NSW Department of Education
Liverpool Boys and Girls High School Upgrade
Flood Impact and Risk Management Plan

11th March 2025 | 24-96 | Approved Issue [G]

Executive Summary

This Flood Impact and Risk Management Plan has been prepared by Woolacotts Consulting Engineers for NSW Department of Education to assess the potential environmental impacts of flooding on the proposed development at 18 Forbes Street, Liverpool and its surrounding areas. Flooding occurs across Liverpool City Council (LCC) and a previous flood study, Draft Georges River Flood Study by BMT (2021), provides background on flood behaviours within this LGA.

Existing Flood Behaviour

Draft Georges River Flood Study by BMT (2021) indicates the site is affected by flooding for the probable maximum flood (PMF), however unaffected by the 1% AEP or 0.5% AEP flood event. The flooding is classified as riverine flooding and reaches the site approximately 11 hours after commencement of rainfall for the PMF storm event.

Proposed Development

The proposed development is construction of a new six-storey high school building, including school hall, gymnasium and landscape works.

Flood Impacts of Proposed Development

LCC provided their TUFLOW model from the Georges River Flood Study assessment. The proposed topography and buildings were added into the model to assess the impact of the new development.

Hydraulic modelling indicates that there is a minor afflux of less than 1mm just outside the property boundary, south-west of the site along Campbell Street. There are also negligible impacts on flood velocities and flood depths.

LCC advised the PMF flood level to be 10.80m AHD and recommended this level be adopted as a minimum finished floor level (FFL).

Management of Flood Risks

Risks associated with flooding have been managed by:

- Raising of internal finish floor levels to be at minimum RL 10.80m AHD, as per LCC advice;
- Designing all structural elements below the PMF level to be structurally sound and with flood compatible materials;
- Protecting all utilities up to the PMF level; and
- Providing additional provisions for flood warning systems

Evacuation

Evacuation of the school is available by both vehicles and pedestrians via the high-ground located along Forbes Street. The new school gymnasium is to be used as a flood emergency assembly area during evacuation of the school.

Contents

Document Control

Rev No	Date	Revision details	Approved	Verified	Prepared
A	04.07.2024	Approved Issue	JC	LN	LN
B	09.07.2024	Approved Issue	JC	LN	LN
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F	21.02.2025	Approved Issue	JC	KC	KC
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1.0 Introduction

This Flood Impact and Risk Management Plan has been prepared by Woolacotts on behalf the NSW Department of Education (the Applicant) to assess the potential environmental impacts that could arise from the redevelopment of the Liverpool Boys High School and Liverpool Girls High School, at 18 Forbes Street, Liverpool NSW, 2170 (the site).

This report has been prepared to document and discuss the flood risks associated with the school, as it is subject to riverine flooding. This report will also provide recommendations on mitigation measures to reduce the site's risk to personal safety of staff, students and property damage in the event of a flood.

This report accompanies a Review of Environment Factors that seeks approval for redeveloping the Liverpool Boys and Liverpool Girls High Schools into a single co-educational school, including:

[redacted]

- Construction and operation of a six-storey school building, including school hall and gymnasium;
- Associated parking and building services;
- Tree removal;
- Associated landscaping and play spaces;
- Augmentation of service infrastructure; and
- Associated off-site infrastructure works to support the school, including (but not limited to) services, kiss and drop point and pedestrian crossings.

Refer to the Review of Environmental Factors prepared by Ethos Urban for a full description of works.

Site Description

The site is located at 18 Forbes Street, Liverpool, within the Liverpool Local Government Area (LGA). The site is legally described as Lot 1 DP1137425 and has a total area of approximately 74,973m2.

The site comprises a broadly rectangular portion of land which currently contains the existing Liverpool Boys High School, Liverpool Girls High School, and the Gulyangarri Public School, which commenced operations in January 2024 and is located to the east of the wider site.

The site's western portion contains Liverpool Boys High School and Liverpool Girls High School. Liverpool Girls High School in the site's southwest comprises three, two-storey buildings. Liverpool Boys High School in the site's northwest, comprises approximately four, two-storey buildings, with adjacent at-grade carparking and various sports courts.

An aerial image of the site is shown at Figure 1 below.

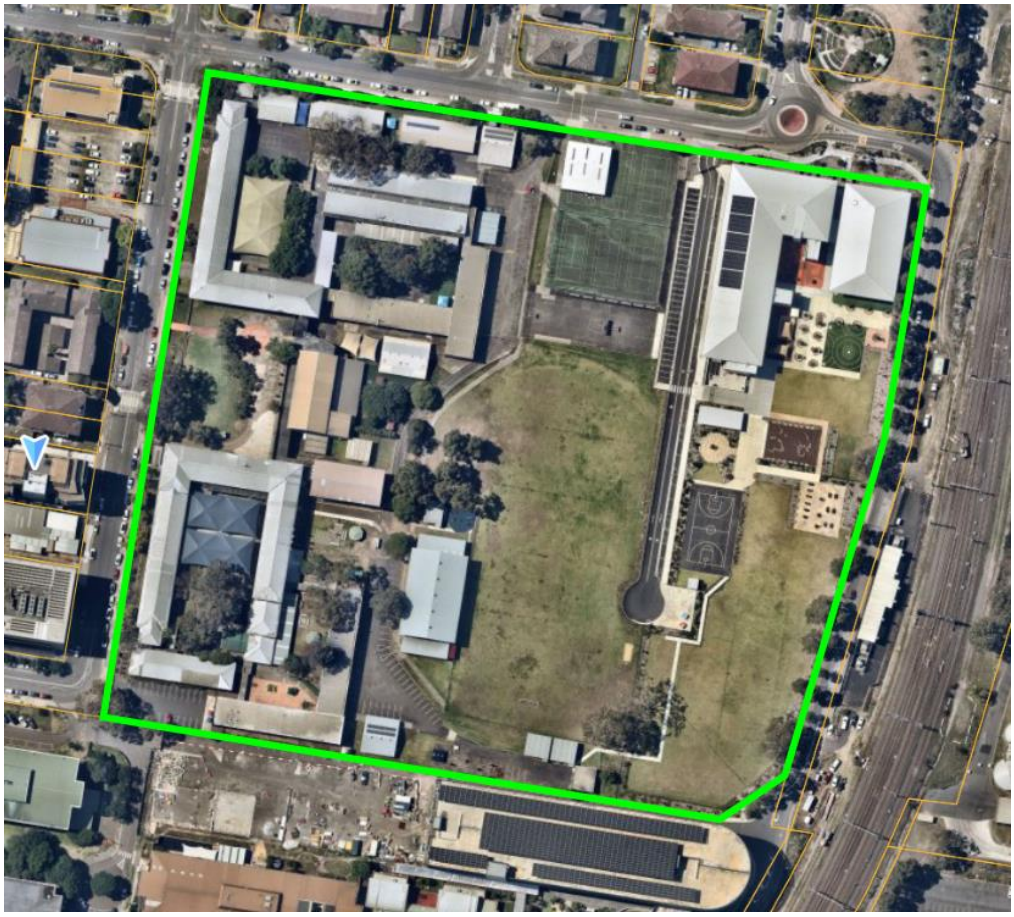


Figure 1 – Site Location Plan
(*Image adopted from Nearmaps*)

Statement of Significance

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential flood impacts are low and will not have significant adverse effects on the locality, community and the environment;
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community.

The following documents have been taken into account in the preparation of this report.

- Flood Risk Management Guideline LU01 2023.
- Flood Risk Management Manual 2023.
- Liverpool City Flood Emergency Sub Plan 2023
- Liverpool City Council Development Control Plan 2008 – Part 1: General Controls for All Development.

- Flood Emergency Response Plan by FloodMit with reference No. J2205_R8 updated Oct 2022.
- Australian Building Codes Board. Information Handbook, Construction of Buildings in Flood Hazard Areas. www.abcb.gov.au. 2012.
- Australian Building Codes Board. Standard, Construction of Buildings in Flood Hazard Areas. www.abcb.gov.au. 2012.
- Australian Emergency Management Institute. Technical Flood Risk Management Guideline: Flood Hazard. (2014).
- NSW Government. Flood risk management manual, the policy for management of flood liable land. (2023).
- NSW Government. Planning Circular PS 24-001. (2024).

REF Requirement Table

Item	REF Requirement	Relevant Section of Report
1.0	**Flood Hazard & Behaviour**	
1.1	Flood Hazard	Section 2.1
1.2	Flood Behaviour And Mechanisms	Section 2.1
1.3	Frequency of Inundations	Section 2.1
1.4	Flood Modelling Assessment, Impacts and Results	Section 2.2.4, Appendix D
1.5	Impacts of Climate Change	Section 6.0.1, Appendix D
2.0	**Evacuation & Emergency Response**	
2.1	Evacuation Routes	Section 3.0.2
2.2	Evacuation Constraints	Section 3.0.2, 4.0.1
2.3	Flood Timeframes	Section 4.0.1
2.4	Flood Response	Section 5.0
3.0	**Flood Mitigation and Management**	
3.1	Flood Planning Level	Section 2.2.4
3.2	Mitigation Measures	Section 6.0.3

Part 1: Flood Impact Assessment

2.1 Flood Behaviour

2.1.1 Flood Investigation

The proposed development is located within the Liverpool City Council Local Government (LGA).

Flood information relating to The Site has been obtained from the following documents:

- Georges River Flood Study Final Draft Report, January 2020 (BMT 2020)

The above documents indicate that The Site is impacted by Georges River flooding. Riverine/Creek flooding occurs when a creek or river overflows its banks, causing water to spread into areas that are normally dry. This type of flooding is a common occurrence during heavy rainfall, or other weather events that result in an increased volume of water flowing into the creek.

2.1.2 Flood Extents

Following the council engineer's advice, the site was determined to be affected by a Probable Maximum Flood (PMF). Woolacotts utilised the existing TUFLOW model to determine the PMF flood level, as shown in Figure 2 for the PMF flood extent.

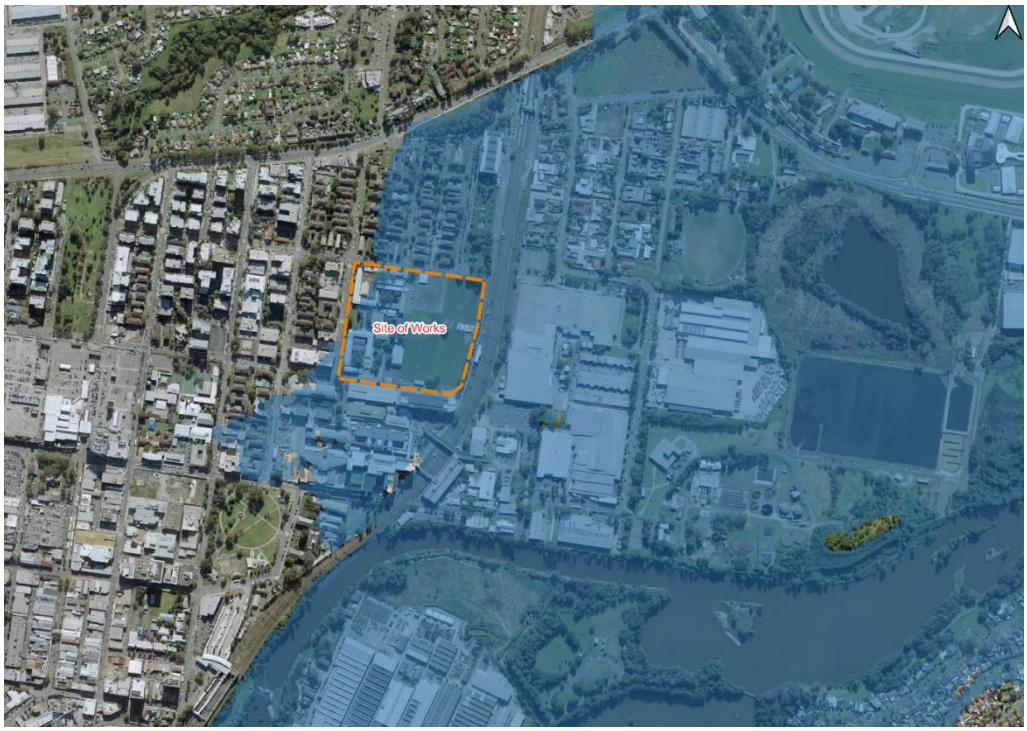


Figure 2 – PMF Extent Map

2.1.3 Flood Hazard

The Liverpool City Council – hereafter referred to as The Council – has categorised flood liable land as follows:

- High Flood Risk Category: This includes land below the 1% Annual Exceedance Probability (AEP) flood level that faces high hydraulic hazards or significant evacuation difficulties. Development in this category is typically restricted due to the high potential for flood damage, risks to life, and evacuation challenges. Compliance with flood-related building and planning controls is crucial to mitigate flood damages.
- Medium Flood Risk Category: This includes land below the 1% AEP flood level that does not face high hydraulic hazards and has no significant evacuation difficulties. While there is still a considerable risk of flood damage, it can be minimized with appropriate development controls.
- Low Flood Risk Category: This encompasses all other land within the floodplain (within the extent of the probable maximum flood) that is not classified under the High or Medium Flood Risk Categories. The risk of flood damage in this category is low for most land uses, and most developments are permitted.
- No Flood Risk Mapping: This indicates areas where flood risk categories have not been determined yet. Applicants may need to conduct a flood study to determine the flood extent and appropriate Flood Risk Categories to apply necessary controls as required by the Development Control Plan.

The flood hazard for the site is based on the velocity and depth of the floodwaters. Flooding from the George River for PMF storm event classifies the site as a low flood hazard level. Refer to Figure 3 below which was adopted from Liverpool City Council Hydraulic Hazard Map.

