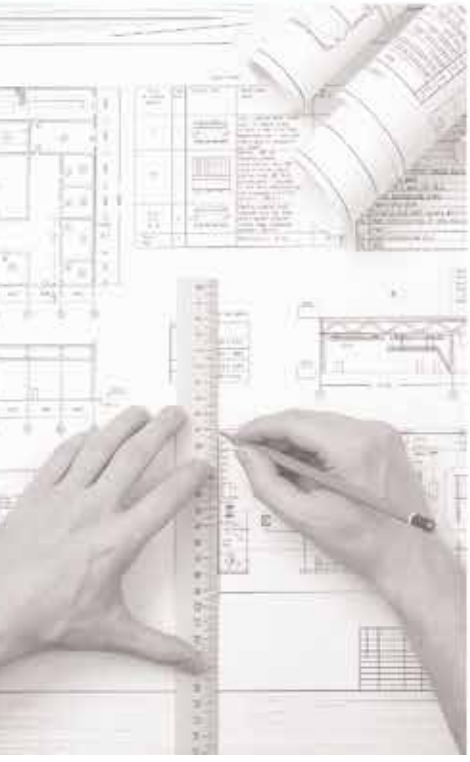
Appendix E

Flood impact assessment





GEORGES COVE VILLAGE

MODIFIED PLANNING PROPOSAL

146 NEWBRIDGE RD MOOREBANK

FLOOD IMPACT ASSESSMENT AND

FLOOD EMERGENCY RESPONSE PLAN

OCTOBER 2024

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ATTACHMENTS

1. Introduction

The proposed Georges Cove Village (Site A) site is located at 146 Newbridge Road, Moorebank (refer Figure 1).

2. Background

The Georges Cove Village site is one of three development sites under the same land ownership in the Moorebank East precinct. The two other sites are the Georges Cove Residences (R3-zoned lands) currently being developed by Mirvac and the Georges Cove Marina site. These sites were recently nominated by Liverpool Council as site A (Georges Cove Village), C (Georges Cove Residences) and D (Georges Cove Marina) – see Figure 2 below.

Figure 2 Moorebank East Precinct

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Given the one ownership of sites A, C and D, we have been working with Liverpool Council since 2012 on the flooding issues considering these three sites as an integrated site. Cardno (now Stantec) have undertaken all the flood modelling for these three developments, and the sites are interrelated for wider flood modelling purposes.

The benchmark pre-development land ground levels were formulated by Council and adopted in the Cardno 29 January 2013 flood assessment as the base landform for the pre-development flood modelling of the three sites. The details of this landform are shown on Figure 3. Council required that this base had to be used for the flood impact assessment by Cardno of the three developments and all future flood models.

As a result, Liverpool Council required that there be no reduction in flood storage capacity over the combined area of the three developments for the 100yr ARI flood event.

In the 13 April 2018 Cardno flood impact report, integrated flood impact modelling was undertaken for the proposed development on the three sites incorporating changes to landforms and works to ensure the required no change in flood storage. On the Georges Cove Village site (site A), some existing fill was to be removed to compensate for fill elsewhere over the integrated sites and the proposed building on the Georges Cove Village site was designed to have a void at lower levels to accommodate the extra flood storage. The Cardno flood report and the modelling and design results were then accepted by Liverpool Council.

3. Site Description

This Planning Proposal site (site A) has frontage to Newbridge Road and it's entry is south of Brickmakers Drive. There is a Council drainage channel along the western boundary of the site, the Mirvac Georges Cove Residences residential development (site C) is bordering to the south and there is a proposed mixed-use development to the east, on the Flower Power site (Site B-refer Figure 1).

The benchmark pre-development site ground levels (see Figure 3) had previously been agreed with Council in which the ground levels rose quickly from the Newbridge Road entry to levels above the flood planning level (which is RL 6.1m AHD) for the Georges River located nearby to the south east. The existing road level on the site entry from Newbridge Road is about RL 2.5m AHD.

In the proposed integrated development of the three sites, the post development ground levels were lowered to RL 3m AHD for the Moorebank Cove Village site (site A) to accommodate flood storage within and below the building void. Council has accepted the Cardno flood impact report (13 April 2018) in which there is no flood storage loss over the integrated three sites (sites A, C and D).

4. Flood Characteristics

The predicted benchmark pre development flood levels for the Moorebank Cove Village site (site A) are (Cardno 29 Jan 2013):-

- 20 year ARI RL 4.6m AHD
- 100 year ARI RL 5.6m AHD
- Probable Maximum Flood (PMF) RL 10.2m AHD
- Flood Planning Level (FPL) RL 6.1m AHD

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A PMF flood event is estimated (by Cardno) to occur on average **every 1,600,000 years.**

The benchmark pre-development 20 year and 100 year ARI flood extents are depicted on Figures 4 and 5 for the site (Cardno 29Jan2013). The pre-development site had a low flood hazard with only a small strip along the Newbridge Rd frontage being flood affected. Flooding on the site is a combination of flood storage and flood fringe.

5. Proposed Development

The proposed development consists of a supermarket and retail specialty shops on Level 3 and commercial/light industrial on Level 4 and associated parking on Levels 2, 3 and 4. The dock loading area is on Level 1 (refer Figures 6 – 11).

Except for the Loading dock level (Level 1), the rest of the site's proposed built form (parking and commercial spaces) is above the 100 year ARI or PMF flood levels.

The loading dock access on Level 1 is only accessed from Newbridge Road at a level of RL 2.5m. On Level 1, from the Newbridge Road entrance level of RL 2.5m it then ramps up to an elevated loading dock at RL 3.4m AHD and to an open area creating extra flood storage. In times of flood, obviously the Loading dock will not be required or be in use during flood events. Light vehicle (but not Heavy Vehicle) access is normally available from Level 1 to the retail car parking at Level 2 above at a level of RL 7m AHD, which is well above the 100 year ARI and above the Flood Planning Level of RL 6.1m AHD. Level 3 contains the supermarket and retail shops as well as further retail carparking at a level of RL 10.2m AHD. This level is at the Probable Maximum Flood (PMF) level and is, as such, considered flood free. Level 4 has the commercial/light industrial uses which are two storey units at a floor level of RL 15.2m AHD which is 5m above the PMF flood level and as such, also flood free.

Car access to the proposed development will be from Newbridge Road on the northern frontage and from the Mirvac Georges Cove Residences development (site C) and from Newbridge Rd (entry only). The car ingress/egress in a flood emergency will be via the DCP Road into the Mirvac Georges Cove Residences (site C) residential area (which is higher than the 100 year ARI) and then onto the existing high level road bridge leading to Brickmakers Drive (RL 6.0m AHD) and then onto Maddecks Ave and Nuwarra Road. Nuwarra Road is above the Probable Maximum Flood (PMF) level. Normal Commercial Heavy Vehicle access to the Village site is proposed to be only available from Newbridge Rd via a left in and left out entry from Newbridge Road.

Pedestrian access/egress in a flood emergency will be via the DCP Road into the Mirvac Georges Cove Residences (site C) residential area and via the high-level pedestrian bridge leading to Paine Park and then to flood-free land along Horizon Circuit towards Nuwarra Rd.

6. Flood Impact Assessment

6.1 Flood Levels and Velocity

The flood assessment by Cardno (13 April 2018) compared the benchmark pre development flood conditions with the integrated development of the three sites A (Georges Cove Village), C (Georges Cove Residences) and D (Georges Cove Marina). The development

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included the assessment of flood storage to ensure there was no loss of storage. This included incorporation of the flood storage void in the Georges Cove Village development (site A).

The findings of the extensive Cardno flood modelling (13 April 2018) were that there were no significant adverse impacts on flood levels and velocities caused by this Planning Proposal (Georges Cove Village development -site A) compared to the Councils benchmark pre development case.

All proposed parking areas are at levels above the FPL and the retail parking on Level 3 is flood free at the PMF level. All the proposed habitable floor levels including the supermarket, retail shops and commercial/light industrial uses are flood free with floor levels at or above the PMF level.

The areas below the FPL will be constructed using flood compatible materials (such as concrete) which will minimise any flood damage to the building.

6.2 Flood Storage

The Cardno flood assessment (13 April 2018) determined that the proposed integrated development over sites A, C and D would increase the flood storage available in the area thereby improving flood behaviour. The flood void to be incorporated in the proposed Georges Cove Village development (site A) provides extra flood storage as part of the overall integrated developments.

6.3 Flood Risk

The proposed development has the benefit of providing all commercial areas at or above the PMF flood level and will be flood free. All parking areas are above the flood planning level (FPL). All of the areas of the building below the FPL will be built with flood compatible materials to minimise any flood damage. A Flood Safe Plan has been devised within Sections 6.4, 15 and Attachment A to further minimise the risk to life by providing a three-stage flood evacuation plan adequate for the three developments on Sites A, C and D.

The requirements of the *NSW State Government Floodplain Development Manual 2005* and *Flood Risk Management Manual 2023* are designed to minimise risk to life and flood damage and these documents have been considered when assessing this PP.

Flood damage will be minimised by locating all commercially habitable areas at or above the PMF level and are as such, flood free. All of the building structure below the Flood Planning Level will be constructed with flood compatible materials. Flood damages will therefore be minimised. The risk to life due to flooding has been minimised by having all commercially habitable floor levels which are flood free and a Flood Safe Plan for evacuation.

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6.4 Flood Emergency Response Plan

Risk to life will be minimised by having all commercially habitable areas at or above the PMF flood level and by engaging a flood emergency response plan (refer Section 15 and Attachment A). This plan has a three-stage response to a flood warning alert. Although there is no residential component to this Georges Cove Village (site A) proposal, the same three stage evacuation plan has been approved by Liverpool Council for the Mirvac Georges Cove Residences development (site C) adjacent to this Georges Cove Village development. The evacuation routes and flood signs for the Georges Cove Residences development are detailed on Figure 16.

The first stage evacuation of the Georges Cove Village (site A-shopping centre and commercial/light industrial) is by car via the Mirvac Georges Cove Residences (site C) development to Brickmakers Drive, up Maddecks Ave to Nuwarra Rd and to the regional flood refuge or local flood refuges. If this evacuation were to become impossible at some point, then a second stage pedestrian flood evacuation will be possible via the elevated pedestrian bridge over Brickmakers Drive to Paine Park and up Horizon Circuit to flood free land and local refuges. The third stage is shelter in place on flood free floor levels (PMF) with access to all amenities, should for some reason, people refuse to leave the development. This third stage will not be encouraged but will be there as a fall-back, extreme emergency response during a PMF event.

The BOM currently provide a 12-hour warning for floods likely to rise above RL 4m AHD in the Georges River and there is a further 1.6 hours until floodwaters reach the 100 yr ARI flood level (RL 5.6m AHD). If it rises further, to say RL 6m AHD, it will eventually hinder the vehicle evacuation on Brickmakers Drive. This provides a minimum total of 13.6 hours advance warning to evacuate the site by vehicle. However, a further time of 1 hour (a total of 14.6 hours) is available for the pedestrian evacuation because the pedestrian bridge allows access to land at RL 7m AHD which is equivalent to a 1 in 2000yr ARI flood.

Using the very conservative SES flood evacuation model, the SES allow evacuation to commence 8 hours **after the flood warning** to account for mobilising of SES door knockers to alert people (6 hours) and a further 2 hours for people to act. For the subject development being a shopping centre/light industry, a digital flood warning alert would be sent to the supermarket manager/flood warden and the light industrial flood warden so that flood evacuation actions could start immediately - far sooner than the 8 hours nominated by SES.

The vehicular flood evacuation via the road crossing to Brickmakers Drive would be used by the three Benedict-related developments being the Georges Cove Village (site A), Mirvac Georges Cove Residences (site C) and the Georges Cove Marina (site D). The total number of car parking spaces in these developments will be 1356 (marina – 637, residences – 358, village – 361). The SES recommend that the very conservative road carrying capacity in a flood evacuation would be 600 vehicles per land per hour. At this very conservative SES rate (versus road design that is required to allow for 1400 vehicle/lane/hr) and taking the very conservative view that the number of cars onsite to be 100% (all spaces full), then the time to evacuate the three developments would be 2.3 hours. The SES however, require that a safety factor of 1 hour be added, to give a total time required for car evacuation of 11.3

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hours (8+2.3+1) **for the entire 3 Benedict/Mirvac Sites(A/C/D).** This represents a very conservative required time for vehicular evacuation, yet, it is still appreciably less than the SES's nominated available time of 13.6 hours.

If a pedestrian flood evacuation was required (because the vehicular flood evacuation failed at some point), it would be via the elevated pedestrian bridge over Brickmakers Drive from the Mirvac Georges Cove Residences development (site C). The number of people using the pedestrian bridge has been very conservatively estimated as equal to that of all of the cars possible to be parked in the development, with a conservative two people, in each car. This provides a very conservative estimate of 2,712 people on foot, because it theoretically assumes that **no** people leave the three sites in cars and **all** of them instead walk out.

For the pedestrian evacuation, the SES uses the same 6 hours for door knocking and 2 hours for people to leave the development. The SES assumes that people walk at a rate of 2km/hour in an evacuation. The pedestrian bridge would be the logical pinch point for this evacuation. It is approximately 230m long and using a conservative walk rate, and that they cross the bridge in single file (although the bridge is actually some 3.4m wide), then 230 people would cross the bridge in 7 minutes. As such, 2,712 people would cross the bridge in 1.4 hours. If the people were exiting two abreast on the bridge (the bridge is easily wide enough), the travel time for the entire population to walk across the bridge would be 0.7 hours.

The people would then complete the remaining average walking distance of 970m (1200m minus 230m) in 0.5 hours leading to a total walking time (again using the very conservative single file exiting across the bridge) of 1.9 hours. The SES require that a safety factor of 1 hour be added, to give a total time required for pedestrian evacuation of **all three of the Benedict/Mirvac sites** of 10.9 hours (ie.8+1.9+1). This very conservative required time for pedestrian evacuation of the entire three developments (sites A, C and D) is still significantly less than the SES available time of 14.6 hours. This does not include the data from the NSW State Government surveys that suggest that some 20% of dwellings are unoccupied at any given time due to travel/holidays/work, etc.

This analysis, using the overly conservative SES methodology, indicates that the infrastructure provided in the three developments have adequate infrastructure and plans which are capable of minimising the risk to life from flooding.

The Molino Stewart report recommended the provision of the elevated pedestrian bridge over Brickmakers Drive to enable pedestrian evacuation and this bridge has been installed.

A flood emergency response plan has been prepared (see Section 15 and Attachment A) for the proposed B6 development which incorporates the following:

- Flood signs directing people from Level 1 and 2 to Level 3;
- Audible and visual alarms in Levels 1 and 2 when flood waters reach RL 3m AHD;
- Flood emergency response plan attached to leases and body corporate documents;
- Nomination of wardens to organise people at times of floods;
- Annual training of wardens and tenants on flood emergency response activities;
- A Plan which will include a three stage evacuation strategy including vehicle and pedestrian evacuation and an absolute last case option to shelter in place;

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- The nomination of the supermarket area (located at RL 10.2m AHD) as flood refuge area when alarm is activated for Levels 1 and 2.

