Opal Aged Care

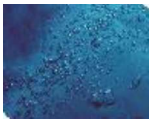
Flood Impact Report and Draft Flood Risk and Emergency Response Plan: 12 Station Road, Toongabbie, NSW

P1605655JR01V04
December 2016

martens consulting engineers

ENVIRONMENTAL

WATER



WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to prepare a Draft Flood Risk Emergency Response Plan in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Opal Aged Care (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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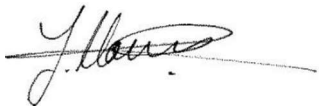
Jonathan Frecker / Michael Huan	Terry Harvey	Terry Harvey	

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All enquiries regarding this project are to be directed to the Project Manager.

Executive Summary

This report has been prepared to assess the impact of the proposed development at 12 Station Road, Toongabbie on flooding behaviour, prepare a risk assessment and a flood emergency response plan for the development.

Flooding behaviour was analysed using a DRAINS hydrological model and 20 year ARI, 100 year ARI and PMF flood levels from flood maps provided by council. Risk assessments for the 100 year ARI event and PMF event were undertaken to identify the potential hazards affecting the development due to flooding.

Results indicate that the site grounds are generally unaffected by flooding up to the 100 year ARI event. Site grounds are inundated in PMF events, however all habitable levels are located at or above the PMF event flood level. Risk assessments indicate that the risk levels caused by hazards to persons, structures, services and vehicles up to the PMF event are generally low to very low.

Based on the expected flooding behaviour and risk levels, this report provides and describes several flood risk mitigation measures, including:

- Features incorporated into design of the proposed development.
- A proposed on-site flood warning system.
- Preliminary flood emergency response plan which will form part of the development's overall emergency management plan.

Contents

1 Introduction

1.1 Overview

Martens & Associates have been engaged to provide a Flood Impact Report and Draft Flood Risk and Emergency Response Plan for the proposed development at 12 Station Road, Toongabbie, NSW (the "site").

1.2 Site Details

Table 1 summarises general site details.

Table 1: Site details.

Element	Site Details
Site Address	12 Station Road, Toongabbie, NSW
Lot/DP	Lots 7, 8, 9, DP22506, and Lot 30 DP 1106209. Proposed to subdivide to form Lot 502
Site Area	4,887 m^2
Neighbouring Environment	The site is bounded by Girraween Creek to the west, Toongabbie Sports and Bowling Club to the north, Wentworth Avenue to the east and residential apartment buildings to the south
Site Elevation	Approximately 29.3 mAHD
LGA	Parramatta City Council

1.3 Relevant Guidelines

This report has been prepared with reference to the following guidelines:

- Department of Infrastructure, Planning and Natural Resources (2005) *Floodplain Development Manual: The management of flood liable land.*
- Parramatta Local Emergency Management Committee (2009) *Parramatta Local Disaster Plan (DISPLAN)*.
- Parramatta City Council (2006) *Local Floodplain Risk Management Policy.*
- Parramatta City Council (2011) *Parramatta Development Control Plan.*

2 Proposed Development

2.1 Overview

This section provides a description of the proposed development.

2.2 Proposed Development Details

The proposed development comprises a 128 bed residential care facility providing 24-hour nursing and personal care for seniors who are less independent or frail and have been assessed by the Aged Care Assessment Service. The facility will provide four habitable levels in total, and will be owned and operated by the Client. The facility also incorporates several design features which act as flood risk mitigation measures, which are described in Section 6. Proposed uses for each level of the site are summarised in Table 2.

Table 2: Proposed uses.

Level	Proposed Uses
Ground Floor	• 18 single-bed rooms (dementia units) with ensuite bathrooms; • staff amenities, staff lockers; staff lounge, staff offices; • utility rooms and bulk store rooms; • lounge/activities room and multi-purpose room; • nurses stations; • dining area and servery; • hair salon; • cafe and seating; • reception and office; • hot desk; • lift access; • laundry facilities and garbage rooms; • an external courtyard and outdoor seating; and • at grade parking
Level 1	• 40 single-bed rooms with ensuite bathrooms; • Lounge rooms and terrace areas, • dining area and servery; • nurses station; • staff amenities, • treatment room; • linen cupboards and store rooms; • garbage rooms; and • lift access
Level 2	• 40 single-bed rooms with ensuite bathrooms; • Lounge rooms and terrace areas, • dining area and servery;

Level	Proposed Uses
	• nurses station; • staff amenities, • treatment room; • quiet room; • linen cupboards and store rooms; • garbage rooms; and • lift access
Level 3	• 30 single-bed rooms with ensuite bathrooms; • lounge/activity rooms; • terrace areas including one large landscaped terrace area; • dining area and servery; • nurses station; • staff amenities, • treatment room; • quiet room; • linen cupboards and store rooms; • garbage rooms; and • lift access
Roof Level	• Hydraulic plant room; and • Mechanical plant room

3 Flooding Behaviour

3.1 Overview

This section describes existing flood behaviour in the vicinity of the site and compares flood levels to proposed habitable floor levels of the proposed development.