Figure 3 – Flood Hazard from George River

(Image adopted from the Liverpool Online Flood Map)

Flood hazard mapping has been developed through the application of ARR 2019 and Australian Emergency Management Institute (AEMI) flood hazard guidelines. The guidelines consider the threat to people, vehicles and buildings based on flood depth and velocity at a specific location. The AEMI flood hazard mapping can be used to assess the flood hazard for site occupants and proposed site usage, as well as for the community surrounding The Site. The hazard categories are shown in Figure 4 below.

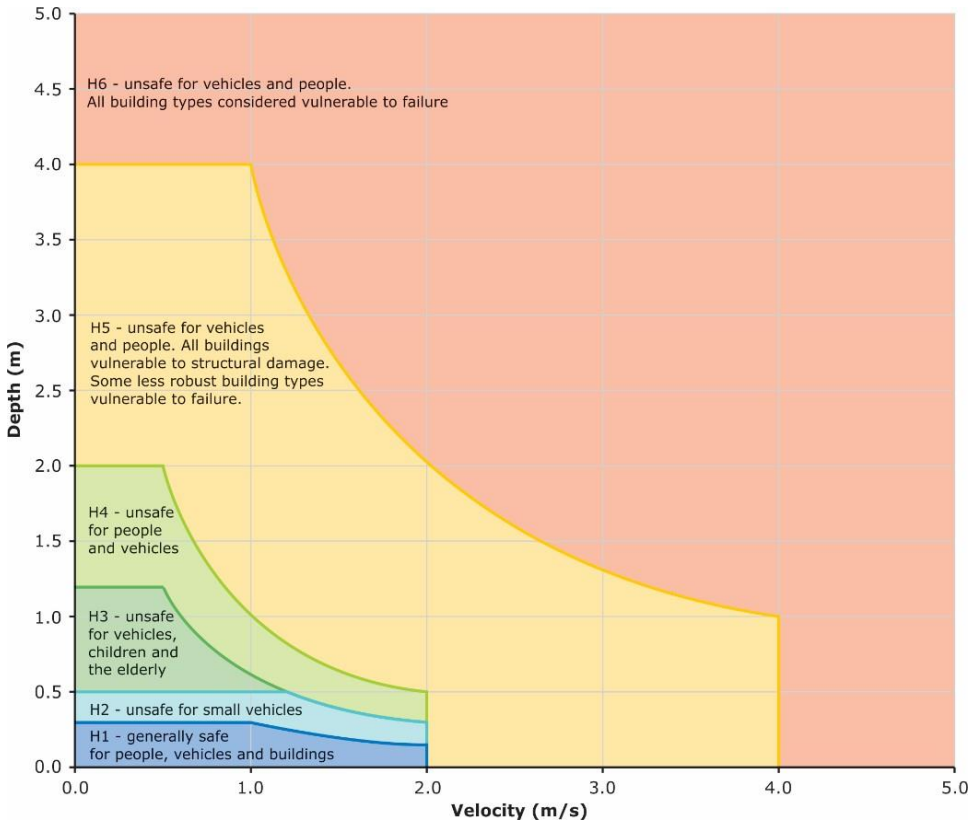


Figure 4 – Flood Hazard Curves

(Source: Australin Emergency Management Handbook 7)

Based on hydraulic modelling, most of the site is classified as a flood hazard category H4 and H5 for the PMF flood event. The Site unaffected by flooding for the 1% AEP and 0.5% AEP storm events.

2.2 Proposed Development

2.2.1 Description of Works

The proposed development includes a 6-story building situated at the northwest corner and a library above a proposed hall/gym at the eastern corner. Refer to Figure 5 below.

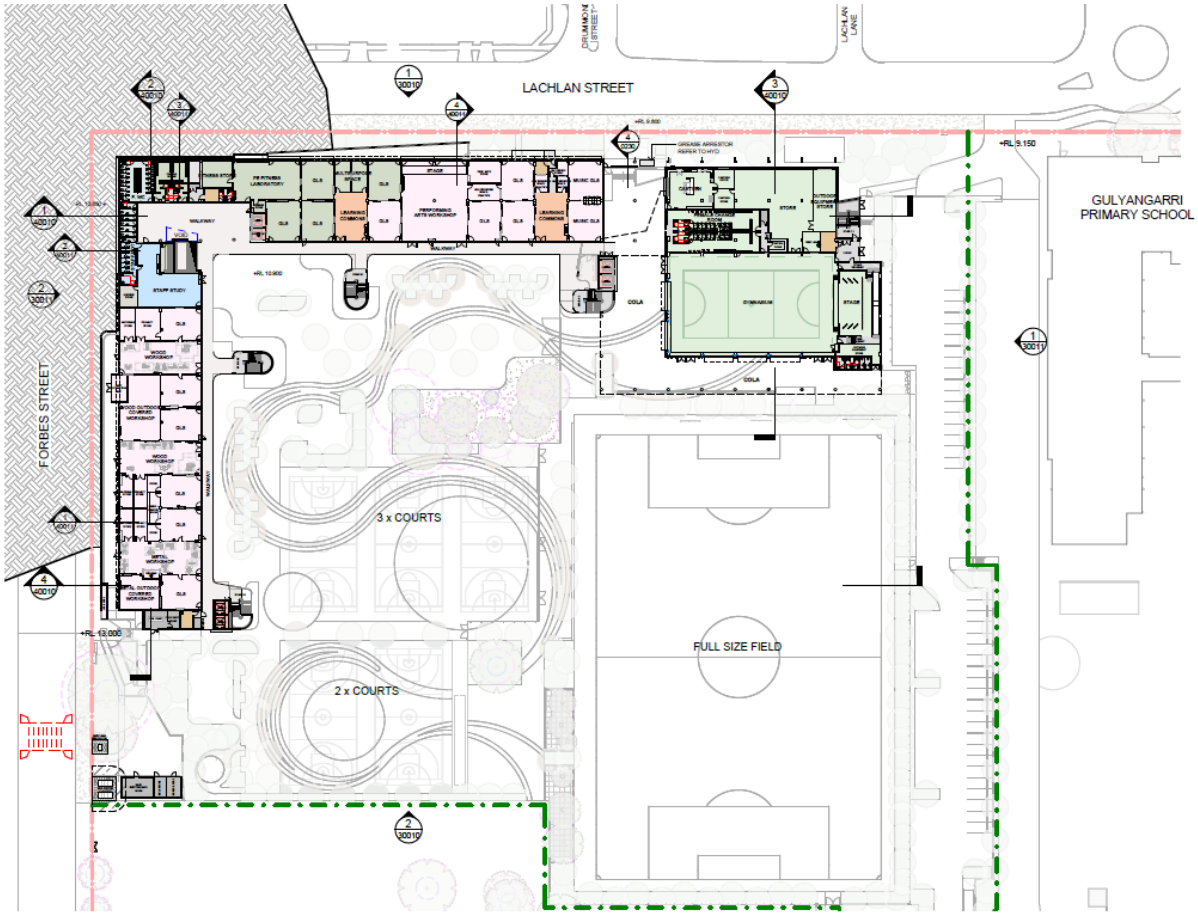


Figure 5: Lower Ground Floor Plan

(Image adopted from NBRS Architectural Drawings Project #24089, Rev 13)

2.2.3 Flood Model

The TUFLOW model from the Georges River Flood Study (BMT, 2020) was utilized as the basis for developing the updated hydraulic model for this study. Key elements such as topography, land use, manning coefficients, stormwater networks, blockage factors, inflow boundaries, tailwater boundaries, and storm durations remained unchanged. The building footprint and associated earthworks (based on design surface provided by the civil engineer) of the proposed development at 18 Forbes St, Liverpool NSW 2170 was modified accordingly.

Although the TUFLOW model has not received official approval by Council, it was recommended by Council to use this model to evaluate the development's impact on the existing flooding regime during PMF storm events.

2.2.4 Assessment on Proposed Development.

The TUFLOW output, as shown in Appendix D, indicates that the development has raised flood levels south-west of the site (along Campbell Street) by 1mm and with varying depths within the site boundaries. This is acceptable in accordance with standard industry practice. There is no impact to Burnside Drive. Given this minimal increase and negligible impacts to flood hazard levels or velocities, it is concluded that the development does not impact the existing flooding regime. Refer to Appendix D for more information.

To prevent water ingress into the buildings, all internal floor levels are to be raised to match or exceed the flood planning level (FPL). Liverpool City Council (referred to as "The Council") recommended using the PMF flood level as the FPL for the proposed development. Consequently, a minimum floor level of 10.80m AHD must be adopted to meet council requirements – Refer to Appendix C.
A finished floor level of 11.00m AHD has been proposed, which is above the recommended FPL.

Part 2: Flood Risk Assessment

3.0 Flood Response Assessment

3.0.1 Identification of Risks

The development of educational facilities is categorised as 'Sensitive Uses and Facilities' under Section 9 of Part 1 of the Liverpool Development Control Plan 2008. The site's flood risk is designated as Low Flood Risk according to the Liverpool Flood Map, and floodplain controls have been established in accordance with the Georges River Floodplain.

Given the site's classification as a sensitive development and the flood hazard outcomes outlined in Section 2.1.3, the safest course of action is to evacuate all individuals from the site before a flood event, if possible, to minimize the risk of anyone being stranded. The recommended procedures for minimizing risk in response to flooding, in order of preference, are as follows:

- If flooding is anticipated that could isolate the site, evacuate all non-essential personnel and impose restrictions on transport to the site.
- If flooding is forecasted that will definitely isolate the site, evacuate everyone.
- If evacuation is not possible due to riverine flooding, remain on site.

The proposed site, including all buildings, will be flood-resistant for events up to the PMF storm event, which has a flood level of 10.80 mAHD. Besides flood depths, the velocity of floodwaters is another critical factor affecting safe evacuation. Based on flood modelling, the site does not present significant evacuation challenges, making it generally safe for vehicles and people to evacuate from the site.

Refer to Section 3.0.2 and Appendix E for flood evacuation route.

3.0.2 Flood Evacuation Route

According to FloodMit, flood emergency assembly locations may not be needed if the school is closed before the start of the school day or if an early closure is successfully carried out within the available flood warning time. However, for situations where early closure is unsuccessful or a small number of students and staff remain on-site, designated assembly points have been established.

These assembly locations and access routes are detailed in Appendix E. These routes and emergency assembly points have been reviewed and approved by both Liverpool Council and the SES.

3.0.2.1 Liverpool Boys and Girls High School

FloodMit recommends that relocation of all remaining high school occupants to the gymnasium area should be completed no later than when flooding is observed within Gulyangarri Public School buildings (estimated at 7.1m at Liverpool Weir). The relocation should be completed within approximately one hour. Evacuation from the site via Forbes Street should commence upon all occupants being relocated to the gymnasium area. Refer to Figure 6 below for flood assembly areas and Appendix C for flood evacuation route.

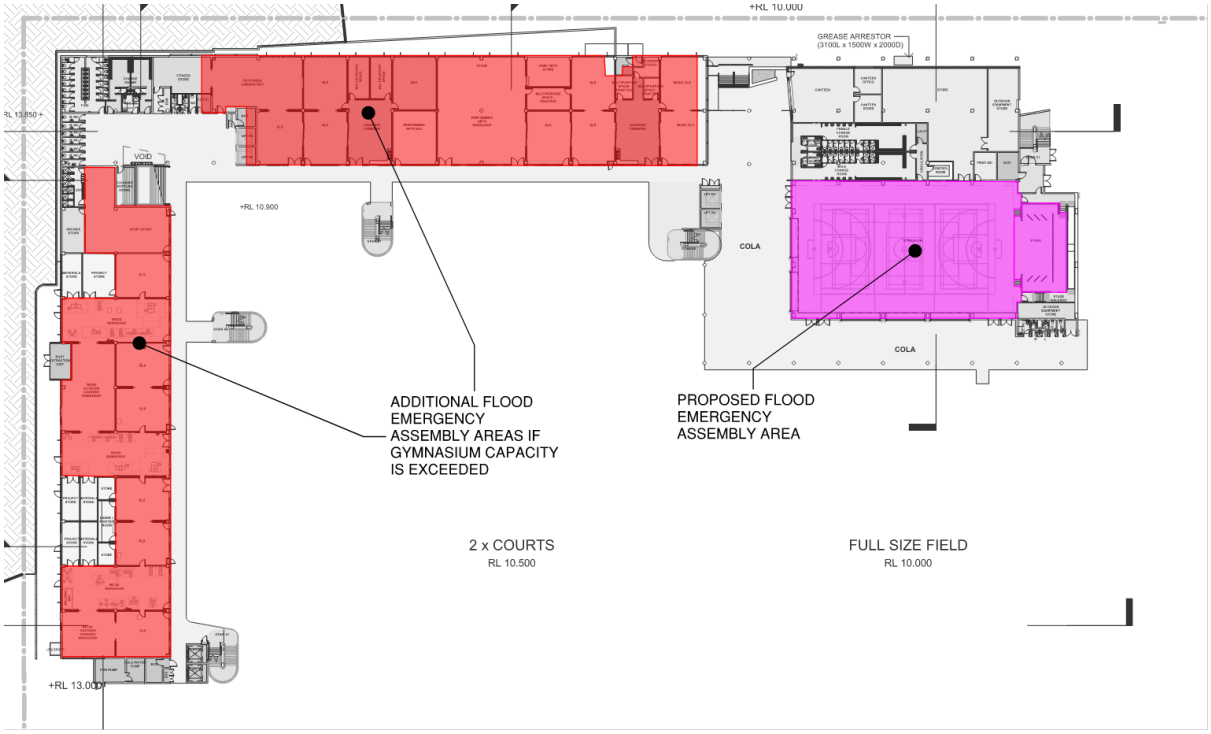


Figure 6: Flood Emergency Assembly Area

(Image adopted from NBRS Architectural Drawings Project #24089, Rev 13)

3.0.2.2 Gulyangarri Public School

The new primary school lacks suitable flood emergency assembly points on its premises. FloodMit advises relocating any remaining students and staff to higher ground on the western side of the school, near Forbes Street.