The building will be designed to structurally withstand the flood flow and debris loads.

The Planning Proposal for the B6 site is considered to reduce the site's reliance on the evacuation capacity of the Moorebank East precinct for the following reasons:

a. The Planning Proposal does not seek to increase the building height of floor space ratio of the site nor does it seek to introduce any additional land uses to the site which are not already permissible;
b. The Planning Proposal seeks to allocate greater floor space to a non-residential land use than what is currently permitted on site (4000m2 vs 1600m2) and as such reduces the potential residential yield of the subject site;
c. The Planning Proposal does not propose to allocate any floor space to a residential land use and proposes commercial and light industrial land use only, however residential land use is permissible on the subject site regardless of the Planning Proposal; and
d. Evacuation risks from the proposed non-residential land uses can be adequately managed and mitigated at the Development Application stage by way of measures including a Plan of Management, Flood Evacuation Plan, Flood Impact Assessment Report along with stringent conditions of development consent (eg – closure of the centre (including cars and pedestrian access) well in advance of flood events through implementation measures such as boom gates and barriers to car and pedestrian access.

In summary, the design of the proposed B6 development readily exceeds the flood risk management requirements of both Council and the State government.

7. Conformance to Flood Policy

7.1 NSW Government Flood Policy

The *NSW Government's Flood Prone Land Policy 2005* and *Flood Risk Management Manual June 2023* support the wise and rational development of flood prone land. The policy acknowledges that flood prone land is a valuable resource that should not be sterilized by unnecessarily precluding its development and that development should be treated on its merits rather than through the application of rigid and prescriptive criteria.

The aim of the Policy and the Manual is to appropriately manage the risk to personal safety and damages from floods. These aims are adopted in the *Liverpool Local Environmental Plan 2008*. The way in which the proposed development conforms to these aims and objectives is discussed in Sections 7.2 and 7.3.

7.2 *Flood Risk Management Manual June 2023*

The primary objective of this policy is to reduce the impacts of flooding and flood liability on communities and individual owners and occupiers and to reduce private and public losses from floods.

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The Manual deals with the responsibilities of state and local governments as well as developers as setout in ten principles of flood risk management. The principles are listed below and text is provided in the relevant principles as to how the proposed development conforms to these principles.

Principle 1 – Establish sustainable governance arrangements.

The State has Floodplain Risk Management (FRM) and Emergency Management (EM) systems in place which will be improved by the implementation of the requirements in the Manual. The proposed development complies with the LGA and State FRM and EM flood requirements.

Principle 2 – Think and plan strategically.

The FRM information and controls in place in the LGA have been improved by our site specific flood modelling so that we well understand the flood behaviour and risks on the site and Council has provided specific flood controls for the proposed development of Sites A, C and D.

Principle 3 – Be consultative.

Liverpool Council has consulted widely with the community in the FRM processes for the wider area and also in the local area as a result of many Planning Proposals and DAs for the Moorebank East Precinct.

Principle 4 – Make flood information available.

Liverpool Council has provided FRM information for the local and wider areas affected by flooding on the Georges River and the developer has provided to Council, FRM specific to the site to demonstrate that the proposed development conforms with the Manual.

Principle 5 – Understand flood behaviour and constraints.

Extensive flood modelling has been undertaken specifically for the subject site by Cardno (now Stantec) so that there is a detailed understanding of the flood behaviour and constraints for the full range of floods from the 20-year ARI to the PMF flood. The mapping of flood risks for the Council benchmark pre development conditions indicated that the majority of the site was above the flood planning area.

Principle 6 – Understand flood risk and how it may change.

Extensive flood modelling was undertaken for the pre and post development conditions to show that there was no loss of flood storage and that the proposed development was not located in a floodway. It also demonstrated that the proposed development would not adversely impact the flood behaviour on adjacent sites.

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Principle 7 – Consider variability and uncertainty.

Uncertainties in flood behaviour have been minimized by the use of very experienced flood practitioners Cardno who developed a fit for purpose flood model which was calibrated and validated considering historical flood information.

A freeboard of 0.5m has been adopted to provide a flood planning level (FPL) for the minimum commercially habitual floor levels in the development. This FPL is the 100yr ARI flood plus 0.5m freeboard which is Council's minimum level for commercially habitual floors. The FPL for the development is RL 6.1m AHD. The proposed development has a minimum commercially habitable floor level at RL 10.2m AHD which is the PMF flood level. So, the lowest commercially habitual floor level is flood free and is 4.1m above the 100 yr ARI flood level.

This provides an additional 3.6m freeboard for the uncertainties in the 100yr ARI flood level which is significantly above the freeboard recommended by both the NSW Government and Liverpool Council (0.5m). This freeboard will readily accommodate flood level increases due to climate change and any uncertainties in flood behaviour.

Principle 8 – Maintain natural flood functions.

The site is not located within a flood conveyance area but does have flood storage and flood fringe categories. Liverpool Council required that the proposed developments on Sites A, C and D should not result in any loss of flood storage as well as no adverse flood impacts on adjacent sites. It has been demonstrated in the extensive flood modelling by Cardno that these two requirements have been met by the proposed development. Council has accepted these flood model results in the approval of development on Sites C and D.

Principle 9 – Manage flood risk effectively.

A *Flood Emergency Flood Plan* (FERP) has been prepared for the development and will be implemented by the retail and industrial managers as flood wardens in a similar fashion to Fire Risk Management. This Plan will minimize the risks to people's lives in all floods.

The proposed development of Site A consists of retail and light industrial users. There will be no dwellings on site. The FERP has two main flood evacuation strategies which consists of evacuation by car and evacuation on foot. The primary evacuation will be by car and if for some reason this strategy fails then a pedestrian evacuation will be implemented.

The development includes the provision of an elevated pedestrian bridge across Brickmakers Drive to Paine Park (which has ground levels equivalent to a 1 in 2000yr flood) which will allow access to flood free land and facilities. These strategies have been accepted by Council in the approval of developments on Sites C and D.

A fall back strategy, which is not recommended, is for people who for some reason have not evacuated Site A and these people can shelter in place on floor levels well above the PMF flood level with access to full amenities. The FERP requires regular review of the FERP and training of flood wardens and staff in all aspects of flood risk management.

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Use of the very conservative SES model for flood evacuation identifies that evacuation of people from the combined developments at Sites A, C and D would be possible easily within the time provided from the initial warning to the time the flood waters reach the 100 yr ARI flood level.

The FERP has been developed to cater for the flood evacuation of all people from the combined developments on Sites A, C and D.

The FERP provides effective management of the flood risk to people's lives for all floods.

The proposed development will be constructed of flood compatible materials below the FPL. This will minimise the risk to flood damages on the site.

Principle 10 – Continually improve management of flood risk.

The FERP will be regularly upgraded as required as result of lessons learnt in floods or changes to flood regulations. The FERP requires regular training and can be upgraded if this training identifies better ways of doing the flood evacuations or when new technologies are available to assist with evacuation. Flood warning systems may improve over time which provide more relevant information to make flood evacuations more efficient and these improvements could be incorporated in the FERP as required.

7.3 Liverpool LEP 2008

7.3.1 Clause 5.21 LEP Objectives for Flood Planning

The *Liverpool Local Environmental Plan 2008* (LEP) specifies the following objectives of flood planning (see text in bold italics).

5.21 Flood planning

(1) The objectives of this clause are as follows—
(a) to minimise the flood risk to life and property associated with the use of land,

Risk to life has been addressed by locating all commercially habitable uses in this Georges Cove Village PP (site A) at or above the PMF – they are flood free. Risk to property has been addressed by use of flood compatible materials below the FPL and locating commercially habitable areas in flood free areas.

(b) ***to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,***

The benchmark per development landform specified by Liverpool Council for the Georges Cove Village site was that it was above the Flood Planning Level (100yr ARI flood level plus 0.5m freeboard) over the majority of the site except for a small area along Newbridge Road. Access to the site is from both Newbridge Road and the Mirvac Georges Cove Residences development (site C) so that access/egress is always available when Newbridge Road is flooded. The development is located outside of the major flood flow conveyance area and is subject to flood storage and flood fringe. The proposed development is therefore compatible with the flood function.

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(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,

The development has a positive impact on flood behaviour by providing a significant increase in flood storage.

(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.

The commercially habitable areas of the development are flood-free and efficient evacuation of the site is possible by both vehicle and foot.

(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—

(a) is compatible with the flood function and behaviour on the land, and

The site has only minor flood fringe and flood storage along the Newbridge Rd frontage on the site with the majority of the built form located above the flood planning level (100 year ARI). As such, the development is compatible with flood function and behaviour.

(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and

The proposed development will add considerable flood storage thereby improving flooding conditions on the site. It will not adversely impact on existing flood conditions on adjacent sites or development.

(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and

This report identifies that the addition of this Georges Cove Village development (site A) will not adversely impact the safe evacuation by vehicle or pedestrian means of the Georges Cove Marina (site D) or the Mirvac Georges Cove Residences (site C), even based on the very conservative SES assessment methodology. The infrastructure of the road to Brickmakers Drive and elevated pedestrian bridge to cross Brickmakers Drive have adequate capacity for the flood evacuation strategies for the three developments.

(d) incorporates appropriate measures to manage risk to life in the event of a flood, and

A Flood Emergency Response Plan has been prepared for the development and will be implemented by the Supermarket Manager and light industrial Flood Warden.

(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

The proposed development will not adversely impact on erosion or stability of river banks.

(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—

(a) the impact of the development on projected changes to flood behaviour as a result of climate change,

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The proposed development has a minimum commercially habitable floor level (Level 3) at RL 10.2m AHD. This will be 4.6m above the existing 100 yr ARI flood level and will readily cater for climate change impacts on flood levels to the year 2100.

(b) the intended design and scale of buildings resulting from the development,

The design and scale of the development is compatible with the site and surrounding development.

(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,

This report identifies that the addition of this Georges Cove Village development (site A) will not adversely impact the safe evacuation by vehicle or pedestrian means of the Georges Cove Marina (site D) or the Mirvac Georges Cove Residences (site C) based on the very conservative SES assessment methodology. The infrastructure of the road to Brickmakers Drive and elevated pedestrian bridge to cross Brickmakers Drive are adequate for the three developments.

(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.

The surrounding area is impacted by flooding and the flood emergency response plan caters for this flooding in terms of safe evacuation plans. The surrounding sites are not affected by coastal erosion.

8. Liverpool DCP

8.1 Merits Based Approach

The Liverpool DCP identifies in Section 9 that the *NSW Government Floodplain Development Manual 2005* and the *Flood Risk Management Manual June 2023* are based on a merit based approach to flood-prone land planning. It recognizes that it is about risk management in terms of personal safety and flood damages. The aim is to minimize these risks within acceptable bounds and the flood planning level (100yr flood level plus 0.5m freeboard-RL 6.1m AHD) is recommended as the acceptable bound for management of flood damages and the need for adequate evacuation above the PMF level for personal safety.

The DCP is a guideline document prepared for a broad range of developments. The flood planning matrix takes these broad land uses and provides guidelines for acceptable land uses in three flood hazard categories. The aim is to achieve the above objectives.

The proposed development is on a site which Council specifies in the agreed benchmark predevelopment landform as being above the 100 year ARI flood level and above the flood planning level except at the entrance off Newbridge Road. Hence the site is defined as a Low Flood Hazard category.

The proposed development conforms to the nine flood planning objectives as listed in Section 9 of the DCP. In Section 8.2 below, there is discussion as to how the proposed development, based on its merits, conforms to the flood planning objectives in the DCP.

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8.2 Flood Planning Objectives

a) to minimize the potential impact of development and other activity upon the aesthetic, recreational and ecological value of the waterways corridors.

The development site is not located within a waterway corridor however it minimizes the potential aesthetic, recreational and ecological impacts.

b) to ensure essential services and land uses are planned in recognition of all potential floods.

There are no essential services for the broader community incorporated into the development however the proposed uses of the development have been planned in recognition of all potential floods.

c) to reduce the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods

The proposed development complies with this objective and goes further by reducing the flood risks to below that normally accepted in floodplains in the following manner:-

- the open area above Level 1 would be constructed with flood compatible materials to reduce flood damages;
- all commercially habitable floor levels are at or above the PMF flood level;
- all parking floor levels are either above the FPL or above the PMF level;
- internal access is available to floor levels above the PMF level;
- there is pedestrian and vehicular flood evacuation access on routes above the 100yr flood level to areas external to the site above the PMF; and
- the building will be designed to withstand the hydraulic forces due to a PMF flood.

As such, the proposed development readily conforms to this objective.

d) to ensure that the economic and social costs which may arise from damage to property due to flood is minimized and is not greater than that which can be reasonably managed by the property owner and general community.

All commercially habitable uses on site are located at or above the PMF level and are flood free. All parking is located above the FPL and the building will be constructed of flood compatible materials below the FPL. This exceeds the Council's DCP requirements. Because the proposed development is designed to be beyond that typically conforming to the DCP (as described above for c), the economic and social costs are minimized beyond that normally considered acceptable.

As such, the proposed development conforms to this objective.

e) to limit developments with high sensitivity to flood risk (eg critical public utilities) to land with minimal risk from flooding

The proposed development does not have uses with a high sensitivity to flood risk.

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f) to prevent intensification of inappropriate use of land within high flood risk areas or floodways.

The proposed development is located in a low flood risk site and not in a floodway or high flood risk area. All commercially habitable land uses will be located on floor levels above the PMF flood level and will be flood free. On this basis, there is no intensification of inappropriate land use.

As such, the proposed development conforms to this objective.

g) to permit development with a lower sensitivity to the flood hazard to be located within the floodplain, subject to appropriate design and siting controls.

The proposed development conforms to this objective because it is located in a low flood hazard zone. The access to the site will not be overtopped by the 100yr ARI flood and all the commercially habitable floors will be above the PMF level. All retail and commercial uses will be located above the PMF and will be flood free. There is a Flood Safe Plan should the site need to be evacuated.

As such, the development will have appropriate land uses given the low flood hazard and the appropriate design and siting controls.

h) to ensure that development should not detrimentally increase the potential flood affectation on other development or properties either individually or in combination with the cumulative impact of development that is likely to occur in the same floodplain.

The proposed development site will not have significant adverse impacts on flooding behaviour on adjoining sites. Extensive flood modelling of these three development sites (A, C and D) has demonstrated that no adverse flood impacts would occur and thereby conforms to this objective.

i) to ensure that development does not prejudice the economic viability of any Voluntary Acquisition Scheme.

The proposed development would not affect or prejudice the economic viability of a voluntary acquisition scheme.

In summary, the proposed development conforms to all of the Council's DCP flood planning objectives and hence, based on a merits-based approach as recommended in the *NSW Government's Floodplain Development Manual 2005/Flood Risk Management Manual 2023* and Council's DCP, the Georges Cove Village development (site A) should be permitted.

9. Ministerial Directions under Section 9.1 EP&A Act

The proposed development is located on land zoned *E3* (formerly B6), *Productivity Support*. Section *4.1 Flooding* of the Ministerial Directions under Section 9.1 EP&A Act does not allow a significant increase in development within flood planning areas.

