TTW Structural Civil Traffic Façade

Flood Impact Assessment Report

NEXTDC S5 Data Centre

Prepared for NEXTDC / 10 October 2025

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Your Partner in Engineering

Contents

Glossary and Abbreviations

Annual Exceedance Probability	AEP	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage
Australian Height Datum	AHD	A common national surface level datum often used as a referenced level for ground, flood and flood levels, approximately corresponding to mean sea level.
Average Recurrence Interval	ARI	The long-term average number of years between the occurrence of a flood equal to or larger in size than the selected event. ARI is the historical way of describing a flood event. AEP is generally the preferred terminology.
Bureau of Meteorology	BOM	An executive agency of the Australian Government responsible for providing weather services to Australia and surrounding areas.
Development Control Plan	DCP	A Development Control Plan is a document prepared by the Council which provides detailed guidelines which assist a person proposing to undertake a development. A DCP must be consistent with the provisions and objectives of a Local Environmental Plan (LEP).
Flood Emergency Management Plan	FEMP	A step-by-step sequence of agreed roles, responsibilities, actions and management arrangements for the conduct of emergency operations. The objective is to ensure a coordinated response by all agencies having responsibilities and functions in emergencies.
Flood Emergency Response Plan	FERP	Set of instructions outlining the emergency response strategy (e.g. evacuation or stay-in-place approach) and defined responses during a flood emergency.
Finished Floor Level	FFL	The level, or height, at which the floor of a building or structure (including alterations and additions) is proposed to be built.
Flood hazard		A source of potential harm or a situation with a potential to cause loss of life, injury and economic loss due to flooding. Flood hazard is defined as a function of the relationship between flood depth and velocity.
Flood Planning Level	FPL	The combination of the flood level from the defined flood event and freeboard selected for flood risk management purposes.
Freeboard		A factor of safety typically used in relation to the setting of floor levels or levee crest levels. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour etc.
Local Environmental Plan	LEP	LEPs provide a framework that guides planning decisions for local government areas through zoning and development controls. Zoning determines how land can be used (for example, for housing, industry, or recreation).
New South Wales State Emergency Service	NSW SES	The NSW SES is an agency of the Government of New South Wales, is an emergency and rescue service dedicated to assisting the community in times of natural and man-made disasters.

Probable Maximum Flood	PMF	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.
Representative Concentration Pathways	RCP	RCPs make predictions of how concentrations of greenhouse gases in the atmosphere will change in future as a result of human activities. The four RCPs range from very high (RCP8.5) through to very low (RCP2.6) future concentrations.

1.0 Introduction

TTW has been engaged on behalf of NEXTDC to prepare a high-level Flood Assessment Report for the S5 Data Centre located in Macquarie Park, in the City of Ryde Local Government Area (LGA).

This report assesses the flooding behaviour of the site and surrounding area under existing site conditions, as well as flood planning controls relevant to the level of flood risk. The details of this report are based on current available information and correspondence undertaken at the time of writing. This report provides an update to the previously submitted Flood Impact Assessment Report to address the adjustments that have occurred following the response to submissions received late 2024.

1.1 Relevant Guidelines and References

The following documents have been reviewed and referenced in preparing this report:

- Australian Institute of Disaster Resilience (2017). Flood Hazard Guideline 7-3 adr-guideline-7-3.pdf (aidr.org.au)
- Bewsher Consulting (2010). Macquarie Park Floodplain Risk Management Study and Plan Flood Study Report. Macquarie Park Catchment | City of Ryde (nsw.gov.au)
- City of Ryde (2014). Development Control Plan (DCP) 2014 Development Control Plan | City of Ryde (nsw.gov.au)
- City of Ryde (2014). Ryde Local Environmental Plan (LEP) 2014 Ryde Local Environmental Plan 2014 - NSW Legislation
- New South Wales Department of Infrastructure, Planning and Natural Resources (2005). Floodplain Development Manual Floodplain Development Manual (nsw.gov.au)
- NEXTDC. (website 2024) S5 Sydney Data Centre S5 Sydney NEXTDC Data Centre
- NSW Department of Planning and Environment (2023). Flood risk management guideline FB03 Flood hazard (nsw.gov.au)
- WMA Water (2023). Flood Harmonisation Study – Flood Study Update Draft Report City of Ryde Draft Flood Study 2023 | City of Ryde (nsw.gov.au)

1.2 Project Introduction

The proposed development (SSD-63168959) will seek approval for the S5 data centre development at 269 Lane Cove Road, Macquarie Park. Specifically, the Project comprises the redevelopment of the site as summarised below:

- Site preparation works including demolition and removal of existing structures, tree removal and bulk earthworks.
- Staged construction and operation of two connected data centre buildings (Building A and Building B) with a maximum height of 65 metres and a combined total gross floor area (GFA) of 47,285m^2 comprising 33,142m^2 of technical data hall floor space and 14,143m^2 of office, retail and innovation hub floor space.
  - Building A will be delivered in Stage 1 and will comprise the following:
    - Basement parking for 51 car spaces including two accessible spaces and 10 EV spaces

- Seven storeys of technical data floor space accommodating seven data houses: 16,571m^2
- Utilities including diesel generators (3MWe), above-ground water tanks for industrial water (600kL each), above-ground diesel storage tanks (100kL each) and an aboveground water tank for fire water (400kL each).
- Business identification signage facing Waterloo Road and Lane Cove Road.
- Integrated 'Building O' component within Building A, comprising:
  - Two retail tenancies at ground level: 326m^2
  - Lobby and innovation hub including auditorium and training rooms: 3,186m^2
  - NEXTDC and ancillary office floor space on upper levels: 10,631m^2

– Building B will be delivered in Stage 2 and will comprise the following:

- Seven storeys of technical data floor space accommodating seven data halls: 16,571m^2
- Utilities including diesel generators (3MWe), above-ground water tanks for industrial water (600kL each), above-ground diesel storage tanks (100kL each) and an aboveground water tank for fire water (400kL each).
- Business identification signage on the western and southern building facades.

- Landscaping across the site in accordance with the project staging, delivering a mix of native and endemic plant species, shrubs and grasses, including 139 additional trees within a total area of 4,959m^2 deep soil and a resultant tree canopy cover of 5,707m^2
- Staged delivery of public domain works including:
  – Stage 1: construction of Road 13 within the subject site and public plaza.
  – Stage 2: construction of Road 6 (half-width) within the subject site, including provision for a future pedestrian/cycle overbridge (to be delivered by others), and works along Lane Cove Road.
- Delivery of 90 megawatts of power with a 33kV switching station to be accommodated on site, as well as other site services, including stormwater infrastructure.

The following table provides a comparative analysis of the original proposal and revised proposal based on the key development features.