The lawn in front of the Liverpool Boys High School (LBHS) Hall is suggested as a dry weather assembly point, while the Hall itself, with a capacity of 500 people standing (CBRE comm, 2022), serves as a wet weather location. However, due to the proposed works for the new Liverpool High School (LHS), the LBHS Hall is to be demolished. Therefore, the recommended revised flood emergency assembly area is the new LBGHS gymnasium area, which is covered and located above the PMF level of 10.80m AHD.

FloodMit recommends that this relocation should be completed no later than when flooding is observed along Burnside Drive (estimated at 6.4m at Liverpool Weir) and before the existing primary school buildings are inundated (estimated at 7.1m at Liverpool Weir). The relocation should be completed within approximately one hour.

Currently, the only access route from the primary school to the Liverpool High School Hall is via the public footpath on Lachlan Street and Forbes Street. This route is not ideal during severe weather, as small children could be exposed to heavy rainfall. FloodMit suggests further investigation into alternative access options.

3.0.2.3 Evacuation Trigger

The primary triggers for deciding to close the school before the start and after commencement of the school day are based on flood warning predictions provided by the Bureau of Meteorology (BOM). These trigger levels are outlined in Table 1.

Table 1: Triggers to Close Schools prior to Start of School Day	
Warning Level	Response Action
1 – Advice	Heightened level of threat. Stay up to date as the situation changes. Close school as instructed by SES and/or BOM.
2 – Watch and Act	Conditions are changing and you need to start taking action now to protect staff, students and visitors. Begin provisions to evacuate the site.
3 – Emergency Warning	The highest level of warning. Danger is imminent and immediately evacuate the site.

3.0.2.4 Evacuation During Construction and Temporary School Use

All construction personnel, staff, students and visitors are to begin evacuation from the site via Forbes Street no later than when flooding is observed within Burnside Drive unless advised otherwise by SES or BOM. The relocation should be completed within approximately one hour. Refer to Appendix C for flood evacuation route.

Refer to Table 1 above for trigger protocols.

4.0 Flood Emergency Management Plan

4.0.1 Total Warning Time

In the given model, floodwaters typically reach their highest levels at the site approximately 11 hours after the start of the PMF storm event, leading to the flooding classification of "riverine flooding" by the Bureau of Meteorology due to the rapid rise in flood rates from the George River. The PMF flooding lasts approximately 31 hours.

4.0.2 Official Flood Warnings

The Bureau of Meteorology (BoM) and NSW State Emergency Service (SES) issue a range of official warnings and flood advice through their websites, local radio, television, social media etc. For the BoM, official warnings include:

- **Severe thunderstorm warnings** – Issued when severe thunderstorms are expected. The warnings will describe the area under threat and the associated hazard/s (e.g. riverine flooding, high winds)
- **Severe weather warnings** – Issued when severe weather is expected to develop or move into an area. Severe weather includes high winds, heavy rain, abnormally high tides etc.
- **Flood Watch** – A warning that flood-producing rain is expected to happen in the near future
- **Flood Warning** – A warning of flooding at a predicted height, time, and location

For the SES, official warnings include:

- **Advice** – Provide information on what is expected to happen during a flood and the likely flood consequences. Personnel are to stay up to date as the situation changes.
- **Watch and Act** – Issued when flood conditions are beginning to change and immediate action is required. Once the warning has been issued you should get prepared to evacuate.
- **Emergency Warnings** – Issued when you are required to evacuate. The evacuation order advises people what to do and where to go.
- **All Clear** – Issued when it is safe to return to the site.

Other ways you may be informed of possible flooding is via:

- A door knock by emergency services,
- Word of mouth, or
- The SES may issue an Emergency Alert. An Emergency Alert is a message that is sent to your landline or mobile phone as a voice or text message.
- TV, radio and other media

4.0.3 Site Specific Warnings

In addition to the official warnings, it is strongly recommended that The Site adopt the following site-specific warning systems.

PA system

It is recommended that The Site adopt a public announcement (PA) system with an emergency tone that can be activated during a flood event. The PA system must have a backup power supply that is independent of the electrical grid in case of power failures.

It is also anticipated that this system will be utilised for other emergencies such as fires.

Warning Signs

Multiple flooding warning signs will be located throughout The Site to raise flood awareness for the facility personnel and provide clear directions on what to do during a flood event.

4.0.4 Important Contacts

Refer to Appendix A for a summary list of Important Contacts. The Chief Flood Warden is to fill out this list.

5.0 Flood Response Preparation

5.0.1 Flood Preparation & Response Team

To ensure the safety of the customers/visitors and staff during a flood emergency, a Flood Preparation and Response Team is required. This team will consist of Liverpool Boys/Girls High School – hereafter referred as “The School”-, a Chief Flood Warden, Deputy Flood Warden, Flood Wardens and First Aid Officers. Refer to Figure 7 below for the organisational structure of this team.

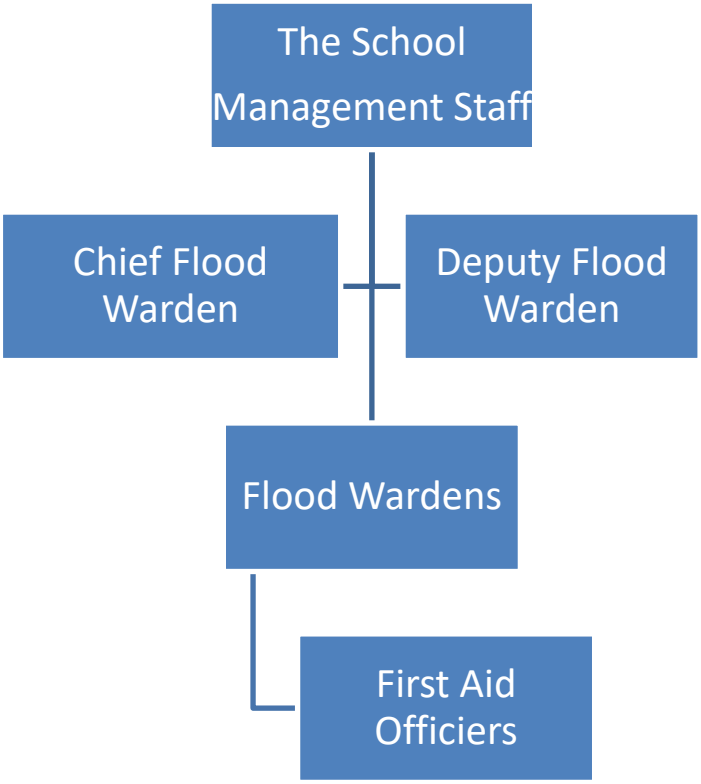


Figure 7 – Flood Preparation and Response Team

The School Management Staff shall appoint the Chief Flood Warden, a Deputy Flood Warden from the facility staff. Once these wardens have been selected, the Chief Flood Warden shall seek out assistance from other staff to join the team as Flood Wardens and First Aid Officers.

It is standard industry practice to have 2 fire wardens per 20 people (https://www.evacservices.com.au/fire-warden-training/). It is recommended that the same personnel who are fire wardens are also flood wardens.

SafeWork NSW recommends a minimum of one first aid officer for every 50 workers. The first aid officers are to assist with minor injuries during the flood evacuation procedure or liaise with emergency services for more serious incidents.

Once the Flood Preparation and Response Team has been established, the Chief Flood Warden shall be responsible for managing the team.

5.0.2 Flood Preparation & Response Team Responsibilities

The roles and responsibilities of the members of the Flood Preparation and Response Team are listed in Table 2 below:

Table 2 – Flood Preparation and Response Team Responsibilities	
ROLE	**RESPONSIBILITY**
The School Management Staff	▪ Appoint a Chief Flood Warden and Deputy Flood Warden from suitable facility staff. ▪ Ensure that the Chief Flood Warden is enacting the Flood Emergency Response Plan. ▪ Ensure all personnel are made aware of The Site's flood risks.
Chief Flood Warden	▪ Brief all flood wardens on the Flood Emergency Management Plan and any changes. ▪ Monitor weather daily on the Bureau of meteorology website. ▪ Activate commencement of Flood Emergency Management Plan in event of the flooding. ▪ Liaise with emergency services if required. ▪ Conduct Flood Emergency Response drills biannually. ▪ Ensure the Flood Preparation and Response team is adequately trained. ▪ Review Flood Emergency Management Plan. ▪ Conduct flood preparation review as per Table 3 – Flood Preparation Review.
Deputy Flood Warden	▪ Undertake the Chief Flood Warden's duties in the event that the Chief Flood Warden is away/unavailable. ▪ Assist Chief Flood Warden in enacting Flood Emergency Management Plan. ▪ Provide support to the Chief Flood Warden where required.
Flood Wardens	▪ Ensure the Chief Flood Warden is notified in the event of a flood emergency. ▪ Receive text messages or emails from the Early Warning Network. ▪ Direct all building personnel to the nominated evacuation assembly location and ensure they remain calm. ▪ Undertake the required training as instructed. ▪ Ensure the Flood Emergency Kit is up to date.

First Aid Officer	▪ Implement first aid treatment as required. ▪ Liaise with emergency services as required. ▪ Auditing and maintaining the first aid kit and fire extinguishing equipment. ▪ Assist building personnel with medical conditions and/or mobility restrictions. ▪ Undertake the required training as instructed.

5.0.3 Flood Emergency Kit

The NSW SES website provides a list of recommended items in a flood emergency kit, this includes: https://www.ses.nsw.gov.au/floodsafe/prepare-your-home/emergency-kit/

Emergency kit contents:

- Portable radio with spare batteries
- Megaphone
- Torch with spare batteries
- First aid kit
- Candles and waterproof matches
- Important papers including emergency contact numbers
- Ensure emergency kit is in a waterproof storage container

If evacuating the personnel, place in your emergency kit:

- A good supply of required medications
- The sign-in book for visitors
- Fresh food and drinking water

On a regular basis, check your emergency kit (remember to check use-by dates on batteries and gloves) and restock items if you need to. Also, keep a list of emergency numbers in the emergency kit.

5.0.4 Flood Signage

Flood signages shall be installed at the frontage of The Site especially the eastern corner of The Site to advise staff, customers / visitors of the risk of flooding and provide details on the flood emergency response plan. These signages shall be located in visible areas and include the flood emergency egress plans.

5.0.5 Flood Awareness Training

Flood awareness training is required for the Flood Preparation and Response Team and all staff. It is strongly recommended that flood emergency response drills occur a minimum of twice annually. This will ensure flood wardens know how to respond in a flood emergency and that building personnel are aware of the flood hazard. After the drill has been carried out, the flood emergency response procedure should be reviewed to identify any room for improvement and amended as necessary.

5.0.6 Flood Monitoring

The Chief Flood Warden is to monitor storm activity/weather in the afternoon daily via the BoM website and/or radio. Storm warnings for next day events triggering riverine flooding should be monitored carefully. It is up to the discretion of the Chief Flood Warden to The Building for the following day if deemed appropriate.

5.0.7 Flood Preparation Review

The Flood Emergency Management Plan and associated tasks need to be reviewed on a regular basis to ensure their effectiveness. Table 3 below lists the tasks, who is responsible for reviewing them and when the review should occur.

Table 3 – Flood Preparation Review		
TASK	**RESPONSIBILITY**	**DATE**
Review of flood emergency management plan	Chief Flood Warden	▪ Every 6 months minimum ▪ After a flood event ▪ If there are any changes that impact the ability of the plan to be implemented
Flood Awareness Training	Chief Flood Warden	▪ Every 6 months minimum ▪ After a flood event for debrief
Audit and test flood alarm system	Chief Flood Warden	▪ Every 6 months minimum ▪ After a flood event for debrief
Audit, maintain and test emergency electrical lighting	Electrical contractor under the supervision of Chief Flood Warden	▪ Every 6 months minimum ▪ After a flood event - if problems occurred
Audit and maintain flood emergency kit	Flood Wardens	▪ Every 6 months ▪ After a flood event for re-stocking
Audit and maintain first aid kit	First Aid Officer	▪ Every 6 months ▪ After a flood event for re-stocking
Audit and maintain fire fighting equipment	Fire Warden	▪ Every 6 months ▪ After a fire event
Check for Flood Study updates	Chief Flood Warden	▪ Annually: Contact Liverpool City Council for any updates to the Flood Study

5.0.8 Flood Response

The Site is affected by riverine/creek flooding caused by intense rainfall events, the flood response operations for The Site will begin on receipt of the Bureau of Meteorology advice, or when other evidence leads to an expectation of flooding as detailed below.

Table 4 – Flood Emergency Response Alert and Activation Levels

Response Item	Action	Procedures	Responsibility
Monitor	Daily weather (intense heavy rainfall) / precipitation forecast monitoring	Monitor the Bureau of Meteorology (BOM) on a daily basis.	Chief Flood Warden
Flood Alert	Increase the level of alert	Notify all facility staff of flood alerts, watch or advice. Monitor the Bureau of Meteorology (BOM) website.	Chief Flood Warden
Flood Watch	Increase the level of alert and prepare for activation of FEMP.	Notify all facility staff of flood alert, watch or advice.	Chief Flood Warden
Severe weather warning for riverine flooding	Increase level of alert, prepare for activation of FEMP.	Notify all facility staff of flood alerts, watch or advice.	Chief Flood Warden
Severe thunderstorm warning for riverine flooding	Increase the level of alert and prepare for activation of FEMP.	Notify all facility staff of flood alerts, watch or advice. Monitor the Bureau of Meteorology (BOM) website.	Chief Flood Warden
Activation: Occurrence of localised intense rainfall with associated observation of rising water levels on-site or adjacent waterways.	Mobilise all customers/visitors and staff to designated emergency assembly areas (The Places). Close The Site to external visitors.	Immediately notify all staff and customers of the activation of flood emergency response plan.	Chief Flood Warden

When the flood response operation is activated, the following actions should be taken:

- The chief flood warden should activate the flood emergency alarm.
- Instruct all visitors,staff and student.
- Turn off the electricity and/ or any machinery and gas (if applicable) at the mains before leaving and turning off and securing any gas bottles.
- Take the emergency kits.
- Never enter or travel through floodwater.
- Confirm occupancy numbers.
- Keep listening to the local radio station for information, updates, and advice.
- Follow all instructions given by the chief flood warden and emergency services.

