TTW Structural Civil Traffic Façade

Flood Concept Report

University of New England (UNE)
Tamworth Central Campus

Prepared for UNE Tamworth 21 November 2023

221823

Taylor Thomson Whitting (NSW) Pty Ltd (ACN 649 974 112)
(ABN 74 649 974 112) I Consulting Engineers
Level 6, 73 Miller Street, North Sydney NSW 2060

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Contents

1.0 Introduction

TTW has been engaged by Architectus to provide engineering consultancy services for the University of New England Tamworth Central Campus project.

This report contains an overview of the existing hydraulic conditions for the site and assesses the concept design in relation to relevant flooding and hydrology issues.

1.1 Scope

University of New England (UNE) is collaborating with Tamworth Regional Council to establish a university presence that encourages growth in the city and surrounding area, improves educational performance across the region, and supports Tamworth Regional Council's aims for the region.

The scope of this project includes an educational building with basic tutorial and lecture rooms as well as associated lifts. The project concept design plan includes a four-storey building with associated landscaping, cultural ground and carparking. This development will cater to a total of 266 students and 31 staff members.

The scope of works to complete the Flood Impact Assessment for the development is as follows:

- Review in detail Council's existing flood study and model.
- Review Council's flood planning requirements against site flood conditions.
- Run Council's hydraulic model with any updated data available and produce detailed flood maps for the site.
- Confirm updated and detailed flood extents, levels, velocities and hazards at the development site.
- Undertake site inspection to verify site constraints and assumptions in the detailed flood model.
- Run up to 3 alternative development proposals (building layouts or flood mitigation options) and confirm the flood impact associated with each development proposal.
- Carry out flood impact assessment for the developed scenario including:
  - Hazard mapping
  - 100 year and PMF mapping
  - 100-year Afflux maps
  - Flood Planning Levels
- Produce a Flood Impact Assessment report detailing the above.

1.2 References and Guidelines

This report has been prepared in the context of relevant documents as follows:

- Tamworth Regional Council Development Control Plan 2010
- Tamworth Regional Local Environmental Plan 2014
- Tamworth Regional Council's draft Flood Risk Management Plan
- Tamworth City-Wide Flooding Investigation (Volume 1 and 2, 2019) by Lyall & Associates
- UNE Tamworth Site Investigation and Campus Development Strategy (2021)
- University of New England Tamworth plan (2020)

2.0 Existing Conditions

2.1 The Site

The proposed campus location is on Peel Street, Tamworth at the corner of Roderick and Peel Streets. The site is situated within the local government area of Tamworth Regional Council, in the northeast region of New South Wales. Peel River is adjacent to the site to the south-west.

The site is surrounded predominantly by a mix of low-density residential properties and industrial premises to the north-east, agricultural land and Peel River to the south of the site. The Campus is approximately 20-minutes' walk from Tamworth train station and a 7 minutes' drive to Tamworth Hospital.

The site location and surrounding environs are shown in Figure 2.1.

