

Civil Engineering Report

Barker College Concept and Stage 1 Works

Prepared for EPM Projects / 15 July 2022

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1.0 Introduction

Taylor Thomson Whitting (TTW) have been engaged by EPM Projects to provide Civil engineering consultancy services for alterations to the existing Barker College as part of a State Significant Development (SSD). This report will cover the Concept and Stage 1 approval of the proposed works.

The Stage 1 works focus on the implementation of pedestrian infrastructure developments. This report will address the civil engineering design requirements of the Stage 1 developments including stormwater, water quality, flood design, pavement design, and earthworks. These are to be designed in line with Hornsby Shire Council Development Control Plan (DCP) and AUS-SPEC Specifications where necessary in addition to other relevant standards.

1.1 Planning

The below Planning Secretary's Environmental Assessment Requirements (SEARs) were issued on the 15th of December 2021 for the Alterations and Additions to Barker College (reference number SSD-31822612).

Table 1.1: SEARs Requirements

Conditions	Reference
Issue and Assessment Requirements – Concept Proposal	
12. Ground and Water Conditions - Provide an assessment of the potential impacts on soil resources, including related infrastructure and riparian lands on and near the site. - Provide an assessment of the potential impacts on surface and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines, downstream assets and watercourses.	Section 4.1 and Section 4.2 provide an assessment of the potential impacts on surface water quality and quantity in relation to drainage lines.
13. Stormwater and Wastewater Provide an overarching Integrated Water Management Plan for the development that: - Is prepared in consultation with the local council and any other relevant drainage or water authority. - Details the proposed drainage design for the site including any on-site treatment, reuse and detention facilities, water quality measures, and the nominated discharge points. - Demonstrates compliance with the local council or other drainage or water authority requirements and avoids adverse impacts on any downstream properties	Section 4.1 and Section 4.2 addresses the drainage design for the site, including on site treatment, reuse and detention facilities, water quality measures and nominated discharge points.
14. Flooding Risk Identify any flood risk on-site having regard to adopted flood studies, the potential effects of climate change, and any relevant provisions of the NSW Floodplain Development Manual and the Hornsby Floodplain Risk Management Study and Plan (Cardno, 2015).	Section 4.3 addresses the flood risks on site.

Assess the impacts of the concept development, including any changes to flood risk on-site or off-site and detail design solutions and operational procedures to mitigate flood risk where required.	
Issue and Assessment Requirements – Stage 1 Development	
8. Sediment, Erosion and Dust Controls Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles.	Section 4.2.1 addresses the sediment, erosion and dust controls.

1.2 Relevant Documents

- Hornsby Shire Council Development Control Plan (DCP) 2013
- Hornsby Shire Council Local Environmental Plan (LEP) 2013
- Hornsby Shire Council Water Sensitive Urban Design (WSUD) Guidelines 2015
- Hornsby Floodplain Risk Management Study and Plan (Cardno, 2015)

2.0 The Site

The existing site is located at 91 Pacific Highway, Hornsby, NSW, 2077 and is defined as Lot 100 of DP1262386. The site is bounded to the north by the Pacific Highway, the east by Unwin Road, the south by Clarke Road, and the west by College Crescent. The site is classified as R2 residential zoning with housing to the east, south and west, and commercial businesses to the north. The T9 Train line runs parallel to College Crescent west of site.

An aerial image of the site is provided below.



Figure 2.1: Barker Site Location

3.0 Overview of Proposed Development

Barker College has proposed the development of multi-stage works to enhance the existing conditions of site as well as improve amenities and facilities to support both the current and future staff and student populations. These developments will consist primarily of a new aquatic centre, co-curricular performing arts and exam centre, maintenance shed, and the improvement to existing pedestrian and vehicle access around site.

Detailed approval of the Stage 1 works is primarily associated with the improvement to pedestrian infrastructure through the site and will include the following developments;

- Rationalisation of the internal Chapel Drive carriageway and Junior School associated parking area to improve traffic flow and pedestrian safety associated with the internal Pick-Up and Drop-Off (PUDO) system.
- Landscape works to 'The Avenue' roadway to create a new Civic space for the school and transitioning to the existing east-west site connection on RB Finlay Walk and towards C-Block.
- Construction of a new elevated east-west walkway along the southern edge of C-Block.
- Construction of a new north-south pathway connection linking the Rosewood Centre to the Junior School Campus.
- Increase the existing cap to total student and full-time staff numbers allowed on campus to 2850 students and 480 staff.

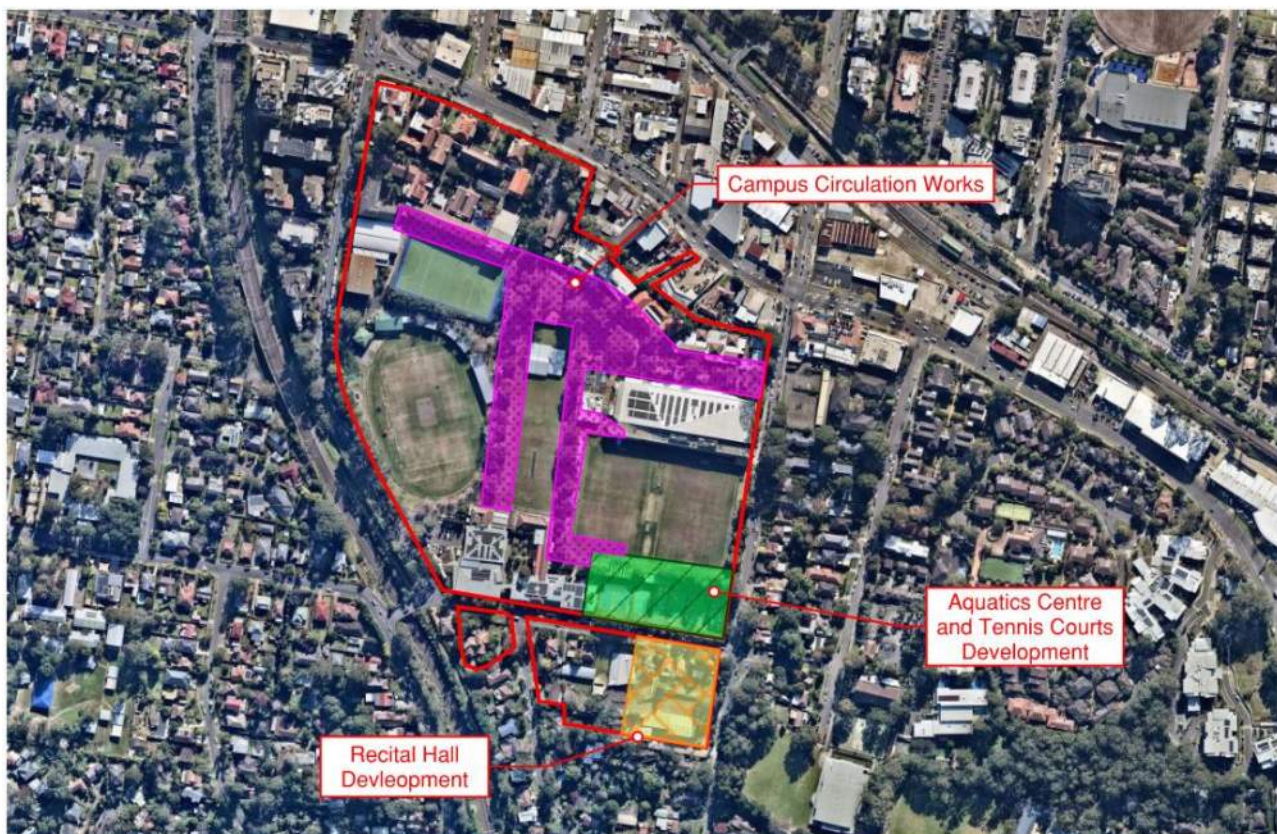


Figure 3.1 – Overview of Proposed Works

4.0 Concept Design

4.1 Stormwater Quantity

Stormwater is to be designed in accordance with Section 1C.1.2 – Stormwater Management of the Hornsby Shire Council Development Control Plan 2013 (DCP). All new stormwater is to be conveyed by gravity as discharge from site via Council's existing drainage system. Existing catchment conditions should be maintained where practical. Roof catchments will be collected in roof gutters and conveyed by downpipes to an in-ground pipe system. Surface stormwater flows will be conveyed by site grading and collected by Surface Inlet Pits (SIP). Where required, in-ground stormwater is to be connected to Onsite Stormwater Detention and water quality treatment devices.

4.1.1 Onsite Stormwater Detention

Onsite Stormwater Detention (OSD) will be provided where required under Council's Specifications for Stormwater Drainage. Requirements relating to properties required to provide OSD are outlined within Section 1C.1.2- Stormwater Management of the Hornsby DCP requirements and are as follows;

Water Hydrology

- c. An on site stormwater management system that deals with detention, retention and discharge rates is required for all development involving external works to maintain environmental flow* rates in the receiving watercourses.
- d. An on-site detention (OSD) system, designed in accordance with the HSC Civil Works Specification, should be provided for the following types of development:
 - Subdivision,
 - Single dwellings where required by covenant,
 - Two or more dwellings, or
 - Non-residential developments with external alterations.

OSD is therefore required to be provided where an increase to total impervious area will result in increased flows overwhelming the capacity of downstream stormwater networks. In such scenarios, OSD is to be included to reduce post-development flow rates experienced up to and including the 1 in 20 year Average Recurrence Interval (ARI) to the maximum flow rate generated during a 1 in 5 year ARI storm event pre-development. Where downstream drainage capacity is available, discharge from site to Council networks will be maintained post-development.