The Liverpool flood planning area maps indicate that a small component of the Council benchmark pre development site along the Newbridge Road frontage is in the flood planning area. The majority of the site, in its Council designated benchmark pre development state, is above the flood planning level. The Directions allow inconsistencies with this Direction if the inconsistency is of a minor

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significance. It is considered that the proposed inconsistency is of minor significance because it only involves a minor part of the site frontage along Newbridge Road which falls into the flood planning area. The majority of the site is not affected by this Direction.

Notwithstanding this justification, further justification is given below based on the proposed design of the development which ensures that the development conforms to the State and Council flood policies such that the risks to personal safety and flood damages are appropriately managed and even managed beyond the requirements of these policies. Liverpool Council has also given development approval for the developments on sites C and D. It is argued that because of this level of flood risk management, any inconsistency with the Direction will be of minor significance in terms of flood risk.

The significance is measured in terms of its impact on the objectives of the planning of flood prone land. These are outlined in the Section 4.1 Flooding Clauses (1) to (5). The degree to which the development would conform to these clauses is discussed as follows.

(1) shall be consistent with the NSW Flood Prone Land Policy and principles of the Floodplain Development Manual 2005/Flood Risk Management Manual June 2023

The proposed development does conform to these documents/policies in that it minimizes the potential flood risk to personal safety and property damages. It is to be located in a low flood risk area as per the Council DCP which is compatible with retail and commercial development.

(2) not rezone the land

The Planning Proposal is not seeking to rezone the land.

(3)(a) does not permit development in floodways.

The development would not be located within a Floodway. It is located in an area of Flood Storage and Flood Fringe.

(3)(b) not permit development that will result in significant flood impacts to other properties.

Extensive flood modelling by Cardno (which has been previously provided and accepted by Liverpool Council) has demonstrated that the development would not have any adverse flood impacts on other properties. In fact, the development by design would provide additional flood storage which would assist to reduce the flood risks in the local area.

(3)(c) not permit residential accommodation in high flood hazard areas.

The proposed development does not include dwellings and is not in a high flood hazard area.

(3)(d) not permit a significant increase in the development and/or dwelling density of that land.

No dwellings are proposed in the development of the Georges Cove Village development (site A). The site is now Zoned *E3 Productivity Support*. The proposed LEP amendment (this PP) for this land therefore would **not** increase the development of that land beyond its present zoning. Importantly from a flood risk point of view, this risk would be managed in accordance with Council and State government flood policies.

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(3)(e) not permit flood sensitive uses where the occupants of the development cannot effectively evacuate.

The development does not propose any sensitive uses of the site for which occupants cannot effectively evacuate.

(3)(f) not permit development without consent.

The proposed development requires Development Consent.

(3)(g) not impose significantly increased requirement government spending on flood management.

The proposed development does not impose significant increase in government spending of flood management. The development has been specifically designed to manage the flood risk and has a detailed Flood Safe Plan to manage any flood evacuation required for the site.

(3)(h) not permit hazardous materials that cannot be effectively contained in a flood

All the commercially habitable floor levels are at or above the PMF flood level and as such, are flood free. No hazardous materials will be stored at lower levels.

(5) not determine a flood planning level that is inconsistent with the Floodplain Development Manual 2005.

The flood planning level adopted for this development is consistent with the *Floodplain Development Manual 2005*.

The proposed development therefore conforms with requirements for flooding in the Section 9.1 Ministerial Directions which commenced on 1 March 2022.

10. Considering Flooding in Land Use Planning Guideline

This guideline provides recommendations to Council's to adopt revised flood related development guidelines under two headings into their Local Environment Plan. The first heading is *Flood Planning Areas* and this has been adopted into the Liverpool LEP. The proposed development complies with these requirements as detailed in Section 8.2 above.

The second heading recommended to Council was for Special Flood Considerations. This was related to requirements for flood sensitive and hazardous landuses such as hospitals, child care centres etc. Council has not adopted these Special Flood Considerations into the LEP, however, the proposed development does not contain any of the listed sensitive or hazardous land uses listed under the Special Flood Considerations in the guideline and as such, is not relevant to this development.

11. Planning Circular PS 21-006 14 July 2021

This circular provides advice on Council adoption of the revised Clauses 5.21 and 5.22 into their LEPs. Liverpool Council has adopted Clause 5.21 but not Clause 5.22. The requirements of Clause 5.21 have

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been dealt with in Section 8.2 of this report. Clause 5.22 deals with requirements for flood sensitive uses which make flood management and evacuation difficult. The proposed development does not have any of these flood sensitive uses.

The other recommendation in the *Planning Circular* is for Councils to use the Considering Flooding in Land Use Planning Guideline. The requirements of the guideline have been dealt with in Section 11 of this report.

12. DPE Draft Shelter in Place Guidelines

The DPE draft guidelines for *flood shelter in place* recommend that use of shelter in place is for flash flooding which the guideline recommends should be for an elevated flood level duration not longer than 6 hours in which evacuation is not possible from the site.

The proposed development could experience flood durations longer than 6 hours however, would nevertheless comply with this draft guideline in that the recommended flood evacuation strategy is for use of cars as the first stage and if for some reason this method fails, then pedestrian evacuation would be initiated as a second stage response. The use of a third stage, shelter place is not recommended but is readily and abundantly available on site should this be required. The light industrial floor level is at RL 15.2m AHD. **This level is 5 metres above the worst-case RL 10.2m AHD PMF level** and has availability to all amenities.

13. DPE Support for Emergency Management Planning 2022

This Flood Risk Management Guide EM01 from 2022 sets out seven principles for Flood Emergency Management (EM). The proposed development complies with the guiding principles in the following ways.

Principle 1 Any proposed EM strategy should be compatible with any existing community EM strategy

The proposed development flood emergency response plan integrates into the regional response plan with vehicular evacuation and integrates into the local pedestrian evacuation strategy approved for the Mirvac Georges Cove Residences (site C) development.

Principle 2 Decisions should be informed by understanding the full range of flood EM risks to the community

The proposed development and the flood emergency response plan has been informed by a knowledge of the behaviour of all floods up to the PMF, the inclusion of a three-stage flooding response to cater for all eventualities and a development design which will minimize flood damage.

Principle 3 Development of the floodplain does not impact on the ability of the existing community to safely and effectively respond to a flood

The proposed development uses the same vehicular and pedestrian evacuation routes and infrastructure as for the evacuation of the Mirvac Georges Cove Residences (site C) and Georges Cove Marina (site D) and this infrastructure has been provided to service these three developments on Sites

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A, C and D. Liverpool Council has approved the flood evacuation strategy for the Georges Cove Residences (site C).

There will be no adverse impacts on the ability of existing communities to safely and effectively respond to a flood (refer Section 16).

Principle 4 Decisions on redevelopment within the floodplain are supported by an EM strategy that does not increase risk to life from flooding

The development provides a two stage flood response plan which has been approved for two other developments (sites C and D) with infrastructure with sufficient capacity to accommodate the proposed development. As such, the proposed development will not increase the risk to life from flooding.

Principle 5 Risks faced by the itinerant population need to be managed

All people onsite are considered in the Emergency Response Plan, including itinerant people. There are no dwellings proposed for the Village which reduces the risk of the number of itinerant people being onsite. The development is a commercial-only development and the plan is instigated and managed by business related managers whose responsibility will be to ensure that all people respond appropriately to the warnings and instructions.

Principle 6 Recognize the need for effective flood warning and associated limitations

There will be regular training of the flood wardens and workers so that they are familiar with the flood warnings and timing to leave the proposed building. The BoM and SES will issue digital warnings which provide significant durations for the flood response. The Flood Wardens will be trained to initiate the first stage response in cars and if this appears to fail, then to initiate the second stage response which is a pedestrian evacuation. There will be information available regarding flood refuges and the potential dangers to people who do not initially wish to evacuate the site.

Principle 7 Ongoing community awareness of flooding is critical to assist effective emergency response

Regular training of all flood wardens and people working onsite will be undertaken along with practice evacuations so that all workers on site can assist with an evacuation in a flood.

14. *2022 Flood Inquiry Report* findings

There were 28 recommendations from the *2022 Flood Inquiry Report*. The majority of these recommendations related to government and community agencies. The recommendations which relate more directly to the subject development were related to essential services and flood education.

The development will need to provide essential services such as power, water and sewerage services during a flood. This can be achieved through design and appropriate location of these services. A backup generator may be considered necessary to ensure power to the Levels 3 and 4 and the provisions of potable water dispensers on these levels as well.

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With regard to flood education, the supermarket, retail shops and light industrial premises will each have a copy of the Flood Emergency Response Plan and Flood Safe Plan and the lease will require training of the flood wardens and annual training of all workers on the site in terms of flood behaviour and managing the flood evacuations. These requirements will be similar to the requirements for fire management.

These inclusions in the proposed development will address the relevant flood recommendations from the *2022 Flood Inquiry Report*.

15. Flood Emergency Response Plan

15.1 Flood Protection Measures

A Site Manager will be appointed by the building owner to be responsible for the site operations and maintenance. The Site Manager will have an office on site and will be responsible for the management, training and implementation of the flood responses on the site. This person will be the Chief Flood warden. The Site Manager on behalf of the building owner, will appoint two Flood Wardens (one for each of Levels 3 and 4) and Assistant Flood Wardens should any of the Flood Wardens be unavailable during a flood event. These wardens would be drawn from the supermarket Store Manager and tenant principals of the small retail/light industrial areas on each floor.

The Site Manager and Wardens would be trained by flood engineers as organised by the building owner as to the flood behaviour and flood response. The site manager would also be trained as to the building electrical and maintenance operations. People suited to this work are available from the large real estate companies who manage many different types of commercial and industrial buildings.

Training of the Site Manager and Wardens would be repeated on an annual basis so that they were familiar with any revisions or updates to the flood responses on the site.

All commercially habitable floor levels and most of the car parking areas in the development are at or above the PMF and therefore are flood free. During a PMF flood, the flood level would be RL 10.2m AHD. The only non-PMF level carpark is on Level 2 with a floor level of RL 7m AHD which is 0.9m above the Flood Planning Level (FPL) – 100yr ARI flood level plus freeboard of 0.5m.

Vehicle access to the site is available from the existing Mirvac Georges Cove Residences (site C) development onto Brickmakers Drive at RL 6m AHD or from Newbridge Rd at Level 1 with a level of RL 2.5m AHD.

There will be a remote-controlled gate installed across the driveway at the RL 2.5m AHD Newbridge Rd entrance to prevent vehicles from entering or leaving the site when the flood hazard in Newbridge Road is unsuitable for small cars ie more than 300mm flood depth. A flood depth marker will be installed at the driveway so that flood depths can be monitored to ensure the driveway gate was closed at the appropriate time. In addition, a water activated alarm will be installed to provide an audible and flashing light warning once flood waters reach RL 2.7m AHD ie 200mm deep on Newbridge Rd. Once the alarm is activated, the gate closing will be automatically activated. There will also be a manual override so that flood wardens can manually close the gate across the driveway. Once this gate is closed, all vehicles will be directed through the Mirvac Georges Cove Residences (site C) exit.

There will be a backup generator/battery storage system which will activate if there is any power failure on the site especially to the flood warning alarm and gate closing mechanisms.

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The site occupants will have full-time access available to their own office/warehouse units during all floods to access water, sanitation, food and emergency kits. The site manager would also have access in their office to water, sanitation and emergency kits in the site managers cupboards/storage units.

Signage will be provided near the car parking spaces to warn that during significant storms, cars may be prevented from leaving the site via the Newbridge Rd exit due to the unsafe flood hazard. The cars would then be directed to the Mirvac Georges Cove Residences (site C) evacuation route. Signage for the flood evacuation will be provided in the Mirvac Georges Cove Residences development indicating vehicular and pedestrian flood evacuation routes (refer Figure 16).

15.2 Flood Warning Actions

The BoM will provide a 12 hour flood warning for floods likely to rise above RL 4m AHD. This warning would be provided digitally to the Chief Flood Warden who would forward the warning to all Flood Wardens onsite. An alarm would then be activated to initiate a flood evacuation according to the Flood Emergency Response Plan. A message over the loudspeakers would be given over Levels 2 to 4 for people to return to their cars and evacuate the site by both the Newbridge Rd and Mirvac Georges Cove Residences (site C) access to Brickmakers Drive. The Flood Wardens would ensure that people were directed out of the retail and light industrial areas to the carparks and out of the development.

If flood levels rise more quickly than anticipated, the exit to Newbridge Rd shall be closed automatically by the flood gate. This will be obvious as the visible and audible alarm will indicate that this exit is closed. The flood wardens will then direct cars to the Mirvac Georges Cove Residences exit to Brickmakers Drive. This enacts the first stage of the FERP which is vehicle evacuation.

There would be some 13.6 hours warning time until flood waters would be expected to impact on access to Brickmakers Drive (100 yr flood level RL 5.6m AHD). As such, the time available for the vehicular evacuation from the site would be 13.6 hours. The exit of all the cars from the Georges Cove Village (site A) carpark and the other two developments (Mirvac Georges Cove Residences – site C and Georges Cove Marina – site D) would rely on the same flood infrastructure and should take no longer than 2 – 3 hours which provides considerable extra time for the evacuation based on the 13.6 hour warning time (refer Section 6.4). This duration is based on the very conservative SES evacuation road half-capacity for vehicular evacuation, rather than the actual design/as-built car capacity rating for these roads.

If the vehicle evacuation fails for some reason during the 2 - 3 hour period, the Chief Flood Warden would review the situation and if necessary, would instigate the pedestrian flood evacuation. There would be 14.6 hours warning for flood waters to reach RL 7m AHD which is the level in Paine Park at the end of the elevated pedestrian bridge over Brickmakers Drive.

The pedestrian flood evacuation would involve people walking from the Village to the elevated pedestrian bridge over Brickmakers Drive and north up Horizon Circuit until the ground levels are above the PMF flood level. This distance is approximately 1.2km and at the very conservative SES walking rate (2km/hr) and allowing for the bridge to be a pinch point, would take approximately 1.9 hours to evacuate all people from the local area including the Village (site A), Marina (site D) and Mirvac Georges Cove Residences (site C). This leaves considerable time (9.7 hours) for safe evacuation (based on the SES evacuation methodology) even if it starts after a failed vehicular evacuation say after 3 hours for the initiation of the flood evacuation.

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It should be remembered that each of the three Benedict/Mirvac developments (sites A, C and D) have design levels that provide fall back emergency for everyone to shelter in place above the PMF however, this will not be recommended.

15.3 Other Sources of Flood Information

15.3.1 Observation of Local Rainfall

An important indication of likely imminent flood activity would be intense local rainfall over a long duration.

15.3.2 Bureau of Meteorology

As discussed above, the Bureau of Meteorology does provide flood predictions for the subject area.

Severe Thunderstorm Warnings are issued together with maps indicating the current location and predicted path of thunderstorms. Severe Weather Warnings are for severe weather not related to thunderstorms, cyclones or fire, such as “east coast lows” or other causes of intense rainfall or storm surge.