Table 1: Project Details

Element	Original Proposal	Revised Proposal	Change
1. Land Use Activity	2. Data centre with 14 data halls, ancillary office and innovation space plus two retail premises	3. Data centre with 14 data halls, ancillary space office and innovation plus two retail premises	4. Nil change
Total Site Area	22,381m^2	22,381m^2	Nil change
Total GFA	46,935m^2	47,285m^2	+350m^2
Data Hall	33,643m^2	33,142m^2	-501m^2
Lobby/Innovation Hub	3,192m^2	3,186m^2	-6m^2
Ancillary Office	9,765m^2	10,631m^2	+866m^2
Total Retail GFA	335m^2	326m^2	-9m^2

Element	Original Proposal	Revised Proposal	Change
Floor Space Ratio	2.1:1	2.11:1	+0.01:1
Car Parking	105 spaces	51 spaces	-54 spaces
Bicycle Parking	12 spaces	20 spaces	+8 spaces
Motorbike Parking	11 spaces	17 spaces	+6 spaces
Maximum Building Height	Building O: office and innovation hub – 49 metres over 10-storeys Building A: data centre – 65 metres over nine-storeys Building B: data centre – 65 metres over nine-storeys	Building O: office and innovation hub – 49 metres over 10-storeys Building A: data centre – 65 metres over nine-storeys Building B: data centre – 60 metres over nine-storeys	Nil change to Building O Nil change to Building A -5 metres for Building B
Deep Soil and Landscaped Area	Deep soil zone: 1,825m^2 (8.1% total site area, 13.1% future site area) Soft landscape: 5,251m^2 (23.5% site area)	Deep soil zone: 4,959m^2 (22.16% total site area, 35.6% future site area) Soft landscape: 6,570m^2 (29.4% site area)	+3,134m^2 deep soil (+14.06% site area, +22.5% future site area) +1,319m^2 soft landscape (+5.9% site area)
Tree Removal	Tree removal = 146 Retained trees = 70 Proposed trees = 81 Total trees = 151	Tree removal = 126 Retained trees = 90 Proposed trees = 139 Total trees = 229	-20 trees removed +20 trees retained +58 trees proposed +78 additional trees
Tree Canopy Cover	5,688m^2 (25.4%)	5,707m^2 (28.7%)	+19m^2 (+0.1%)
Cut and Fill Volume	Net cut 46,530m^3	Net cut of 75,650m^3	-29,120m^3
Power Consumption	90 megawatts	90 megawatts	Nil
Operating Hours	24-hours, 7 days a week	24-hours, 7 days a week	Nil
Jobs - full-time equivalent (FTE) employees	Construction: 942 Operation: 490	Construction: 942 Operation: 490	Nil
Utilities and services	60 x diesel generators (@2Mwe = 120Mwe) 12 x above-ground diesel storage tanks (@110kL = 1,320kL) 8 x above-ground water tanks for industrial water (@460kL= 3,680kL) 2 x above-ground water tanks for fire water (@350kL = 700kL) 1 x 33kV switching station	48 x diesel generators (@3Mwe = 144MWe) 16 x above ground diesel storage tanks (@100kL = 1600kL) 8 x above ground water tanks for industrial water (@600kL = 4,800kL) 1 x above-ground water tank for fire water (@400kL) total) 1 x 33kV switching station	-12 x diesel generators (+24MWe) +4 x above-ground diesel storage tanks(+280kL) Nil change to number of tanks (+1,120kL) -1 above-ground water tank (-300kL) Nil

Element	Original Proposal	Revised Proposal	Change
Public domain works	2 x roads (Road 5 and Road 13) and road widening: 4,945m^2 Public plaza: 3,522m^2	2 x roads (Road 13 and part Road 6) and road widening: 4,734m^2 Public plaza: 3,762m^2	-211m^2 roads (Road 5 deleted and Road 6 introduced) +240m^2 public plaza

A preliminary ground floor plan is provided in Figure 1.

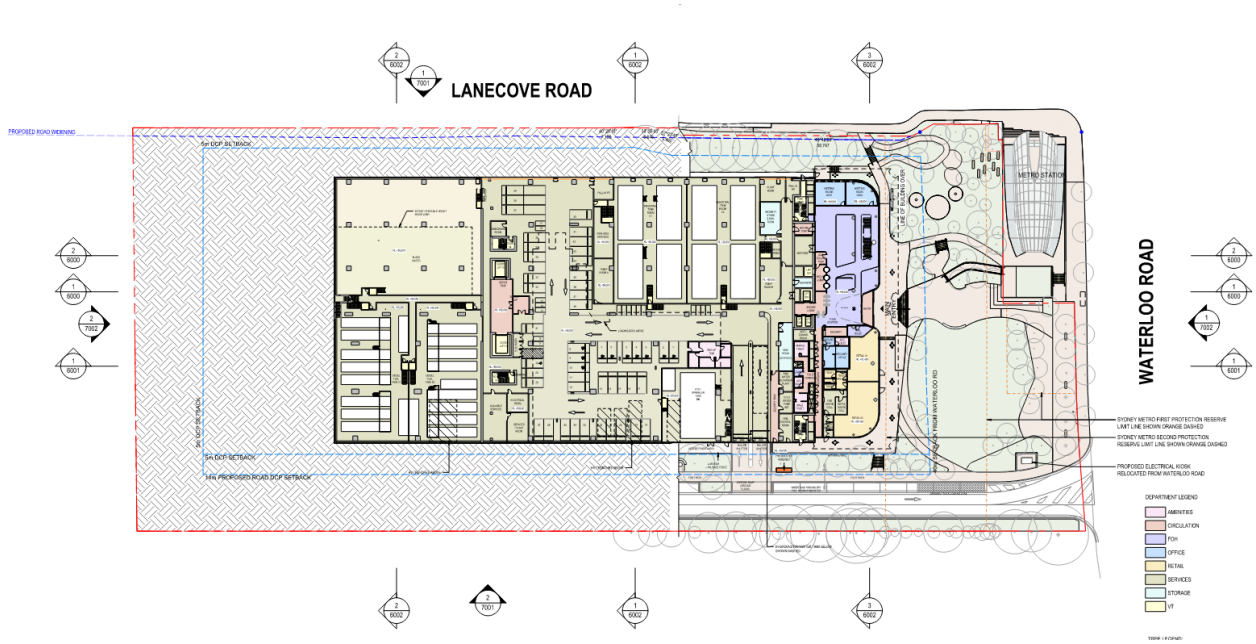

Figure 1: Preliminary ground floor plan for the proposed development. Source: HDR Architecture (26/08/2025)

2.0 Site Location and Characteristics

2.1 Location and Layout

The site is located at 269 Lane Cove Road, Macquarie Park and comprises a single, approximately rectangular lot, legally described as Lot 3 in Deposited Plan (DP) 1129811. It is located on the corner of Lane Cove Road and Waterloo Road and is approximately 22,381m^2 in size. A map of the site location is provided in Figure 2.