3.2 Flooding Behaviour

The dominant feature controlling flood behaviour on the site is Girraween Creek located directly adjacent and to the West of the site. Girraween Creek is a heavily vegetated channel with a catchment area of over 900 hectares. The *Parramatta City Council Flood Map* (refer to Attachment A) and the survey plan (RPS Australia East Pty Ltd, March 2016, refer to Attachment B) were used to approximate the flood behaviour at the site.

Flooding is contained within the Girraween Creek channel adjacent to site up to the 20 year ARI event. North of the site on Station road, flood waters begin to back up although access to site via Cornelia Road is unimpeded.

Flooding is generally contained in the Girraween Creek channel adjacent to the site between the 20 and 100 year ARI event. North of the site on Station Road, flood water continues to back up however access to site is still not impeded via Cornelia Road.

Flood water overtops the creek banks and rises to a depth on site of approximately 0.9 m from the 100 year ARI to the PMF event. The *Parramatta City Council Flood Hazard Map* (refer to Attachment A) indicates that the hydraulic hazard (velocity and depth product) for this site is classified as low.

3.3 Flood Hydrographs

Approximate creek hydrographs at the site were produced using preliminary DRAINS hydrological modelling of the upslope catchment. The 20 and 100 year ARI and PMF events of varying durations were modelled. The peak flow hydrographs are presented in Figure 1.

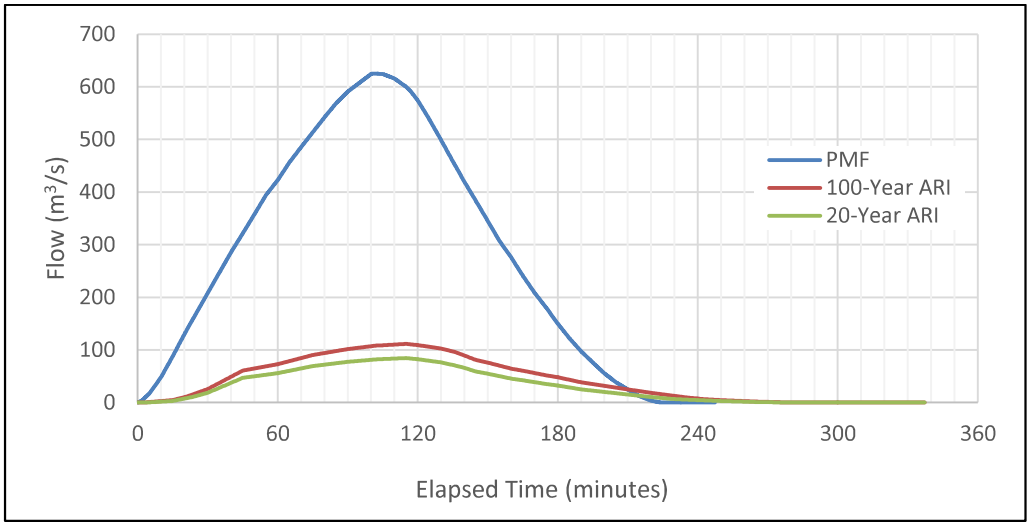


Figure 1: Approximate flood hydrographs for the 20 and 100 year ARI and PMF storm events.

The initial water level adjacent to the site was inferred to be 26.50 mAHD, and flood levels for the 20 and 100 year ARI and the peak PMF event are approximately 28.38 mAHD, 28.61 mAHD and 30.17 mAHD respectively based on *Parramatta City Council Flood Map*. Resulting flood level hydrographs were then created based on these levels and peak flows obtained from DRAINS, and are shown on Figure 2. Various duration PMF events have been included to assess different flooding scenarios.

Figure 2 indicates that the egress road is not inundated in the 20 year ARI and 100 year ARI event. The egress road is inundated in all PMF events; however the ground floor FFL is higher than the PMF flood level which indicates that all residents and staff will be able to shelter in place in the facility for the duration of the storm. For the shorter duration PMF events (1.5 hour to 3 hour), the flood level is expected to rise to the egress road level in 30 to 45 minutes, and will take between 2 hours and 3 hours for the flood level to fall below the egress road level. For the longer duration PMF event (6 hour), the flood level is expected to rise to the egress road level in 70 minutes, and will take 4 hours for the flood level to fall below the egress road level. As a result all persons in the site could have only 30 minutes to evacuate the site in a PMF event. In contrast, all persons would need to shelter in place for up to 5 hours in a longer duration PMF event.