These warnings are available at http://www.bom.gov.au/nsw/warnings/.

15.3.3 The NSW SES

The SES issues Local Flood Advices. These are issued on the basis of localized valley watch information for locations for which the BoM does not issue Flood Warnings. They normally predict which class of flooding (minor, moderate or major) will occur, and must not contradict any Flood Warnings provided by the BoM for other gauges on the same river. Local Flood Advices are to be clearly identified as being issued by the SES.

15.3.4 Flood Warning Actions

A. Heavy rainfall is experienced

During heavy rainfall a designated Flood Warden to commence visual monitoring of the entry on Newbridge Road.

B. The alarm sounds or flashes to confirm BoM or SES warnings

The Flood Wardens commence movement of people to their cars and directing them to the exits. The Flood Wardens monitoring car evacuation to ensure it occurs smoothly. If Newbridge Rd exit is closed by flood waters, then cars are to be directed to the Mirvac Georges Cove exit route. The Chief Flood Warden to decide after three hours if the pedestrian evacuation should be initiated. If so, then Flood Wardens manage pedestrian evacuation to the elevated pedestrian bridge over Brickmakers Drive. The Wardens are to ensure that all people leave the site.

15.3.5 Local Emergency Management

Liverpool Council works in collaboration with emergency service organisations to ensure the safety of the community. Council is required to appoint a Local Emergency Management Officer (LEMO) who in the event of an emergency in the Liverpool Local Government Area will act as the coordinator who will liaise with other emergency services such as NSW Police, Fire & Rescue and State Emergency Services.

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Council's LEMO also acts as the chair of the Local Emergency Management Committee. Council provides executive support to the committee which facilitates an effective communication network with all emergency response agencies and ensures that resources will be available to respond to emergencies if the need arises.

15.3.6 Local Television and Radio Stations

Local television and radio stations would disseminate warnings from the Bureau of Meteorology, SES and other relevant sources. Increasingly, mass SMS messaging is used to quickly communicate with nearly everyone.

15.4 Flood Response

15.4.1 Flood Awareness

Workers, visitors and shoppers on site will be made aware of the flood hazard and evacuation procedures through a combination of measures.

Signage will be placed at key locations to raise flood awareness among all people on site. The signage is to raise awareness to flooding on site and flood evacuation procedures.

Evacuation plans detailing the evacuation procedures will be provided to each shop, office, and light industrial premises along with placement at other key locations.

Flood warning signs may be provided to raise awareness of flooding during dry times, but also to alert visitors and workers to the depth of floodwaters during flood events.

15.4.2 Flood Safe Plan

A *Flood Safe Plan* for the property has been prepared and supplied as Attachment C. The *Flood Safe Plan* will need updating with relevant information following occupation of the buildings and annually in the future as appropriate. This review would be arranged by the Site Manager.

This includes the first aid training of Flood Wardens including the use of a battery-operated defibrillator.

15.4.3 Hazardous Materials

Possible hazardous materials should only be stored on Levels 3 and 4, above flood levels. The hazardous materials might include:

- Cleaning chemicals eg chlorine bleach; disinfectants, etc and
- Petrochemical fuels eg petrol, oil, diesel.

15.4.4 Utilities

The following items have been identified as infrastructure relevant in flood emergencies: electricity and water. During significant storms, interruptions may be experienced to electricity and pumps

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for water supply. Local substations may be affected by floodwaters in extreme events approaching the PMF. A backup generator is proposed for the site to provide emergency power supply to Levels 3 and 4 should there be a blackout in the area during a flood.

Water and gas may also become unavailable during severe flood events due to offsite network issues.

15.4.5 Operations and Responsibilities

Flood Wardens will co-ordinate the emergency response to flooding at all times. There will be up to 3 designated Flood Wardens for each floor on the building, plus a Site Manager, who is the Chief Flood Warden.

Flood Wardens will be trained by the Site Manager with assistance from flood engineers. A training register will be maintained by the Site Manager with annual audits to ensure that sufficient Flood Wardens are trained in the procedures.

Notwithstanding warnings and orders given by the SES, Police or other authorities, Flood Wardens are responsible for issuing directions and warnings to all workers and visitors.

A copy of this FERP or future version(s) will be stored on site in hardcopy in a weather proof, easily accessible location that is clearly marked and available to emergency services. Additional copies will be given to each office/warehouse and will be available for staff training and reference in an emergency.

15.4.6 Emergency Procedure

15.4.6.1 Informal Monitoring

Weather conditions can be monitored informally at http://www.bom.gov.au/nsw/warnings/ and the BoM also provides real time rain radar coverage for Sydney at http://www.bom.gov.au/products/IDR713.loop.shtml.

15.4.6.2 Flood Warden Actions

In accordance with the flood warnings, the following actions must be co-ordinated by the Flood Wardens.

A. *Heavy rainfall is experienced*

During heavy rainfall a designated flood warden to commence visual monitoring of the entry on Newbridge Road.

B. *The Flood alarm sounds or flashes*

The Flood Wardens instruct shops to cease trading and commence movement of people to their cars and directing them to the exits. The Flood Wardens monitoring car evacuation to ensure it occurs smoothly. If Newbridge Rd exit is closed by flood waters, then direct cars to the Mirvac Georges Cove exit route. The Chief Flood Warden to decide after three hours or sooner if the pedestrian evacuation should be initiated. If so, then Flood Wardens manage pedestrian evacuation towards the elevated pedestrian bridge over Brickmakers Drive. Wardens must ensure that all people leave the B6 site.

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15.4.7 Recovery

Following a flood event, people on site should notify family and friends of their location. The Site Manager and/or the Flood Wardens will inspect the site to organise any repairs, removal of debris and other works to ensure safe operations.

16. Conclusions

The proposed E3-zoned retail and light industrial/commercial development proposed in this Planning Proposal for Site A has been designed to exceed the State and Local Government requirements for flood management including considering the recent recommendations for the *2022 Flood Inquiry Report, Flood Risk Management Manual June 2023* and revisions to the flood-related State and Council Planning requirements. In addition, it considers the *Planning Circular PS 21-006 14 July 2021*, *DPE Shelter in Place Guidelines Draft*, *DPE Support for Emergency Management Planning* and *Considering Flooding in Landuse Planning*. It also complements the adjacent and recently approved development sites at Georges Cove Marina (site D) and Mirvac Georges Cove Residences (site C).

There is sufficient vehicular and pedestrian infrastructure to provide safe flood evacuation and a plan to be instigated by trained flood wardens in the case evacuation is required during severe flooding. There is also a fall-back emergency (not recommended), the shelter-in-place option available above PMF flood levels (if required) and additionally, the same option is provided in the approved Georges Cove Marina (site D) and Mirvac Georges Cove Residences (site C) developments.

The Planning Proposal for the B6 site is considered to reduce the site's reliance on the flood evacuation capacity of the Moorebank East precinct for the following reasons:

a. The Planning Proposal does not seek to increase the building height of floor space ratio of the site nor does it seek to introduce any additional land uses to the site which are not already permissible;
b. The Planning Proposal seeks to allocate greater floor space to a non-residential land use than what is currently permitted on site (4000m2 vs 1600m2) and as such reduces the potential residential yield of the subject site;
c. The Planning Proposal does not propose to allocate any floor space to a residential land use and proposes commercial and light industrial land use only, however residential land use is permissible on the subject site regardless of the Planning Proposal; and
d. Evacuation risks from the proposed non-residential land uses can be adequately managed and mitigated at the Development Application stage by way of measures including a Plan of Management, Flood Evacuation Plan, Flood Impact Assessment Report along with stringent conditions of development consent (eg – closure of the centre (including cars and pedestrian access) well in advance of flood events through implementation measures such as boom gates and barriers to car and pedestrian access.

In summary, the design of the proposed B6 development readily exceeds the flood risk management requirements of both Council and the State government.

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FIGURES

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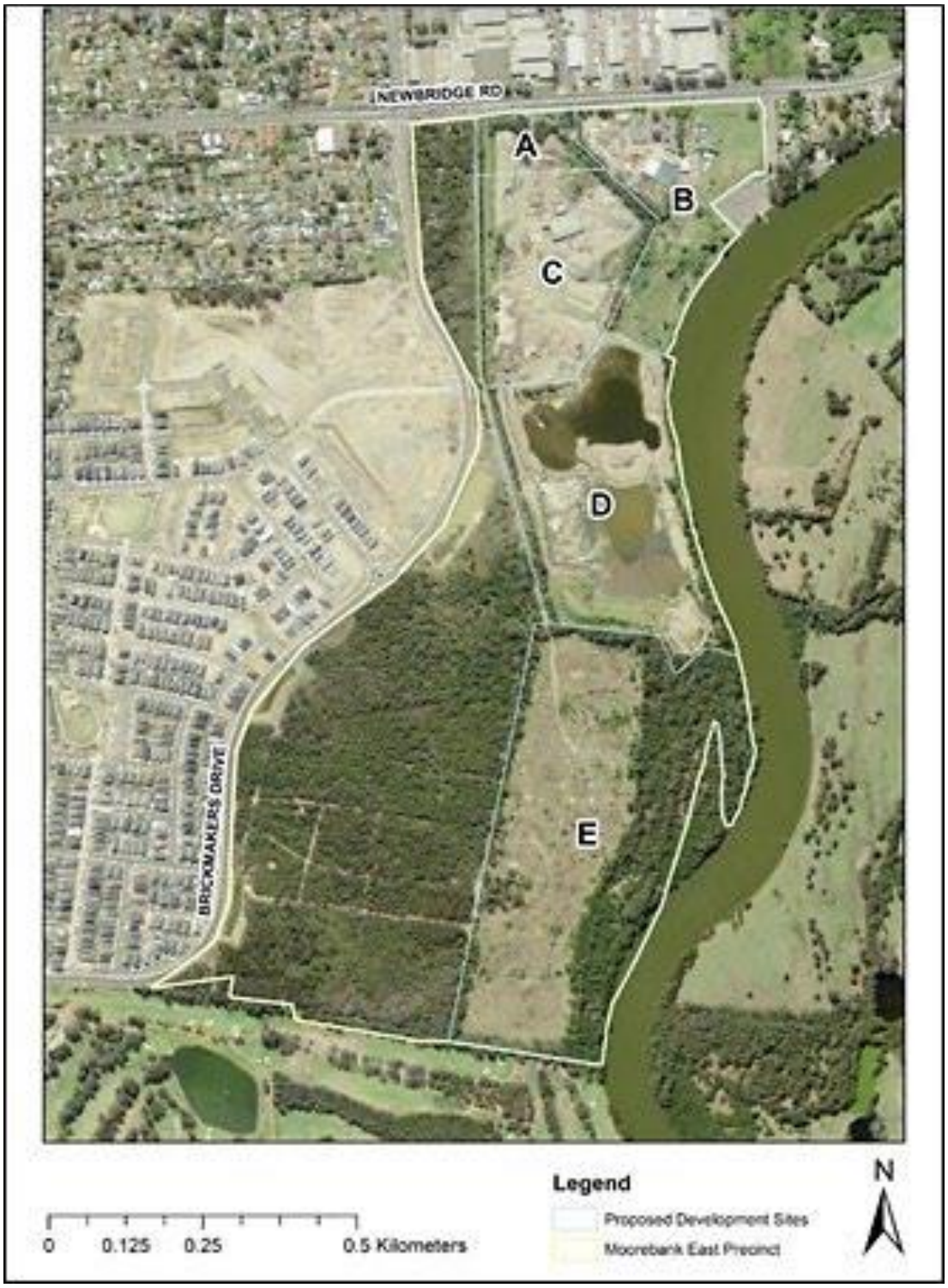
FIGURE 1

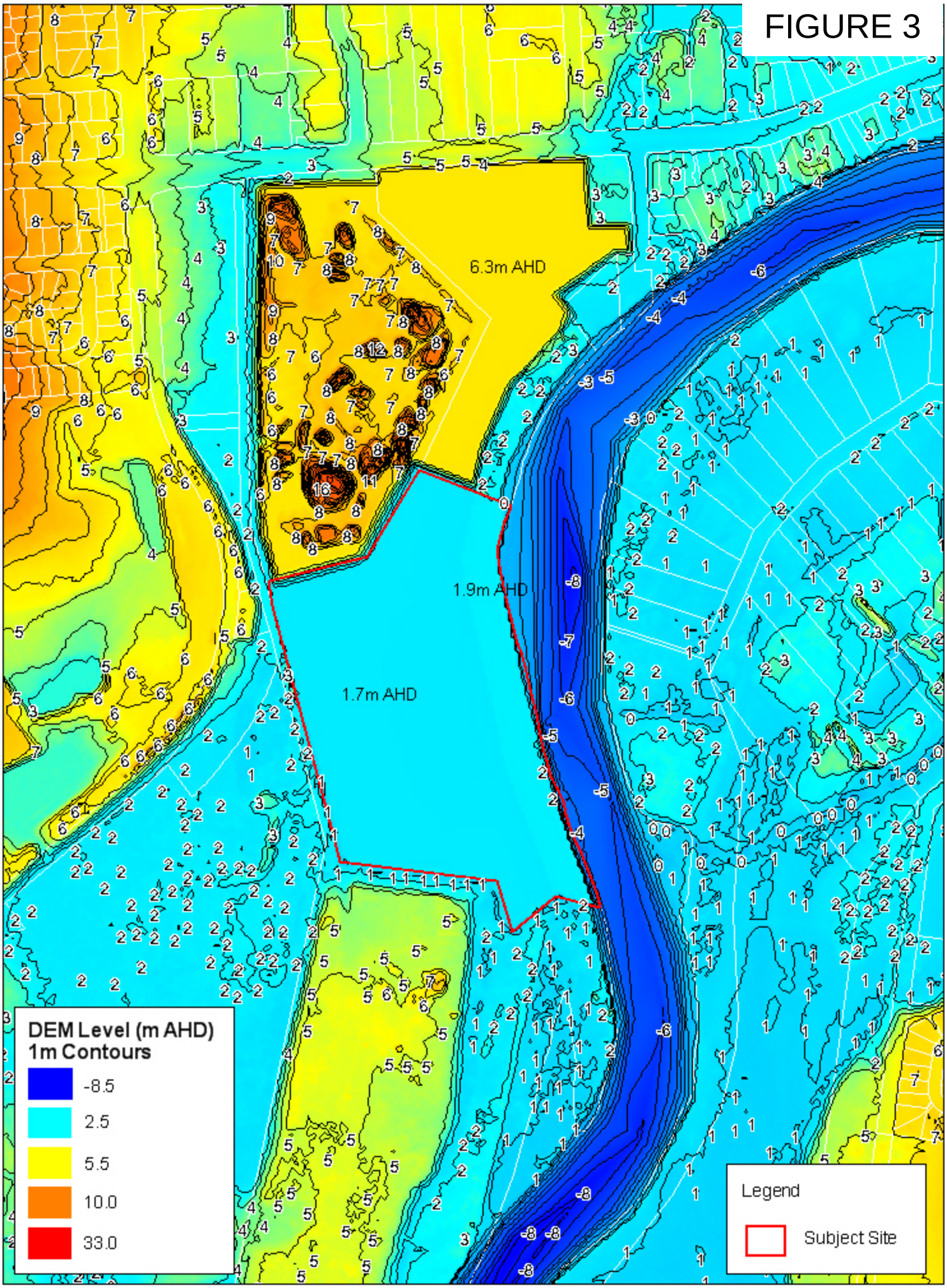
Proposed Georges Cove Village
Locality Plan