The site is located in the City of Ryde Local Government Area (LGA) within the Macquarie Park corridor, an established employment precinct with a particular focus on innovation. Macquarie Park is a nationally significant research and employment centre and includes the head offices for some of Australia's leading companies including Foxtel, Optus and Siemens. The site is approximately 2km southeast of Macquarie University, and 1.5km southeast of Macquarie Shopping Centre.

Existing development includes a two-storey office furniture store (Work Arena) at the northern end of the site and offices and studios associated with Foxtel in the southern portion of the site. Scattered trees exist along the site boundaries, particularly within the western setback to Lane Cove Road, along the southern boundary and the eastern boundary.

Vehicle access to the site is currently provided from Waterloo Road with an internal driveway providing access to several at-grade parking areas. A further vehicle crossover has been constructed along the Lane Cove Road frontage; however, it is not currently in use and barriers have been installed prohibiting access.

The site is well serviced by public transport with several bus routes operating along Lane Cove Road and Waterloo Road. The entrance to Macquarie Park Metro Station is immediately to the north of the site. The site includes a lengthy frontage to Lane Cove Road which provides access to the M2 Hills Motorway and Epping Road.

Figure 2: Map of the site location. Site boundary is highlighted in orange. Source: Urbis GIS 2023

As shown in the zoning map in Figure 3, the site is zoned as a Commercial Centre (E2), with surrounding areas in Macquarie Park zoned for Productivity Support (E3) and areas south of Epping Rd zoned for Low-Density Residential (R2).

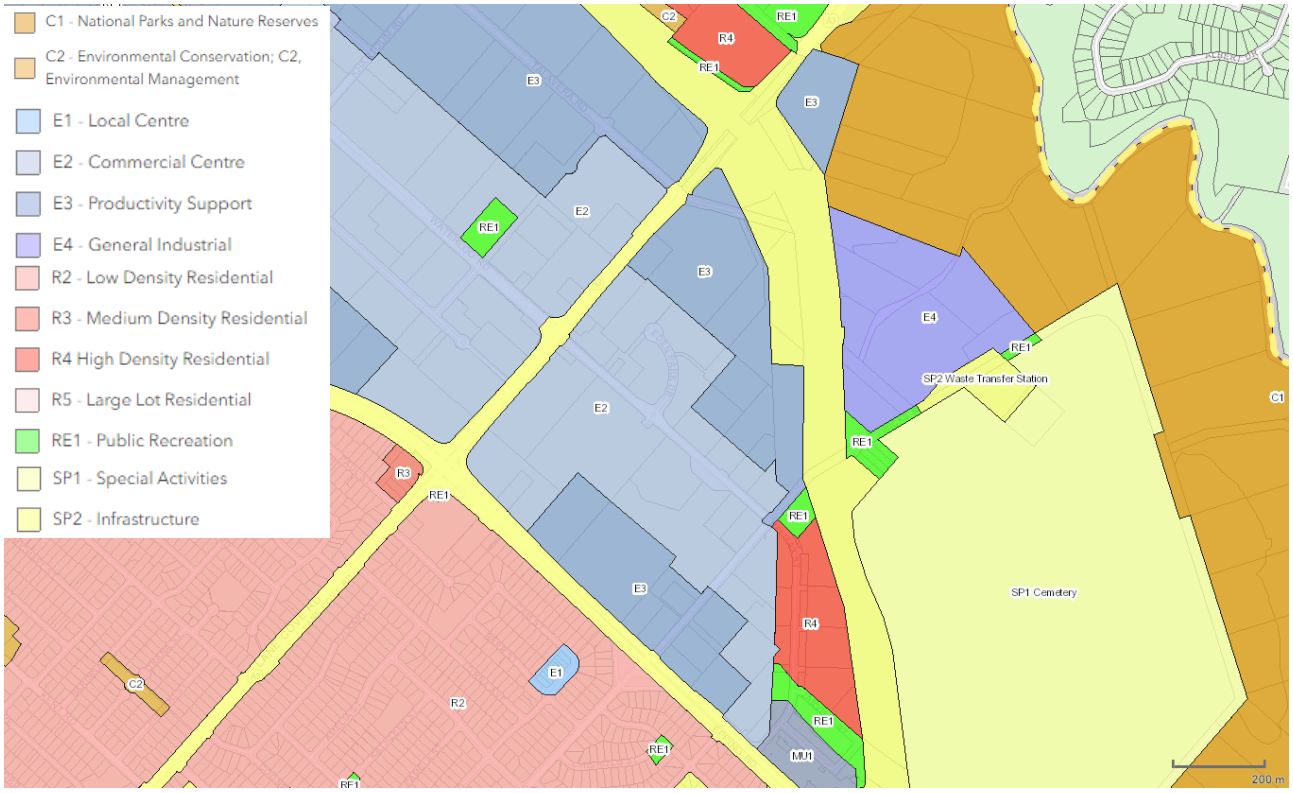

Figure 3: Land zoning around western Macquarie Park. Source: City of Ryde LEP

2.2 Site Topography

Topographic data was taken from the most recent 2020 LIDAR survey, as obtained from the Elevation Information System (ELVIS) – a cloud-based system that provides free access to Australian elevation and bathymetry datasets.

The elevation data shows that the site slopes upwards from Waterloo Rd in the north-east, towards a high point at the southern site boundary. Site elevations vary between 69.5m AHD and 55.0m AHD, rising 14.5m over a distance of 233m with an estimated average gradient of 6.2%. The elevation of the site and surrounding area is presented in Figure 4, with a cross-section through the site presented in Figure 5.