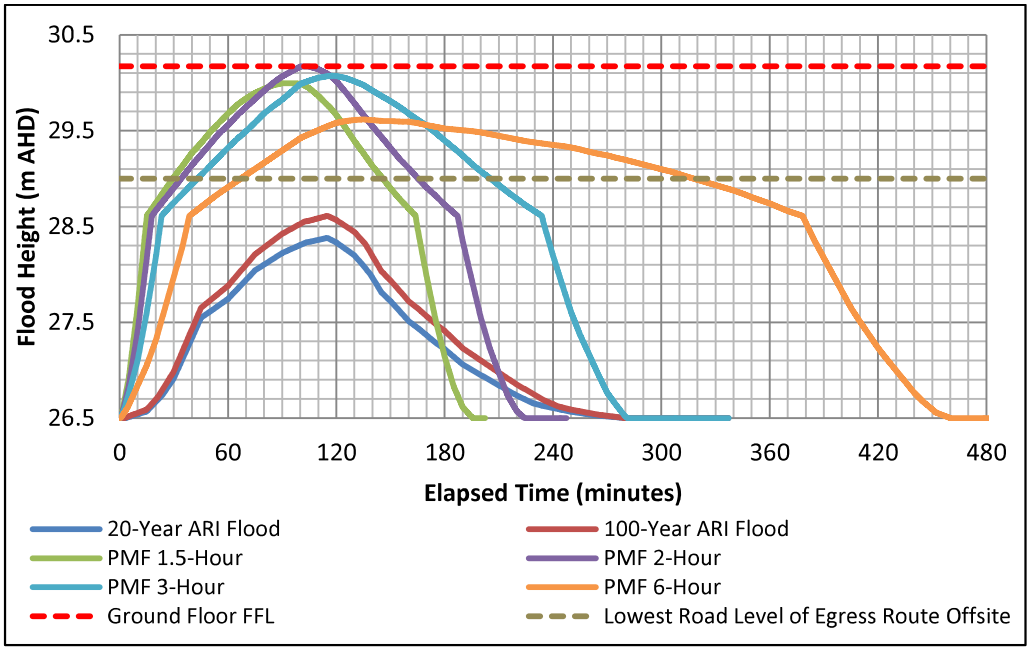


Figure 2: Approximate flood level hydrographs for the 20 and 100 year ARI and PMF events.

3.4 Minimum ARI for Inundation

As the ground floor level is at the PMF event flood level, no habitable levels will be inundated in any storm event. The probability of the flood level reaching the ground floor level has been estimated from Figure 3 at approximately 1 in 1,000,000 years.

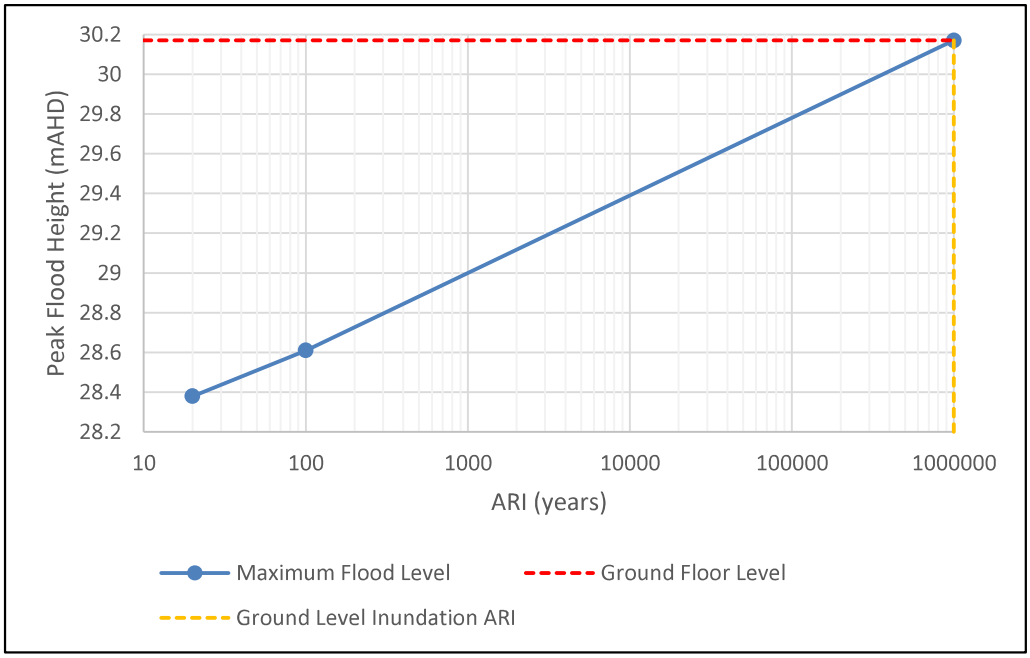


Figure 3: Approximate flood levels for 20 year ARI to PMF storm events.

4 Planning Considerations

4.1 Overview

This section will address the controls and objectives set out in *Parramatta Development Control Plan* (2011) in the context of the site and proposed development.

4.2 Site Compatibility Certificate

A *Certificate of Site Compatibility* (May 2016) issued by the Department of Planning and Environment (refer to Attachment C) has certified that the site is suitable for a residential care facility, subject to a flood evacuation plan being prepared to "demonstrate how people dependent on care can be evacuated in case of an emergency". In compliance with the certificate, this report provides flood risk mitigation measures and a shelter in place evacuation strategy in Section 6, which addresses measures such as flood warning systems, educating staff and residents about flood risks and training staff to perform evacuations.

In this regard it is noted that all habitable floor levels are at or above the PMF event. As outlined in this report, it is safer for residents to shelter in the building during the PMF event compared to evacuating to another place or walking to the streets.

4.3 Flooding Objectives

The proposed development is located in flood liable land and is categorized as a "Low Flood Risk" precinct (low hydraulic hazard and affected by storm events between the 100 year ARI event and PMF event). The proposed development is also classified as "Sensitive Uses and Facilities". Therefore under the Floodplain Matrix or Table 2.7 in *Parramatta Development Control Plan* (2011), the proposed development is classified as an unsuitable land use. A review of the flooding objectives in Section 2.4.2 of *Parramatta Development Control Plan* is provided in Table 3, and is further elaborated upon in the following sections.