5.11 STORMWATER DETENTION

1. Installation of Stormwater Detention is required on redevelopment sites within the Shire where under capacity drainage systems exist. A redevelopment site is defined as a site which used to have or was originally zoned to have a lower density development than is proposed.

2. Council's policy on OSD is being reviewed. The current OSD requirements for developments are that the Q20 post development outflow from the site is restricted to the Q5 predevelopment flow.

Note: Council may require additional storage for OSD systems for all storms up to Q100 in areas known to be subject to flood inundation.

OSD can be provided in an underground tank or as an above ground storage area. All systems require a positive covenant and a restriction as to use to ensure the system is not modified without Council consent.

4.2 Stormwater Quality

Hornsby Shire Council's DCP outlines that "developments are required to achieve water quality targets for major redevelopment on sites greater than 2,000m², or other development that increases the impermeable area on a site by more than 2,000m²." Where sites do not increase the impermeable area by more than 2,000m², water quality treatment measures will not be proposed. Sites that do increase impermeable area will be required to meet Hornsby Shire Council's stormwater quality treatment targets.

- 90% reduction in the post development mean annual load of Gross Pollutants (GP).
- 80% reduction in the post development mean annual load of Total Suspended Solids (TSS).
- 60% reduction in the post development mean annual load of Total Phosphorus (TP).
- 45% reduction in the post development mean annual load of Total Nitrogen (TN).

Water Quality

i. In urban areas, the following development types should be designed to achieve the water quality targets in Table 1C.1.2(b);

- major redevelopment on sites greater than 2000m², and
- other development that increases the impermeable area on a site by more than 2000m².

Table 1C.1.2(b) Urban Stormwater Quality Targets

Pollutant Type	Performance Target Reduction Loads
Gross Pollutants	90% reduction in the post development mean annual load of total gross pollutants
Total Suspended Solids	80% reduction in the post development mean annual load of total suspended solids
Total Phosphorous	60% reduction in the post development mean annual load of total phosphorous
Total Nitrogen	45% reduction in the post development mean annual load of total nitrogen.

j. Medium and high density residential developments with a site area of between 1000m² and 2000m² should demonstrate that they achieve the water quality targets in Table 1C.1.2(b) above, or utilise one of the following deemed to comply solutions:

- 80% of the roof area of the development is to drain to a tank(s) that has a capacity of 3,000 litres per 100m² of roof area of the development. The tank(s) is to be connected to the communal water system, and to all dwellings for toilet flushing and laundry, or
- provide a bioretention system(s) which is at least 1.5% of the total impervious area and drains all of the impervious areas.

Where required, proposed water quality treatment train systems are to be modelled using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) to determine that the stormwater treatment train has been designed in accordance with Council's specific stormwater quality requirements.

4.2.1 Stormwater Quality During Construction

The erosion and sediment control measures to implement during construction will be provided in accordance with the Council requirements and Landcom NSW Managing Urban Stormwater: Soils and Construction 2004. A Soil and Erosion Control plan will be prepared for the site and issued as part of the Development Application. Typical measures to be implemented would include:

- Provision of sediment and erosion controls at locations downstream of construction areas (e.g. sediment fences, sediment basins, other as required).
- Provision of stormwater diversions around the construction site for run-off from upstream undisturbed areas.
- Identification of stockpile locations.
- Identification and locations of sediment control barriers.
- Protection of existing stormwater using geotextile filters, sandbags or similar.
- Identification of work staging to limit the area and duration of soils exposure.

Identification of suitable locations for construction vehicle access and wheel wash facilities.

4.3 Flooding

Design of flood planning requirements are outlined within Section 1C.3.2 of the Hornsby DCP. Flood Planning Levels (FPL) are defined by Council as the level of the 1 in 100-year ARI (average Recurrence Interval) flood event plus 500mm freeboard as defined in the NSW Floodplain Development Manual 2005. The objectives of flood control measures of site are to minimise the risk to life, property, and environment from flood events. Design objectives of site are to meet the following criteria:

Prescriptive Measures

General

- a. Where a development proposal is on land shown as 'Flood Planning areas' on the HLEP Flood Planning Map or is on other land at or below the flood planning level, a comprehensive flood study should be prepared by a qualified hydraulic engineer and is to be submitted with any development application on land that demonstrates that:
 - The development addresses the provisions of Clause 6.3 of the HLEP, and
 - The development complies with best practice.
- b. The overland flow path should not be built upon and should have minimal planting. Development is required to demonstrate that any overland flow is maintained for 1 in 100 year average recurrence interval (ARI) flood.
- c. All potential pollutants that are stored or detained on-site (such as on-site effluent treatment facilities, chemicals or hazardous materials) should be stored 0.5 metres above 1 in 100 year ARI flood level. Details should be provided as part of any application.

- All habitable floor levels are to be a minimum of 0.5m above the 1:100 ARI Flood Level and all garages or basement ramps should be 0.3 metres above the 1:100 ARI Flood level.

Although the site is not identified as a Flood Planning Area within the Council HELP map, sections of site have been outlined as Low Hazard zones within the Hornsby Floodplain Risk Management Study and Plan 2015. Flooding is primarily associated with the western and southern boundaries of site, with portions of surrounding roadways subject to high hazard levels during the 1%AEP. A summary of flooding on site is provided in **Figure 4.1** below.

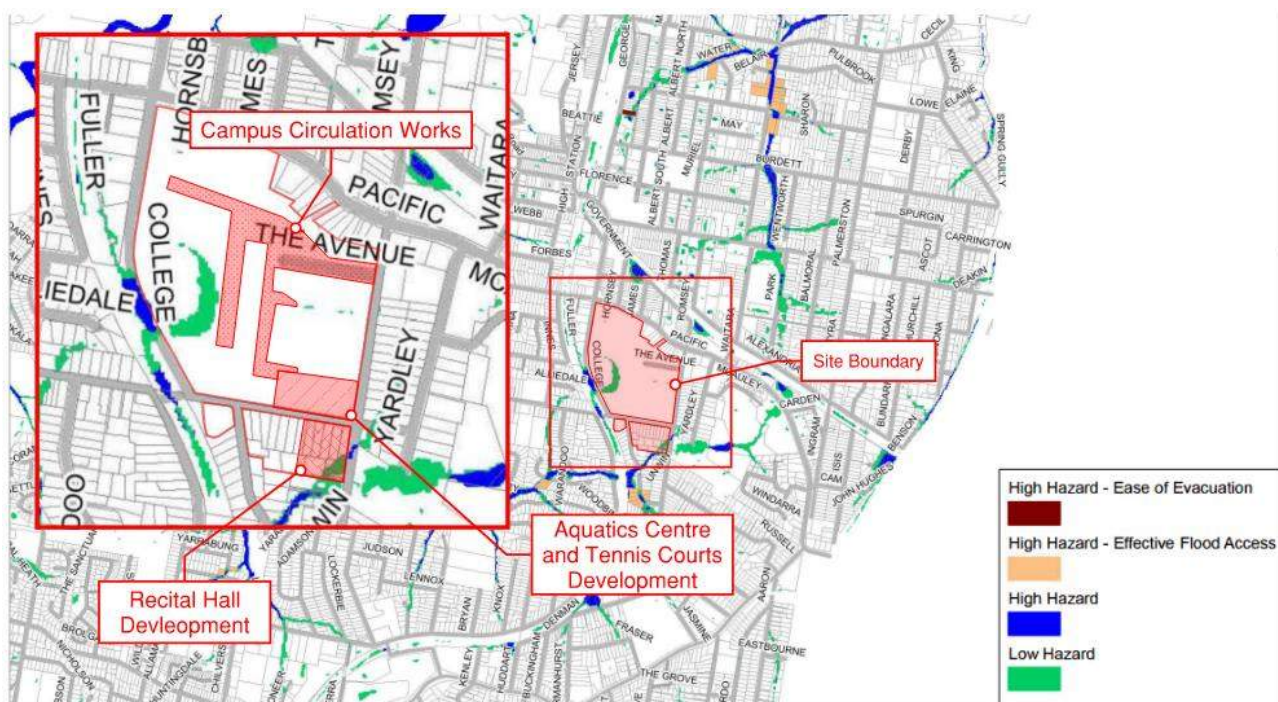


Figure 4.1 –1%AEP Flood Risk Map - Hornsby Floodplain Risk Management Study and Plan 2015

In accordance with Council DCP requirements, the following Flood Planning Levels are to be adopted for design of site:

- All habitable floor levels are to be a minimum of 0.5m above the 1:100 ARI flood level, and
- All garages or basement ramps should be 0.3m above the 1:100 ARI flood level.

Future detailed approval of the Recital Hall development will require a two-dimensional flood study to determine the appropriate habitable floor levels and ensure no adverse impact to adjacent sites. A two-dimensional flood study will be prepared during the detailed approval phase for the Recital Hall development.

4.4 Aquatics Centre and Tennis Courts

4.4.1 Proposed Development

Development of the site will involve the design and construction of a two-storey structure with a single level of basement as well as associated landscape works. Use of site will be primarily associated with an aquatics centre with staff and user facilities and amenities associated with the ground floor of site. Existing on-grade tennis courts are to be shifted to the second storey of the proposed development. Additional amenities to service these courts including change rooms, staff rooms, and a seminar room as well as retractable shade structures are also proposed as part of works.

Pedestrian access to site will be associated with proposed works outlined within the Stage 1 works, with additional entry points located along Unwin Road to the site east and Clarke Road to the South West. Vehicular access to site will be available via Clarke Street with 35 carpark bays located within the basement of site. Additional plant access will be made available along Clarke Road to service the continued operation of site.