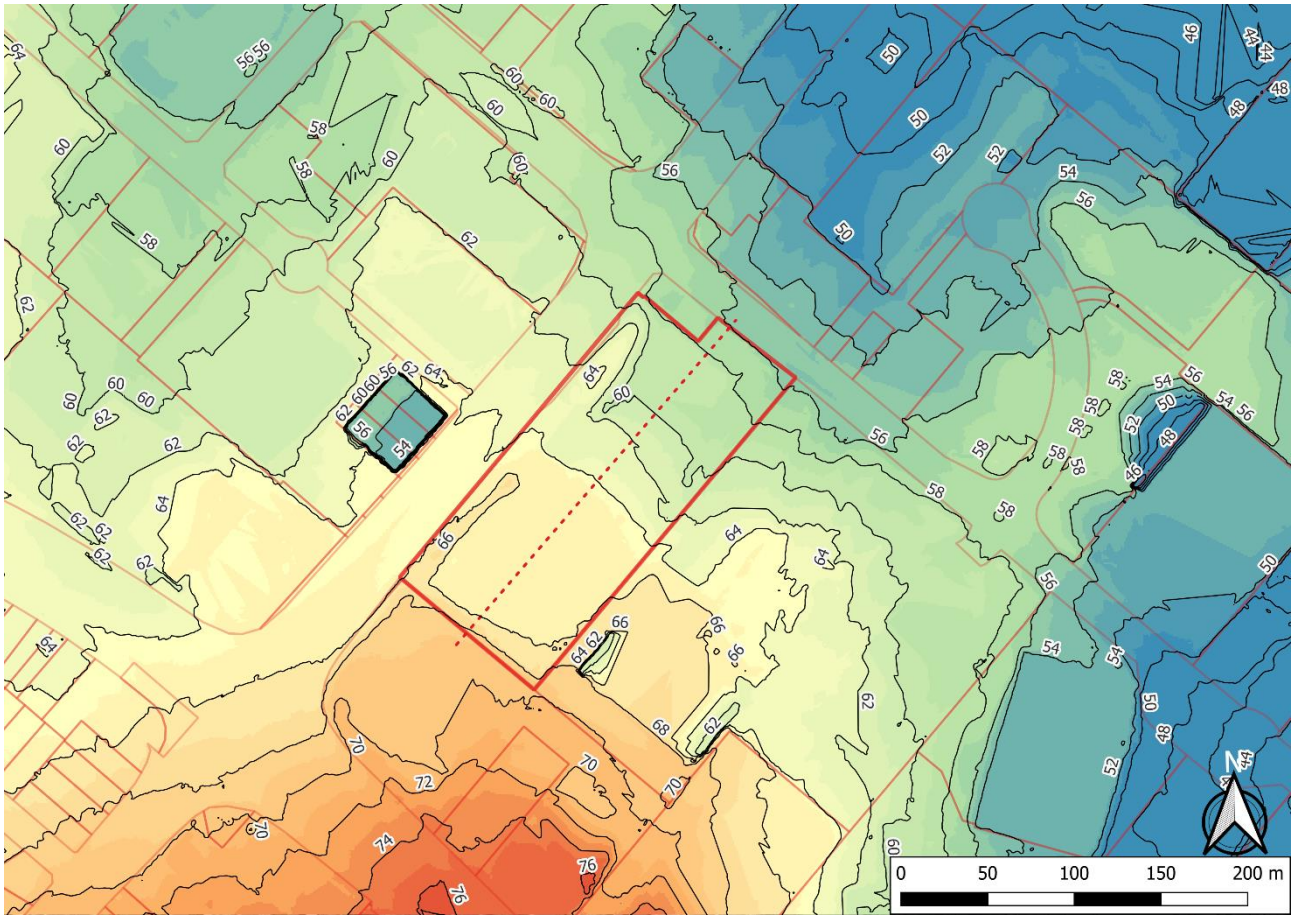

Figure 4: Topography at and around the site. Site boundary is outlined in red. Source: DEM obtained from ELVIS

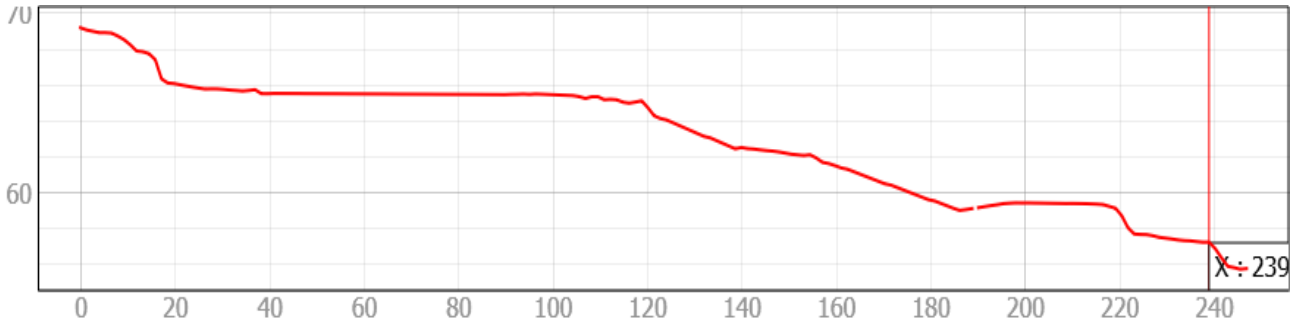

Figure 5: Elevation (m AHD) along the section indicated in Figure 4.

3.0 Available Flood Information

An earlier flood study, focused on catchments in the Macquarie Park Corridor, was conducted by Bewsher Consulting (2010) on behalf of the City of Ryde as part of a more comprehensive Floodplain Risk Management Study & Plan, published in 2011. In 2023, an updated flood study of the entire LGA was conducted by WMA Water, which is currently available as a draft report. This study was conducted based on the more recent Australian Rainfall and Runoff (ARR) 2019 Guidelines. In comparison to the study by Bewsher (2010), uses updated software, more recent elevation data, updated hydraulic structures information, and a finer cell grid (2m instead of 3m). It is important to note that this is a draft report, and the results should be considered preliminary until the release of the final report by WMA. Additional flood modelling will be conducted during the design development phase to refine and validate the findings, based on the final report.

In the catchment map presented by Bewsher (2010), the site falls almost entirely within the Porters Catchment, which drains into the Lane Cove River via Porters Creek (see Figure 6). The catchment has an area of 225 ha, with a total conduit length of 16,300m and 540 stormwater pits.