Monitoring of the BoM will continue throughout this process to ensure updated information is available.

5.0.9 Early or Pre-emptive Facility Closure

The decision for the facility closure should be made based on the severe thunderstorm warnings and severe weather warnings from the Bureau of Meteorology in the metropolitan area to give an indication of possible overland flow flooding.

5.0.9 Post-flood Response

Once a flooding event has occurred, the first priority will be to determine if it is safe to reopen the facility. A safety walk-through will be used to do this with the facility management involved such as the chef flood warden and the deputy warden. A qualified electrician will also accompany the management team, to identify danger areas. The team will review the below:

- Flood damage to pavements within The Site and surrounding roads.
- Determine if flood waters have subsided.
- Inundated or water-affected power boxes and electrical equipment to be checked by the electrician. The power is to remain off until reviewed.
- Equipment or debris that was moved by flood waters should be returned to the correct location or disposed of if necessary.

All hazards are ensured to be identified and eliminated prior to reopening the facility.

6.0 Flood Risk Management

6.0.1 Risk Identification

As the site is impacted by creek/riverine flooding, it is inevitably exposed to flood risk. This flood risk relates to risk to property and life.

Risk to property refers to flood related damage to the proposed building and its associated components as a result of a flood event. This includes both structural and non-structural components of the building.

Risk to life refers to the flood related hazards for staff and visitors during a flood event. This includes personnel attempting to evacuate during a flood event.

Major flood risks identified for the proposed development include, but are not limited to:

- Failure of Structural Components
- Failure of Utilities
- Failure of Warning Systems (official flood warnings and site-specific warnings)
- Increase in flood levels due to climate change
- Evacuation

Failure of Structural Components

Floods can produce a range of forces on buildings including hydrostatic actions, hydrodynamic actions, debris actions, wave actions, erosion, and scour. These forces must be accounted for in the structural design of the building to avoid the risk of the building collapsing.

The Site is not impacted by 1% AEP or 0.5% AEP flooding. Refer to flood extent map in Appendix F. This means that floodwaters will only reach the building in storm events larger than the 0.5% AEP, with the PMF being the worst case.

Failure of Utilities

Utilities and associated equipment located below a flood level have the potential to fail if inundated by floodwaters. Utilities include electrical systems, plumbing, telecommunication, HVAC and similar services.

The Australian Buildings Code Board's Building in Flood Hazard Areas (2012) requires utilities to be designed for damage only up to the Flood Planning Level unless they present a risk to human life. For storm events that result in larger flood levels than the Flood Planning Level, such as the PMF, the Floodplain Development Manual states that the principal concern is with the safety of people and critical infrastructure rather than property protection. The following utilities present a risk to human life if they fail during the PMF flood event.

Electrical Hazard

Electrical equipment, wiring, etc. has the potential to be damaged during a flood event and/or submerged in water, this could potentially result in electrocution or fatality.

Power Failure

In the event that power is cut off for the Site, it is likely to make the building unsafe or uncomfortable. This may lead to people attempting to leave The Site and walk through floodwaters.

Note: There are a number of critical systems within the building that rely on power for emergencies. It is assumed that emergency systems and critical infrastructure including alarm systems, emergency lighting, communication systems etc. will have backup power supplies that are independent of the electrical grid in case of power failures.

Failure of warning systems

Official Warning Systems

If the official warning systems nominated in Section 3.1 fail, there is a risk that there will be little or no time for evacuation procedures to be activated.

Site Specific Warning Systems

Similar to the official warning systems, if the site specific warning systems detailed in Section 3.2 fail then there is a risk that there will be little or no time for evacuation procedures to be activated.

Climate Change

The 1% AEP rainfall intensity was increased by 10% to account for potential increases in rainfall intensity associated with climate change. The procedures outlined in Book 1, Chapter 6 of ARR2019 were applied with the following parameters/assumptions; East Coast South Cluster, medium consequence risk rating, SSP2-4.5, 2090 planning horizon.

In the hydrological model, the application of the 10% increased rainfall results in a peak flow increase across the study catchment of about 10%. The augmented inflows to the hydraulic model (TUFLOW) translate to a general increase of peak water levels within the proposed site by 0.40-0.70m for the PMF storm event. Based on this assessment it is concluded that the climate change scenario has a significant effect on flood risk at the site. However, the evacuation route in Appendix E is still safe for use for the 1% AEP storm.

Refer to Appendix D for the climate change impact on the proposed flood conditions.

Refuge Above Flood Water

If there is no refuge above the floodwaters, then there is potential that people can be trapped in floodwaters. As detailed in Section 3.0.2, the gymnasium is to be used as a flood emergency assembly area, and it has an FFL of 11.00m AHD, 200mm above the PMF flood level. There is no risk of water entering the building during the PMF flood event.

Medical Emergencies

It is possible that medical emergencies may occur during a flood event.

Medical related emergencies requiring hospital grade care will be unsafe for people located within the flood waters. If this medical emergency involves life threating conditions, failure to receive medical attention could be fatal.

We note that the surrounding streets of the site are also affected by flood waters, however access to the flood emergency assembly area is accessible via Forbes Street.

Evacuation

There is the possibility that personnel evacuating may decide to leave the flood emergency assembly area and walk-through floodwaters. This may occur for several reasons such as the flood event occurring at the end of a working day and the school staff wanting to get home, personnel wanting to be with families or if the flood emergency assembly area is not safe or functional.

Walking through floodwaters is hazardous and presents risks of injury or death. Hazards associated with traversing floodwaters include:

- Floodwaters being deeper and faster flowing than appears
- Floodwaters containing hidden snags and debris
- Floodwaters eroding / washing away road surfaces leaving deep holes and uneven surfaces which cannot be seen.

The NSW SES advises people to never enter floodwaters.

6.0.2 Risk Analysis and Evaluation

Analysing the risks identified in Section 6.0.1 is based on the likelihood of the risk occurring and the impact of the risk occurring. The likelihood rating is based on the probability of the event occurring at some point in the future and assumes no risk mitigation techniques have been employed. The impact rating is based on the severity of the risk if the event actually occurs and takes into account injuries, death, potential damage and financial impacts.

Evaluating the risks is based on the analysis results of the likelihood rating and impact rating. The risk evaluation is based on the risk matrix located in Appendix B.

Table 5 - Risk Analysis and Evaluation

Risk	Likelihood Rating	Impact Rating	Risk Level
Structural Failure	Possible	Major	High
Utility Failure			
- Electrical Hazard	Possible	Major	High
- Power Failure	Likely	Moderate	High
Failure of Warning Systems	Possible	Major	High
Climate Change	Likely	Major	High
Evacuation	Likely	Moderate	High

In assessing the likelihood of the above risks, it is important to note that the majority of these risks are based on a PMF event occurring. The probability of the PMF event occurring is 1:100,000 which is considered very rare.

6.0.3 Risk Treatment

To mitigate the risks identified in Table 5 above, it is proposed to introduce control measures according to the hierarchy of controls (Refer to Appendix B). In adopting the hierarchy of controls, preference is given to the top measure 'Elimination', however where this is not feasible or practical, lower measures are adopted. Refer below for the proposed control measures:

Structural Components

All structural elements below the PMF level shall be constructed from flood compatible materials.

All structures shall be designed and constructed to ensure structural integrity for anticipated flood actions including immersion and impact of debris up to the PMF level.

Materials used for structural purposes and located below the PMF level shall be capable of resisting damage, deterioration, corrosion, or decay taking into account the likely time the material would be in contact with the flood water and the likely time it would take for the material to subsequently dry out. These materials include but are not limited to load bearing columns, bracing members, structural connections, fasteners, wall framing members etc.

Utilities

Utilities and associated equipment potentially exposed to floodwaters, including electrical systems, plumbing, telecommunication, HVAC and similar should be designed, constructed, and installed to prevent floodwater from entering and accumulating within the system.

Electrical

All electrical equipment, wiring, fuel lines or any other service pipes and connections must be waterproofed to the flood planning level. Electrical equipment that presents a risk if inundated by floodwaters or supports critical infrastructure (such as communications rooms) shall be waterproofed up to PMF level.

Power Failure

Backup power supplies that are independent of the electrical grid shall be made available for utilities located within the building. It is recommended that the components of this system be located above the PMF level to avoid flood damage.

Warning systems

Official Warning Systems

It is recommended that the flood wardens of the facility do not solely rely on one source for flood warnings but monitor a range of sources including BoM, SES, Television, Radio and social media etc. This way if one source fails, flood warnings can be obtained from other sources.

In addition to the official warning systems, it is recommended that flood sensors be strategically placed around the building in the event that one or more official warning systems fail or are not provided in time. This will still allow time for evacuation procedures to begin before floodwaters reach the site.

Site Specific Warning Systems

As detailed in Section 5.2 Site Specific Flood Warning, it is assumed that a site-specific warning system will be adopted. This warning system must have a backup power supply that is independent of the electrical grid in case of power failures. It is also anticipated that this system will be utilised for other emergencies such as fires. The components of this system are to be located above the PMF level to avoid flood damage.

Climate Change

To determine the impact of climate change with respect to an increase in rainfall intensity, the existing flood models for creek/riverine flooding will need to be updated.

If the revised flood models show a rise in the PMF level, then a new PMF level will need to be set for the building. Once a new PMF level is adopted, evacuation strategies will need to be modified to suit the new conditions.

Evacuation

To ensure all staff, students and visitors are aware of the risks associated with flooding, regular training for Flood Wardens and Chiefs are to be provided. As advised by the SES, it is never safe to walk through flood waters. Ensure flood evacuation routes are communicated clearly during evacuations.

6.0.4 Monitoring and Reviewing Control Measures

A formal review of the risks identified within this report is undertaken on a regular basis. This review shall ensure that appropriate action is taken should the likelihood, impact or identified risks change and to ensure that any emerging risks are appropriately dealt with.

7.0 Revised Risk Analysis and Evaluation

Adopting the above control measures outlined in Section 6.3 Risk Treatment results in a revision of the risk analysis and evaluation detailed in Section 6.2. The result of this revision is shown in Table 6 below.

Table 6 – Revised Risk Analysis and Evaluation

Risk	Likelihood Rating	Impact Rating	Risk Level
Structural Failure	Rare	Major	Moderate
Utility Failure			
- Electrical Hazard	Rare	Major	Moderate
- Power Failure	Rare	Moderate	Moderate
Failure of Warning Systems	Unlikely	Moderate	Moderate
Climate Change	Rare	Major	Moderate
Evacuation	Likely	Moderate	High

8.0 Conclusion

The TUFLOW results, as detailed in Attachment D, reveal that the development has caused an increase in flood levels of 1mm during a PMF event, south-west of the site along Campbell Street. Considering this slight rise, it is determined that the development does not alter the current flooding regime. The site is not impacted by flooding for the 1% AEP or 0.5% AEP storm events.

This report identifies the major flood risks associated with the development. These flood risks include:

- Failure of Structural Components
- Failure of Utilities
- Failure of Warning Systems (official flood warnings and site-specific warnings)
- Increase in flood levels due to climate change
- Evacuation

Upon identification of these risks in Section 6.0, they were analysed and evaluated with the majority of them being classified as high level. Further to this, risk treatment measures are to be proposed by the design team for these risks which include:

- **Failure of Structural Components**
  - Structure to be designed up to PMF level
- **Failure of Utilities**
  - To be moved above PMF level if possible or else flood protected
- **Failure of Warning Systems (official flood warnings and site-specific warnings)**
  - Do not solely rely on one source for flood warnings but monitor a range of sources
  - Place flood sensors strategically around the building in the event that one or more official warning systems fail
- **Increase in flood levels due to climate change**
  - Update existing flood model for overland flow flooding
  - If a new PMF level is required, modify evacuation route as required.

Monitoring and reviewing control measures need to be put in place to ensure that appropriate action is taken should the likelihood, impact or identified risks change and to ensure that any emerging risks are appropriately dealt with.

Upon adoption of the risk treatment measures in Section 7.0, the risks were re-analysed and evaluated. This resulted in the majority of risks being classified as moderate level; one was classified as high level.