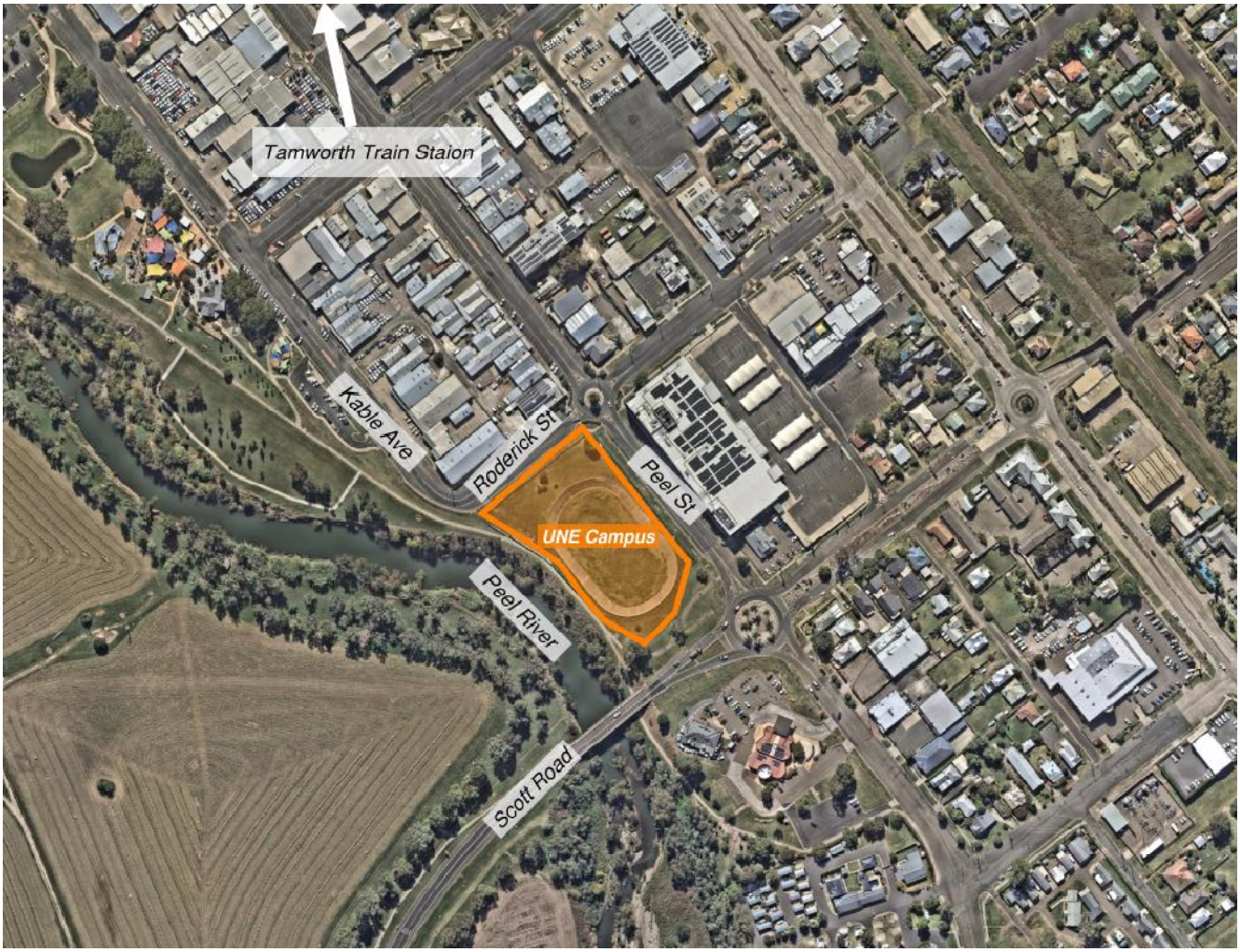

Figure 2.1: Site Location within Local Context

2.2 Regional and Local Flood Studies

The city of Tamworth lies on the Peel River in the headwaters of the Namoi River basin. The Peel River has a catchment area of about 3,080 km^2 at Tamworth, which includes the Cockburn River (1,130 km^2) and Goonoo Goonoo Creek (662 km^2) catchments. Figure 2.2 below is a catchment plan showing the layout of the catchment and river system upstream of Tamworth.

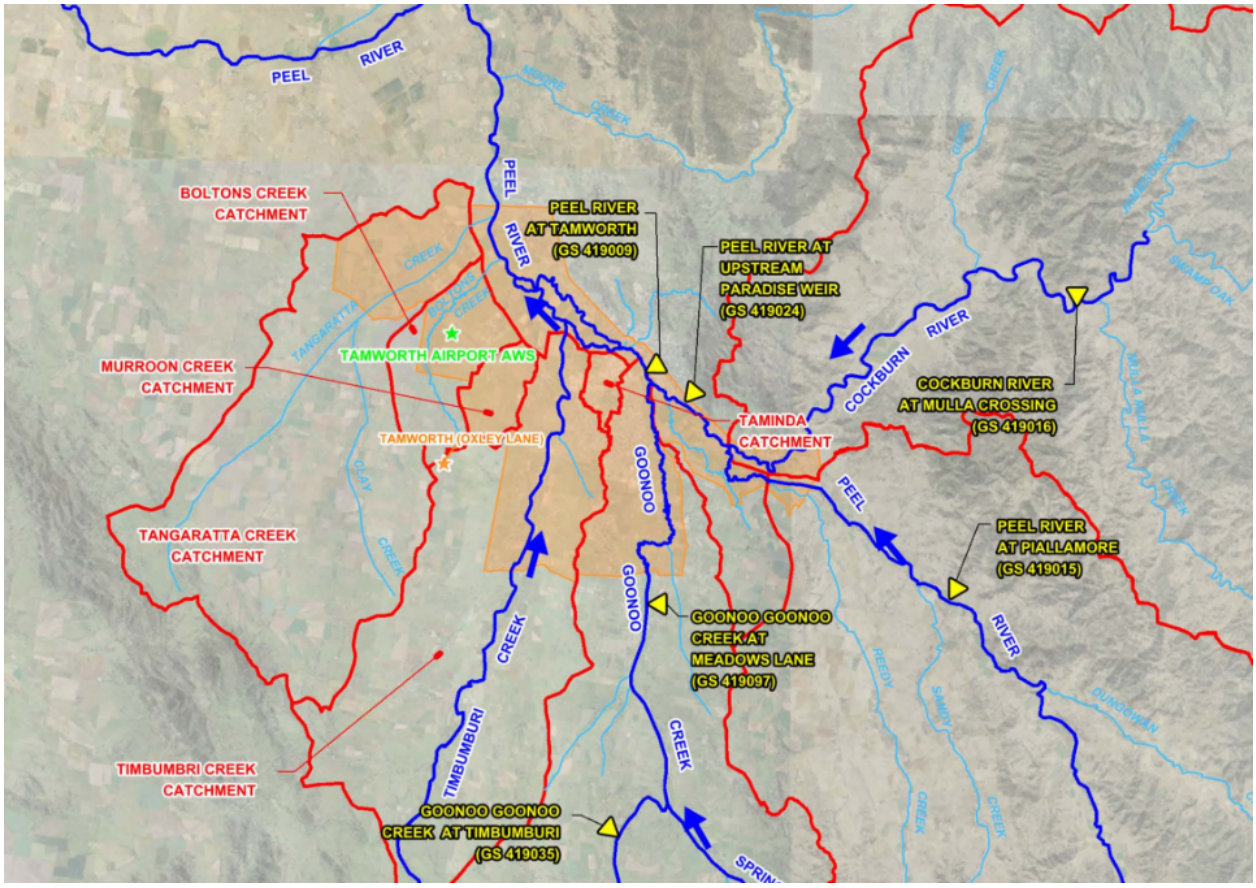

Figure 2.2: Catchment Plan

Previous flood studies have been undertaken on behalf of Tamworth Regional Council. The most recent is the Tamworth City-Wide Flooding Investigation (Volume 1 and 2, May 2019) by Lyall & Associates. The study objective was to define both overland flow and mainstream flooding patterns in parts of Tamworth for flood frequencies ranging between the 20 and 200 year Average Recurrence Interval (ARI), as well as for the Probable Maximum Flood (PMF).