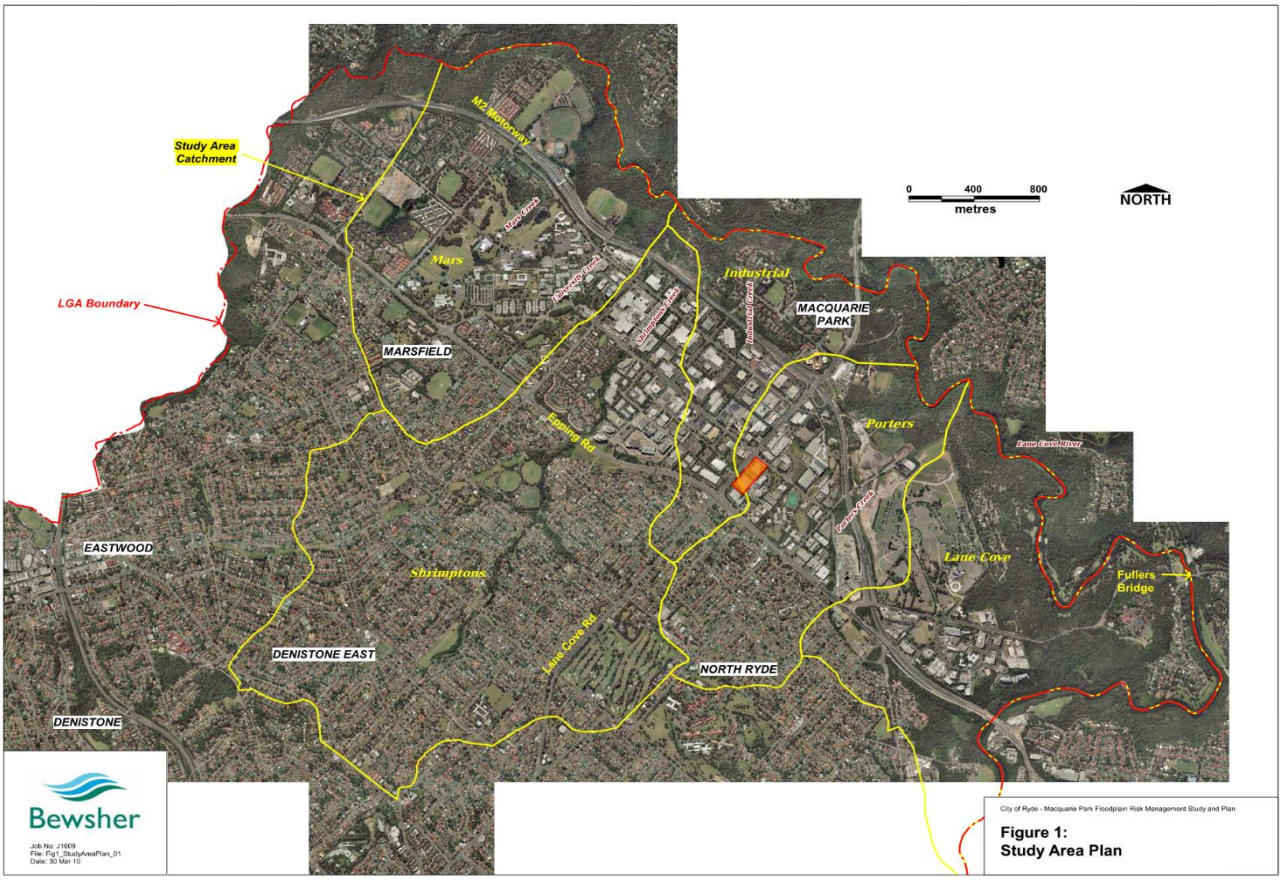

Figure 6: Map of catchments in the Macquarie Park Corridor. Approximate site boundary is highlighted in orange. Source: Bewsher (2010)

Analysis by WMA (2023) indicates that the site itself experiences negligible flooding even during the PMF event, with depths less than 100mm and a depth x velocity (D x V) product of less than 0.2m^2/s. Figure 7 presents peak flood depths during the PMF event, at the site and its surrounding areas, and shows that flooding of up to 0.3m along Lane Cove Rd, and of up to 0.5m along parts of Waterloo Rd and at Macquarie Park Station, can occur.

Flood velocities in these affected areas can be significant. The peak velocity graph provided in Figure 8 shows that flooding along much of Lane Cove Rd exceeds 1.5m/s during the PMF event, with some areas exceeding 2m/s. Flood velocities simulated along Waterloo Rd are less severe at an average of 1m/s, but with some localised points with flows greater than 1.5m/s.

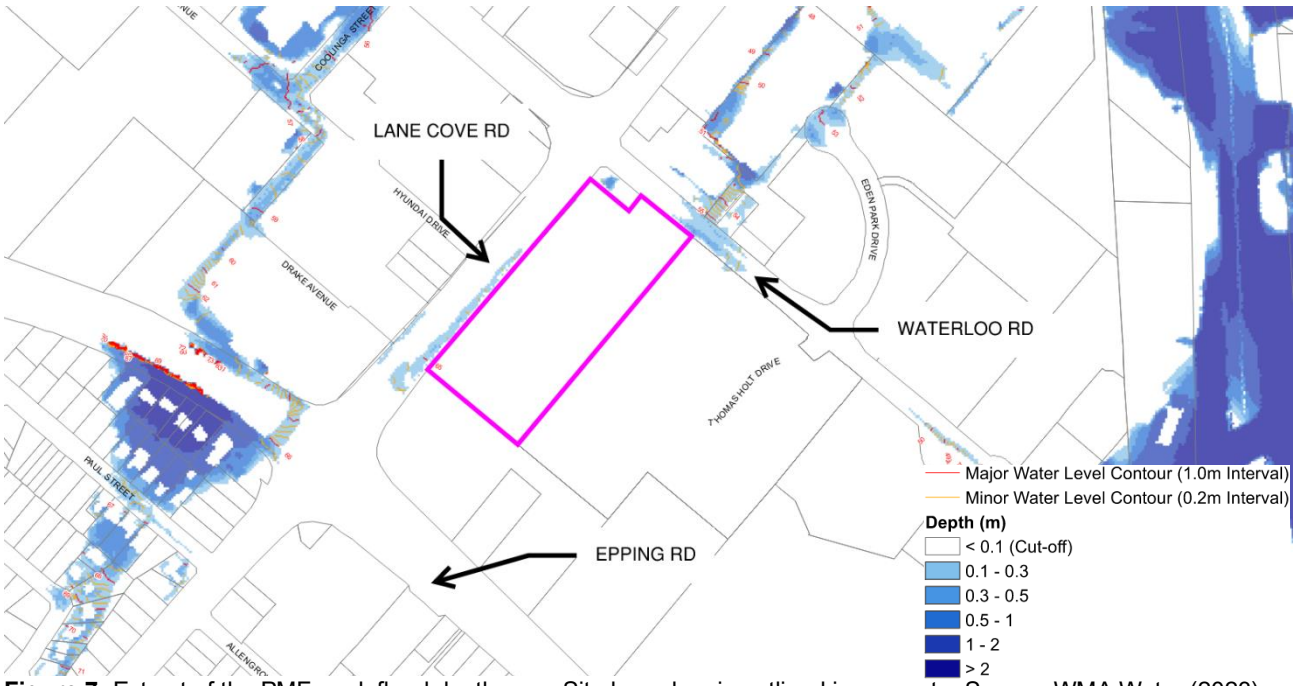

Figure 7: Extract of the PMF peak flood depth map. Site boundary is outlined in magenta. Source: WMA Water (2023)