FIGURE 2



MOOREBANK EAST PRECINCT
SITE LOCATIONS

FIGURE 3



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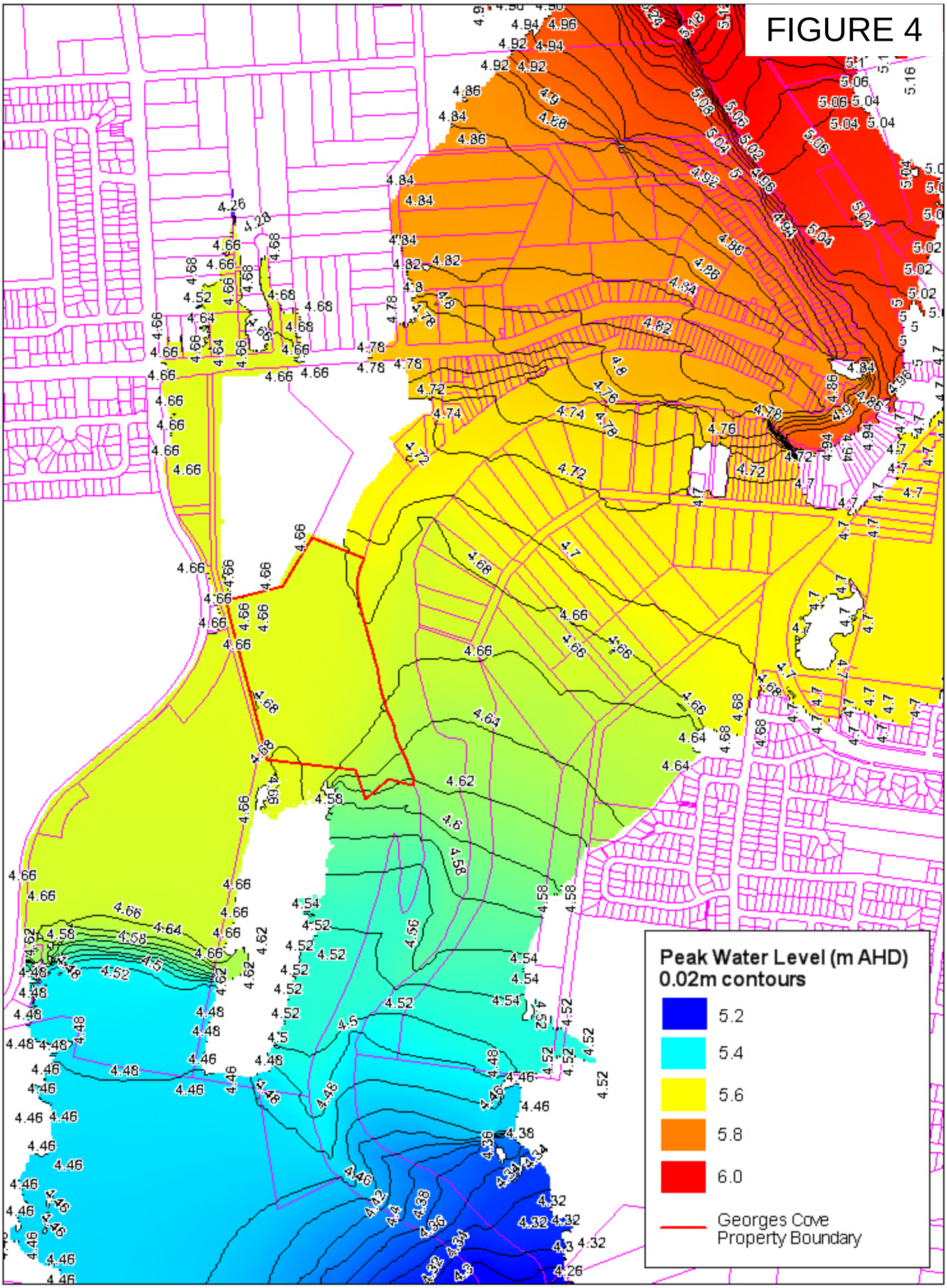
January 2013

Georges Cove
Flood Impact Assessment

Figure 2-5
Benchmark (Pre-Development) DEM

FIGURE 4



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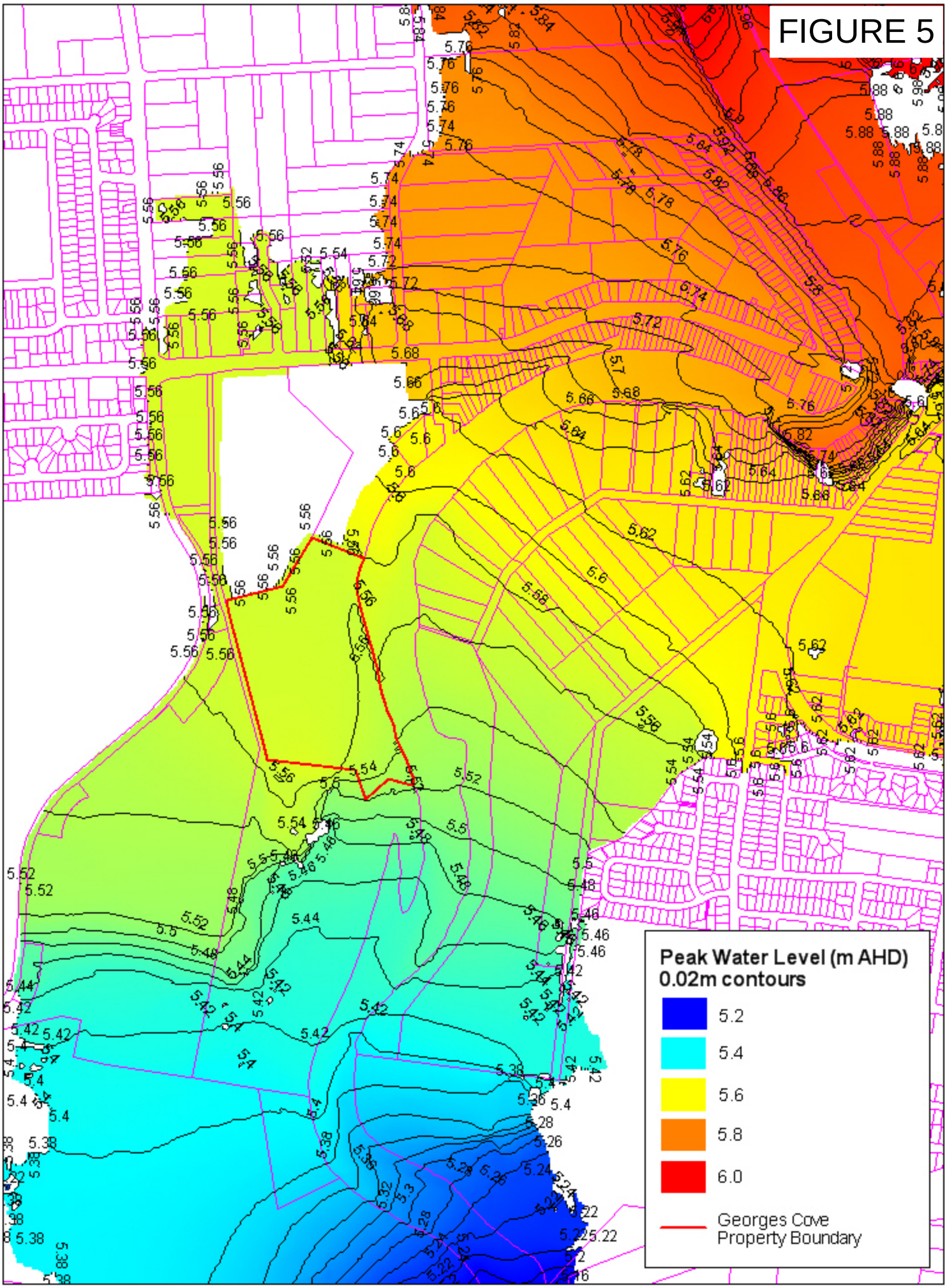
Georges Cove
Flood Impact Assessment

Figure 3-1
20 year ARI
Peak Water Level
Pre-Development

FIGURE 5



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Georges Cove
Flood Impact Assessment

Figure 3-6
100 year ARI
Peak Water Level
Pre-Development

DEVELOPMENT SUMMARY

LEVEL	PARKING	NLA COMMERCIAL	NLA RETAIL	CIRCULATION/ SERVICES
LEVEL 1 - DOCK	0.0 m²	0.0 m²	0.0 m²	216.9 m²
LEVEL 2 - PARKING	5786.1 m²	0.0 m²	0.0 m²	479.3 m²
LEVEL 3 - SUPERMARKET	2794.6 m²	3809.2 m²	1045.0 m²	862.7 m²
LEVEL 4 - INDUSTRIAL	4382.1 m²	3864.7 m²	0.0 m²	141.8 m²
LEVEL 5 - INDUSTRIAL MEZZANINE	0.0 m²	1251.9 m²	0.0 m²	0.0 m²
	12962.8 m²	8925.8 m²	1045.0 m²	1700.7 m²

GFA SCHEDULE

NAME	AREA
Core	83.0 m²
GFA_Office	4691.6 m²
GFA_Retail/Commercial	1585.0 m²
GFA_Supermarket	3797.6 m²
Services	230.2 m²
	10387.4 m²

GFA SUMMARY

LEVEL	GFA
LEVEL 1 - DOCK	83.0 m²
LEVEL 2 - PARKING	376.7 m²
LEVEL 3 - SUPERMARKET	5388.0 m²
LEVEL 4 - INDUSTRIAL	3264.2 m²
LEVEL 5 - INDUSTRIAL MEZZANINE	1275.6 m²
	10387.4 m²

AREA	PERMISSIBLE FSR	PERMISSIBLE GFA
17218.4 m²	0.75	12913.8 m²

Area Schedule (NLA - RETAIL)

Level	Area
LEVEL 3 - SUPERMARKET	5326.7 m²
	5326.7 m²

Area Schedule (NLA - INDUSTRIAL)

Level	Area
LEVEL 4 - INDUSTRIAL	3627.5 m²
LEVEL 5 - INDUSTRIAL MEZZANINE	1275.6 m²
	4903.0 m²

PARKING SCHEDULE

LEVEL	CARPARKS				CAR PARKING	MOTORBIKE PARKING
	INDUSTRIAL	INDUSTRIAL (ACCESSIBLE)	RETAIL	RETAIL (ACCESSIBLE)		
LEVEL 2 - PARKING	0	0	182	4	182	5
LEVEL 3 - SUPERMARKET	0	0	97	4	97	5
LEVEL 4 - INDUSTRIAL	72	2	0	0	72	0
	72	2	279	8	351	10

Area Schedule (NLA - RETAIL PARKING RATE)	
Area	Parking Rate (RETAIL)
5326.7 m²	266

Area Schedule (NLA - INDUSTRIAL PARKING RATE)	
Area	Parking Rate
4903.0 m²	140

Area Schedule (NLA - FACTORY PARKING RATE)	
Area	Parking Rate
4903.0 m²	65

Liverpool DCP:

1 disabled parking per 100 retail/commercial

Current Industrial LFA: 4923.5m^2

1 carpark per **35m^2** of **Office LFA**

1 carpark per **75m^2** of **Factory/Warehouse LFA**

Current Retail LFA: 5331.7m^2

1 carpark per **20m^2** of **Retail LFA**

LINK:
https://eplanning.liverpool.nsw.gov.au/Pages/Plan/Book.aspx?exhibit=OnlineControls&hid=4992&s=b6+enterprise+corridor

Liverpool Development Control Plan 2008 > Part 1 (General Controls for all Development) > 20 (Car Parking and Access) > 20.3 (On site parking)

SHEET LIST

No.	TITLE	REV.
SK00.00	DEVELOPMENT SUMMARY	P2
SK00.01	SITE PLAN	P6
SK01.01	LEVEL 1 - DOCK	P6
SK01.02	LEVEL 2 - CARPARK	P6
SK01.03	LEVEL 3 - RETAIL	P6
SK01.04	LEVEL 4 - LIGHT INDUSTRIAL	P2
SK01.05	LEVEL 5 - MEZZANINE OFFICE	P2
SK01.06	LEVEL 6 - ROOF	P2
SK02.01	SECTIONS	P2
SK03.01	WINTER SOLSTICE	P2
SK03.02	EQUINOX	P2
SK05.01	GFA PLANS	P4
SK05.02	NLA PLANS	P4

FIGURE 6

PLANNING PROPOSAL

Revisions

P1	20.12.22	FOR CLIENT REVIEW	DM
P2	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:16 AM

Project: **GEORGES COVE VILLAGE**
146 Newbridge Rd
MOOREBANK, NSW

Drawing: **DEVELOPMENT SUMMARY**

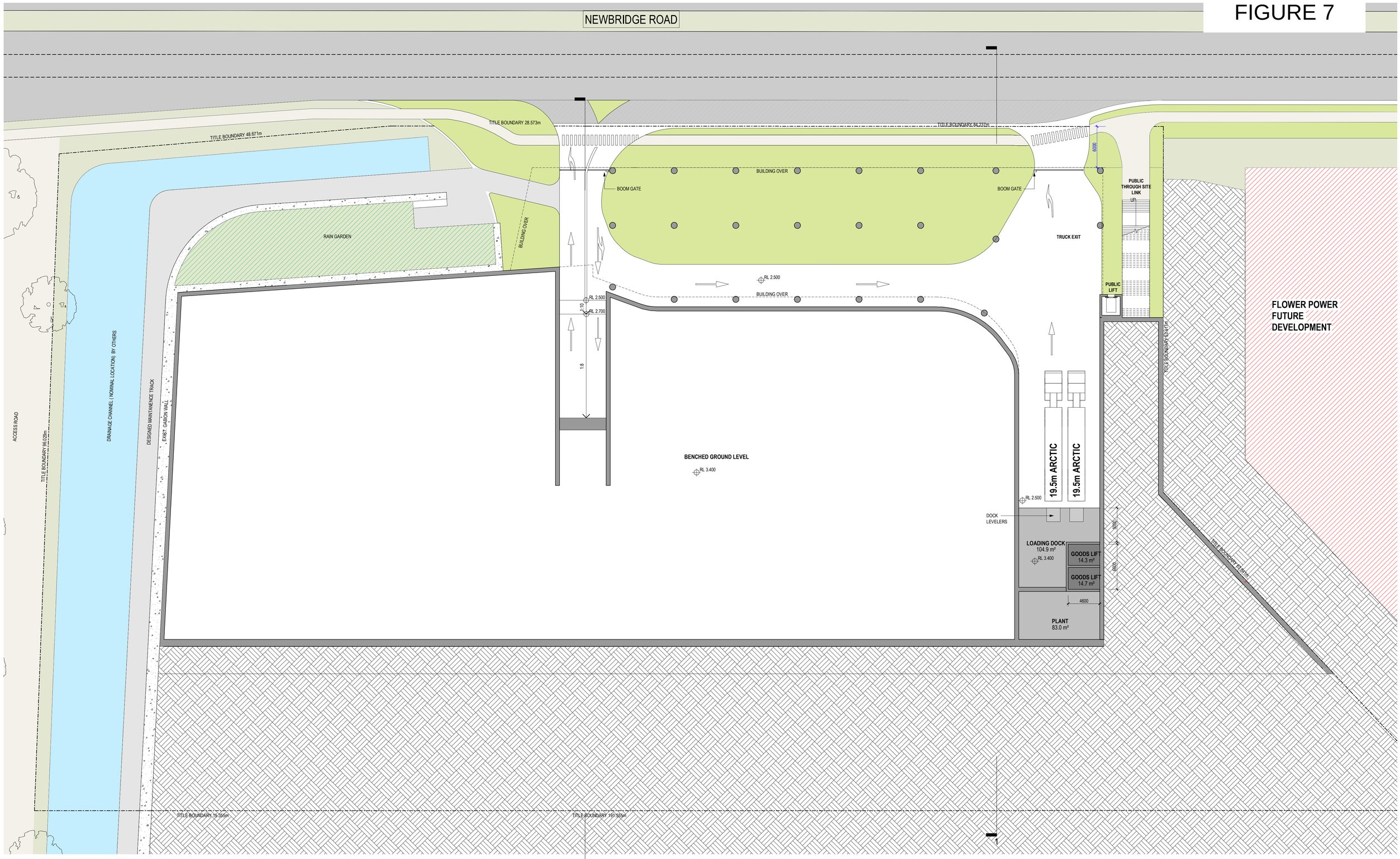
Project No: **214205** Date: **20.12.22** Author: **DM** Scale: @ A1