Council correspondence attached in Appendix A confirms that as the site is protected from flooding by the levee (see figure 2.3 for freeboard to Crest Level of City Levees), the site is not considered to be within the Flood Planning Area (FPA) of the LEP.

Figure 2.4 shows a longitudinal section along the crest of the levee at Roderick Street, indicating that the site is protected by the levee up to the 200-year ARI storm event given flood plain flood level data, where water levels reach approximately RL 381.58m AHD. The 100-year ARI Flood Plain flood level is at RL380.67m AHD, providing an estimated 0.92m freeboard to the levee crest.

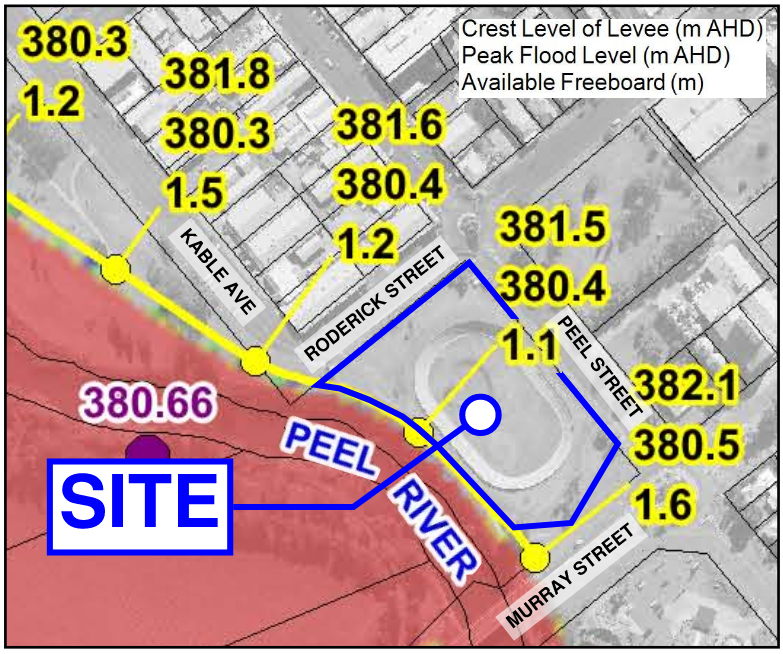

Figure 2.3: Freeboard to Crest Level of City Levees (Source: Lyall & Associates)

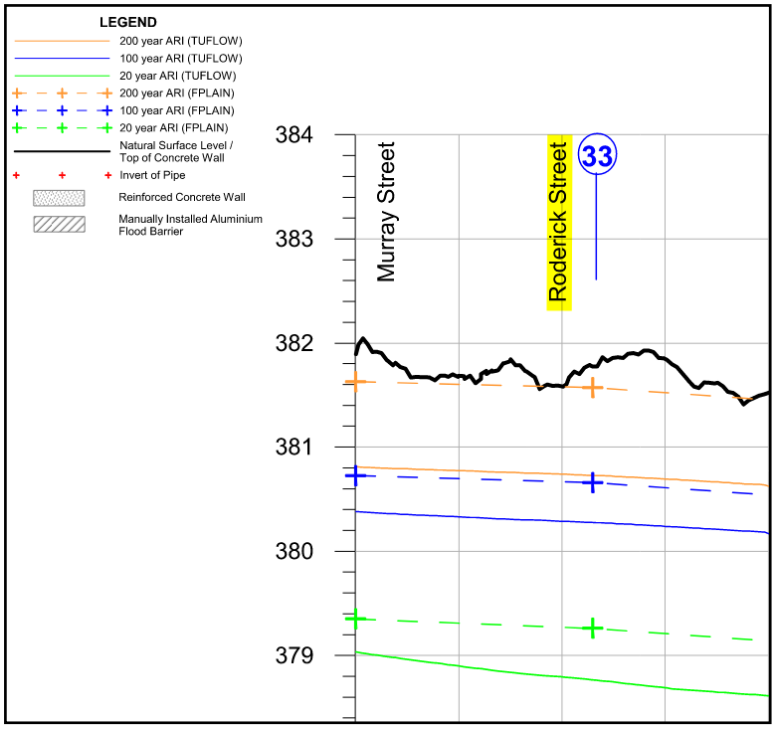

Figure 2.4: Longitudinal Section Along Crest of City Levees (Source: Lyall & Associates)

The site has been identified in Council's draft Flood Risk Management Plan as being affected by overland flow. Flows entering the site from Roderick Street should be considered, especially as the current extent is limited by the velodrome embankment. Figures 2.5 and 2.6 below show the 100-year overland flow path and a section across Roderick Street provided by Council. Overland flooding has been recorded in Roderick Street with all flood gates are open. This is shown to be worse when all flood gates are closed.