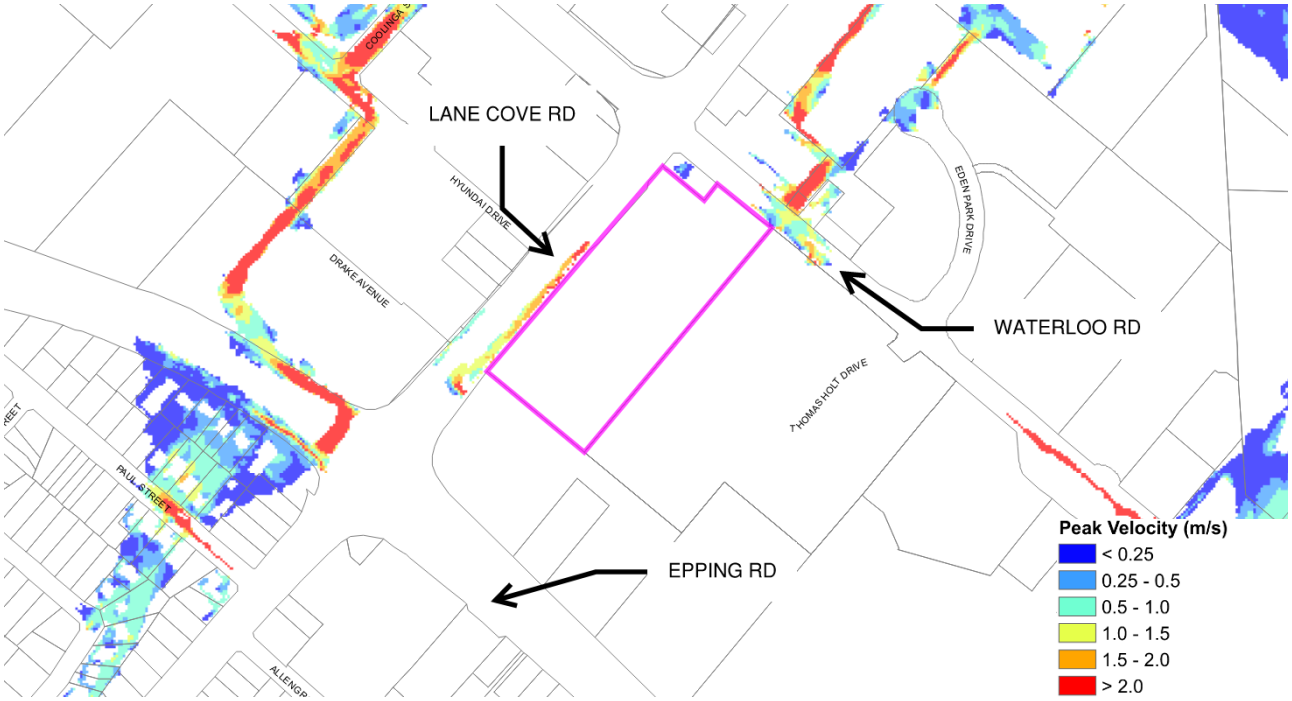

Figure 8: Extract of the PMF peak velocity map. Site boundary is outlined in magenta. Source: WMA Water (2023)

Flood hazard levels are defined by the Australian Institute of Disaster Resilience (AIDR) as a measure of the vulnerability of the community, including people, vehicles and structures, when interacting with floodwaters. Flood hazard is a function of both flood depth and velocity, as seen in the Flood Hazard Vulnerability Curve presented in Figure 9.

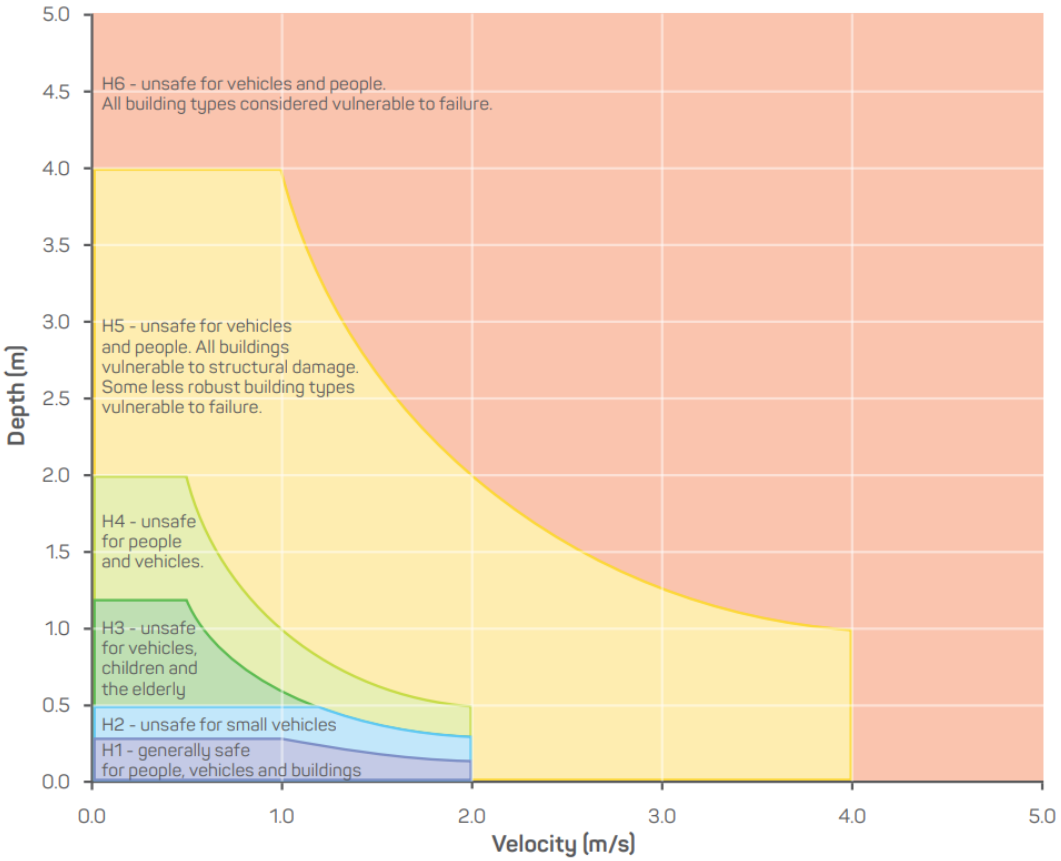

Figure 9: General Flood Hazard Vulnerability Curve. Source: AIDR (2017)

Flood hazard levels vary from H1 (generally safe) to H6 (unsafe for vehicles and people, with all building types vulnerable to failure). A table of flood levels and their definitions in terms of the D x V product is provided below in Table 2.