Table 3: *Parramatta Development Control Plan* (2011) objectives.

Objective	Description	Response
1	Developers and community are aware of the potential flood hazard and risk	Education and training of staff and residents
2	Manage flood liable land in an economically, environmentally and socially sustainable manner	NA/OS

Objective	Description	Response
3	High flood sensitivity developments are sited and designed to provide reliable access and minimise risk of flooding	Residential levels are situated above the PMF event flood level to eliminate risk of flooding
4	Allow development with a lower sensitivity to flood risk to be located in the flood plain	NA/OS
5	Prevent intensification of the development and use of High Flood Risk Precincts	NA/OS
6	Ensure the proposed development does not expose existing development to increased flood risks	NA/OS
7	Ensure building design and location address flood hazard without having an adverse flood impact on the amenity or ecology of an area	NA/OS
8	Minimise the risk to life by ensuring provision of appropriate access from areas affected by flooding	Flood warning system to be installed and shelter in place evacuation strategy to be implemented, refer to Section 6.
9	Minimise damage to property, including motor vehicles from flooding	Flood resistant materials to be used, adequate warning time given to move vehicles, refer to Section 6.
10	Incorporate the principles of Ecologically Sustainable Development	NA/OS

Notes:

1. NA = Not Applicable.
2. OS = Outside the scope of this report.

4.4 Other Permissible Uses

Based on the Floodplain Matrix or Table 2.7 in *Parramatta Development Control Plan*, other development types permissible with consent in a "Low Flood Risk" precinct are described in Table 4.

Table 4: Development permissible with consent

Land Use Type	Development permissible with consent
Critical Uses and Facilities	Telecommunication facilities; waste management facilities
Residential	Health consulting rooms; home based child care
Commercial and Industrial	Function centres; medical centres

Other development types such as telecommunication facilities are critical for the entire LGA are permissible with consent in "Low Flood Risk" precincts. Similar development types which accommodate a large number of people, such as function centres, or developments which accommodate less mobile people or children are also permissible with consent. These development types carry a comparable risk profile with the proposed development.

4.5 Preliminary Flood Impact Analysis

The site has a minimum elevation of 29 mAHD, approximately 400 mm above the 100 year ARI event flood level. Therefore, the proposed development will not impact the behaviour of floods up to and including the 100 year ARI event.

The proposed development has the potential to marginally impact flood levels (subject to flood modelling) once flood levels reach 29.4 mAHD which correlates to the 1 in 10,000 year event. However, these impacts, which are well above the flood planning level, are not considered significant and are not expected to materially affect flood risk on adjoining properties.

5 Risk Assessment

5.1 Overview

This section describes the method used to assess the risk of various hazards identified that could occur due to a flood event, and the subsequent level of risk that each hazard poses.

5.2 Risk Assessment Method

Table 5 provides risk scores based on the combination of the likelihood and consequence of an event occurring. The definitions used to assess likelihood and consequence are described below.

5.2.1 Likelihood of Occurrence

Broad definitions adopted for each of the likelihood terms are based on the following:

1. Almost certain – Expected to occur regularly.
2. Likely – Will probably occur regularly.
3. Possible – Could occur under adverse circumstances.
4. Unlikely – May occur under very adverse circumstances.
5. Rare – Conceivably could occur under exceptional circumstances.
6. Barely Credible – The event is inconceivable or fanciful.

5.2.2 Consequence

Broad definitions adopted for the consequence terms are based on the following:

1. Consequences to person

   Broadly, consequences to person are rated according to the range of injury that would be expected should exposure to the hazard occur. These range from situations where no injury is expected (insignificant consequence) to possible death or major trauma (major consequence) or likely death (severe consequence).

2. Consequence to chattels and property

   Broadly, consequence to chattels and property are rated according to the range of damage that would be expected should exposure to the hazard occur. These range from situations where no damage is expected (insignificant consequence) to substantive damage (major consequence) or complete destruction (severe consequence).

Table 5: Risk Scores Matrix.

		Consequence				
		Insignificant	**Minor**	**Moderate**	**Major**	**Severe**
Likelihood	**Almost certain**	Moderate	Moderate	High	High	High
	Likely	Low	Moderate	Moderate	High	High
	Possible	Very Low	Low	Moderate	High	High
	Unlikely	Very Low	Very Low	Low	Moderate	High
	Rare	Very Low	Very Low	Low	Moderate	Moderate
	Barely Credible	Very Low	Very Low	Very Low	Very Low	Very Low

5.3 Potential Hazards due to Flooding

5.3.1 Hazards to Persons

There are several ways for persons to become exposed to flood hazards, including:

1. Residents exposed to flood waters within site grounds – this is considered rare to barely credible because the site has a minimum level of 29 mAHD which is higher than the 100 year ARI event flood level of 28.61 mAHD; residents will need to be outside during an event approaching the PMF event for this to occur.

2. Residents exposed to flood waters within building – this is considered rare to barely credible because all habitable floor levels are at or above the PMF event flood level.

3. Residents exposed to flood waters while accessing or leaving the site – this is considered rare because the level of the roundabout on Cornelia Road (approximately 29.0 – 29.5 mAHD) is greater than the 100 year ARI event (28.61 mAHD); residents would need to be trying to access the site during an event approaching the PMF event for this to occur.