Figure 2.5: 100-year Overland Flow along Roderick Street

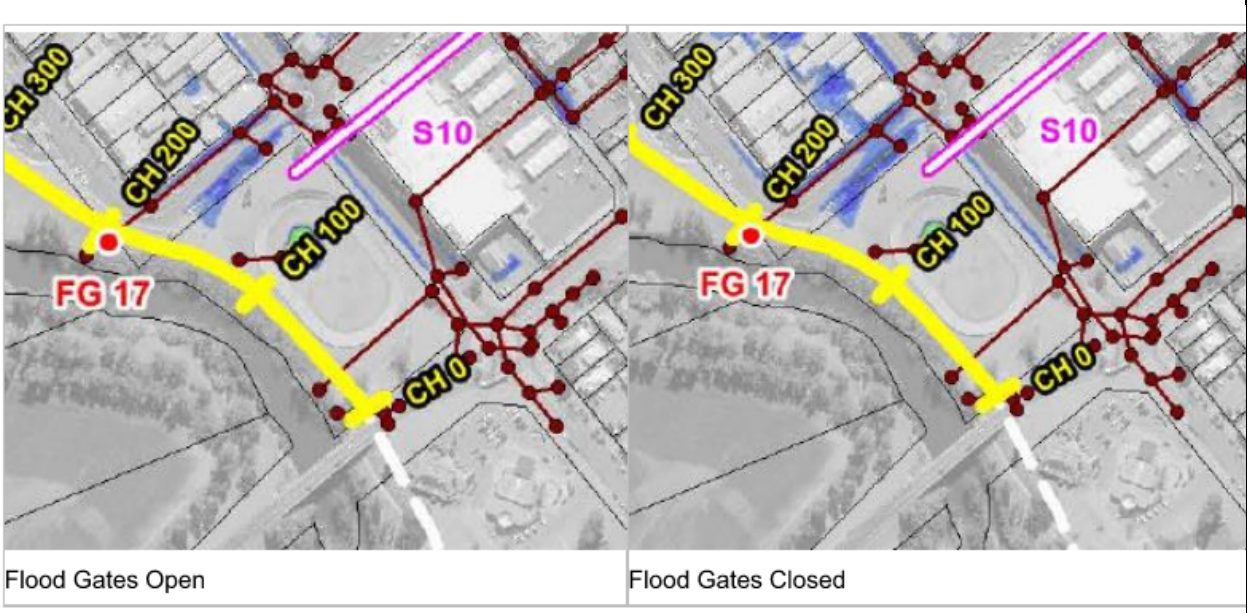

Figure 4.21 Overland Flow Flooding at Velodrome (1 in 100 AEP shown)

Figure 2.6: 100-year Overland Flow (Source: Council Correspondence-Appendix B)

3.0 Flood Planning Levels

3.1 Development on Flood Affected Land

Tamworth Regional Council Development Control Plan 2010 (DCP) has adopted the 1% Flood as its Flood Planning Level. Land below the Flood Planning Level is referred to as “flood affected land”. Flood affected land as shown on the Flood Affected Land Maps is defined as the most current information available to Council and may be derived and interpreted from a combination of the following:

1. Flood Studies identifying the 1% flood, undertaken in accordance with the Floodplain Development Manual, prepared by the NSW Government (as applicable at the time the Study was conducted)
2. Modelling undertaken for specific sites which identifies the 1% flood
3. Historic flood inundation records held by Council as the highest known flood
4. Information contained within an environmental planning instrument or policy
5. Specific flood mapping for the site

The flood planning level adopted in the Tamworth Regional Local Environmental Plan 2010 (LEP) is defined as the level of a 1% flood event plus 0.5 m freeboard. Until the DCP is amended to align with the LEP, the provisions of the LEP override those of the DCP. The flood planning level would therefore be 1% AEP + 0.5m freeboard.

The s10.7 Planning Certificate for the site states:

"34. The land is within the flood planning area and subject to flood related development controls set out in the provisions of the Tamworth Regional Local Environmental Plan 2010 (Clause 5.21) and the Tamworth Regional Development Control Plan 2010 (Development on Flood Affected Land)."

The LEP states at clause 5.21 (2):

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

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

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

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

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

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

Council correspondence attached in Appendix A confirms that as the site is protected from flooding by the levee (see figure 2.3 for freeboard to Crest Level of City Levees), the site is not considered to be within the Flood Planning Area (FPA) of the LEP. Therefore, Council is satisfied that the development is compatible with the flood function and behaviour on the land, and is prepared to grant consent.

3.2 Land Behind Levees

Development on land protected by the urban levee system should include consideration of inundation resulting from a levee breach (failure or overtopping) or stormwater ponding when the river system is in flood. Council have been asked:

- What design criteria (width, duration) should be used for the 2D levee breach analysis
- What flood controls would apply to areas affected by stormwater ponding when the river system is in flood.

Council have confirmed that there are no specific requirements for how a levee failure should be modelled. Overtopping should be considered and addressed in a few paragraphs of text. The mitigating factors to consider include:

- The levee in this location has more than 1m of freeboard to the 1% AEP Peel River flood event;
- Water spilling through a levee failure at this location can gravitate behind the levee away from the site to the northwest.