Figure 4.2 – Aquatics Centre and Tennis Courts Development Ground Floor Plan

4.4.2 Stormwater Quantity

Stormwater discharge from the site is currently serviced by an existing OSD chamber of storage volume 120m³ (with an additional rainwater tank) and permissible site discharge of 110 L/sec in line with a Positive Covenant received from Barker College. This tank is to be reconstructed as part of the planned development of the Aquatics Centre stage of works. The OSD and rainwater tank is planned to meet 1,000m³ storage volume and will be designed in line with Council DCP requirements as well as the Council's Specifications for Stormwater Drainage during the detailed approval phase.

A preliminary DRAINS model has been composed to demonstrate that the 110 L/sec discharge rate outlined as part of the Positive Covenant agreement can be met by the design of site. A conservative estimate of 100% impervious area has been assumed for site and may be refined during the detailed design of site.

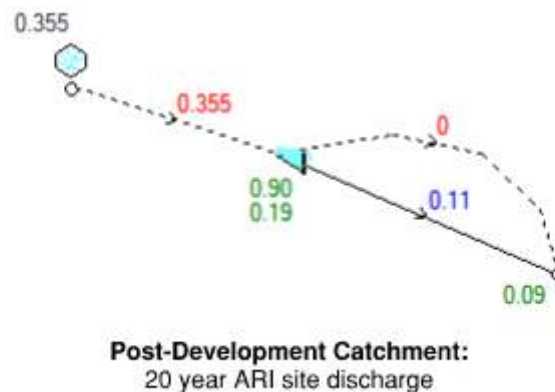


Figure 4.3 –DRAINS Model detailing Pre-Development and Post-Development Flows

4.4.3 Stormwater Quality

Development of site will total approximately 5,000m² and therefore exceeds the 2,000m² requirement outlining the inclusion of water quality control measures required for site. Water quality control measures will be required to meet annual pollutant load reduction targets as identified in Council's DCP and highlighted in **Table 4.1**.

Table 4.1 – Hornsby Council Pollutant Load Reduction Targets

Pollutant Type	Annual Reduction Load Target
Gross Pollutants (GP)	90%
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	65%
Total Nitrogen (TN)	45%

The proposed water quality treatment train will be modelled using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) to ensure that Council pollutant reduction targets are satisfactorily met by the design of site. Water quality targets may be met by site through the use of Water Sensitive Urban Design (WSUD) devices and may include:

- Ocean Protect PSorb 690mm Filter Cartridge or equivalent product,
- Gross Pollutant Traps and Surface Pit Inserts,
- Rainwater Tanks,
- Swales, bioretention swales, and buffer strips,

Integration of several of these devices are likely to be implemented on site dependant on site constraints and will be integrated with site during the detailed approval phase of development. An erosion and sediment control plan is to be provided prior to the commencement of siteworks.

4.4.4 Flood Design

Floor Planning Levels for habitable structures are to meet requirements outlined in Section 1C.3.2 of the Hornsby Floodplain Risk Management Study and Guide 2015 and summarised within Section 4.3 of this report. Floor Planning Levels for site are to equal or exceed the 1%AEP flood level plus 500mm freeboard, whilst access to basement parking is to equal or exceed the 1%AEP flood level plus 300mm freeboard. It is noted that the footprint of proposed works falls outside of zoning identified as subject to flood risk.

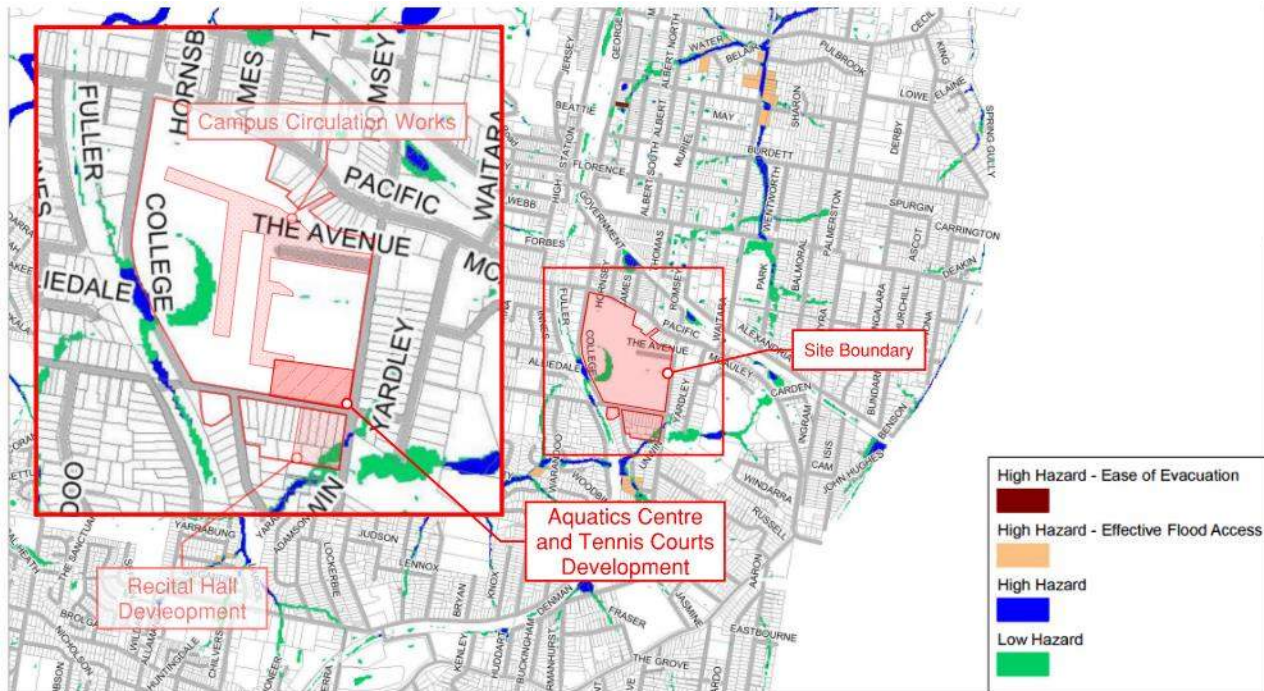


Figure 4.4 –1%AEP Flood Hazard Extents in Relation to Footprint of Works

4.5 Recital Hall

4.5.1 Proposed Development

The development of the site will involve demolition of four existing residential dwellings and the design and construction of a two-storey structure with a single level of basement as well as associated landscape works. Use of site will be primarily associated for use of a recital and performance hall. Additional facilities including several practice rooms and recording studios, storage, and staff and user amenities are also proposed as part of the development.

Access to site will primarily be associated with existing pedestrian infrastructure associated within Clarke Road and Unwin Road as well as additional paths internal to site. Vehicular access will be available via Unwin Road with 90 carpark bays provided within the basement level of site.

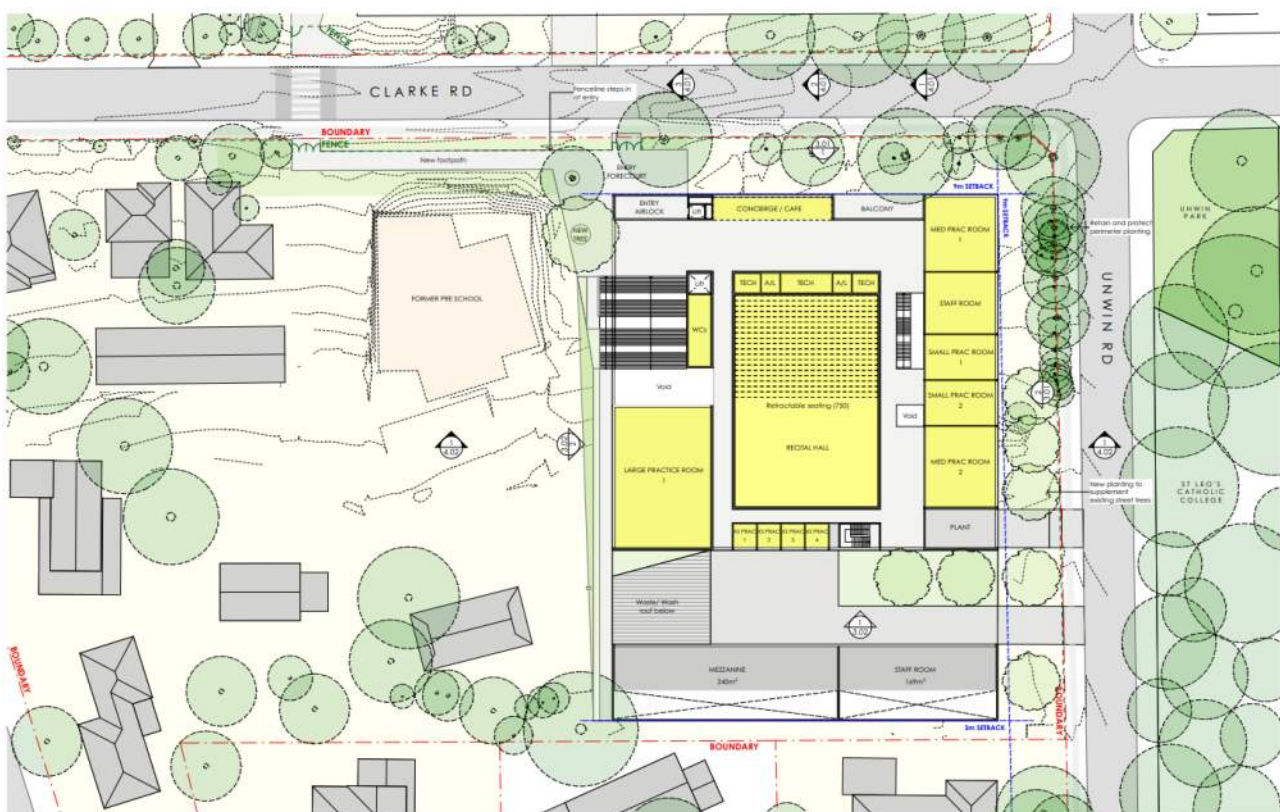


Figure 4.5 – Recital Hall Development Ground Floor Plan

4.5.2 Stormwater Quantity

Use of site is currently operated by four residential buildings owned and operated by Barker College. Existing roof catchment of site is collected by gutters and directed by downpipes to in-ground stormwater. Stormwater flows are then discharged to Council pits located along Unwin Road. Overland flows are directed via site grading to the adjacent site also owned and operated by Barker College.