Table 2: **Flood hazard levels. Source:** Department of Planning and Environment **(2023)**

Hazard vulnerability classification	Description	Classification limit (D and V in combination) m^2/s	Limiting still water depth (D) m	Limiting velocity (V) m/s
H1	Generally safe for vehicles, people and buildings	VxD ≤ 0.3	0.3	2.0
H2	Unsafe for small vehicles	VxD ≤ 0.6	0.5	2.0
H3	Unsafe for vehicles, children and the elderly	VxD ≤ 0.6	1.2	2.0
H4	Unsafe for vehicles and people	VxD ≤ 1.0	2.0	2.0
H5	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure	VxD ≤ 4.0	4.0	4.0
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure	VxD > 4.0	–	–

Considering the results obtained by WMA Water (2023), the site itself is at no risk of major flooding. However, WMA have omitted any flooding with depth less than 100mm and DV < 0.2m^2/s from their results. As such, it is possible that the site may experience some minor nuisance flooding, from very localised runoff, not shown on the flood maps, which would fall well within hazard level H1

Flood hazard levels along Lane Cove Rd are simulated to reach up to a hazard level of H2 (considering peak flood depths can reach up to 0.3m). Some localised points of higher velocity exceed 2.0m/s and are categorized as hazard level H5. During a PMF event, Lane Cove Rd is expected to remain mostly safe to navigate by foot, and trafficable by small vehicles. Similarly, most of Waterloo Road falls under hazard level H2 and at some points, where both velocity and depth are high, hazard levels of H3 or H4 are reached. A flood hazard map for the PMF event is presented in Figure 10.

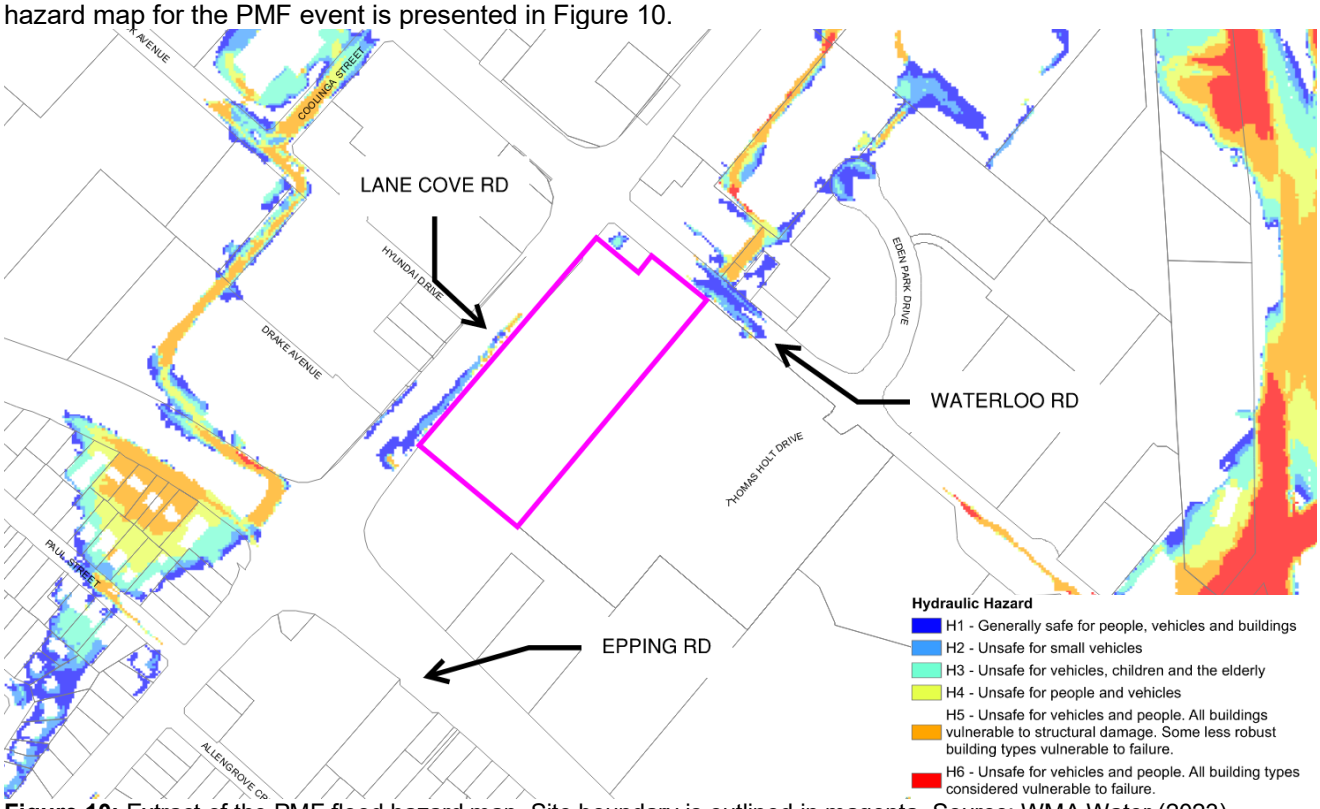

Figure 10: Extract of the PMF flood hazard map. Site boundary is outlined in magenta. Source: WMA Water (2023)

These existing flood studies do not account for the effects of the proposed development, in particular the construction of roads 6 and 13. Current ground elevations mean that site is protected from external inundation during the PMF event. As long as the new roads and landscaping maintain similar ground levels the site will remain protected from external inundation.

It is noted that there is an existing access road, from Waterloo Road to the existing site, where Road 13 is to be located. Currently the grade and levels of this road mean that the site is not inundated. Road 13 will likely follow the existing grade and ramp up higher, than that existing, closer to the proposed buildings. The proposed site will therefore be flood immune in the PMF event from floodwaters observed on Waterloo Road. Depths were simulated to be up to 0.5 metres on Waterloo Road. The level of the Road 13 to the north of the site, adjacent to the data centre buildings, therefore needs to be at least 0.5 metres higher than that of Waterloo Road where it converges with Road 13.

Existing raised landscaping prevents flood waters from entering the existing site from Lane Cove Road. Any future change in the landscaping should maintain the form and levels of the existing landscaping to the extent that the landscaping is not overtopped in the PMF event. As noted depths on Lane Cove Road reach up to 0.3 metres in the PMF event. As such landscaping should offer this immunity to the west of the site, protecting any potential inundation of the data centre buildings. Drainage has been designed to convey the very localised runoff generated on Road 13 to ensure there is no ponding on site.

4.0 Flood Planning Guidance and Requirements

4.1 LEP and DCP Guidance

All developments in the City of Ryde LGA must adhere to the Development Control Plan (DCP), published in 2014 (with amendments made in 2017), which provides planning and design guidelines to support the Local Environment Plan (LEP). Flooding and stormwater guidelines are covered in Section 8.2 of the DCP.

The objectives of the City of Ryde's DPC in relation to flooding are:

- To ensure that development on land affected by flooding and overland flow is undertaken in a manner which provides for the safety of occupants of that development as well as minimise damage to private property, during such flooding events.
- To ensure essential services and land uses are designed with respect to potential flooding and overland flow risks.
- To ensure development does not exacerbate flooding on other properties.
- To ensure flood protection measures are sympathetic to the streetscape and relationship of the building to the street, do not have other adverse environmental impacts.