4.0 Proposed Works

4.1 Overall works

The project involves the construction of a contemporary four-storey university building located adjacent to Roderick Street. Additionally, a car park with access on Peel Street, cultural grounds, and complementary landscaping will be established. This site is situated at the corner of Peel St & Roderick St, with Peel River encompassing it as shown in Figure 4.1.

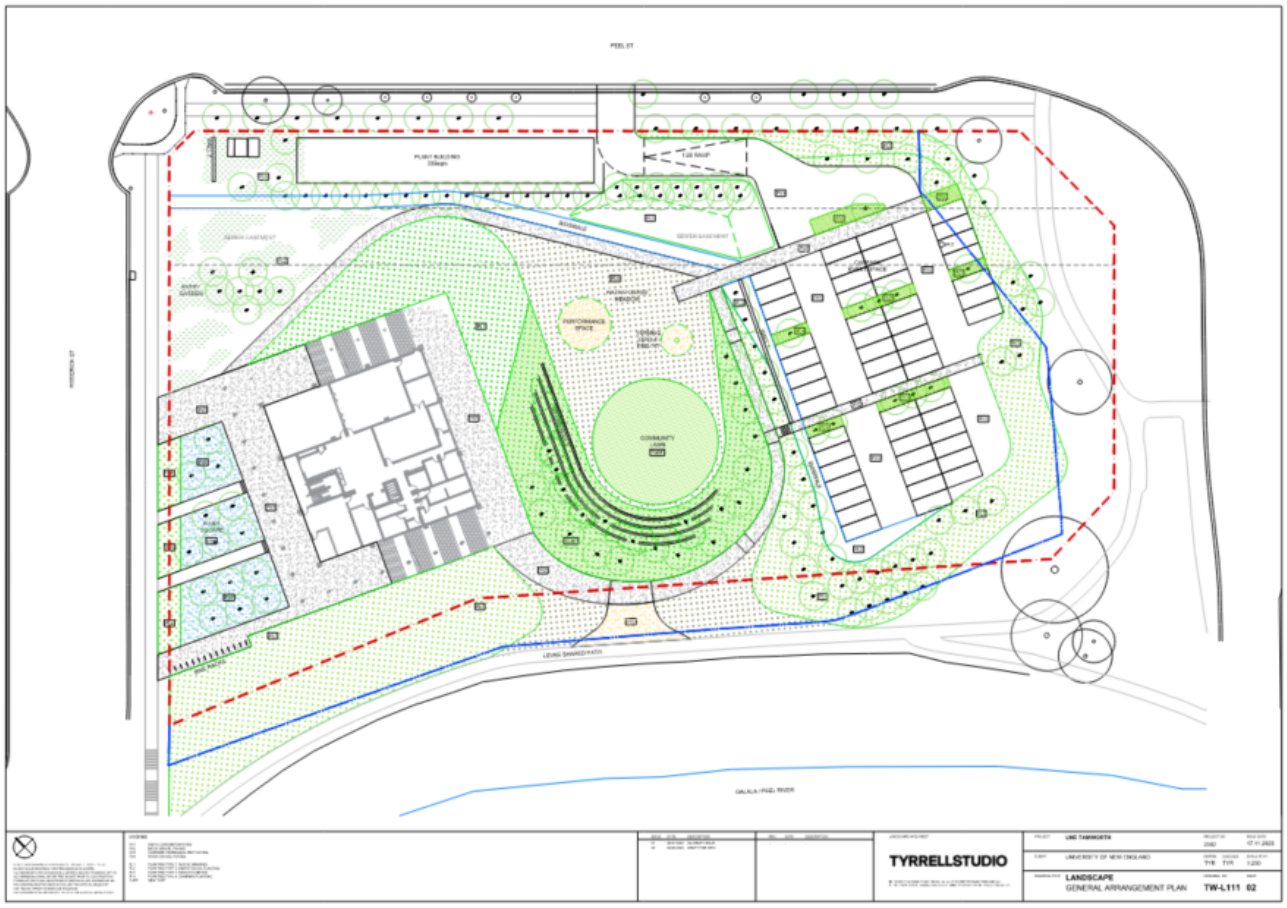

Figure 4.1: Concept Design Option

Several layout options are under active consideration. The currently favoured option involves earthworks where cut and fill volumes will be close to balanced (see Figure 4.2 and Figure 4.2). It is likely that this option will require a ramp from driveway to carpark. The building level 1 is to be suspended, with no fill material beneath.