Redevelopment of site will exceed 2,000m² and therefore it is expected that OSD will be required for implementation on site in order to meet Council stormwater discharge requirements. Design of OSD is to be designed in line with Council DCP as well as the Council's Specifications for Stormwater Drainage during the detailed approval of the works.

A preliminary DRAINS model has been provided to show that an OSD chamber of volume 100m³ and orifice diameter 336mm can meet the existing 5 year ARI storm event site discharge of 153 L/sec. A conservative estimate of 100% impervious area has been assumed for site and may be refined during the detailed design of site.

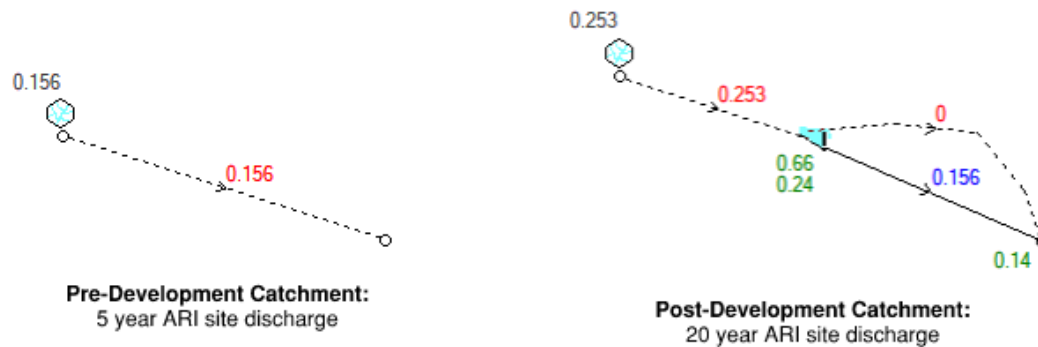


Figure 4.6 –DRAINS Model detailing Pre-Development and Post-Development Flows

As the site is located within zoning identified as flood hazard zoning, additional storage requirements for events up to the 1%AEP may be required by Council. This has been accounted for in site storage requirements but will likely require additional consultation with Council during the detailed approval phase of development regarding additional storage requirements and condition of downstream networks.

4.6 Stormwater Quality

Development of site will total approximately 5,000 m² and therefore exceeds the 2,000m² requirement outlining the inclusion of water quality control measures required for site. Water quality control measures will be required to meet annual pollutant load reduction targets as identified in Council's DCP and highlighted in Table 4.2.

Table 4.2 – Hornsby Council Pollutant Load Reduction Targets

Pollutant Type	Annual Reduction Load Target
Gross Pollutants (GP)	90%
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	65%
Total Nitrogen (TN)	45%

The proposed water quality treatment train will be modelled using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) to ensure that Council pollutant reduction targets are satisfactorily met by the design of site. Water quality targets may be met by site through the use of Water Sensitive Urban Design (WSUD) devices and may include:

- Ocean Protect PSorb 690mm Filter Cartridge or equivalent product,
- Gross Pollutant Traps and Surface Pit Inserts,
- Rainwater Tanks,
- Swales, bioretention swales, and buffer strips, and/or
- Raingardens.

Integration of several of these devices are likely to be implemented on site dependant on site constraints and will be integrated with site during the detailed design phase of development. An erosion and sediment control plan will be provided prior to the commencement of siteworks.

4.6.1 Flood Design

Floor Planning Levels for habitable structures are to meet requirements outlined in Section 1C.3.2 of the Hornsby Floodplain Risk Management Study and Guide 2015 and summarised within Section 4.3 of this report. Floor Planning Levels for site are to equal or exceed the 1%AEP flood level plus 500mm freeboard. Access to basement parking is to equal or exceed the 1%AEP flood level plus 300mm freeboard. Grading on site will need to allow for overland flow routes as per the existing conditions. The basement driveway access on Unwin Road will need to contain a crest at the 1% AEP + 300mm freeboard.

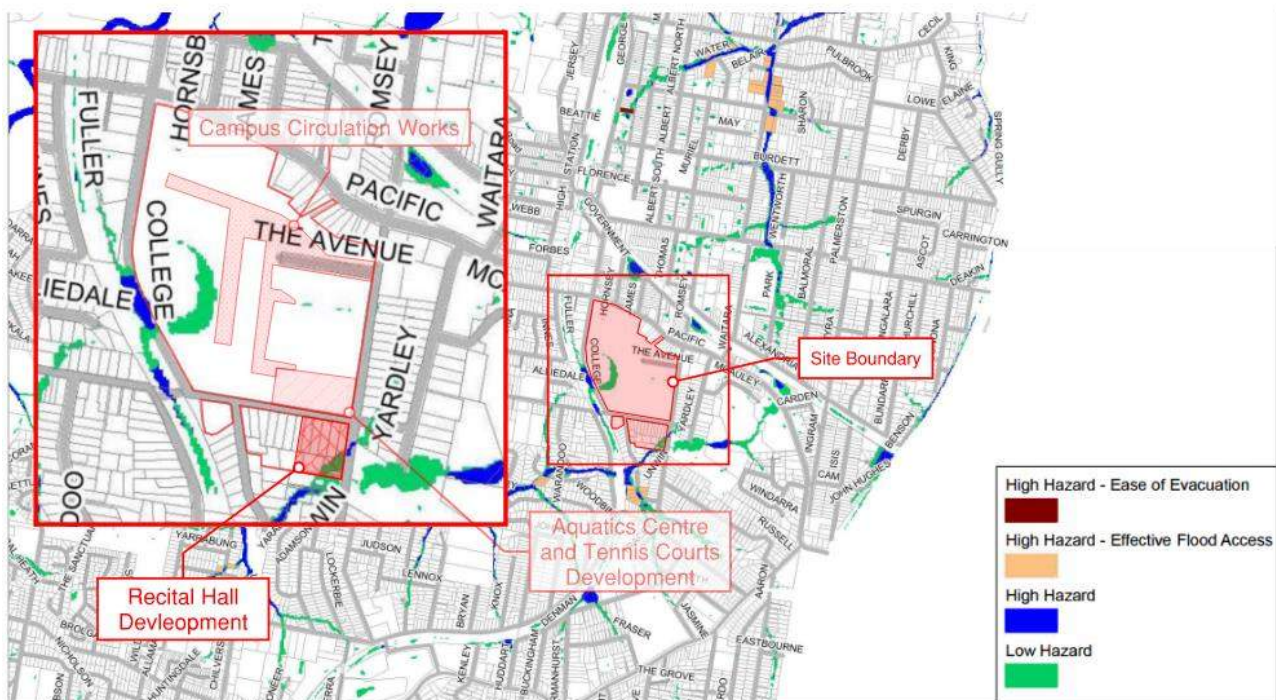


Figure 4.7 –1%AEP Flood Hazard Extents in Relation to Footprint of Works

5.0 Stage 1 Design – Campus Circulation Works

5.1 Proposed Development

Development of Stage 1 works are primarily associated with the implementation of additional pedestrian access and infrastructure works around and through site. Principal works will be associated with the redesign of the existing private roadway known as 'The Avenue' to a single lane shared use roadway to allow pedestrian access whilst retaining vehicular access to several key buildings and emergency services. Additional works are associated with the provision of additional pedestrian pathway works and includes:

- Rationalisation of the internal Chapel Drive carriageway and Junior School associated parking area to improve traffic flow and pedestrian safety associated with the internal Pick-Up and Drop-Off (PUDO) system.
- Landscape works to 'The Avenue' roadway to create a new Civic space for the school and transitioning to the existing east-west site connection on RB Finlay Walk and towards C-Block.
- Construction of a new elevated east-west walkway along the southern edge of C-Block.
- Construction of a new north-south pathway connection linking the Rosewood Centre to the Junior School Campus.
- Increase the existing cap to total student and full-time staff numbers allowed on campus to 2850 students and 480 staff.