Drawing No.: **SK00.00 P2**

rothelowman

Brisbane, Melbourne, Sydney
www.rothelowman.com.au

FIGURE 7



PLANNING PROPOSAL

Revisions			
P2	20.06.19	FOR CLIENT REVIEW	JLi
P3	19.08.19	FOR CLIENT REVIEW	JLi
P4	28.08.19	FOR CLIENT REVIEW	JLi
P5	20.12.22	FOR CLIENT REVIEW	DM
P6	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:31 AM

Project: **GEORGES COVE VILLAGE**
146 Newbridge Rd
MOOREBANK, NSW

Drawing: **LEVEL 1 - DOCK**

Project No: **214205**

Date: **20.12.22**

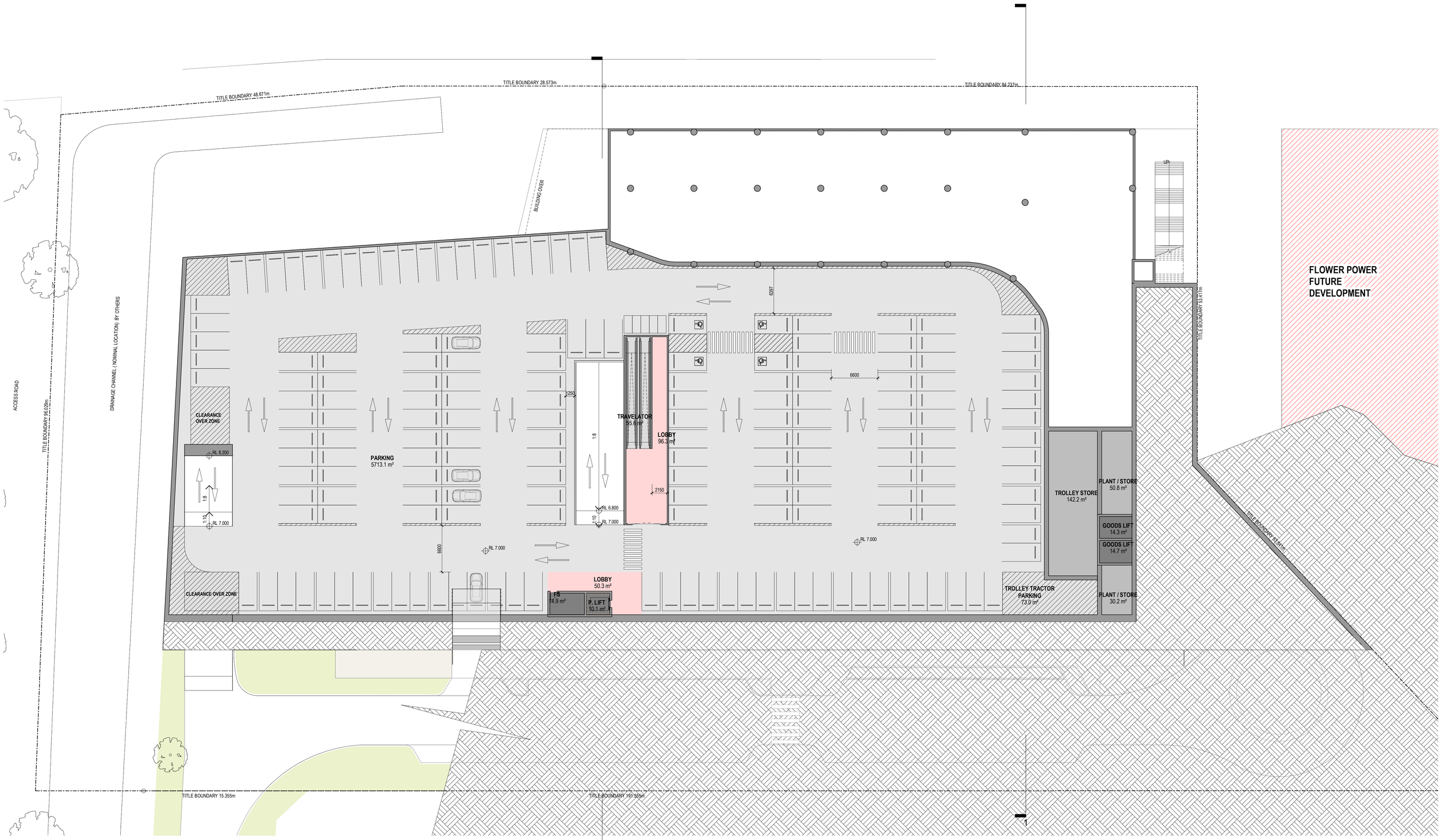
Author: **DM**

Scale: @ A1 **1 : 250**

Drawing No.: **SK01.01 P6**

rothelowman
Brisbane, Melbourne, Sydney
www.rothelowman.com.au

FIGURE 8



PLANNING PROPOSAL

Revisions			
P2	20.06.19	FOR CLIENT REVIEW	JLi
P3	19.08.19	FOR CLIENT REVIEW	JLi
P4	28.08.19	FOR CLIENT REVIEW	JLi
P5	20.12.22	FOR CLIENT REVIEW	DM
P6	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:35 AM

Project: **GEORGES COVE VILLAGE**
146 Newbridge Rd
MOOREBANK, NSW

Drawing: **LEVEL 2 - CARPARK**

Project No: **214205**

Date: **20.12.22**

Author: **DM**

Scale: @ A1 **1 : 250**

Drawing No.: **SK01.02 P6**

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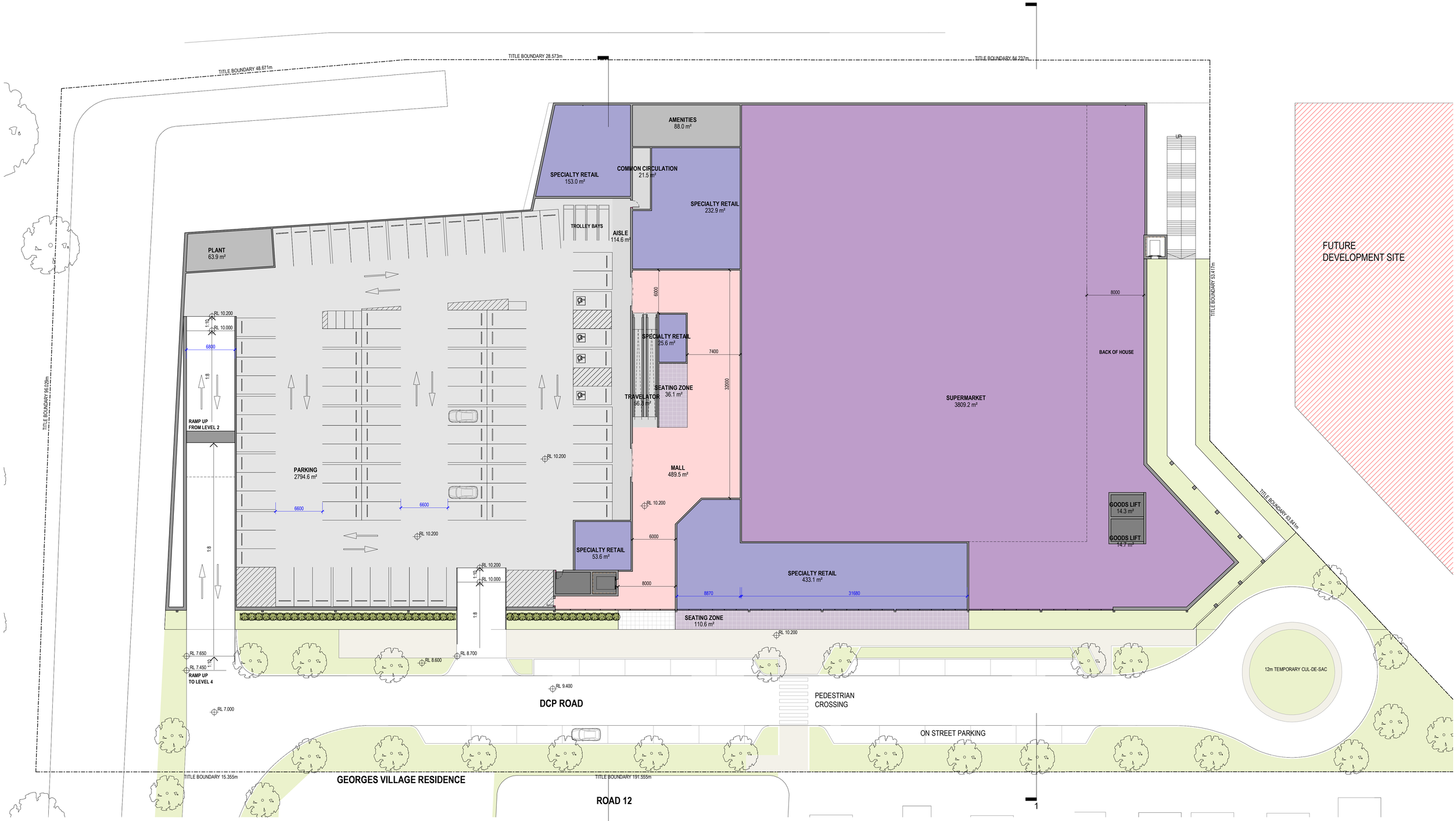
Brisbane, Melbourne, Sydney
www.rothelowman.com.au

FIGURE 9



PLANNING PROPOSAL

Revisions			
P2	20.06.19	FOR CLIENT REVIEW	JLi
P3	19.08.19	FOR CLIENT REVIEW	JLi
P4	28.08.19	FOR CLIENT REVIEW	JLi
P5	20.12.22	FOR CLIENT REVIEW	DM
P6	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:42 AM

Project: **GEORGES COVE VILLAGE**
146 Newbridge Rd
MOOREBANK, NSW

Drawing: **LEVEL 3 - RETAIL**

Project No: **214205**

Date: **20.12.22**

Author: **DM**

Scale: @ A1 **1 : 250**

Drawing No.: **SK01.03 P6**

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FIGURE 10

PLANNING PROPOSAL

Revisions

P1	20.12.22	FOR CLIENT REVIEW	DM
P2	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:48 AM