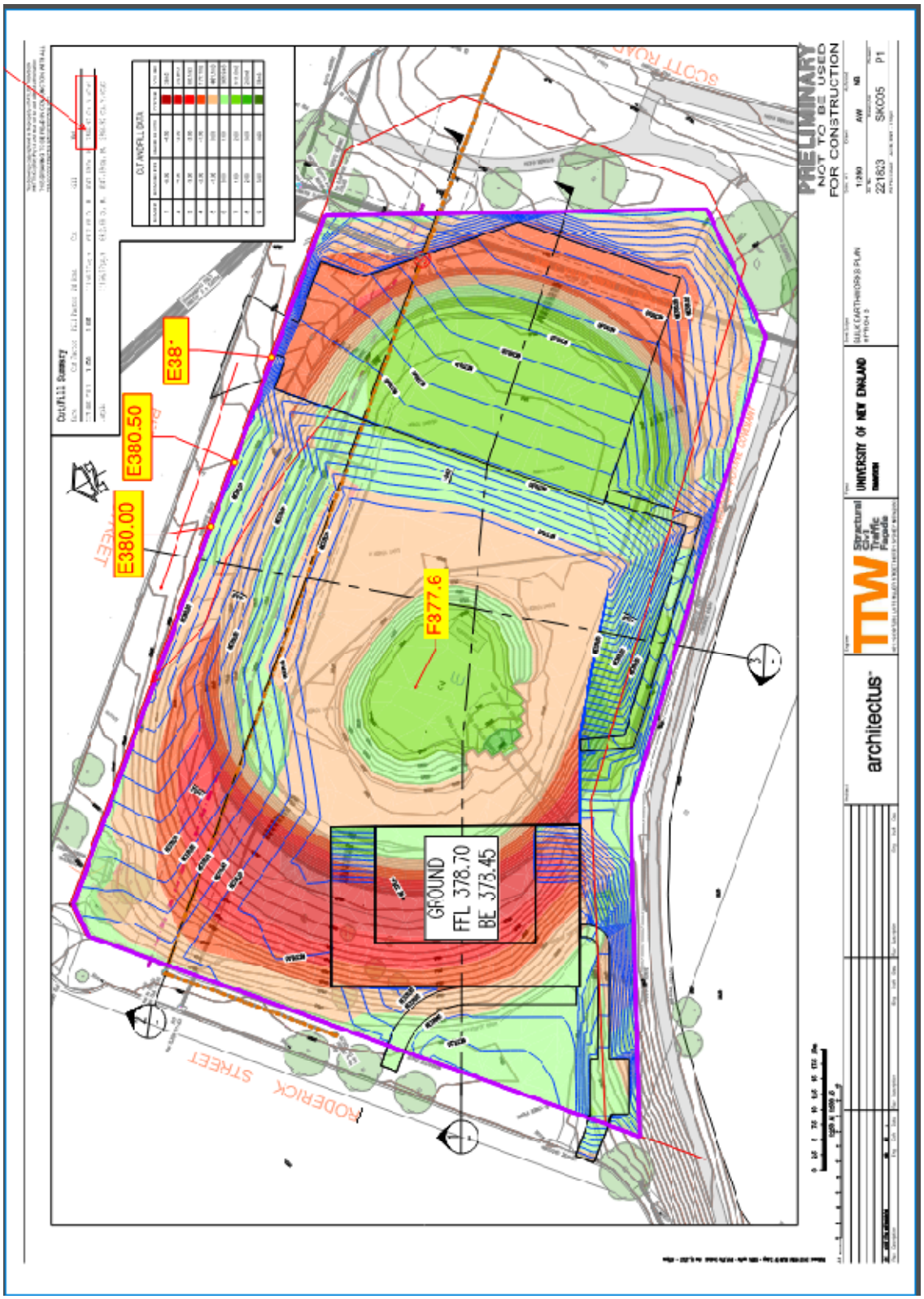

Figure 4.2: Bulk earthworks plan

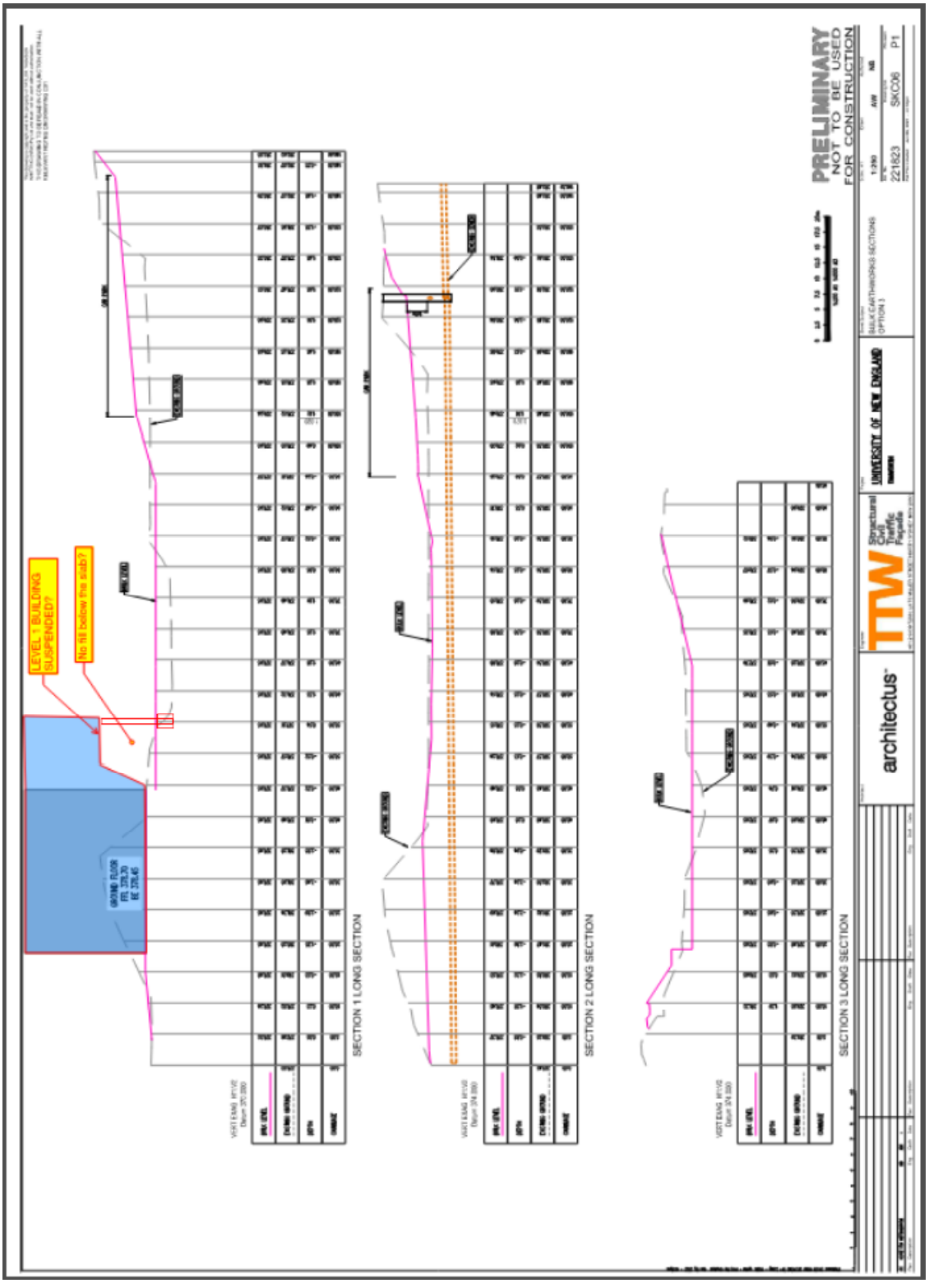

Figure 4.3: Bulk earthworks sections

5.0 Conclusion

5.1 Summary

The concept design has been reviewed with regards to flooding. Council correspondence attached in Appendix A confirms that the site is not considered to be within the Flood Planning Area (FPA) of the LEP, and therefore that Council is satisfied that the development is compatible with the flood function and behaviour on the land, and is prepared to grant consent.

5.2 Levee Breach

Development on land protected by the urban levee system should include consideration of inundation resulting from a levee breach or stormwater ponding when the river system is in flood. Council have confirmed that there are no specific requirements for how a levee failure should be modelled. Overtopping should be considered and addressed qualitatively in a few paragraphs of text. The mitigating factors to consider include:

1. The levee in this location has more than 1m of freeboard to the 1% AEP Peel River flood event level
2. Water spilling through a levee failure at this location can gravitate behind the levee away from the site to the northwest.

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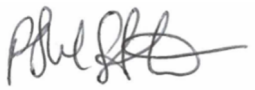

PHILIP MCATEER
Associate Director

Authorised By
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
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JAMIE MARSHALL