Mitigation Measures Table

Project Stage ***Design (D)*** ***Construction (C)*** ***Operation (O)***	**Mitigation Measures**	**Relevant Section of Report**
D / O	Floor levels shall be designed, construction and maintained to a level equal to the PMF (RL 10.80m AHD) at a minimum.	Section 2.2.4
D / O	All structural components below the PMF are to be designed with flood compatible materials, withstand the impact associated with flooding and debris.	Section 6.0.3
D / C / O	Utilities and equipment potentially affected by the PMF flood are to be designed and installed with waterproofing or protected to prevent floodwater affecting the system.	Section 6.0.3
O	Back-up power supplies independent of the electrical grid are to be made available for utilities within the building in the event of power outage. The back-up system needs to be protected up to the PMF flood level.	Section 6.0.3
O	Multiple warning systems are to be provided for flood awareness. Flood sensors are to be installed around the building to trigger raising flood waters.	Section 6.0.3
O	To determine the impact of climate change, existing flood models for creek/riverine flooding and associated evacuation procedures updated to suit the new conditions.	Section 6.0.3
C / O	Training is to be provided to all flood wardens on a regular basis and inform all staff, students and visitors during flood evacuations.	Section 6.0.3

Appendix A

Important Phone Numbers

EMERGENCY NUMBERS	
Emergency Contact	**Number**
Police, Fire or Ambulance	000
NSW State Emergency Service	132 500
NSW Roads and Maritime	132 701
Liverpool City Council	1300 362 170

FLOOD EMERGENCY RESPONSE TEAM (TO BE FILLED OUT BY FACILITY MANAGER)		
Role	**Contact Name**	**Number**
The School Staff		
Chief Flood Warden		
Deputy Flood Warden		
Flood Warden 1		
Flood Warden 2		
Flood Warden 3		
First Aid Officer		

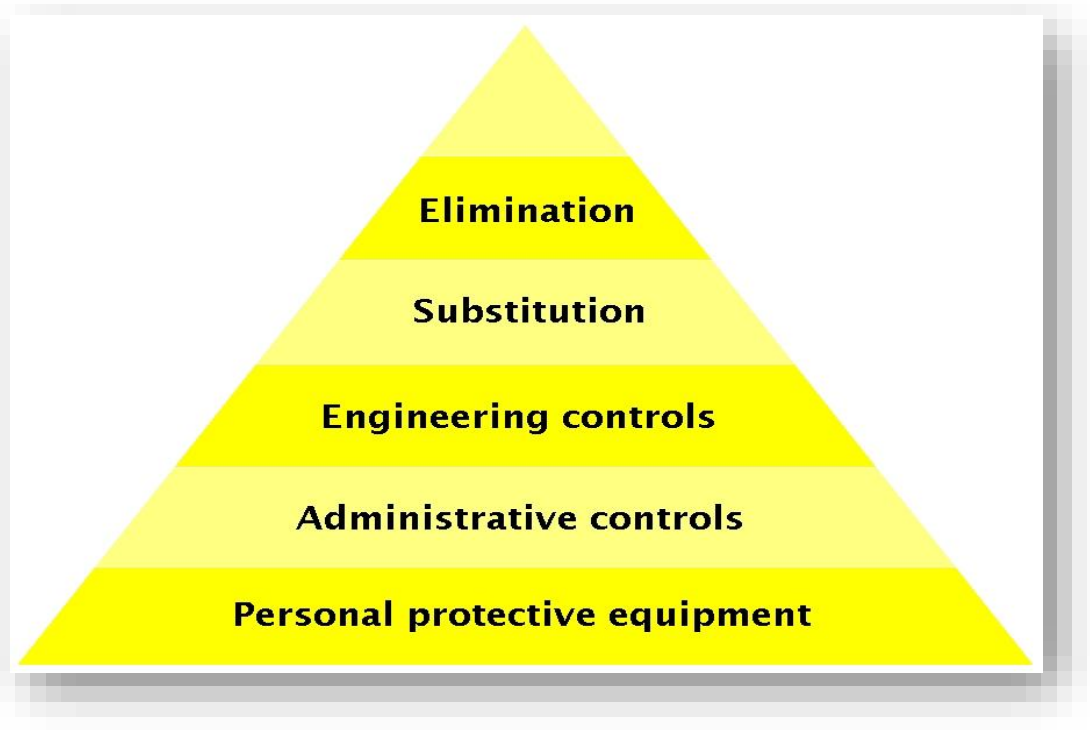
Appendix B

Risk Analysis and Evaluation Tools

Risk Matrix

LIKELIHOOD (probability) How likely is the event to occur at some time in the *(Linear Scale time specific matrix)*	CONSEQUENCES What is the Severity of injuries /potential damages / financial impacts (if the risk event actually occurs)? *(Logarithmic Scale, property industry specific matrix)*				
	Insignificant	Minor	Moderate	Major	Catastrophic
	No Injuries First Aid No Envir Damage << $1,000 Damage	Some First Aid required Low Envir Damage << $10,000 Damage	External Medical Medium Envir Damage <<$100,000 Damage	Extensive injuries High Envir Damage <<$1,000,000 Damage	Death or Major Injuries Toxic Envir Damage >>$1,000,000 Damage
Almost certain - expected in normal circumstances (100%)	MODERATE RISK	HIGH RISK	HIGH RISK	CRITICAL RISK	CRITICAL RISK
Likely – probably occur in most circumstances (10%)	MODERATE RISK	MODERATE RISK	HIGH RISK	HIGH RISK	CRITICAL RISK
Possible – might occur at some time. (1%)	LOW RISK	MODERATE RISK	HIGH RISK	HIGH RISK	CRITICAL RISK
Unlikely – could occur at some future time (0.1%)	LOW RISK	MODERATE RISK	MODERATE RISK	HIGH RISK	HIGH RISK
Rare - Only in exceptional circumstances 0.01%)	LOW RISK	LOW RISK	MODERATE RISK	MODERATE RISK	HIGH RISK

Hierarchy of Control



Appendix C

Council Flood Advice Level

Yolandi Cooper

From: Zeaul Hoque <HoqueZ@liverpool.nsw.gov.au>
Sent: Tuesday, 15 August 2023 9:34 AM
To: Yolandi Cooper
Subject: Liverpool Boys High School & Girls High School (18-20 Forbes Street, Liverpool)

Hi Yolandi

Please find the flood level of the subject site below.

PMF level = 10.8m AHD

Kind Regards

Zeaul Hoque
Acting Senior Floodplain Engineer

LIVERPOOL CITY COUNCIL

02 8711 7747 | | HoqueZ@liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 3 Hoxton Park Road Liverpool, NSW 2170, Australia
www.liverpool.nsw.gov.au

We acknowledge the traditional custodians of the land that now resides within Liverpool City Council's boundaries, the Darug and Dharaw

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From: Zeaul Hoque
Sent: Monday, August 14, 2023 6:40 PM
To: YOLANDI.COOPER@MEINHARDPGROUP.COM
Subject: Liverpool Boys High School & Girls High School (18-20 Forbes Street, Liverpool)

Hello Yolandi

I hope this email finds you well.

I have been informed by Council's Customer Service team that you are interested in obtaining information regarding flooding. Kindly provide me with the details of your request, and I will respond with the relevant information you are seeking.

Thank you for reaching out, and I look forward to assisting you further.

Kind Regards

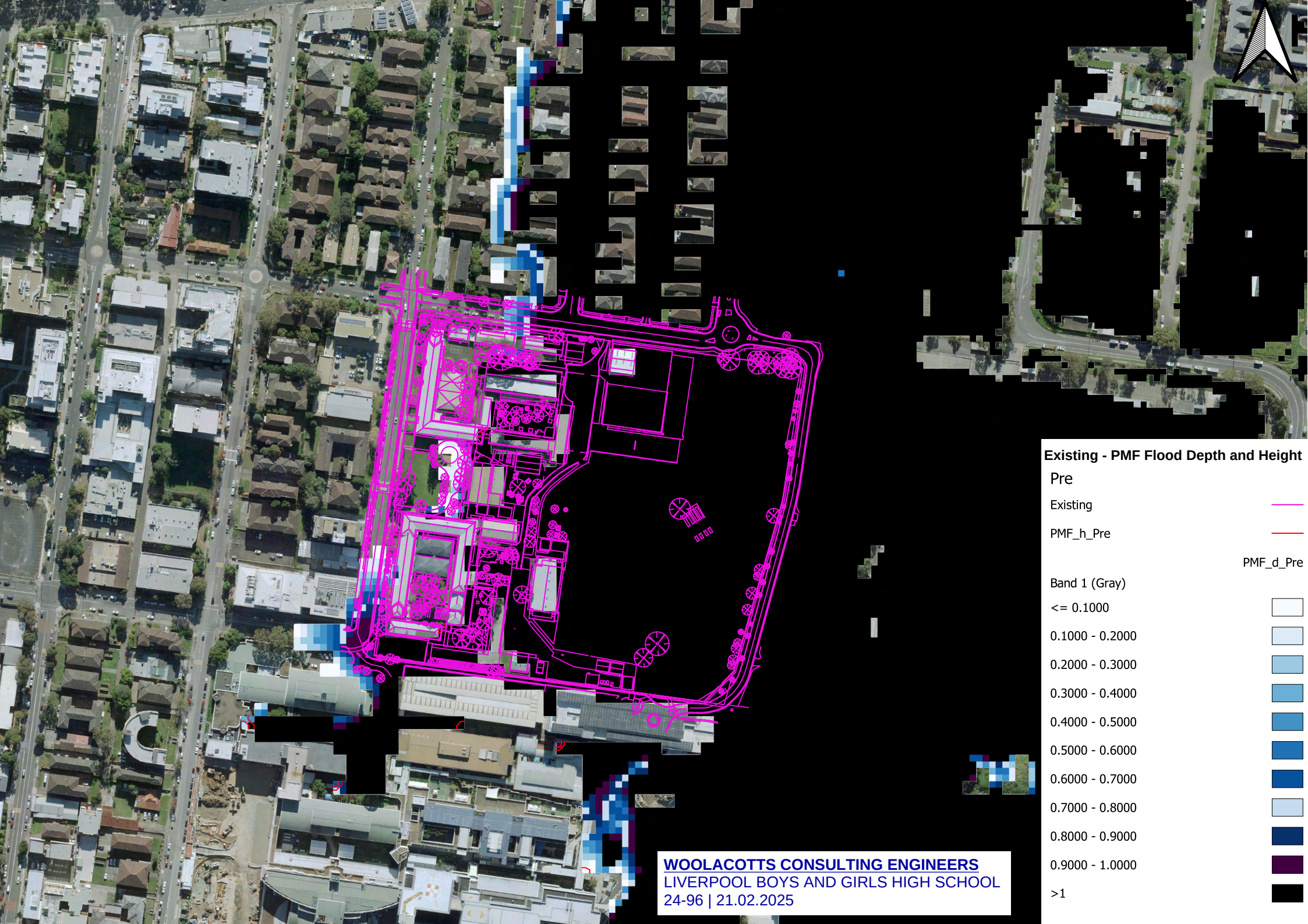
Zeaul Hoque
Acting Senior Floodplain Engineer