Residents in the building may also experience concern during the course of a major flooding event, as vehicular access to and from the site and services may be impacted for approximately 3 to 5 hours in a PMF event. However through the implementation of flood risk mitigation measures, such as educating residents on flood risks and evacuation strategy and having trained staff to assist, resident concerns can be adequately mitigated.

5.3.2 Hazards to Structures

We expect the building to be designed to be resistant to flood forces and make the following assessment:

1. During the 100 year ARI event, all habitable floor levels are not impacted by flood water and therefore the risk is very low.

2. During the PMF event, all habitable floor levels are not impacted by flood water and therefore the risk is very low.

5.3.3 Hazards to Services

Flood waters have the potential to affect services when above the 100 year ARI event flood level and approaching the PMF level. Potential impacts are:

1. Building utilities disrupted.

2. Building lifts disrupted.

3. Medical services disrupted.

4. Food supply disrupted.

The duration of services disruption may be in the order of 3 to 5 hours in a PMF event.

5.3.4 Hazards to Vehicles

Floods can damage cars by: water entering the car components and interior; damage by floating debris; or cars being floated and carried away. The following assessment is made:

1. During the 100 year ARI event, the carpark and the road accessing the site is not affected and therefore the risk is very low.

2. During the PMF event, water depths in the carpark are in the order of 0.5 m and will affect vehicle trafficablity, however the

velocity is expected to be low and therefore the hydraulic hazard and associated risk is low.

5.3.5 Summary

Table 6 and Table 7 summarise the likelihood, consequence and resulting risk score for each hazard described above, for the 100 year ARI and PMF events. It was determined that for all hazards, without implementation of risk mitigation measures, the risk was either low or very low.

Table 6: Risk assessment for the 100 year ARI event.

Hazard	Likelihood	Consequence	Risk Level
Risk to Persons	Barely credible	Insignificant	Very low
Risks to Structure	Barely credible	Insignificant	Very low
Risk to Services	Barely credible	Insignificant	Very low
Risk to Vehicles	Barely credible	Insignificant	Very low

Table 7: Risk assessment for the PMF event.

Hazard	Likelihood	Consequence	Risk Level
Risk to Persons	Rare – Barely credible	Minor	Very low
Risks to Structure	Rare – Barely credible	Minor	Very low
Risk to Services	Rare	Minor	Very low
Risk to Vehicles	Rare – Barely credible	Moderate	Low - very low

6 Flood Risk Mitigation Measures

6.1 Overview

The following section outlines various measures that have been, to be, or are implemented in order to reduce the risk of a flood event to people, structures, services and vehicles. Where applicable, these have been devised with reference to *Parramatta Development Control Plan* (2011) design standards for flood affected developments and the *Parramatta Local Disaster Plan* (DISPLAN) (Parramatta Local Emergency Management Committee, 2009).

6.2 Currently Designed Mitigation Measures

The proposed development is designed to manage evacuation onsite, specifically through a shelter in place evacuation strategy. This strategy is considered to be more effective than evacuating from the site due to the following flood risk mitigation measures:

1. Ground floor level of 30.17 mAHD is at the PMF event flood level. This indicates that all habitable floor levels will not be inundated in any storm event.

2. Switch room, communications room equipment, genset electricity generator and electricity substation are to be installed above the level of the PMF to minimise the disruption to services during any storm event.

3. Buildings are to be constructed using flood-compatible materials up to the PMF event flood level.

4. Flood warning system to be implemented.

All residents, visitors and staff can shelter in place on the ground floor or higher floors during flooding events. As noted in Section 5.3, there will likely be disruption to vehicular access and some services for between 3 and 5 hours in the PMF event, however these risks can be mitigated through the recommended measures in Section 6.3.

In contrast, evacuating from the site in storm events between the 100 year and PMF event will carry a larger risk as people could only have 30 minutes to evacuate from the site in a PMF event before the access roads surrounding the site are inundated, as discussed in Section 2.2. This report recommends shelter in place as the primary evacuation strategy, with site evacuation only occurring following orders received from the NSW State Emergency Service (SES).

6.3 Risk Mitigation Measures

Table 8 summarises risk mitigation measures to be implemented to reduce the risk of floods to people, structures, services, and vehicles. It is noted that several risk mitigation measures have been incorporated into the design of the facility.

Table 8: Risk mitigation measures.

Risk	Mitigation Measure
To persons	• Shelter in place evacuation strategy for all residents to remain on ground floor or higher levels. • Flood evacuation information to be provided in suitable locations. • Staff training in flood hazards and evacuation plans. • Education of residents of the risk of floods and the evacuation plan. • On-site flood warning system. • Flood depth indicator to be installed at the lowest point on Cornelia Road access route.
To structures	• Ground floor to be located above the PMF event flood level to ensure facility is not flooded in any storm event. [1] • Flood resistant materials to be installed in areas affected by the PMF event. [1] • Structural elements to be designed to withstand likely forces from flood water, debris and buoyancy. [1]
To services	• Critical service infrastructure and equipment to be installed above the PMF level. [1] • Genset electricity generator to be located above the PMF level and to be capable of providing emergency electricity supply to the facility in the event that electricity is cut off during a flood or as a result of any other disruption to electricity supply. [1] • Electricity substation to be constructed above the PMF storm event. [1] • Ground floor electrical circuits below the PMF to be isolated during a flood event. • Lifts to be parked above ground level and isolated during a flood event which inundates the building. • Adequate medical equipment to be on level 1 and higher at all times to cater for the facility for up to 4-6 hours of isolation. • Adequate numbers of medical staff to be on site at all times to manage the facility for up to 4-6 hours of isolation. • Adequate food and water to be kept on level 1 and higher to cater for the facility for up to 4-6 hours of isolation.
To vehicles	• Vehicles to be moved off-site to higher ground when flood warning received.