Associate (Flood)

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Appendix A Correspondence

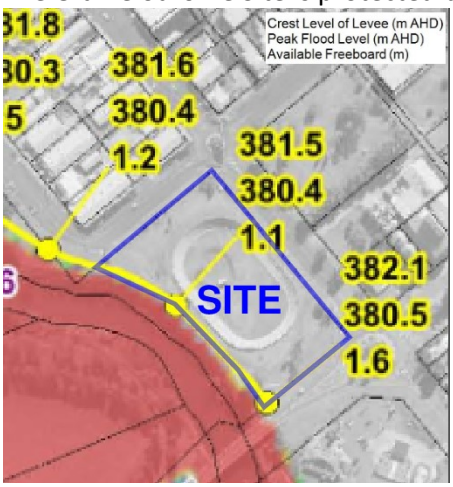
Philip McAteer

From: Pugh, Aidan <a.pugh@tamworth.nsw.gov.au>
Sent: Thursday, 11 May 2023 12:21 PM
To: Jema Lopez; Brake, Steve
Cc: Nemesio Biason Jr
Subject: RE: Prince of Wales Park Flooding and Stormwater Requirements

Follow Up Flag: Follow up
Flag Status: Completed

Hi Jema,

The Old Velodrome Site is protected by the Tamworth CBD levee along Peel River as shown below:



Council does not consider this location to be within the Flood Planning Area as defined in the LEP so the flood related development controls in the LEP do not apply.

This site has been identified in Council's draft Flood Risk Management Plan (currently on public exhibition) as being effected by overland flow. See the 1%AEP overland flow map below. During a development application you should consider the flows entering the site from Roderick Street especially considering that the current extent is limited by the velodrome embankment. I have also included a cross section through the LiDAR surface (green) and 1% flood surface (red) below.

Stormwater detention is not required at this site.

I will have to pass you on to our Development area to provide feedback on the WSUD requires. @Steve – are you able to comment on the status of the WSUD DCP amendment? Or pass Jema's last question on to someone who can?