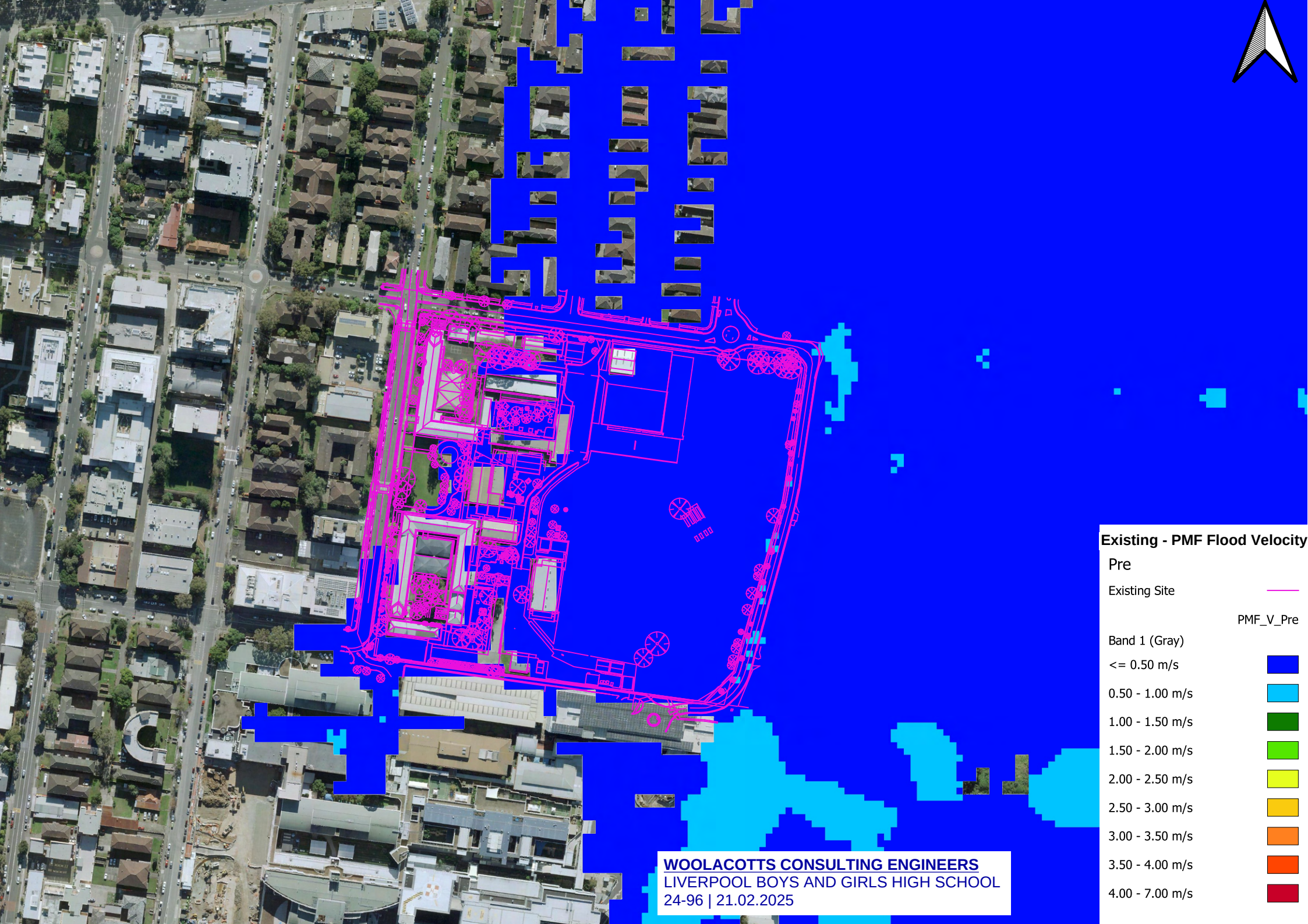
LIVERPOOL CITY COUNCIL

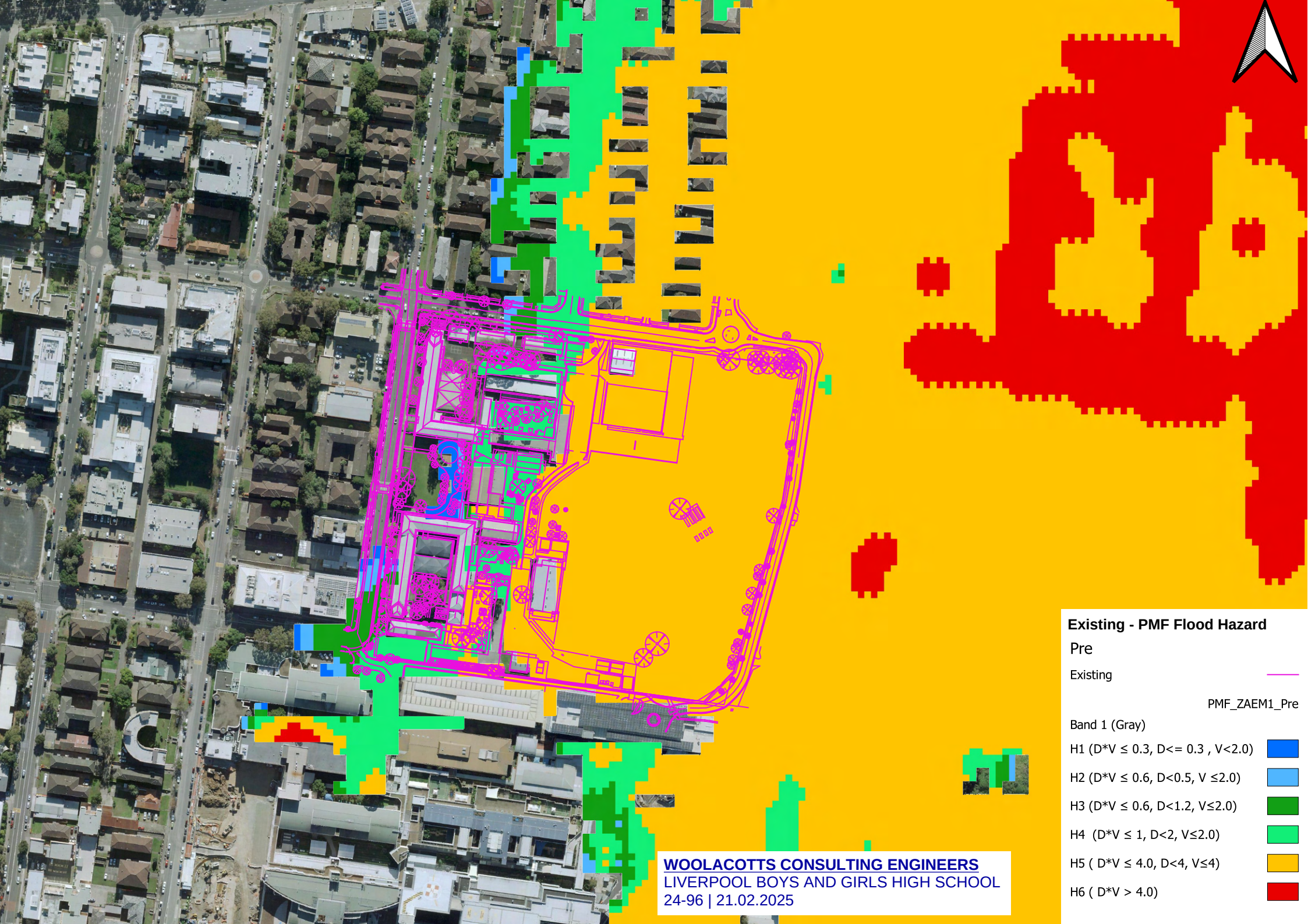
02 8711 7747 | | HoqueZ@liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 3 Hoxton Park Road Liverpool, NSW 2170, Australia
www.liverpool.nsw.gov.au

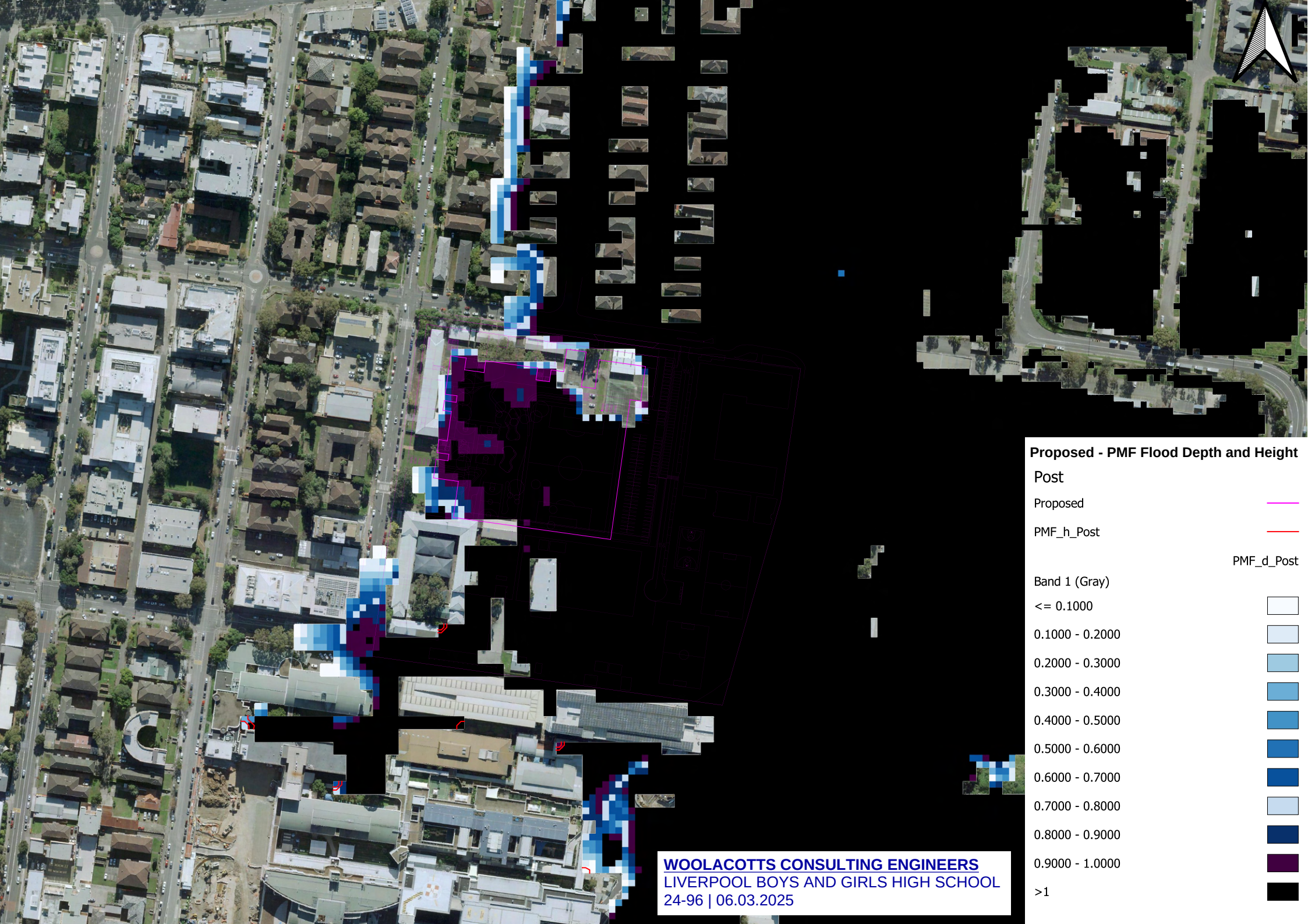
Appendix D

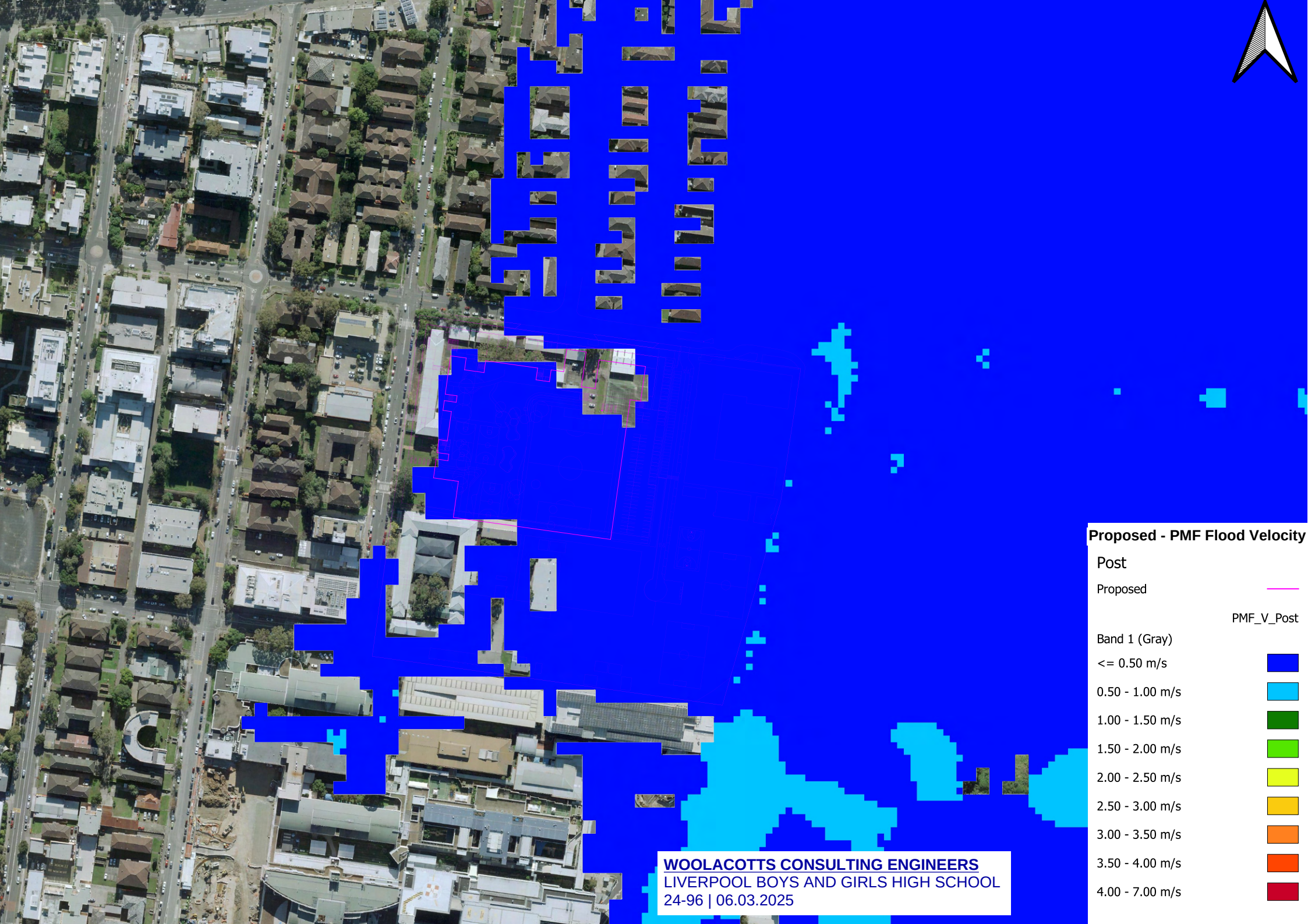
Existing, Proposed and Climate Change Flood Maps from TUFLOW


Existing - PMF Flood Depth and Height
Pre
Existing
PMF_h_Pre
PMF_d_Pre
Band 1 (Gray)
<= 0.1000
0.1000 - 0.2000
0.2000 - 0.3000
0.3000 - 0.4000
0.4000 - 0.5000
0.5000 - 0.6000
0.6000 - 0.7000
0.7000 - 0.8000
0.8000 - 0.9000
0.9000 - 1.0000
>1
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 21.02.2025


Existing - PMF Flood Velocity
Pre
Existing Site
PMF_V_Pre
Band 1 (Gray)
<= 0.50 m/s
0.50 - 1.00 m/s
1.00 - 1.50 m/s
1.50 - 2.00 m/s
2.00 - 2.50 m/s
2.50 - 3.00 m/s
3.00 - 3.50 m/s
3.50 - 4.00 m/s
4.00 - 7.00 m/s
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 21.02.2025


Existing - PMF Flood Hazard
Pre
Existing
PMF_ZAEM1_Pre
Band 1 (Gray)
H1 (D*V ≤ 0.3, D<= 0.3 , V<2.0)
H2 (D*V ≤ 0.6, D<0.5, V ≤2.0)
H3 (D*V ≤ 0.6, D<1.2, V≤2.0)
H4 (D*V ≤ 1, D<2, V≤2.0)
H5 (D*V ≤ 4.0, D<4, V≤4)
H6 (D*V > 4.0)
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 21.02.2025