Notes:

1. Incorporated into design of facility.

6.5 On-Site Flood Warning System

An on-site flood warning system is proposed to warn facility management of a flood emergency. This is to be installed in a pit on-site, hydraulically connected to Girraween Creek (refer to Figure 4). Proposed trigger conditions are summarised in Table 9, to be formalised with further analysis at Construction Certificate phase.

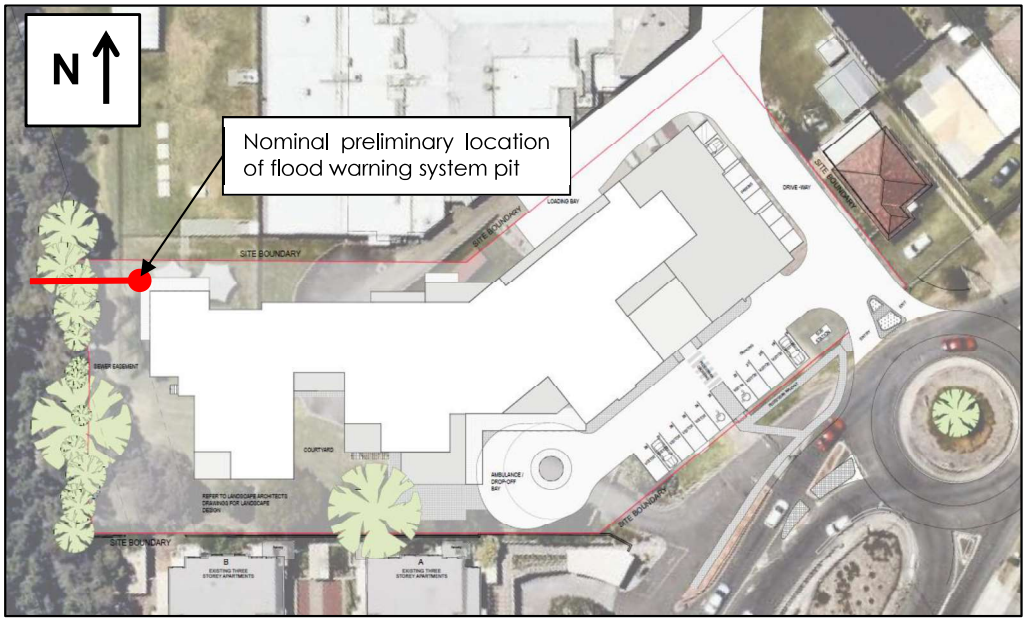


Figure 4: Nominal proposed location of flood warning system pit.

Table 9: Flood warning system trigger levels.

Alarm	Condition	Response
1	Creek rises from natural state to 27.5mAHD in less than 30 minutes	Audible and visual alarm to notify residents to evacuate from ground floor to higher floors.
2	Creek rises to 29.6m AHD	Audible and visual alarm to notify residents that inundation of ground level is imminent or possible

6.6 Preliminary Flood Emergency Response Plan

Table 10 describes the actions to be taken by staff to prepare for, and respond to, a flood event. Note that the primary response is to shelter in place; evacuating from the site should only be undertaken if the NSW SES issues the order to evacuate from the site. These measures are to form part of the Client's Emergency Management Plan for the facility.

Table 10: Flood emergency response plan.

PREPARE PHASE
• Staff to be alert to the threat posed by flooding. • Duty Manager to monitor weather warning services: Bureau of Meteorology, NSW SES, Local Emergency Operations Controller (LEOCon). • Staff to be trained in evacuation procedure, and refreshed annually. • Local SES and LEOCon to be advised of shelter in place evacuation strategy. • Install permanent signage in appropriate locations describing flood risk and evacuation route. • Residents to be educated of the hazard posed by floods and the shelter in place evacuation strategy and procedure. • Regular maintenance and testing of flood warning system to be carried out.
RESPOND PHASE
Weather Warning Received: • Staff, visitors and residents to be notified of a potential risk of flood. • Any residents, visitors or staff in external areas to be brought inside. • Duty manager to stay in contact with LEOCon and NSW SES to monitor the situation. • Non-essential electrical equipment on ground floor to be unplugged.
Evacuation Alarm Signalled: • All residents and visitors to shelter at ground floor or higher floors by staff. • Duty Manager to inform NSW SES and LEOCon of shelter in place. • Vehicles to be moved to higher ground if practicable. • Lifts to be parked on level 1 or higher and isolated to prevent accidental use or persons becoming trapped. • All ground-floor electrical circuits to be isolated. • All ground floor electrical equipment to be unplugged. • Staff to reassure residents and visitors to stay calm and prevent any persons from moving out of the building.
If Evacuate from Site Order Issued by NSW SES: • If NSW SES issues the order to evacuate from the site, Duty Manager to remain in communication with NSW SES. • Duty Manager to confirm location of evacuation site, method of evacuation and safest evacuation route with NSW SES, and then inform staff of details. • Staff to lead organised groups of residents, visitors and other staff (all persons) to the evacuation site following the selected evacuation route. • After moving to evacuation site, staff to perform headcount to account for all persons. • Staff to remain with all persons until the NSW SES advises the situation is all clear.
RECOVER PHASE
• Residents to be moved off-site if necessary in consultation with NSW SES and LEOCon. • Required cleaning and repairs to be carried out. • Testing of services and equipment to be conducted by qualified tradesmen before being re-instated. • Review effectiveness of flood response and update response plan if required.