Project: GEORGES COVE VILLAGE
146 Newbridge Rd
MOOREBANK, NSW

Drawing: LEVEL 4 - LIGHT INDUSTRIAL

Project No: 214205

Date: 20.12.22

Author: DM

Scale: @ A1: 1 : 250

Drawing No.: SK01.04 P2

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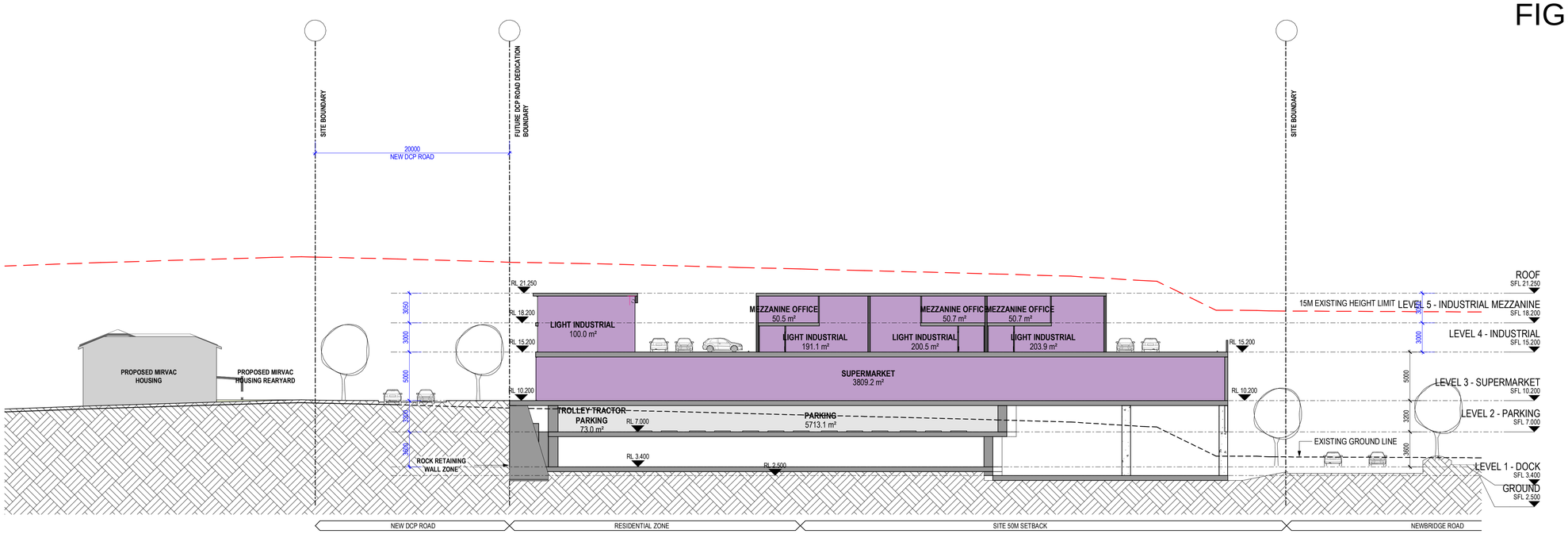
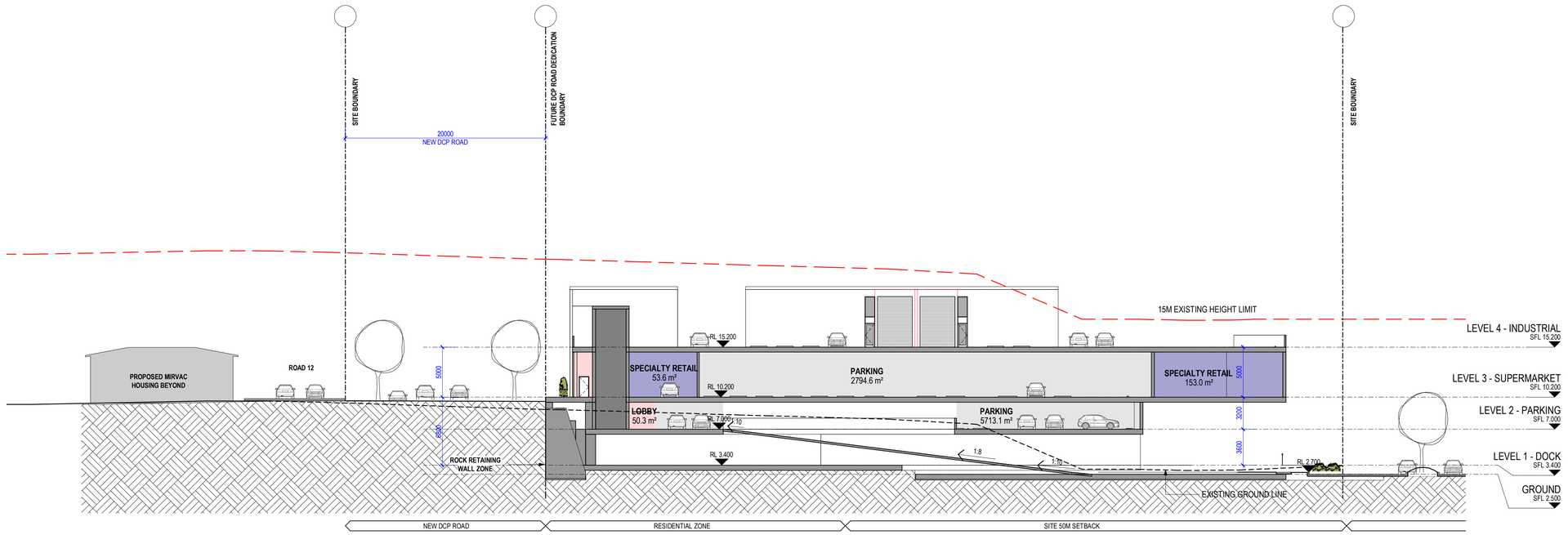
FIGURE 11



SECTION_1



SECTION_2

PLANNING PROPOSAL

Revisions			
P1	20.12.22	FOR CLIENT REVIEW	DM
P2	31.03.23	FOR CLIENT REVIEW	DM

31/03/2023 11:57:59 AM

Project: **GEORGES COVE VILLAGE**
146 Newbridge Rd
MOOREBANK, NSW

Drawing: **SECTIONS**

Project No: **214205**

Date: **20.12.22**

Author: **DM**

Scale: @ A1 **1 : 250**

Drawing No.: **SK02.01 P2**

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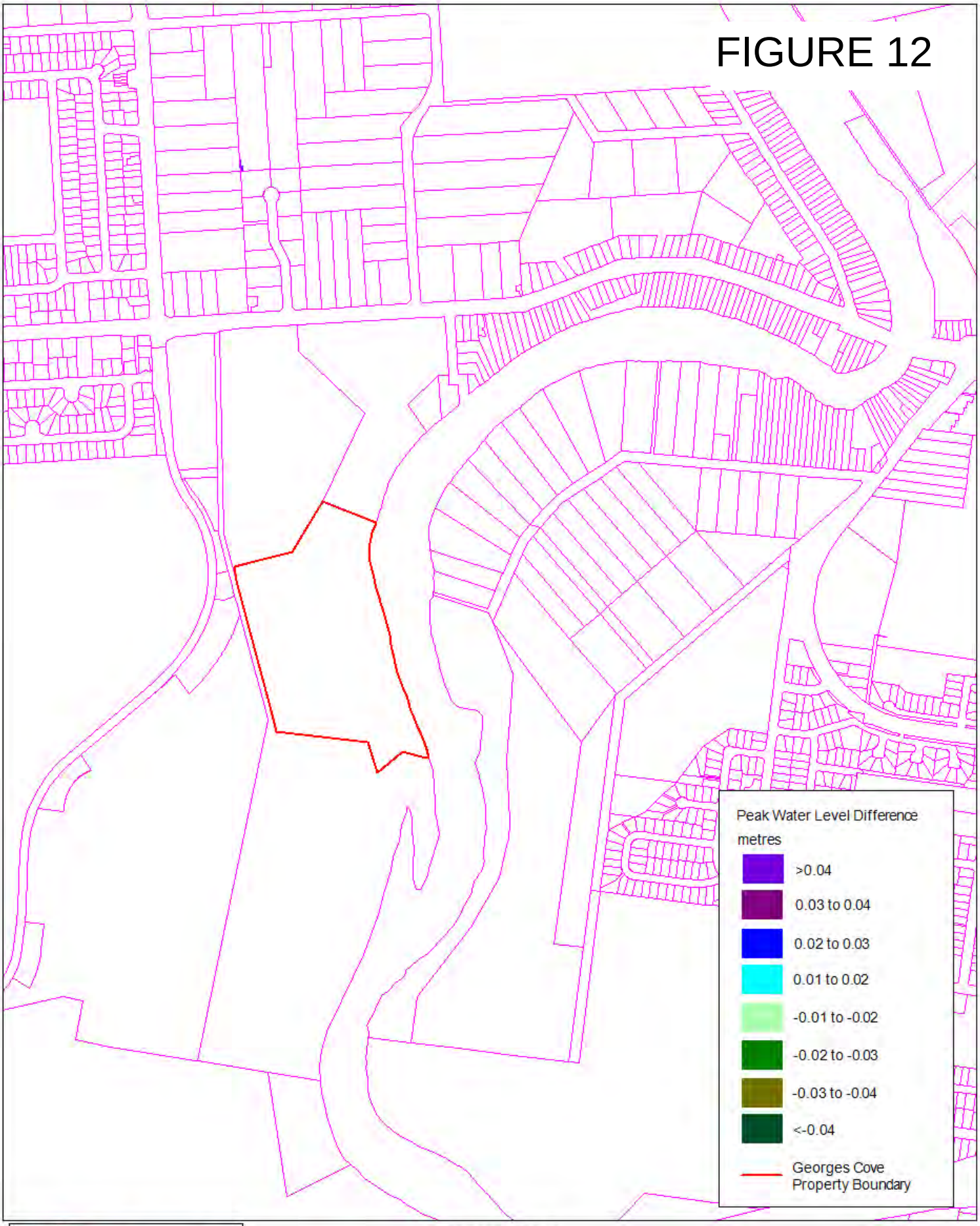
www.rothelowman.com.au

FIGURE 12



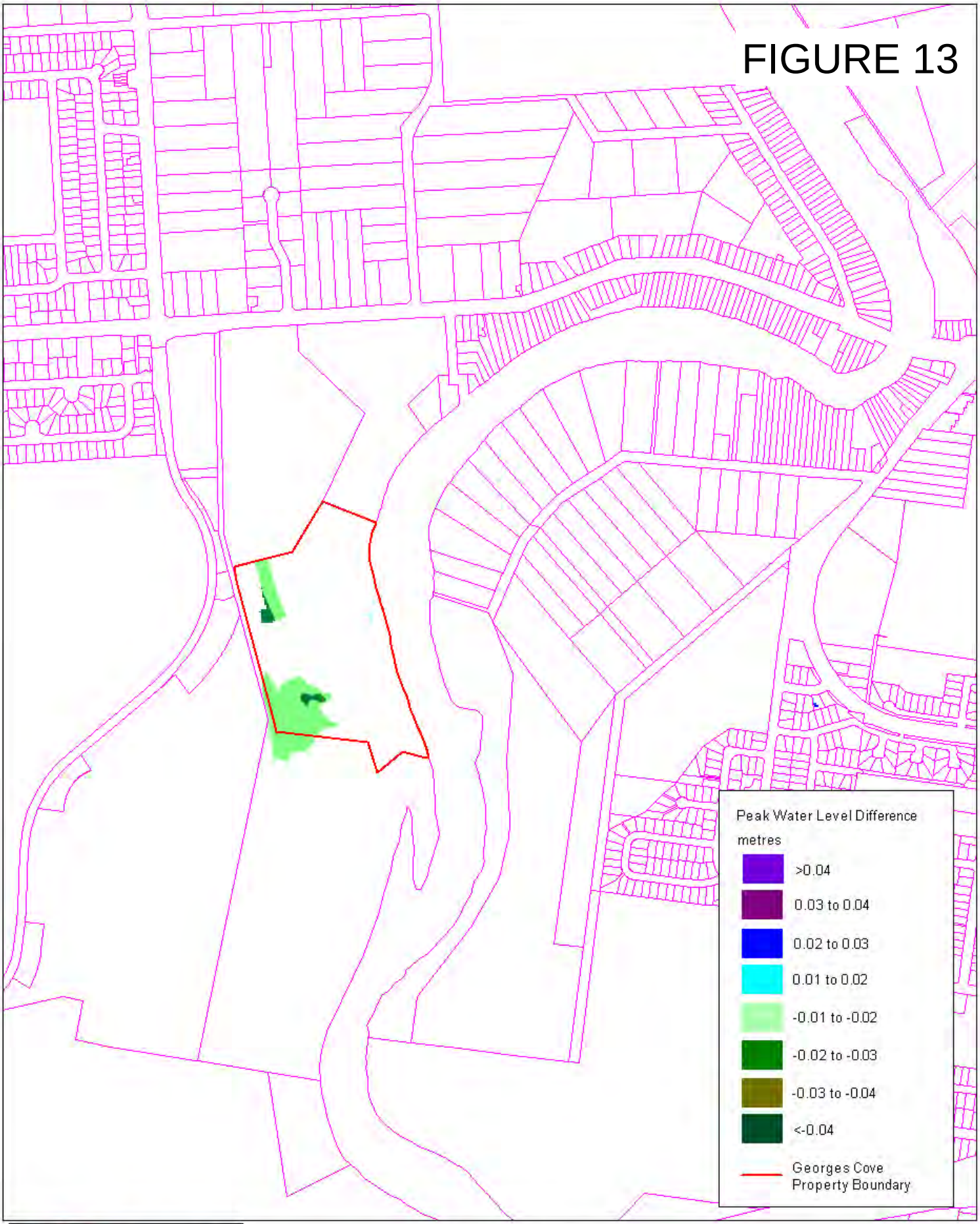
Cardno

Georges Cove
Flood Impact Assessment

Figure
20 year ARI
Peak Water Level Difference
Design (Jan18) Less Approved Design

NA49913037
January 2018

FIGURE 13



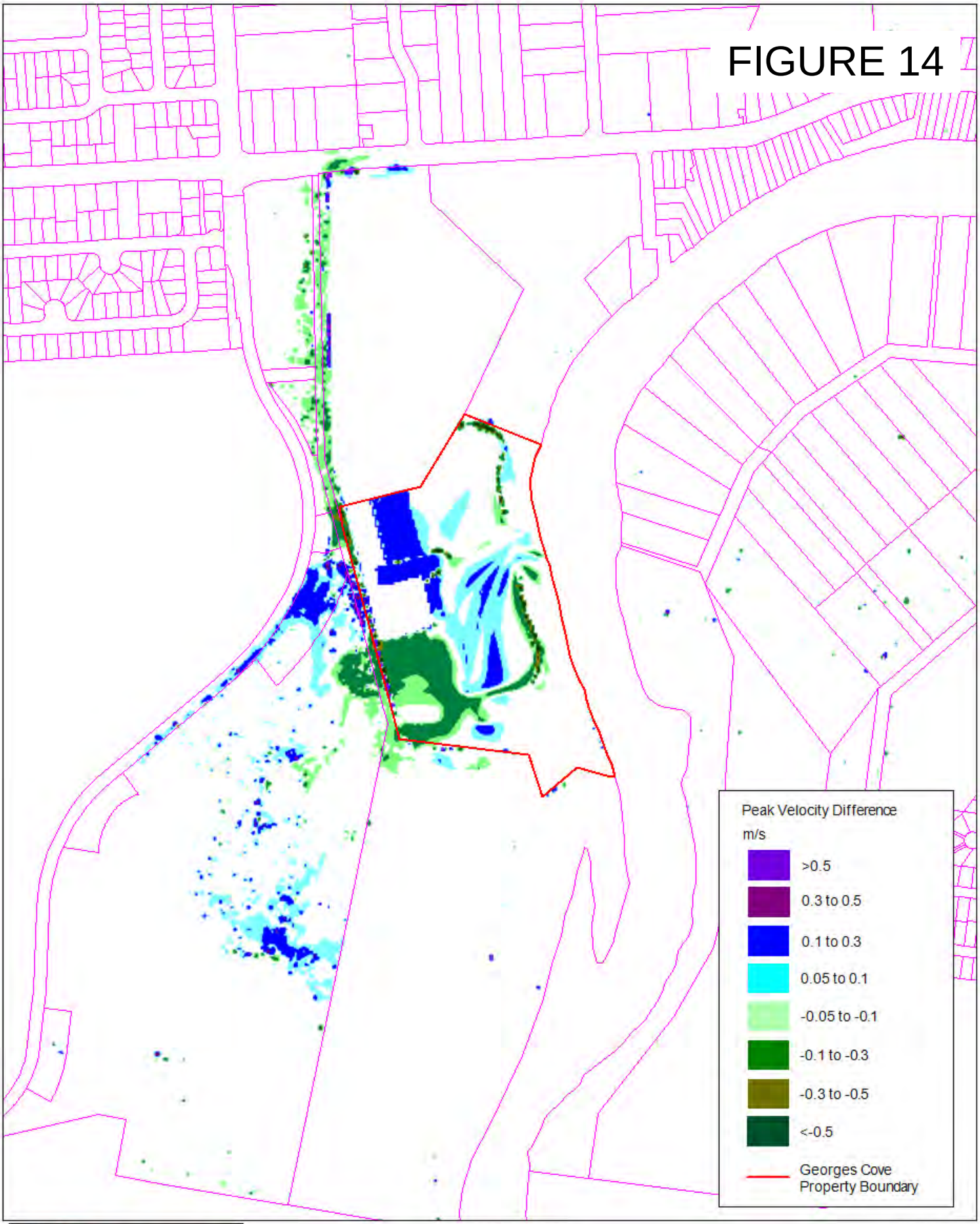
Cardno

Georges Cove
Flood Impact Assessment

Figure
100 year ARI
Peak Water Level Difference
Design (Jan18) Less Approved Design