Cheers,

Aidan Pugh
Stormwater Engineer

P 02 6767 5018 | **E** a.pugh@tamworth.nsw.gov.au

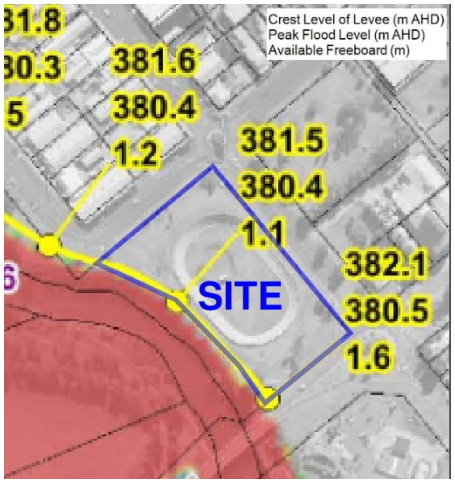
PO Box 555 Tamworth NSW 2340
www.tamworth.nsw.gov.au

From: Jema Lopez <jema.lopez@ttw.com.au>
Sent: Thursday, 11 May 2023 11:48 AM
To: Pugh, Aidan <a.pugh@tamworth.nsw.gov.au>
Cc: Nemesio Biason Jr <nemesio.biasonJr@ttw.com.au>
Subject: Prince of Wales Park Flooding and Stormwater Requirements

Good day Aidan,

Thank you for your time on the phone. As per our discussion, could you please confirm the following items for a proposed school campus at the Prince of Wales Park on the corner of Peel Street and Roderick Street in Tamworth?

- The Prince of Wales Park is protected by a levee approximately 1.1-1.6m west along Peel River as shown below.



- The proposed development does not initially require any freeboard, however will need to comply with the flood planning level as specified in Tamworth Regional LEP 2010 which is 1:100 ARI flood level plus 0.5m freeboard.

> The flood planning level adopted in the Tamworth Regional Local Environmental Plan 2010 is defined as the level of a 1 : 100 ARI (average recurrent interval) flood event plus 0.5 metres freeboard.

Additionally, I am seeking to confirm the stormwater requirements for a proposed development.

- On-Site Detention (OSD) is to be designed in accordance with Council's *Engineering Design Minimum Standards for Subdivisions & Developments (V1, March 2019)* Chapter 3.10.3.4 shown below, which is to match the existing undeveloped peak discharge up to and including the 100-year ARI storm event.

3.10.3.4 DESIGN CRITERIA

All retention/detention structures are to be designed utilising:

- Hydrographs produced by an acceptable method of unit graph theory or mathematical modelling; and
- Flood routing through the structure.

Retention/detention structures shall be designed to maintain the existing undeveloped discharges for the range of storm durations and frequencies from 1 year ARI events up to and including 100 year ARI events.

The methods described in Section 3.6.3 of these Standards may be used to calculate peak flows.

Retention/detention structures with downstream established areas and no clear and safe overland flow paths shall be designed for the peak 100 year ARI storm with consideration of the sensitivity of the design given to 200 year ARI events.

The peak storm duration with retention/detention structures is to be confirmed by the *Developer's Representative.* The critical duration is likely to be longer than without retention/detention. A graph showing the range of peak flood levels in the structure and peak discharges from the structure are to be provided for all storm events examined. Consideration must be given to areas downstream to ensure that changes in timing of peak flows at the confluence of downstream reaches is not adversely impacted by construction of the structure.

A sensitivity analysis must be undertaken for a range of variables (catchment roughness, link lags etc.) to determine how sensitive the design is to minor changes in these variables.

Rainwater tanks either installed or intended to be installed as part of the development shall not be used in retention/detention basin design calculations. The volume of storage in pits and pipes in the minor system is also to be ignored.

- A Water Sensitive Design Statement (WSDS) is to be provided and the development must comply with Council's *Fact Sheet: Water Sensitive Design Statements* shown below. It was also noted on the fact sheet that some sites are part of Council-approved Stormwater Strategy or WSDS may be required to meet different stormwater quality targets that what is shown below. Could you please confirm what target reduction loads should be adopted for the site?

Requirements of a Water Sensitive Design Statement

A Water Sensitive Design Statement is supported by figures and diagrams which demonstrate how the development satisfies the objectives of the Development Control Plan and the Water Sensitive Design performance criteria as outlined in quality and quantity targets.

Stormwater Quality Targets – Subdivision

Site Characteristics		Lots over 2,000 m^2 in size	Lots less than 2,000 m^2 in size
Target Reduction Loads *	Gross Pollutants	90%	90%
	Total Suspended Solids	Neutral or Beneficial Effect on Water Quality – meaning loads of pollutants from future development must be equivalent to or less than that from the existing land use prior to development	80%
	Total Phosphorus		65%
	Total Nitrogen		45%

* *Based on increased pollution generated from development without treatment*

Stormwater Quantity Targets

Stormwater Quantity	Flow rates (for environmental and infrastructure protection)
Target	Retention/detention structures shall be designed to maintain the existing undeveloped discharges for the range of storm durations and frequencies from 5 year ARI events up to and including 100-year ARI events. Retention/detention structures with downstream established areas and no clear and safe overland flow paths shall be designed for the peak 100-year ARI storm with consideration of the sensitivity of the design given to 200-year ARI events.
Intent	Reduce the likelihood of increased rates of bed and bank erosion and damage to benthic habitat in waterways. Ensure that the development does not result in increased stormwater flows that exceed the capacity of the external stormwater drainage infrastructure and/or exacerbate overland flow problems.

Thank you and please let me know if I have missed any flooding/stormwater-related requirements, or misinterpreted any of the above.

Best regards,

TTW

Jema Lopez | Civil Engineer

+61 426 053 329 | +61 2 9067 5017 | jema.lopez@ttw.com.au

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