7 Conclusion

This report has found that the site is generally unaffected by flooding up to the 100 year ARI event, however the site is inundated in PMF events. All habitable levels are located at or above the PMF event flood level.

Risk assessments conducted for the development indicate that flooding impact as a result of the development and the risks posed by flooding to the proposed development are very low, with the exception of the risk to vehicles in the PMF event which is considered to be low to very low.

The risks can be further reduced through implementation of the flood risk mitigation measures provided in this report.

8 References

Department of Infrastructure, Planning and Natural Resources (2005) *Floodplain Development Manual: The management of flood liable land.*

Parramatta City Council (2006) *Local Floodplain Risk Management Policy*.

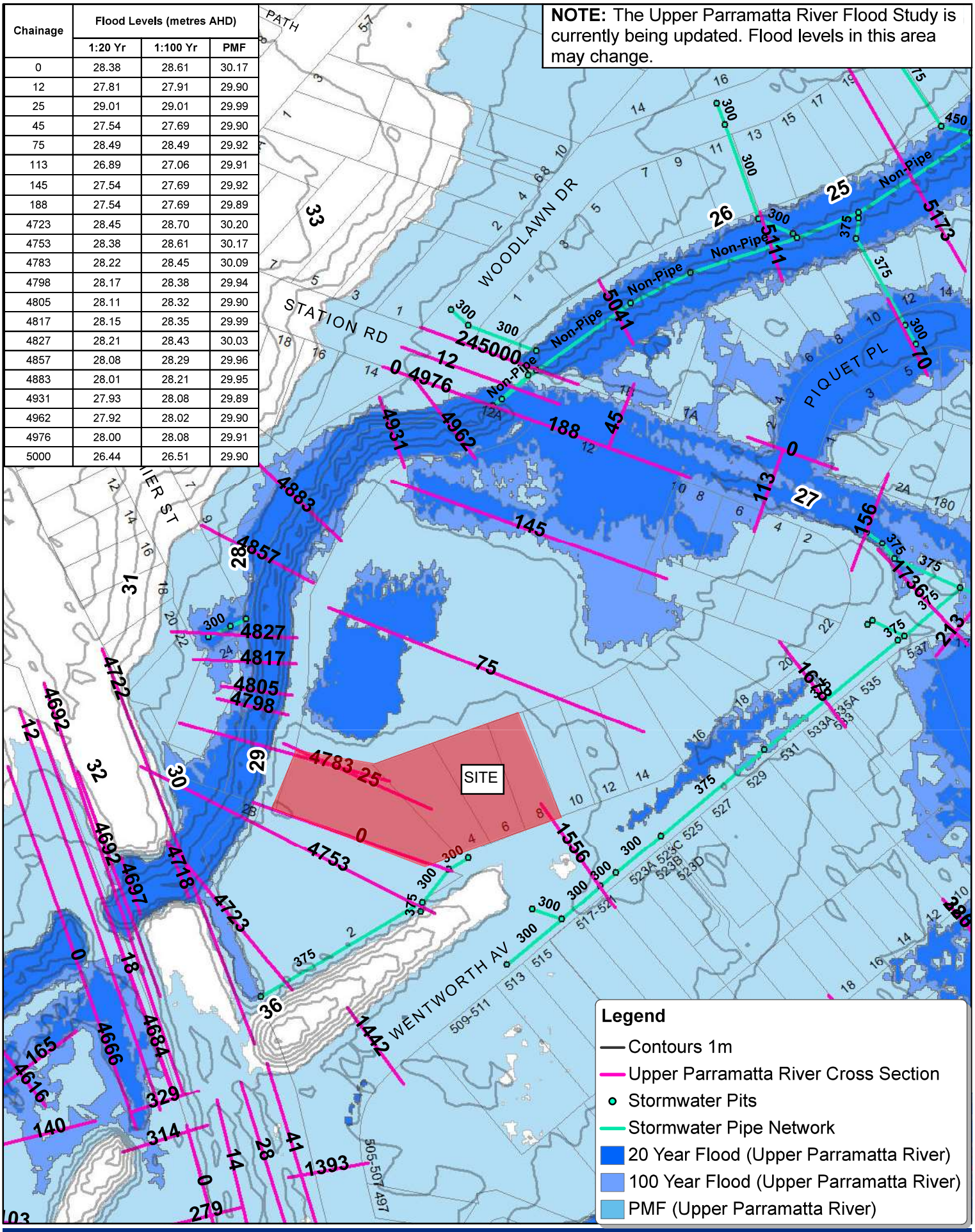
Parramatta City Council (2011) *Parramatta Development Control Plan.*

Parramatta Local Emergency Management Committee (2009) *Parramatta Local Disaster Plan (DISPLAN)*.