NA49913037
January 2018

FIGURE 14



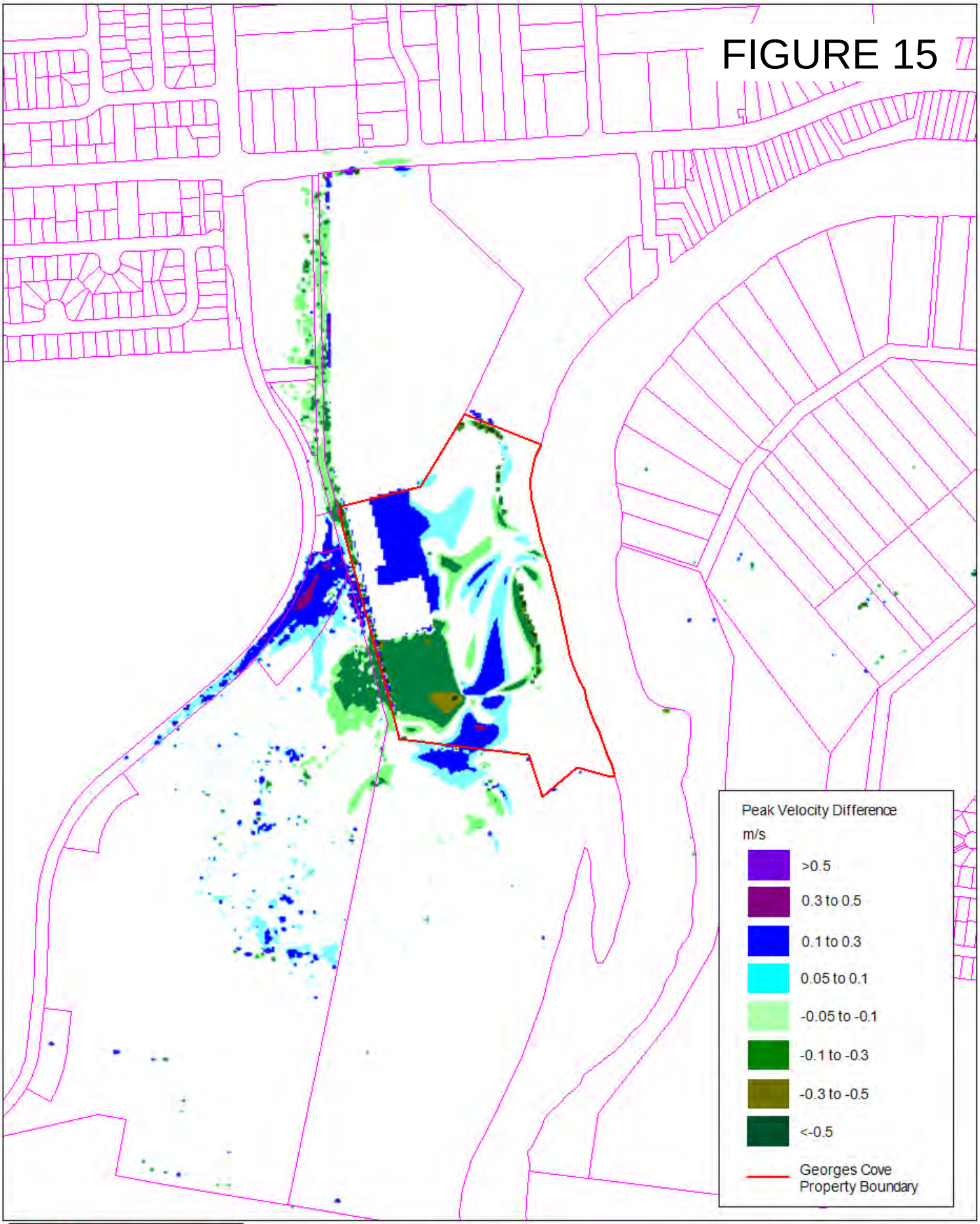
Cardno

NA49913037
January 2018

Georges Cove
Flood Impact Assessment

Figure
20 year ARI
Peak Velocity Difference
Design (Jan18) Less Approved Design

FIGURE 15



Cardno

NA49913037
January 2018

Georges Cove
Flood Impact Assessment

Figure
100 year ARI
Peak Velocity Difference
Design (Jan18) Less Approved Design

FIGURE 16

LEGEND

DENOTES EMERGENCY FLOOD EVACUATION ROUTE & DIRECTION

9.14 X — DENOTES PROPOSED DESIGN LEVEL

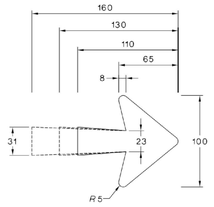
DENOTES VEHICULAR FLOOD EVACUATION ROUTE

VEHICULAR FLOOD EVACUATION DIRECTIONAL SIGN & DIRECTION OF VIEWING (160mm LONG ARROW)

VEHICULAR FLOOD EVACUATION START SIGN & DIRECTION OF VIEWING

PEDESTRIAN FLOOD EVACUATION INFORMATION SIGN (SIGN TO BE PLACED ABOVE DIRECTIONAL SIGN)

PEDESTRIAN FLOOD EVACUATION DIRECTIONAL SIGN & DIRECTION OF VIEWING (160mm LONG ARROW)



DETAIL OF ARROW DIMENSIONS
RATIO: NTS

DIRECTION ARROW TO ROTATE 90° WHEN CHANGING DIRECTION AT AN INTERSECTION

PT 310
DP1118048

PEDESTRIAN BRIDGE

PAINE PARK

ROAD NO. 1

MULLOWAY LANE

MAINSTAY STREET

ANGLER AVENUE

SPINNAKER DRIVE

KETCH LANE

SHORELINE ROAD

MAST PLACE

PROMONTORY WAY

BRICKMAKERS DRIVE

HORIZON CIRCUIT

MARBLE ROAD

TRAVERS STREET

NUVO STREET

MADDECKS AVENUE

PT 19

PT1

PT 200
DP1117280

2
DP602988
(FLOWER POWER)

LOWEST LEVEL IN THE SOUTHERN PORTION OF THE SITE

LOT 3 (Stage 1)
(FUTURE MARINA)

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRN.	APP.
E	SIGNAGE AMENDED	24-08-2022	J.O.	S.G.
D	SIGNAGE ADDED	10-08-2022	J.O.	S.G.
C	REISSUED WITH MINOR NOTES AMENDMENTS	07-03-2020	S.G.	S.G.
B	ISSUED FOR INFORMATION	06-03-2020	S.G.	S.G.
A	ISSUED FOR INFORMATION	26-08-2020	S.G.	S.G.
G	AMENDED SIGN LOCATIONS	08-09-2022	S.G.	S.G
F	ISSUED FOR INFORMATION	31-08-2022	S.G.	S.G.

Client:
MIRVAC HOMES
(NSW) PTY LTD.

0 16 32 48 64
SCALE 1:800 AT A1 SIZE

Designed S.GRAY 26-03-2020
Drawn S.GRAY
Approved -
Date -
PS Number

Beveridge Williams
32 Iolanthe Street
Campbelltown NSW 2560
ph: 02 4625 5055
www.beveridgewilliams.com.au

Project Details: MOOREBANK COVE
NEWBRIDGE ROAD, MOOREBANK

Drawing Title: FLOOD EMERGENCY EVACUATION ROUTE

Sheet 1 of 1
Scale 1:800 @ A1

Project Ref	Stage No	Drawing No	Rev
14005	E45	350	E

S:\JOBS\14\14005\14005 EMW\ENG\CAD\E45 - FLOOD EVAC\14005E45-FLOOD EMERGENCY.dwg

ATTACHMENT A
FLOOD SAFE PLAN

m 0409 912 631 e mark.tooker@tookerandassociates.com.au a 30 Walworth Avenue, Newport abn 39 619 046 070

Flood Safe Plan

Appendix A

Georges Cove Village 146 Newbridge Rd Moorebank

Potential impacts of flooding on workers and visitors	Severity level
People's health and safety are compromised	Low
Frail and elderly customer evacuation	Low
Property is damaged or destroyed	Low
Cars and other property in car park damaged	Low
Profits are lost or service provision stopped	Low
Retail goods are damaged or ruined	Low

Triggers for actions now and always

Actions that can be done immediately and maintained to reduce the potential impact of flooding are detailed as follows.

Actions

Action	How to do it	Who will do it	What you will need	Estimated time needed	Completed
Inform workers and visitors that flooding is a real risk	Use signage in car park and entry, and train flood wardens	Site Manager, Flood Wardens	Training procedures and policies, this plan	1 hour for training	[ ]
Display the FloodSafe Plan and poster	Display Flood Safe Plan in car park and entry and with each tenant	Site Manager	Copy of the flood safe plan	30 minutes	[ ]
Encourage staff to participate in development & implementation of this plan	Site tenant Meeting	Site Manager, Flood Wardens	Flood safe plan and computer	2 hours	[ ]
Ensure OH&S procedures cover specific risks associated with floods	Management meeting to review existing plans and modify where necessary	Site Manager	Copies of all the plans and site audit to identify risks	2 hours	[ ]
Maintain an up to date list of emergency contact numbers for tenants	Management meeting	Site Manager	Various updated contact details and maintain data base	30 minutes	[ ]
Train tenants and workers in flood procedures	Management meeting and training sessions	Site Manager	Copies of the flood safe plan	1 hour	[ ]
Incorporate flood awareness in tenant management and worker induction training	Staff induction manual	Site Manager	Staff induction manual	1 hour	[ ]
Prepare an Emergency Kit	Gather items and store in suitable	Site Manager	Emergency kit to contain torch with	2 hours	[ ]

	location on site and accessible.		spare batteries, portable radio with spare batteries, first aid kit, candles, waterproof matches, waterproof bag for valuables and mobile phone, and a copy of the emergency contacts list and a copy of the flood safe plan		
Ensure flood wardens know flood evacuation actions	Staff training and emergency drills	Site Manager	Building plans	2 hours	[ ]
Store backups of important computer files and critical paper records in suitable location	Create computer backups and paper copies of critical documents and store in suitable location or off-site.	Business owners, Site manager, staff	On-site storage and off-site storage location	1 hour	[ ]

Triggers for actions when flooding is likely

- Heavy rainfall
- The Bureau of Meteorology issuing a Flood Watch
- The Bureau of Meteorology issuing a Severe Weather Warning or Severe Thunderstorm Warning indicating a likelihood of flash flooding
- The Bureau of Meteorology issues flood warning for flood levels above RL 4m AHD
- The State Emergency Service issues flood evacuation order

Actions

Action	How to do it	Who will do it	What you will need	Estimated time needed	Completed
Notify tenants and workers of any warnings	In person and using wardens	Site Manager, Flood Wardens	Broadcast system for verbal warnings to tenants	30 minutes	[ ]
Keep radio tuned to local radio station, keep in contact with BoM, SES and monitor relevant websites	http://www.bom.gov.au/nsw/warnings/ http://www.bom.gov.au/products/IDR713.loop.shtml http://new.mhl.nsw.gov.au/Site-213435	Site Manager	Radio, 4G/5G enabled device and spare batteries	While flooding is likely	[ ]
Ensure flood wardens and staff are aware of Flood Watch or a Severe Weather Warning	In person and using wardens	Site Manager / Flood Wardens			[ ]
Prevent tenants, workers and visitors leaving the site to Newbridge Rd	When ponding occurs on Level 1 and alarm activated and exit gate closes automatically	Site Manager and flood wardens	One flood warden manning the exit	Duration of unsafe conditions	[ ]
Evacuate workers / visitors	Announce flood evacuation order over PA system and direct people to their cars for vehicular evacuation.	Site Manager and flood wardens			[ ]

Back up important computer files and critical paper records and take to the mezzanine level		Site manager or designated staff member			[ ]

Triggers for actions during a flood

Heavy rainfall is experienced

During heavy rainfall a designated flood warden to commence visual monitoring of the entry on Newbridge Road.

The alarm sounds or flashes to confirm BoM or SES flood warnings

The flood wardens commence movement of people to their cars and directing them to the exits. The flood wardens monitoring car evacuation to ensure it occurs smoothly. If Newbridge Rd exit is closed by flood waters, then direct cars to the Mirvac Georges Cove exit route. Chief flood warden to decide after three hours if the pedestrian evacuation should be initiated. If so, then flood wardens manage pedestrian evacuation to the elevated pedestrian bridge over Brickmakers Drive. Wardens ensure all people leave the site.

Action	How to do it	Who will do it	What you will need	Estimated time needed	Completed
Keep in contact with tenants and keep them updated on the situation	Implement staff contacting strategies using tenant meetings, telephone calls or briefings	Site Manager	Radio to obtain up to date information and liaison with the SES if needed; computer or 4G/5G	On going during event	[ ]

			device to check websites		
Do not enter flood water or attempt to leave the building	Ensure wardens are trained and providing relevant information to customers	Site Manager and flood wardens	Latest information and Flood Safe Plan	On going during event	[ ]
Keep radio tuned to local radio station, keep in contact with SES and monitor relevant websites	Tune radio to ABC Local Radio 702 AM; http://www.bom.gov.au/nsw/warnings/ http://www.bom.gov.au/products/IDR713.loop.shtml	Site manager and flood wardens	Radio, spare batteries, phone, computer and 4G/5G mobile device	During event	[ ]
Monitor tenant and worker to ensure safety	Ensure all people onsite are well informed and adhering to flood response actions	Site manager and flood wardens	Undertake regular inspections of floor/tenants	During flood event	[ ]

Triggers for actions after a flood

- Site Manager or flood wardens issue all clear
- The NSW State Emergency Service issue an all clear

Actions

Action	How to do it	Who will do it	What you will need	Estimated time needed	Completed
Before re-occupying the premises undertake an OH&S risk assessment	Conduct a visual risk assessment of external areas, the car park and ground level if appropriate, looking for structural damage, damage to services, dangerous debris, etc.	Site Manager and flood wardens	Any safety equipment that is deemed necessary		[ ]
Remove debris and clean, repair and disinfect any levels which were inundated	With appropriately skilled personnel	Site Manager to organise			[ ]
Replace any essential plant, equipment that is damaged as soon as possible	With appropriately skilled personnel	Site manager to organise			[ ]
Restore critical records, computer equipment and files	With appropriately skilled personnel	Site manager to organise			[ ]

Staff Contact List

Name	Number	Mobile	Flood role / issues
Site Manager			
Flood Warden 1			
Flood Warden 2			
Flood Warden 3			

Emergency Contact List

Name	Number	Mobile
Ambulance	000	
Gas		
NSW SES	132 500	
Sydney Water - Faults	13 090	
Fire - Emergency	000	
Police - Emergency	000	
Electricity		
Bureau of Meteorology (for flood warnings)	1300 659 219	
Liverpool Council Wet Weather Line		
Liverpool Police Station or Cronulla Police Station		
Electrician		

For emergency help in floods and storms phone the SES on 132 500

m 0409 912 631 e mark.tooker@tookerandassociates.com.au a 30 Walworth Avenue, Newport abn 39 619 046 070