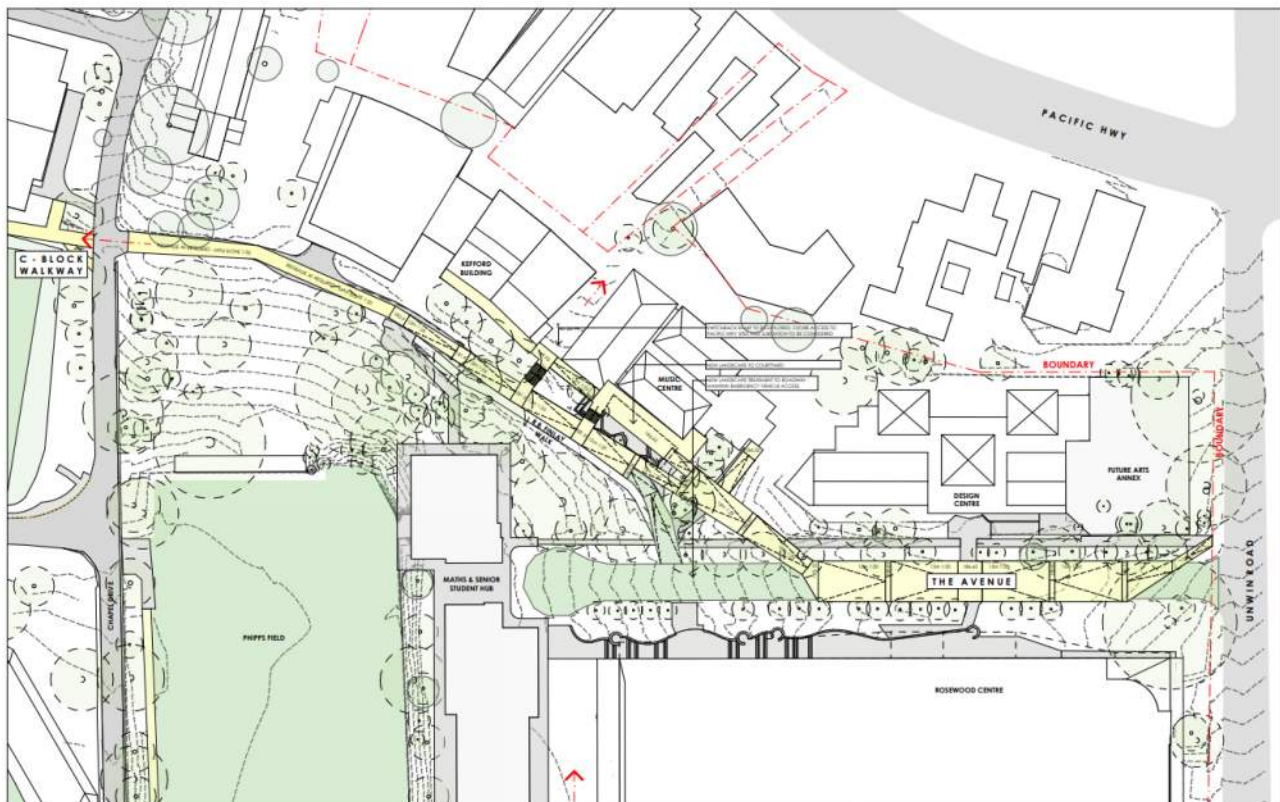


Figure 5.1 – Overview of Proposed Stage 1 Works

5.2 Stormwater Quantity

As part of this development, a survey has been conducted to determine the extent of in-ground stormwater infrastructure located within the proximity of proposed works. A crest is located approximately halfway through the run of 'The Avenue' and therefore stormwater systems within the site are split between two catchments.

- Catchment 1 services the eastern portion of 'The Avenue' and currently drains via site grading to kerb and gutter where it is discharged to Unwin Road as bypass.
- Catchment 2 services the western portion of 'The Avenue' and is currently drained through site grading and kerb and gutter to Surface Inlet Pits (SIP) and Kerb Inlet Pits (KIP). Stormwater alteration works impacting the western catchment have recently been implemented as part of the neighbouring Barker College Math and Science Hub development project currently in the construction phase. The extent of works includes minor alterations to pipe and surface inlet pit locations to allow for the clearance of the new building footprint. A new pit has been constructed over the existing drainage line with a connection rerouted through a breezeway to allow discharge as under pre-development conditions.

A summary of the split between impervious and pervious area of site is outlined in **Figure 5.2** and **Figure 5.3** for existing and proposed scenarios respectively.

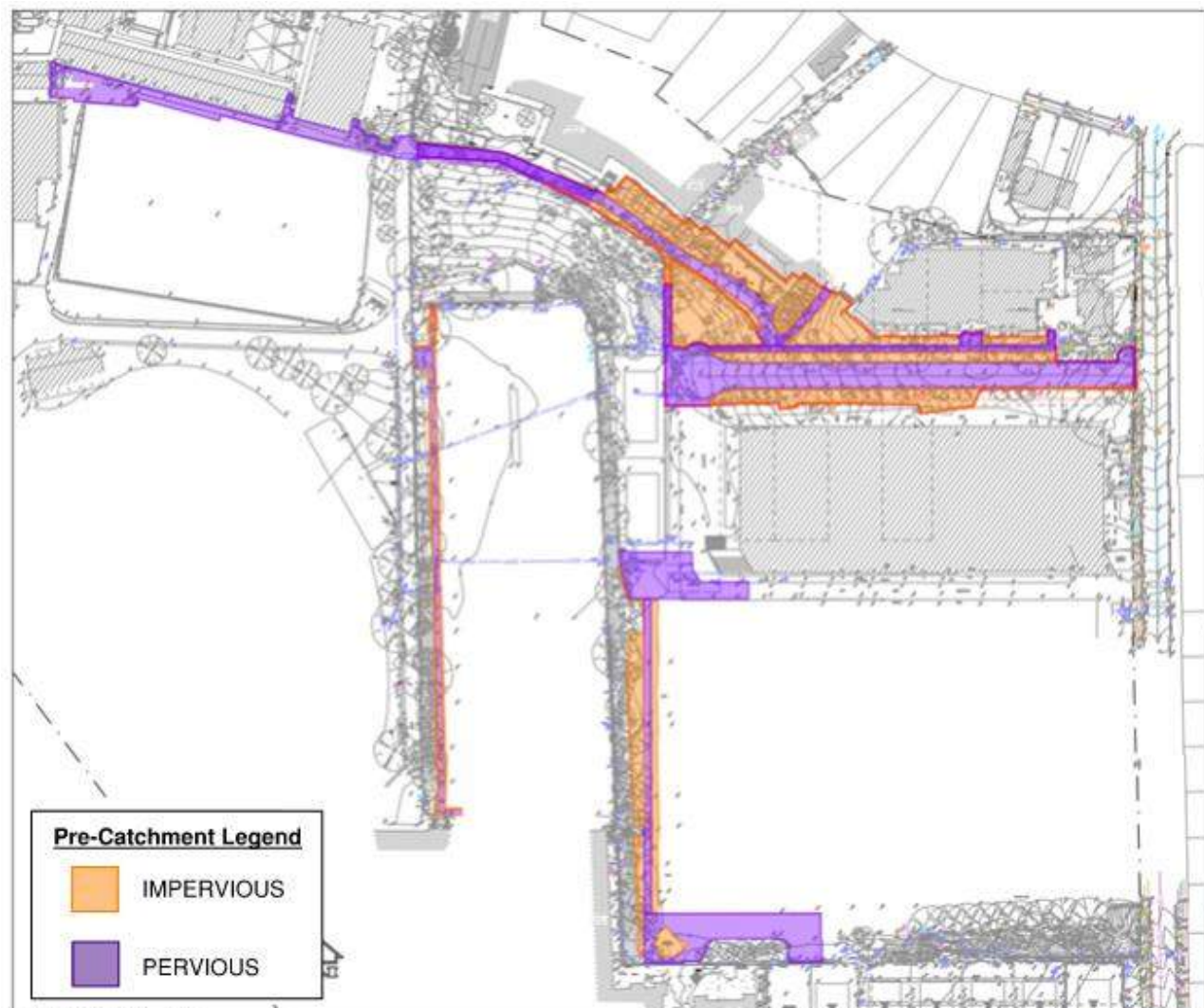


Figure 5.2 – Pre-Development Catchment Plan



Figure 5.3 – Post-Development Catchment Plan

A summary of the split between impervious to pervious area for both pre-development and post development catchment plans have been summarised below.

Table 5.1 – Split between Pervious and Impervious Area

	Pre-Development Area (m ²)	Pre-Development Area (%)	Post-Development Area (m ²)	Post-Development Area (%)
Impervious	5240	58.3%	5315	59.1%
Pervious	3750	41.7%	3675	40.9%
Sum Total	8990	100%	8990	100%

As total impervious area of site will not substantially increase between pre-development and post-development scenarios, it is not expected that stormwater discharge from site will substantially increase when compared with pre-development scenarios. Use of OSD is therefore not proposed as part of the development. A model catchment has been created using DRAINS to demonstrate that discharge from site will not be altered by the proposed scope of works as shown in **Figure 5.4**.

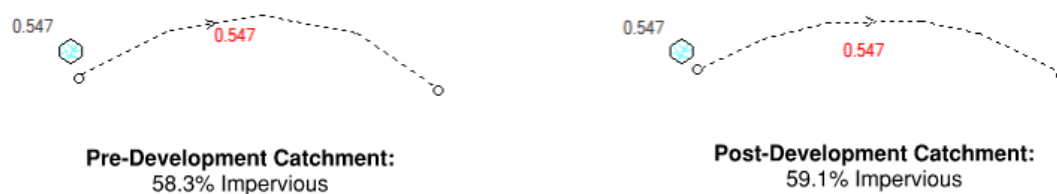


Figure 5.4 –DRAINS Model Comparing 1% AEP Pre-Development and Post-Development Discharge from Site.

In accordance with the Council DCP requirements, discharge from site is split between the two existing catchments as per existing conditions.

- Catchment 1 stormwater flows will be conveyed through overland flow and directed to kerb and gutter to be dispensed to Council pit and lintels located within Unwin Road as under existing conditions.
- Catchment 2 stormwater flows will be directed via site grading to in-ground pits and pipes and drain to the existing point of discharge constructed as part of the approved Barker College Math and Science Hub development currently under construction. Construction of this downstream point of discharge is expected to be finalised prior to the commencement of works.

5.3 Stormwater Quality

The Hornsby Council DCP outlines the requirements for sites where WSUD water quality treatment devices are required. As outlined in Section 4.2, all developments located within urban areas will require water quality treatment devices should the following criteria be met:

- Major redevelopment on sites greater than 2,000m², and
- Other development that increases the impermeable area on a site by more than 2,000m².