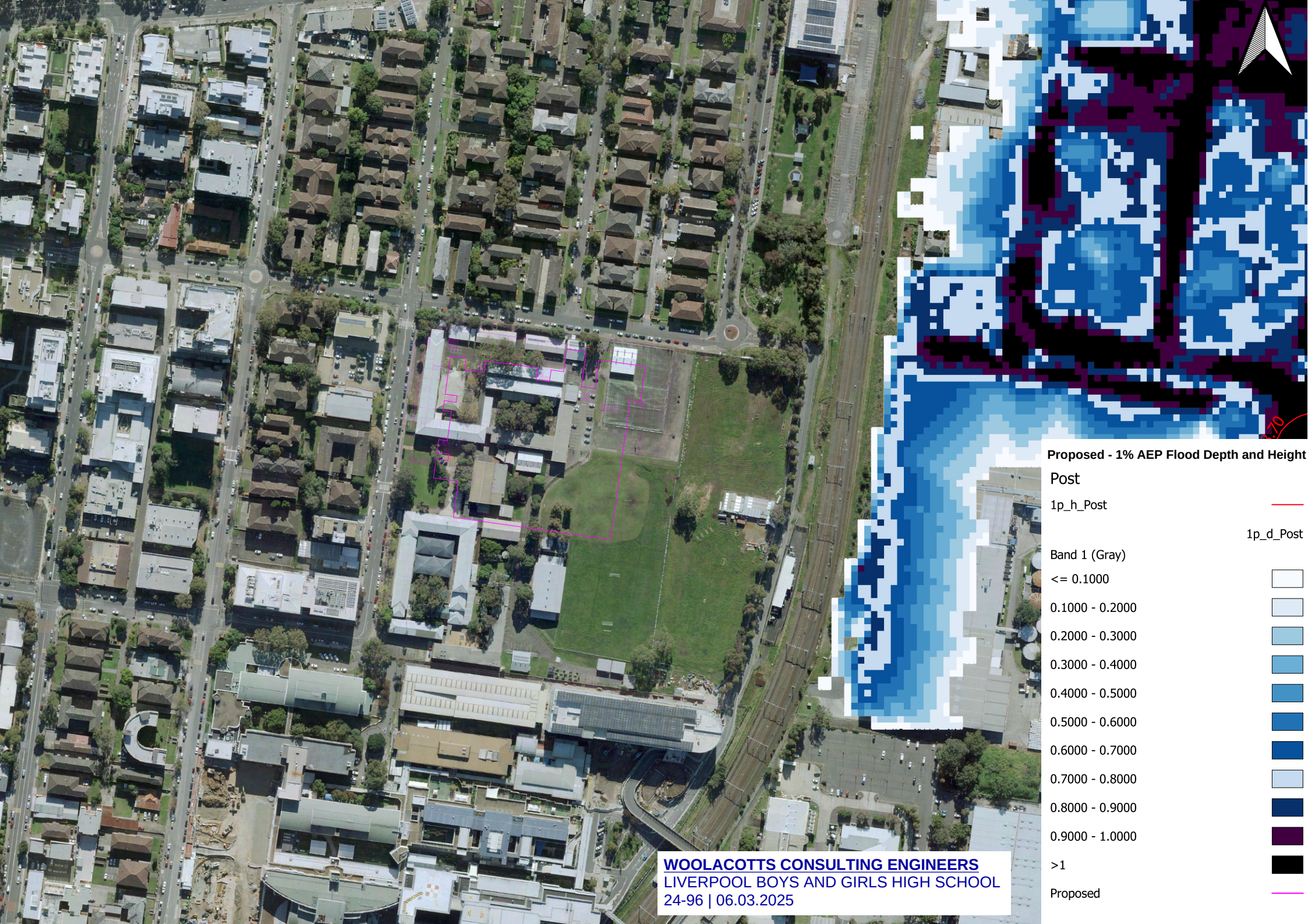

Proposed - PMF Flood Depth and Height
Post
Proposed
PMF_h_Post
PMF_d_Post
Band 1 (Gray)
<= 0.1000
0.1000 - 0.2000
0.2000 - 0.3000
0.3000 - 0.4000
0.4000 - 0.5000
0.5000 - 0.6000
0.6000 - 0.7000
0.7000 - 0.8000
0.8000 - 0.9000
0.9000 - 1.0000
>1
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - PMF Flood Velocity
Post
Proposed
PMF_V_Post
Band 1 (Gray)
<= 0.50 m/s
0.50 - 1.00 m/s
1.00 - 1.50 m/s
1.50 - 2.00 m/s
2.00 - 2.50 m/s
2.50 - 3.00 m/s
3.00 - 3.50 m/s
3.50 - 4.00 m/s
4.00 - 7.00 m/s
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025

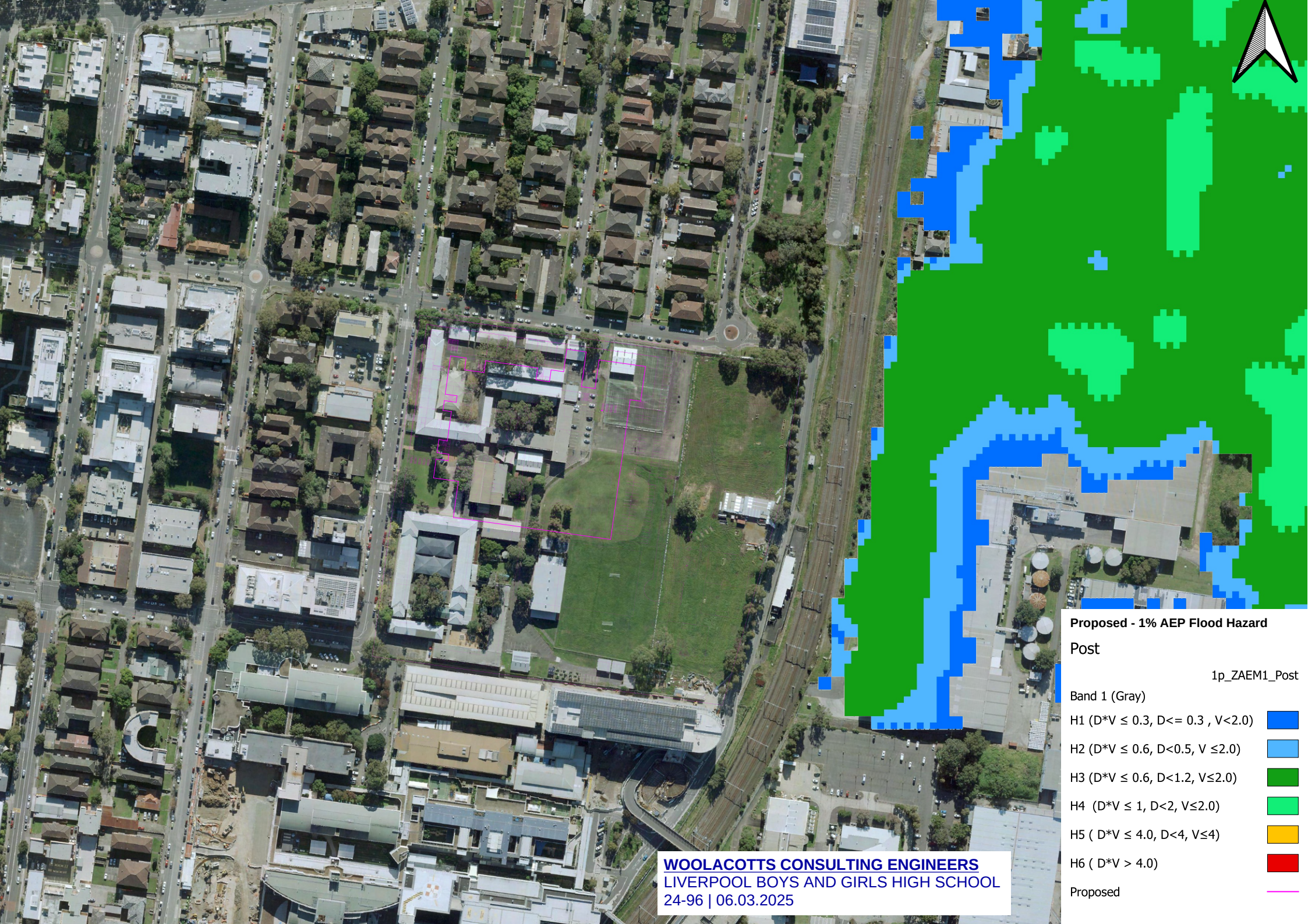

Proposed - PMF Flood Hazard
Post
Proposed
PMF_ZAEM1_Post
Band 1 (Gray)
H1 (D*V ≤ 0.3, D<= 0.3 , V<2.0)
H2 (D*V ≤ 0.6, D<0.5, V ≤2.0)
H3 (D*V ≤ 0.6, D<1.2, V≤2.0)
H4 (D*V ≤ 1, D<2, V≤2.0)
H5 (D*V ≤ 4.0, D<4, V≤4)
H6 (D*V > 4.0)
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025

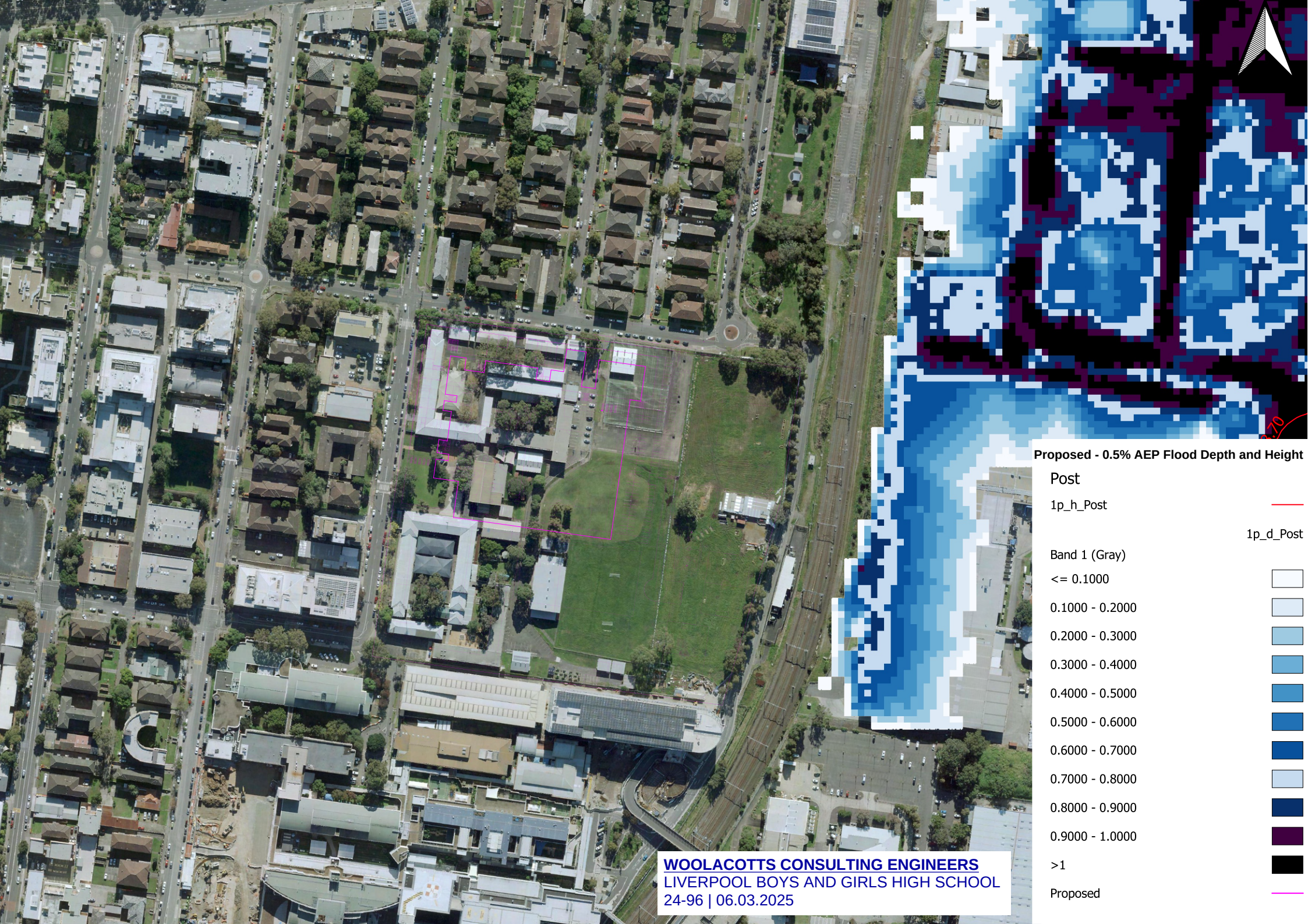

Proposed - PMF Flood Impact (Afflux)
Post
Proposed
PMF_d_Flood_Impact
Band 1 (Gray)
0
0.00 - 0.01 m
0.01 - 0.05 m
0.05 - 0.10 m
> 0.10 m
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - PMF Climate Change Impact (Afflux)
Post
Proposed
PMF_d_Climate_Change_Impact
Band 1 (Gray)
<= 0.00 m
0.00 - 0.50 m
0.50 - 1.00 m
1.00 - 2.00 m
m
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025