The DCP categorises flood-affected areas into High, Medium and Low Flood Risk precincts, as well as an Overland Flow precinct. Flood risk level is based on the severity of flooding, as measured by the DV product. They can be categorised as follows:

- High Flood Risk:
  Areas where there is a potentially catastrophic damage to property, risk to life, evacuation problems or where development would significantly or adversely alter flood behaviour. Most development is restricted in these locations.
- Medium Flood Risk
  Areas whereby there would be potential flood damage or public safety is a concern but could be addressed by the application using appropriate measures.
- Low Flood Risk
  Land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified as either High Flood Risk, Medium Flood Risk Precinct or as an Overland Flow Precinct.
- Overland Flow Precinct
  Areas identified as Overland Flow Precincts are distant from watercourses where shallow inundation (relative to major flooding) occurs following heavy rain. Typically, the depth of inundation will be less than 0.3 m to 0.5 m but more than 0.1 m to 0.2 m in a 100-year ARI event.

As per the City of Ryde DCP, sensitive developments are not permitted in Medium or High Flood Risk areas. Sensitive developments in Low Flood Risk or Overland Flow areas are subject to the following flood controls:

- All floor levels must be no lower than the PMF level. Exemption from this may be considered, subject to consideration of the extent or scale of impact to the community that would occur in the event the structure is inundated.
- New structures subject to flood waters and major overland flows must be designed and constructed to withstand the anticipated hydrostatic forces. For all parts of the development potentially exposed to floodwater up to the PMF event, the development structure must:
  - be constructed of flood compatible building components in accordance with the Stormwater Technical Manual.
  - A structural engineer must certify that the completed works are designed and capable of withstanding forces subject to forces of floodwater, debris, buoyancy forces anticipated by the PMF flood event.

- Development must not adversely impact the existing flood regime in terms of diverting major overland flows or reduce flood storage such to adversely impact the surrounding area. The submitted Flood Impact Statement must demonstrate the development does not;
    - Reduce the pre-developed level of flood storage.
    - Increase flood levels or velocities such to adversely impact adjoining dwellings.

4.2 Flood Controls

While flooded areas of Lane Cove Rd and Waterloo Rd are categorised as Low and Medium flood risk respectively, the site itself does not experience flooding even during the PMF and hence is not part of the flood planning area. A map of flood risk precinct characterisations is provided in Figure 11.

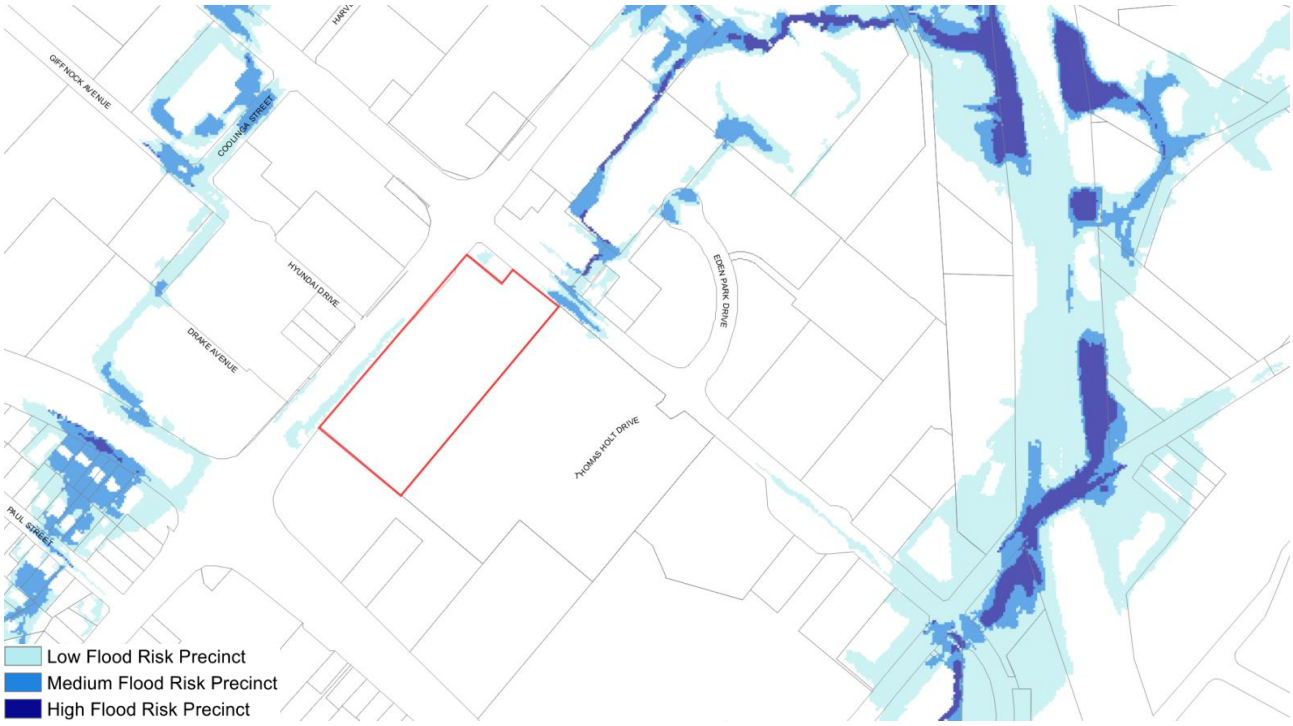

Figure 11: Extract of the Flood Risk Precinct map. Site boundary is outlined in red. Source: WMA Water (2023)

No flood planning controls will apply to the site itself. However, the proposed basement parking is at potential risk of flooding from the connected streets. According to Section 4.4.2 of the DCP, basement parking must include a bunded crest at the PMF level prior to descent into the parking area. Basement access via Waterloo Rd or Lane Cove Rd will require crest heights of at least 0.5m and 0.3m above the road level, respectively as previously reported.

5.0 Conclusion and Recommendation

Updated flood studies by WMA Water (2023) indicate that the NEXTDC S5 site will not be affected by flooding under existing development conditions, even in the PMF event. Lane Cove Road and Waterloo Road do experience mild to moderate flooding, mostly up to hazard level H2, but with some very localised areas of higher- velocity creating higher hazards.

As flooding is known to affect access via Lane Cove Rd and Epping Rd, a more detailed Flood Emergency Management Plan should be developed for the site to inform of appropriate evacuation or shelter-in-place procedures during severe events.

While the development will not be subject to flood planning controls above ground, the proposed basement parking level must consider possible flooding at its access points from the surrounding proposed roadways. As outlined in this report, as long as current elevations are maintained along Road 13, and landscaping levels are maintained along Land Cove Road, the proposed data centre and basement will be protected during the critical PMF event.

Drainage will need to be designed to convey the very localised runoff generated on Road 13 to ensure there is no ponding on site.

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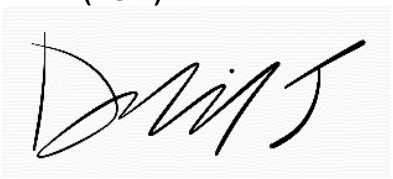

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