Although the area of site exceeds 2,000m², the scope of works involves the reconstruction of an existing roadway to a shared use roadway as well as the augmentation of pedestrian routes through the existing site and associated landscaping works and so has not been classified as falling the classification of a major redevelopment. In addition, total impervious area of site will increase by only 75m² of total site area (approximately 0.8%) as part of the proposed works and therefore does not exceed the 2,000m² additional impervious area requirement.

No water quality treatment devices are proposed as part of the development. An erosion and sediment control plan will be provided prior to the commencement of siteworks once the staging of works is known.

5.4 Flood Design

Development site works are confined to the implementation of on-grade pedestrian pathways and associated landscaping works and therefore are not subject to floor planning levels as outlined within the Hornsby DCP. Overland flow paths are to be maintained post-development through the use of best design practices including site grading and landscaping works to ensure flows remain consistent with existing conditions. Additional drainage infrastructure may be proposed to maintain overland flow routes where appropriate to ensure design of site meets both user and environmental needs subject to detailed design.

6.0 Conclusion

Key aspects of the proposed development works include:

- The site is seeking a concept and stage 1 approval. Detailed stage 1 works include Campus Circulation improvements, while concept works include an Aquatics Centre and Tennis Court development and a Recital Hall development.
- OSD and WSUD water quality design measures are to be employed on sites greater than 2,000m² or sites where an increase to stormwater discharge from site will overwhelm downstream networks as a result of development.
- No stormwater quality or quantity control devices are proposed as part of the Campus Circulation Works development.
- OSD and water quality devices will need to be provided for both the Aquatics Centre and Tennis Courts, and Recital Hall developments, subject to future detailed approvals.
- The existing OSD and rainwater tank volume of 1,000m³ associated with the Aquatics Centre is to be reconstructed and maintained as part of proposed works in accordance with the Positive Covenant agreement on the site.
- Sections of site are subject to Flood Planning Levels (FPL). Habitable floor levels are required to equal or exceed the 1%AEP flood level plus 500mm freeboard. Access to in-ground carparks and basement structures is required to equal or exceed the 1% AEP flood level plus 300mm freeboard. A detailed two-dimensional study will be conducted for the detailed approval of the Recital Hall development to ensure no adverse impact on the adjoining sites.

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Authorised By
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
TAYLOR THOMSON WHITTING NSW TRUST



GRACE CARPP
Associate

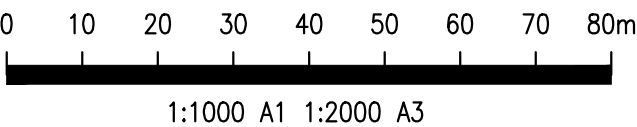
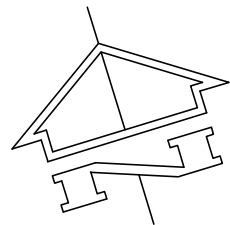
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Appendix A

Civil Drawings

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WHITTING (NSW) Pty Ltd and must not be used without authorisation.
THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL
RELEVANT NOTES ON DRAWING C01

Scale : A1	Drawn	Authorised
NTS	LW	
Job No	Drawing No	Revision
202010	C01	P2
Plot File Created: Jun 30, 2022 - 3:18pm		



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FOR CONSTRUCTION

T:\barker\ C02.dwg - USER: tthw - Plot File Created: Jun 30, 2022 - 3:04pm

A1 0 1 2 3 4 5 6 7 8 9 10

P2 INFORMATION		GC	LW	30.06.22										
P1 PRELIMINARY		GC	LW	12.05.22										
Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date

Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer
TTW **Structural Civil Traffic Façade**
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

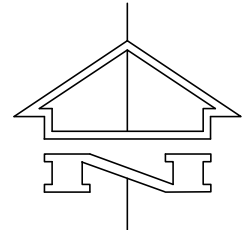
Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
OVERALL PLAN

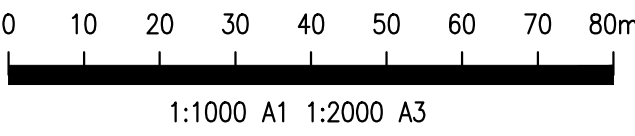
Scale : A1 1:1000	Drawn LW	Authorised
Job No 202010	Drawing No C02	Revision P2
Plot File Created: Jun 30, 2022 - 3:04pm		



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- eEA EXISTING OVERHEAD ELECTRICAL
- eEU EXISTING UNDERGROUND ELECTRICAL
- eG EXISTING GAS
- eT EXISTING TELECOMMUNICATIONS
- eS EXISTING SEWER
- eW EXISTING WATER
- eSW EXISTING STORMWATER



PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

T:\barker\013.dwg - USR: lanna - Plot File Created: Jun 30, 2022 - 3:04pm

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Rev	Description	Eng	Draft	Date

Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date
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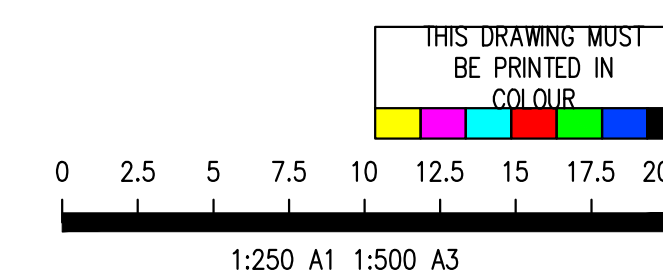
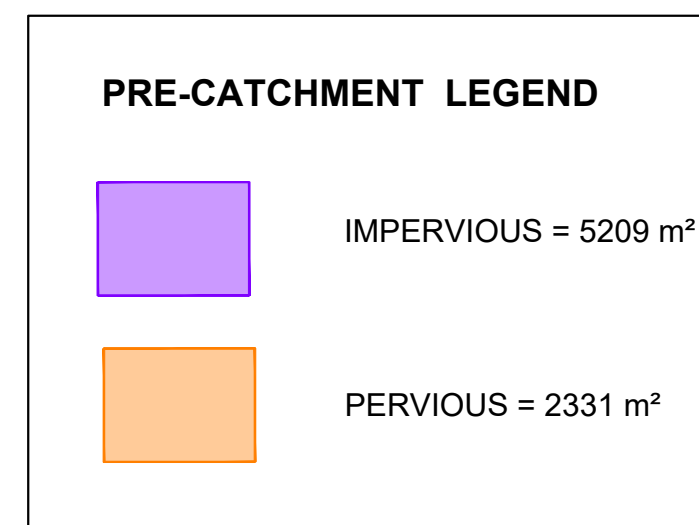
Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer
TTW **Structural Civil Traffic Façade**
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
DBYD SERVICES PLAN

Scale : A1
1:1000
Job No
202010
Plot File Created: Jun 30, 2022 - 3:04pm
Drawn
LW
Drawing No
C03
Revision
P2



PRELIMINARY
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FOR CONSTRUCTION

Scale : A1	Drawn	Authorised
1:250	LW	
Job No	Drawing No	Revision
202010	C04	P2
Plot File Created: Jun 30, 2022 - 3:05pm		

AT									
P2	INFORMATION	GC	LW	30.06.22					
P1	PRELIMINARY	GC	LW	12.05.22					
D	Research officer	Sc	D	Refuge	D	Preparation	Sc	D	D

Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer

TTW **Structural
Civil
Traffic
Façade**

612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

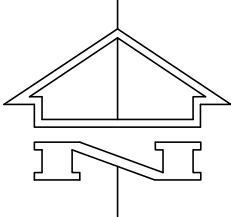
Project	BARKER COLLEGE 91 PACIFIC HIGHWAY
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Sheet Subject	CATCHMENT PLAN - PRE DEVELOPMENT
---------------	----------------------------------

Pathname: C05.dwg - User: tthm - Plot File Created: Jun 30, 2022 - 3:06pm



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PRE-CATCHMENT LEGEND



IMPERVIOUS = 5218m²



PERVIOUS = 3714 m²

THIS DRAWING MUST
BE PRINTED IN
COLOUR

0 2.5 5 7.5 10 12.5 15 17.5 20m

1:250 A1 1:500 A3

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
P2	INFORMATION	GC	LW	30.06.22										
P1	PRELIMINARY	GC	LW	12.05.22										

Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

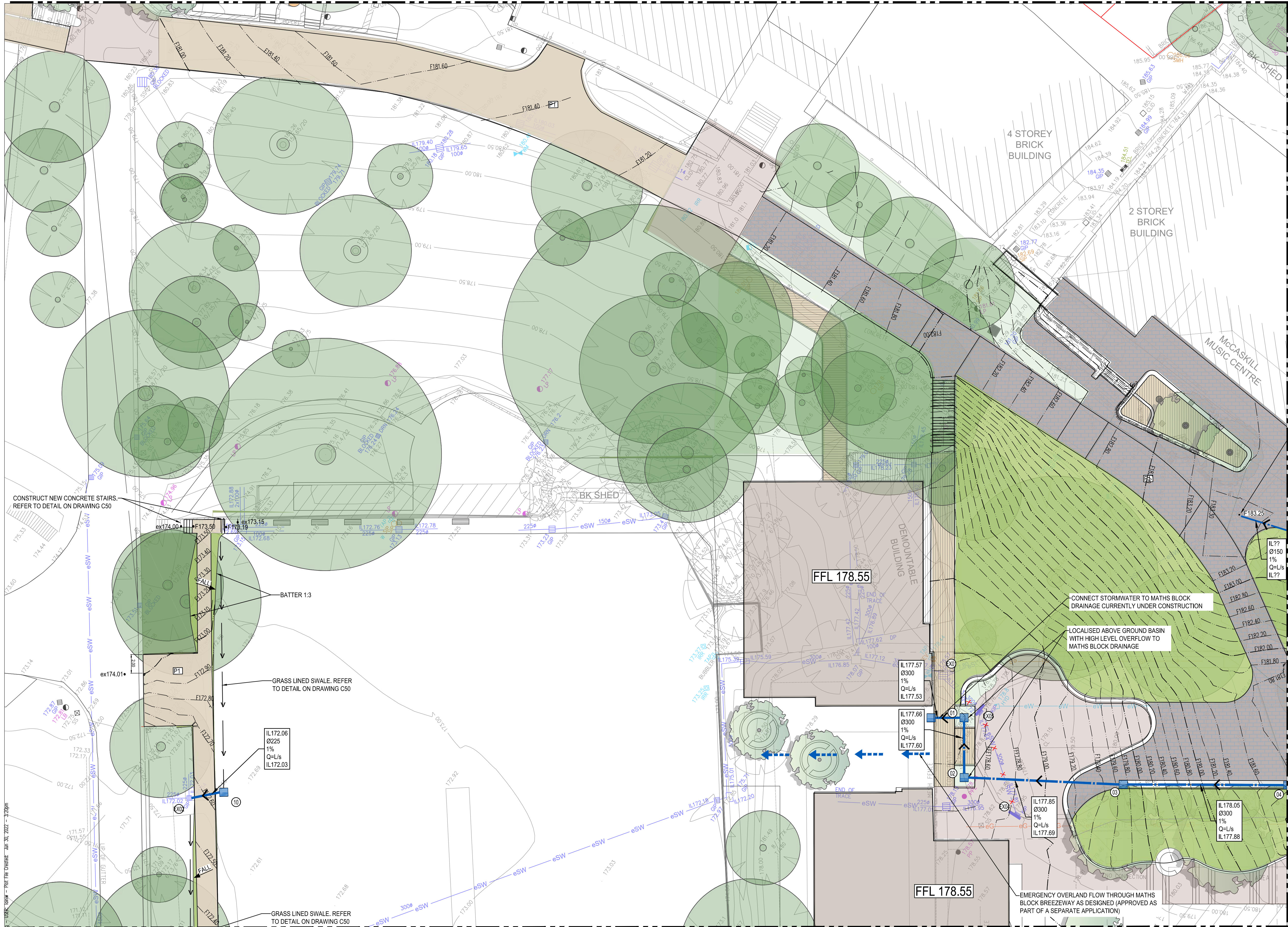
Engineer
TTW **Structural**
Civil
Traffic
Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
CATCHMENT PLAN - POST
DEVELOPMENT

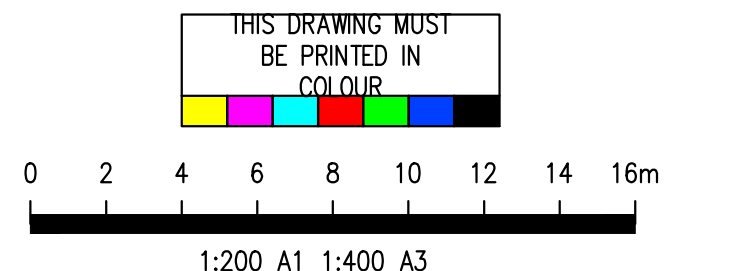
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Job No 202010	Drawing No C05	Revision P2
Plot File Created: Jun 30, 2022 - 3:06pm		

FOR CONTINUATION REFER TO DRAWING C10



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- P1** CONCRETE PEDESTRIAN PAVEMENT
- P2** PAVERS
- P3** CONCRETE ROAD PAVEMENT
- L1** LANDSCAPING
Refer to landscape architect's documentation
- SEATING**
Refer to architect's documentation
- STORMWATER PIPE, FLOW DIRECTION
- STORMWATER PIPE, FLOW DIRECTION
UPSTREAM PIPE INVERT LEVEL
PIPE SIZE AND STRENGTH CLASS
PIPE GRADIENT
PEAK DESIGN FLOW
DOWNSTREAM PIPE INVERT LEVEL
- JUNCTION PIT
- GRATED INLET PIT
- SAG KERB INLET PIT
- ON-GRADE KERB INLET PIT
- DRAINAGE LINE AND PIT NUMBER
- GRATED DRAIN
- SUBSOIL DRAINAGE LINE, Ø100mm U.N.O.
- FLUSHING POINT
- INTERMEDIATE RISER
- BATTER SLOPE
- GRASS CATCH DRAIN OVERLAND FLOW PATH
- KERB AND GUTTER
- VEHICULAR CROSSING
- FINISHED SURFACE LEVEL
MAJOR FINISHED SURFACE CONTOUR
0.5m INTERVAL
MINOR FINISHED SURFACE CONTOUR
0.1m INTERVAL
- EXTENT OF WORKS
EXISTING SERVICE TO BE DEMOLISHED AND REMOVED
- EXISTING OVERHEAD ELECTRICAL
- EXISTING UNDERGROUND ELECTRICAL
- EXISTING GAS
- EXISTING TELECOMMUNICATIONS
- EXISTING SEWER
- EXISTING WATER
- EXISTING STORMWATER



PRELIMINARY
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P2	INFORMATION	GC	LW	30.06.22
P1	PRELIMINARY	GC	LW	12.05.22
Rev	Description	Eng	Draft	Date

Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date

Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

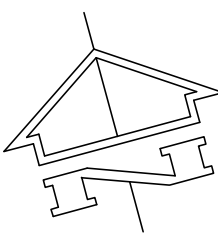
Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
SITeworks PLAN - SHEET 2

Scale : A1
1:200
Job No
202010
Plot File Created: Jun 30, 2022 - 3:20pm
Drawn
LW
Drawing No
C11
Authorised
P2
Revision



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P1 CONCRETE PEDESTRIAN PAVEMENT

P2 PAVERS

P3 CONCRETE ROAD PAVEMENT

L1 LANDSCAPING
Refer to landscape architect's documentation

SEATING
Refer to architect's documentation

STORMWATER PIPE, FLOW DIRECTION

STORMWATER PIPE, FLOW DIRECTION
u/L 10.00
Ø600 2'
1.25%
Q=345L/s
d/L 9.65
UPSTREAM PIPE INVERT LEVEL
PIPE SIZE AND STRENGTH CLASS
PIPE GRADIENT
PEAK DESIGN FLOW
DOWNSTREAM PIPE INVERT LEVEL

JUNCTION PIT

GRATED INLET
PIT

SAG KERB INLET PIT

ON-GRADE KERB INLET PIT

D01-2 DRAINAGE LINE AND PIT NUMBER

GD# GRATED DRAIN

SUBSOIL DRAINAGE LINE, Ø100mm U.N.O.

FLUSHING POINT

INTERMEDIATE RISER

BATTER SLOPE

GRASS CATCH DRAIN

OVERLAND FLOW PATH

KG KERB AND GUTTER

VC VEHICULAR CROSSING

× F22.20 FINISHED SURFACE LEVEL
22.50 MAJOR FINISHED SURFACE CONTOUR
0.5m INTERVAL
22.10 MINOR FINISHED SURFACE CONTOUR
0.1m INTERVAL

X X X EXTENT OF WORKS
EXISTING SERVICE TO BE
DEMOLISHED AND REMOVED

eEA EXISTING OVERHEAD ELECTRICAL
eEU EXISTING UNDERGROUND ELECTRICAL
eG EXISTING GAS
eT EXISTING TELECOMMUNICATIONS
eS EXISTING SEWER
eW EXISTING WATER
eSW EXISTING STORMWATER