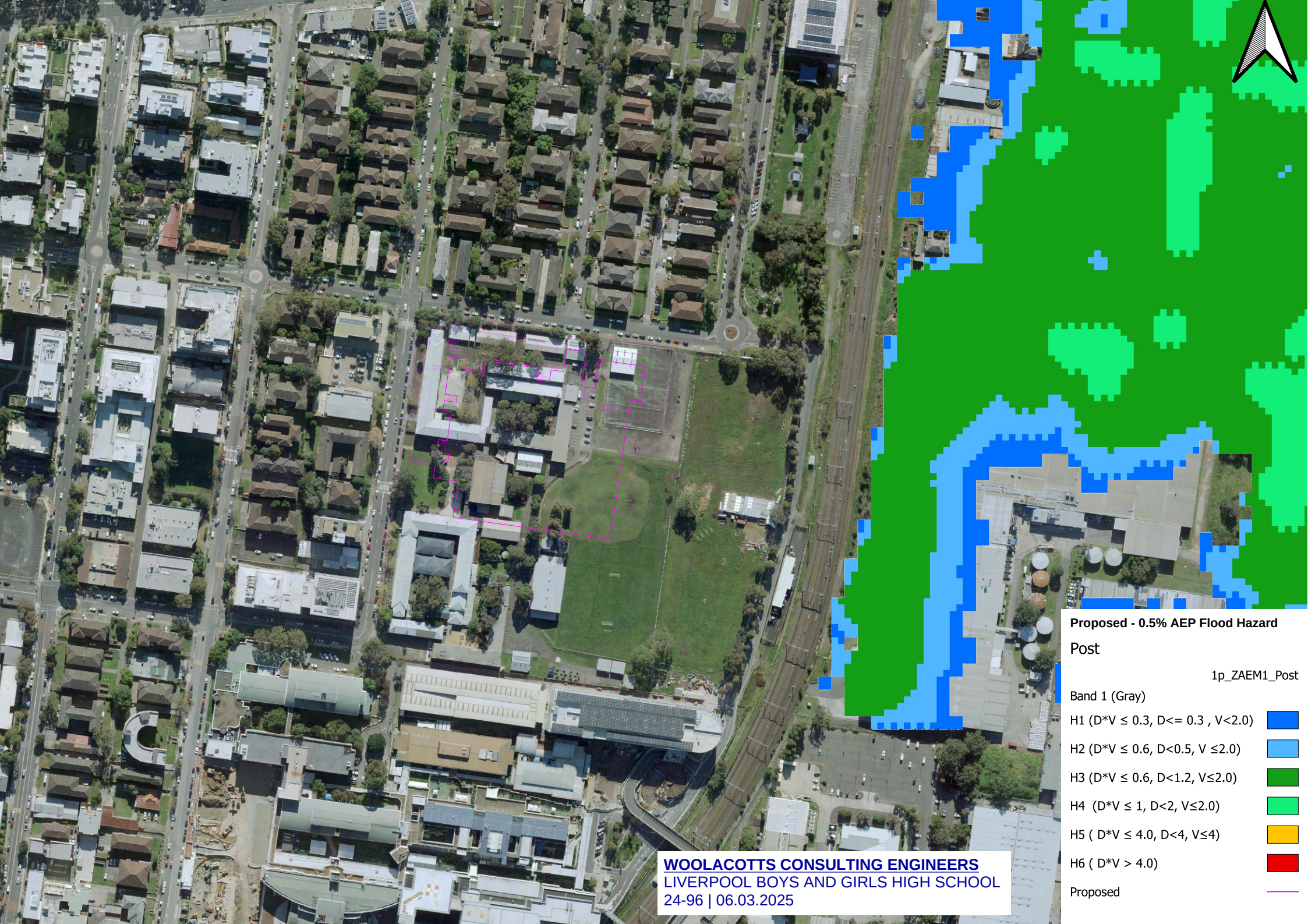

Proposed - 1% AEP Flood Depth and Height
Post
1p_h_Post
1p_d_Post
Band 1 (Gray)
<= 0.1000
0.1000 - 0.2000
0.2000 - 0.3000
0.3000 - 0.4000
0.4000 - 0.5000
0.5000 - 0.6000
0.6000 - 0.7000
0.7000 - 0.8000
0.8000 - 0.9000
0.9000 - 1.0000
>1
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - 1% AEP Flood Velocity
Post
1p_V_Post
Band 1 (Gray)
<= 0.50 m/s
0.50 - 1.00 m/s
1.00 - 1.50 m/s
1.50 - 2.00 m/s
2.00 - 2.50 m/s
2.50 - 3.00 m/s
3.00 - 3.50 m/s
3.50 - 4.00 m/s
4.00 - 7.00 m/s
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - 1% AEP Flood Hazard
Post
1p_ZAEM1_Post
Band 1 (Gray)
H1 (D*V ≤ 0.3, D<= 0.3 , V<2.0)
H2 (D*V ≤ 0.6, D<0.5, V ≤2.0)
H3 (D*V ≤ 0.6, D<1.2, V≤2.0)
H4 (D*V ≤ 1, D<2, V≤2.0)
H5 (D*V ≤ 4.0, D<4, V≤4)
H6 (D*V > 4.0)
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - 0.5% AEP Flood Depth and Height
Post
1p_h_Post
1p_d_Post
Band 1 (Gray)
<= 0.1000
0.1000 - 0.2000
0.2000 - 0.3000
0.3000 - 0.4000
0.4000 - 0.5000
0.5000 - 0.6000
0.6000 - 0.7000
0.7000 - 0.8000
0.8000 - 0.9000
0.9000 - 1.0000
>1
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - 0.5% AEP Flood Velocity
Post
1p_V_Post
Band 1 (Gray)
<= 0.50 m/s
0.50 - 1.00 m/s
1.00 - 1.50 m/s
1.50 - 2.00 m/s
2.00 - 2.50 m/s
2.50 - 3.00 m/s
3.00 - 3.50 m/s
3.50 - 4.00 m/s
4.00 - 7.00 m/s
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025


Proposed - 0.5% AEP Flood Hazard
Post
1p_ZAEM1_Post
Band 1 (Gray)
H1 (D*V ≤ 0.3, D<= 0.3 , V<2.0)
H2 (D*V ≤ 0.6, D<0.5, V ≤2.0)
H3 (D*V ≤ 0.6, D<1.2, V≤2.0)
H4 (D*V ≤ 1, D<2, V≤2.0)
H5 (D*V ≤ 4.0, D<4, V≤4)
H6 (D*V > 4.0)
Proposed
WOOLACOTTS CONSULTING ENGINEERS
LIVERPOOL BOYS AND GIRLS HIGH SCHOOL
24-96 | 06.03.2025

Appendix E

Evacuation Route and Flood Emergency Assembly Locations

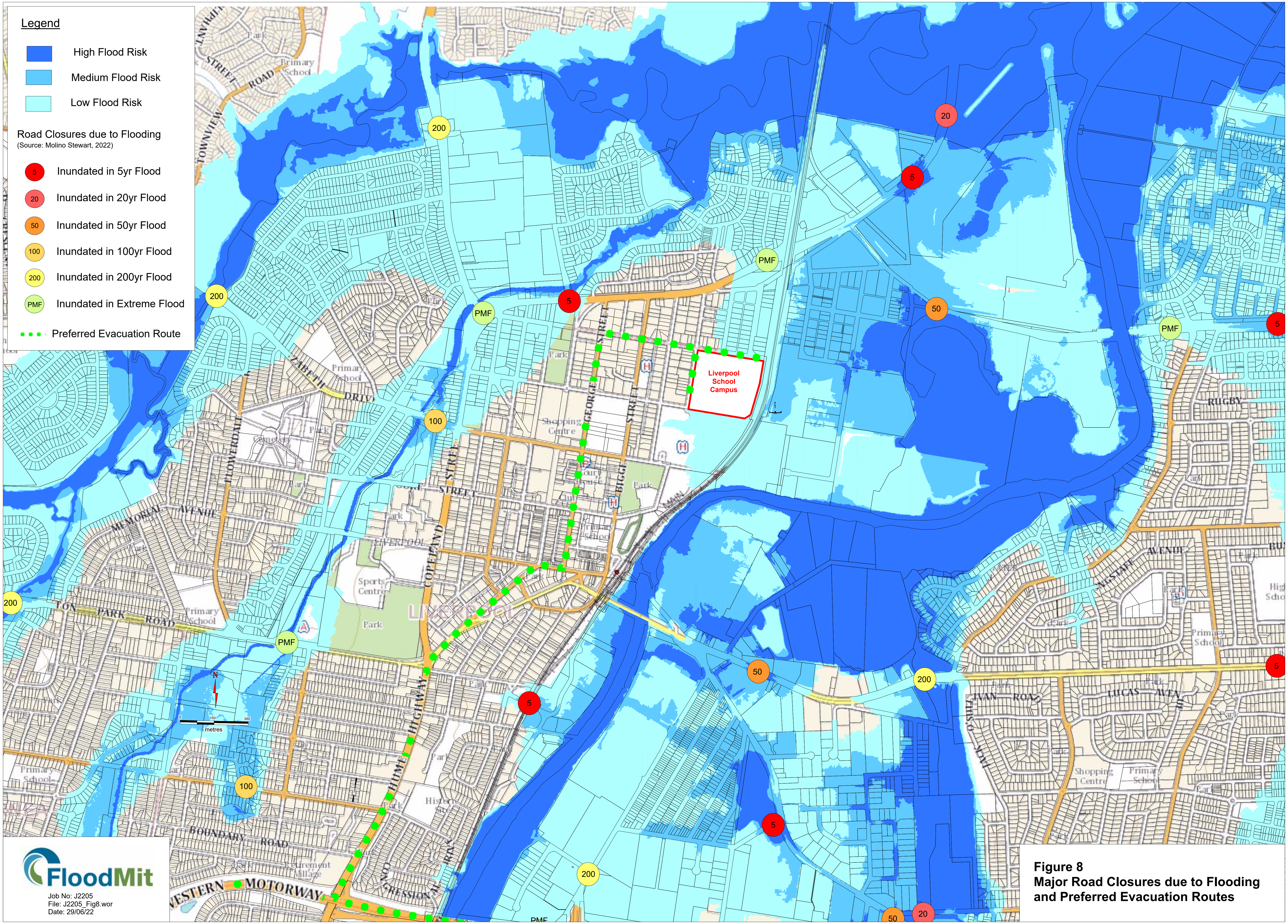
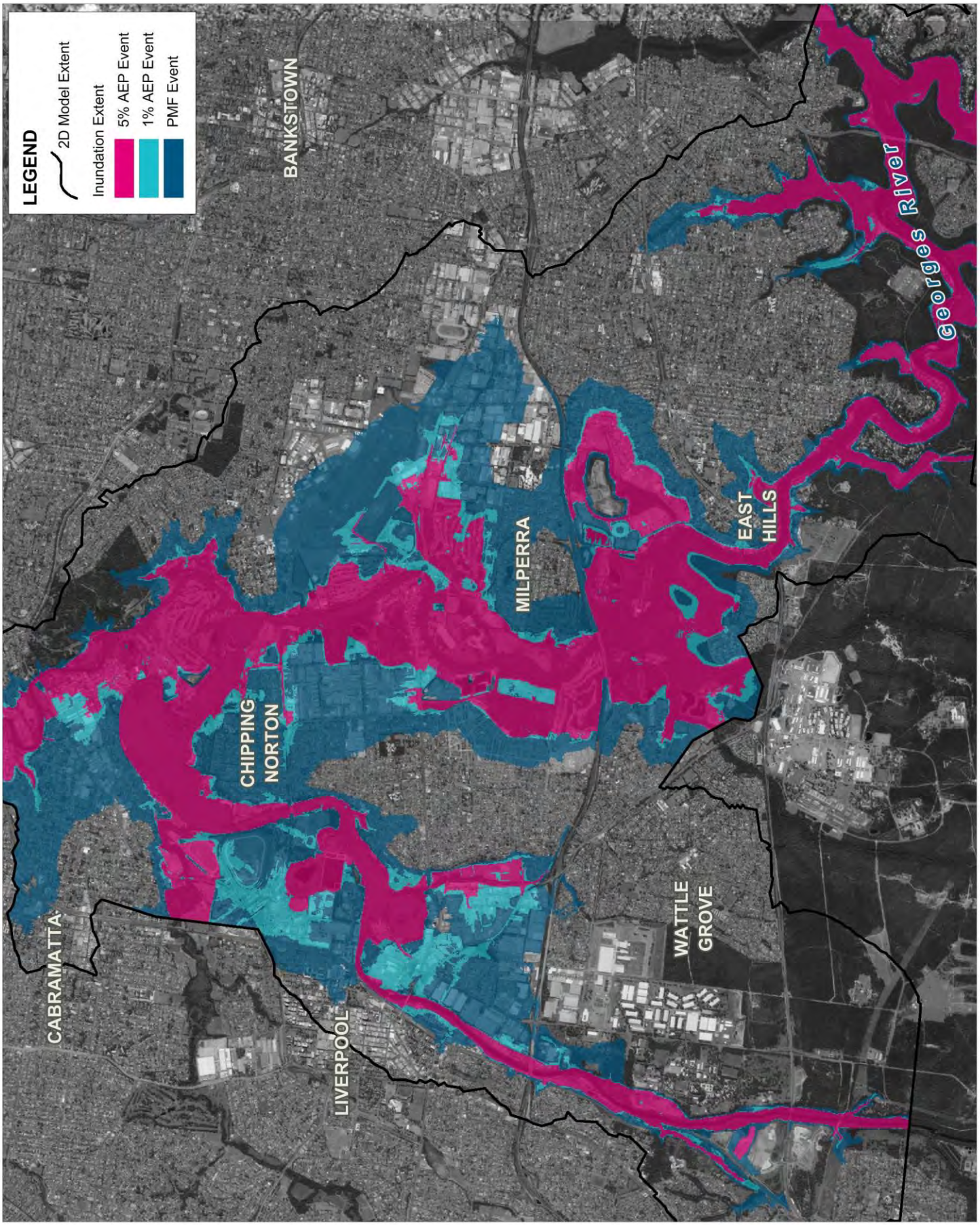


Figure 8
Major Road Closures due to Flooding and Preferred Evacuation Routes

Appendix F

Flood Extent Map

(Source: Georges River Flood Study by BMT 2021)



Title:

Design Flood Inundation Extents

Figure: **7-5**

Rev: **B**

N

0 1.25 2.5km

Approx. Scale

BMT

www.bmt.org

Filepath : K:\S20156_Georges_River_Flood_Study\MapInfo\Workspaces\Figures\DRG_7-5_Inundation_Extents.WOR