9 Attachment A – Parramatta City Council Flood Map and Flood Hazard Map

Chainage	Flood Levels (metres AHD)		
	1:20 Yr	1:100 Yr	PMF
0	28.38	28.61	30.17
12	27.81	27.91	29.90
25	29.01	29.01	29.99
45	27.54	27.69	29.90
75	28.49	28.49	29.92
113	26.89	27.06	29.91
145	27.54	27.69	29.92
188	27.54	27.69	29.89
4723	28.45	28.70	30.20
4753	28.38	28.61	30.17
4783	28.22	28.45	30.09
4798	28.17	28.38	29.94
4805	28.11	28.32	29.90
4817	28.15	28.35	29.99
4827	28.21	28.43	30.03
4857	28.08	28.29	29.96
4883	28.01	28.21	29.95
4931	27.93	28.08	29.89
4962	27.92	28.02	29.90
4976	28.00	28.08	29.91
5000	26.44	26.51	29.90

NOTE: The Upper Parramatta River Flood Study is currently being updated. Flood levels in this area may change.



Parramatta City Council Flood Map

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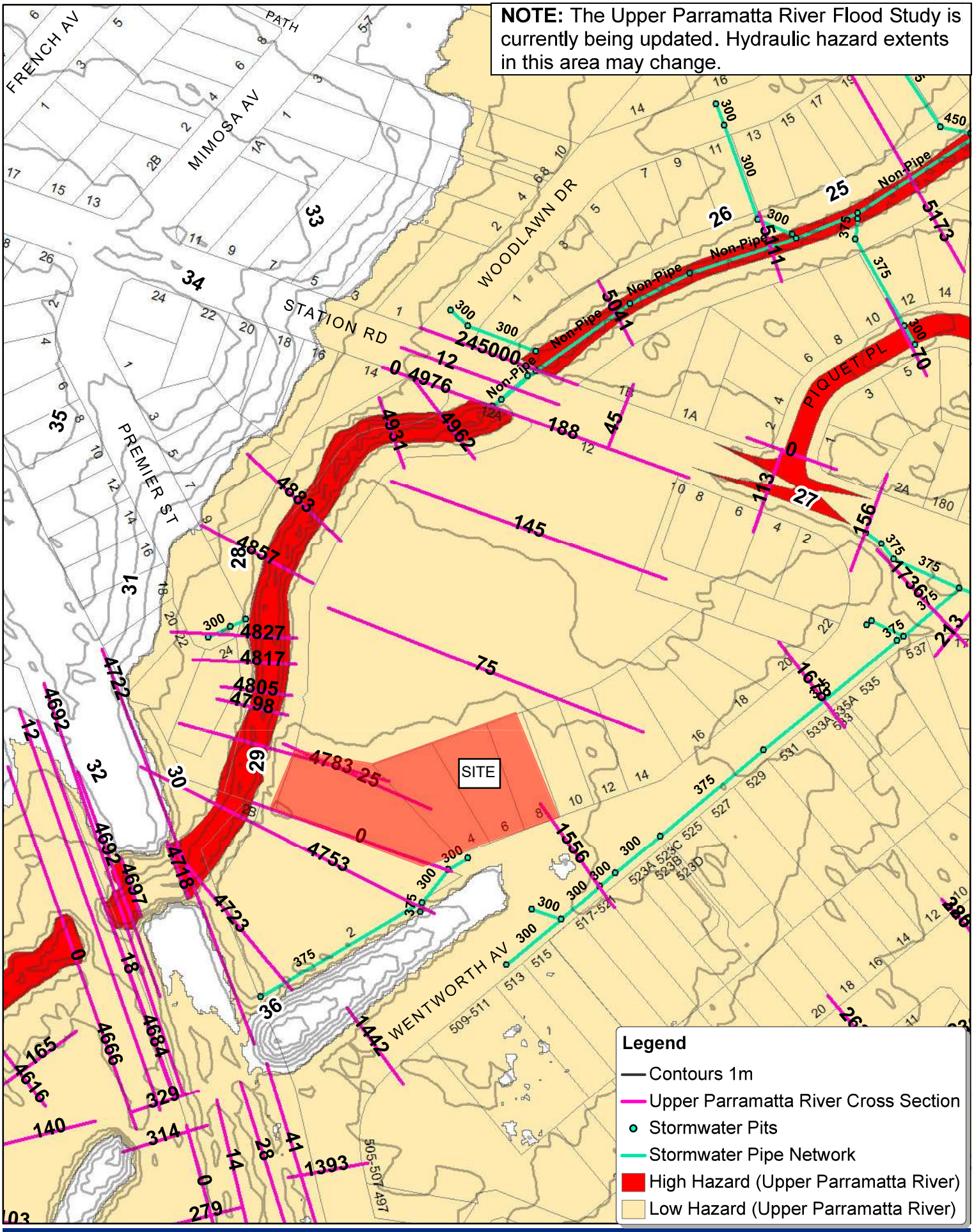

Parramatta City Council Flood Hazard Map

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