THIS DRAWING MUST BE PRINTED IN COLOUR

0 2 4 6 8 10 12 14 16m
1:200 A1 1:400 A3

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

A1 1 2 3 4 5 6 7 8 9 10

P2	INFORMATION	GC	LW	30.06.22
P1	PRELIMINARY	GC	LW	12.05.22
Rev	Description	Eng	Draft	Date
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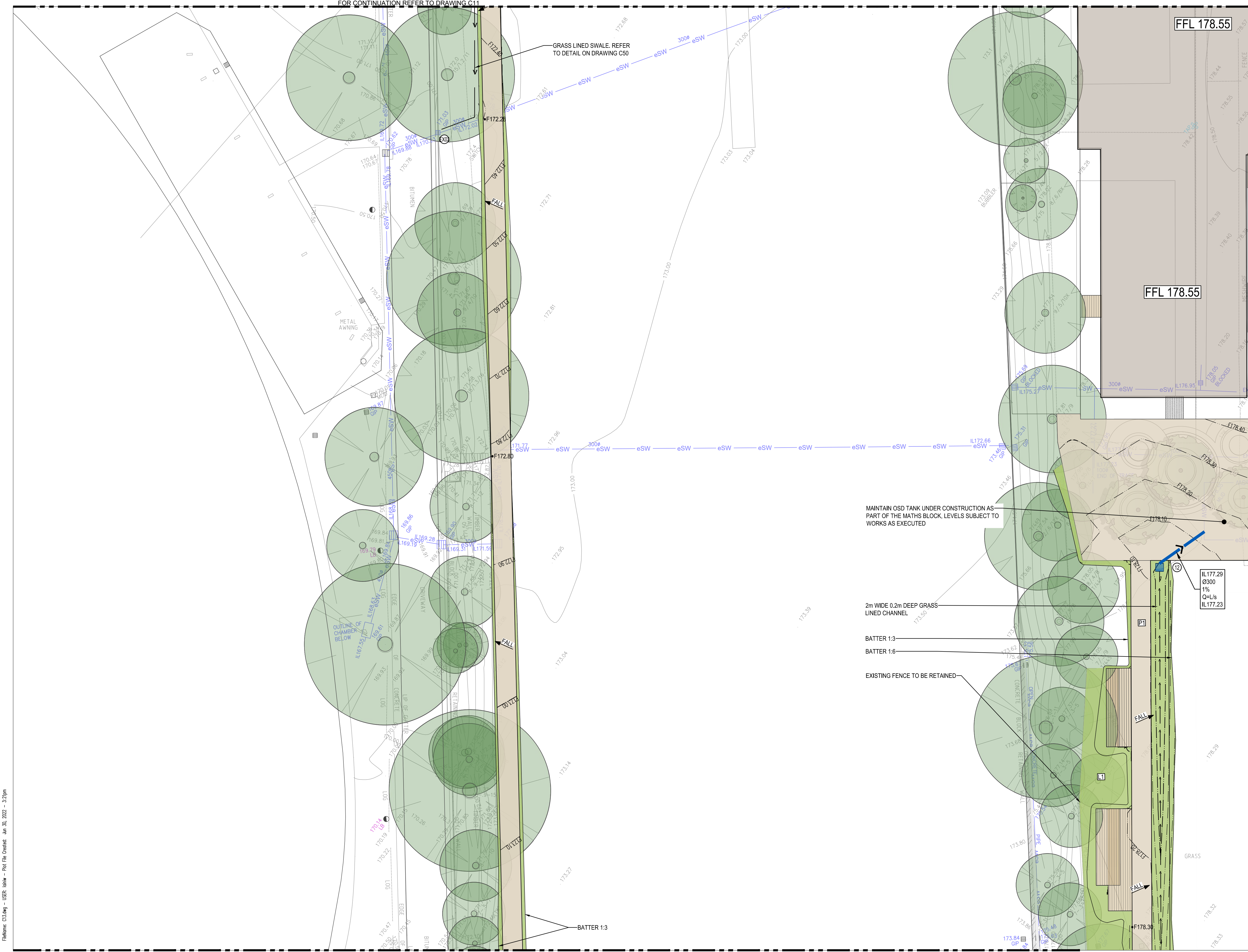
Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer
TTW Structural
Civil
Traffic
Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

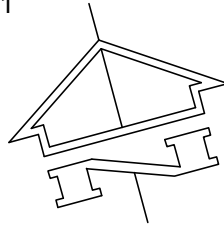
Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
SITWORKS PLAN - SHEET 3

Scale : A1
1:200
Drawn
LW
Authorised
Job No
202010
Drawing No
C12
Revision
P2
Plot File Created: Jun 30, 2022 - 3:10pm



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P1 CONCRETE PEDESTRIAN PAVEMENT

P2 PAVERS

P3 CONCRETE ROAD PAVEMENT

L1 LANDSCAPING
Refer to landscape architect's documentation

SEATING
Refer to architect's documentation

STORMWATER PIPE, FLOW DIRECTION
STORMWATER PIPE, FLOW DIRECTION
u/L 10.00
Ø600 2'
1.25%
Q=345L/s
d/L 9.65
UPSTREAM PIPE INVERT LEVEL
PIPE SIZE AND STRENGTH CLASS
PIPE GRADIENT
PEAK DESIGN FLOW
DOWNSTREAM PIPE INVERT LEVEL

JUNCTION PIT

GRATED INLET PIT

SAG KERB INLET PIT

ON-GRADE KERB INLET PIT

D01-2 DRAINAGE LINE AND PIT NUMBER

GD# GRATED DRAIN

SUBSOIL DRAINAGE LINE, Ø100mm U.N.O.

FP FLUSHING POINT

IR INTERMEDIATE RISER

BATTER SLOPE

GRASS CATCH DRAIN OVERLAND FLOW PATH

KG KERB AND GUTTER

VC VEHICULAR CROSSING

× F22.20 FINISHED SURFACE LEVEL
22.50 MAJOR FINISHED SURFACE CONTOUR
0.5m INTERVAL
22.10 MINOR FINISHED SURFACE CONTOUR
0.1m INTERVAL

X X X EXTENT OF WORKS
EXISTING SERVICE TO BE DEMOLISHED AND REMOVED

eEA EXISTING OVERHEAD ELECTRICAL
eEU EXISTING UNDERGROUND ELECTRICAL

eG EXISTING GAS

eT EXISTING TELECOMMUNICATIONS

eS EXISTING SEWER

eW EXISTING WATER

eSW EXISTING STORMWATER

THIS DRAWING MUST BE PRINTED IN COLOUR

0 2 4 6 8 10 12 14 16m

1:200 A1 1:400 A3

PRELIMINARY
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Filename: C13.dwg - User: twhm - Plot File Created: Jun 30, 2022 - 3:21pm

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Rev	Description	Eng	Draft	Date	Rev	Description	Eng

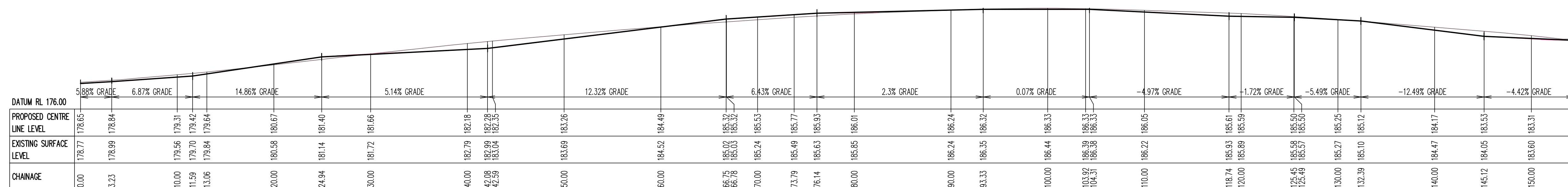
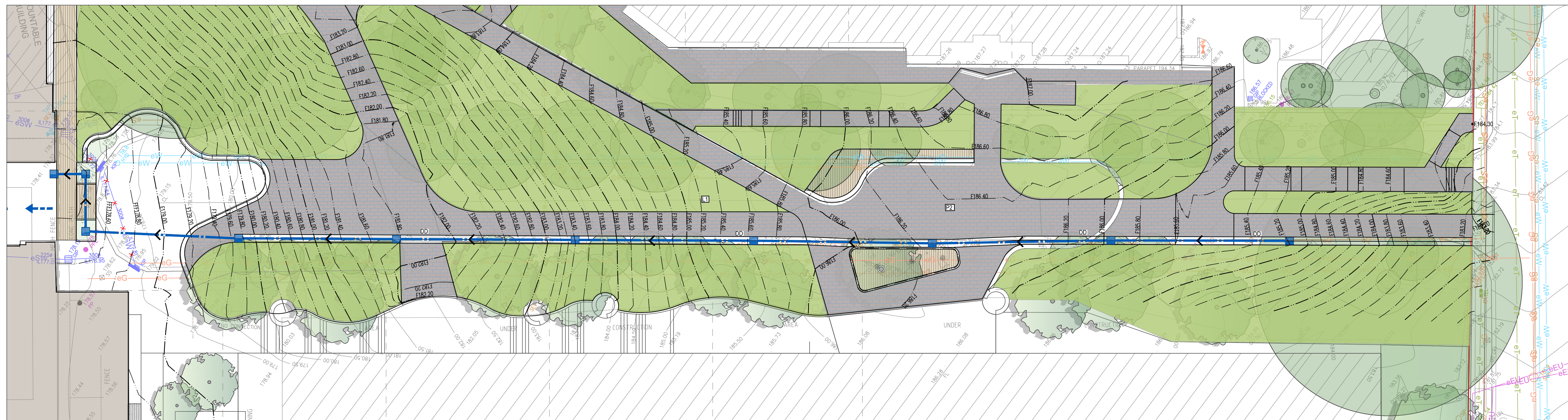
Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
BARKER COLLEGE
91 PACIFIC HIGHWAY

Sheet Subject
SITeworks PLAN - SHEET 4

Scale: A1 1:200 Drawn LW Authorised
Job No 202010 Drawing No C13 Revision P2
Plot File Created: Jun 30, 2022 - 3:21pm



0 2.5 5 7.5 10 12.5 15 17.5 20

1:250 A1 1:500 A3

THIS DRAWING MUST
BE PRINTED IN
COLOUR



PRELIMINARY
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FOR CONSTRUCTION

A1 0 1 2 3 4 5 6 7 8 9 10

P2	INFORMATION	GC	LW	30.06.22										
P1	PRELIMINARY	GC	LW	12.05.22										
Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date

Architect
NEESON MURCUTT + NEILLE
71 York Street, Sydney New South Wales 2000
02 8297 3590

Engineer

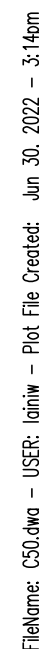
TTW **Structural
Civil
Traffic
Façade**

612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project	BARKER COLLEGE 91 PACIFIC HIGHWAY
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Sheet Subject	FIRE TRUCK CLEARANCE
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Scale : A1	Drawn	Authorised
1:250	LW	
Job No	Drawing No	Revision
202010	C20	P2
Plot File Created: Jun 30, 2022 - 3:13pm		



P2 INFORMATION		GC	LW	30.06.22										
P1 PRELIMINARY		GC	LW	12.05.22										
Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date

Engineer

TTW **Structural
Civil
Traffic
Façade**

612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Sheet Subject

DETAILS - SHEET 1

Scale : A1	Drawn	Authorised
AS SHOWN	LW	
Job No	Drawing No	Revision
202010	C50	P2
Plot File Created: Jun 30, 2022 - 3:14pm		