COSTIN ROE CONSULTING

CIVIL & STRUCTURAL ENGINEERS



CIVIL ENGINEERING REPORT & WSUD STRATEGY FOR PLANNING APPLICATION

DEVELOPMENT SITE

WEST WILTON ESTATE
BERWICK PARK RD & WILTON PARK RD, WILTON, NSW

Prepared for:

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1 INTRODUCTION & SCOPE

Costin Roe Consulting Pty Ltd has been commissioned by Altis Property Partners to prepare this *Civil Engineering Report & WSUD Strategy* to accompany a Planning Application to Wollondilly Shire Council to rezone the land as E4 General Industrial.

Altis Property Partners are the majority land holder within the 108Ha Wilton West Precinct ("Study Area"). Rezoning for development of approximately 55 Ha of the overall land area is proposed. The subject properties are as follows:

- 10 Berwick Park Road
- 20 Berwick Park Road
- 30 Berwick Park Road
- 25 Wilton Park Road
- 45 Wilton Park Road
- 55 Wilton Park Road
- 75 Wilton Park Road
- 85 Wilton Park Road
- 95 Wilton Park Road

This report provides a summary of civil engineering characteristics of the development site and technical considerations to confirm that rezoning of the land can occur and a strategy which could allow future industrial development to occur on the land. The content in this report provides potential solutions and framework which could be integrated into future, more detailed, State Significant Development or Local Council Development Applications and assessments.

This report provides an assessment of the civil engineering characteristics of the development site and technical considerations of the following aspects:

- Earthworks & Geotechnical;
- Roads and Access;
- Water Sensitive Urban Design (WSUD) and Water Cycle Management Strategy (WCMS).

The WCMS comprises several key areas of stormwater and water management which are provided below. These key areas have been established with the aim to reduce impacts from the development on the surrounding environment and neighbouring properties. The water cycle management strategy identifies the management measures required to meet the targets set. The key water cycle management areas assessed in this report are:

- Storm Water Quantity;
- Storm Water Quality;
- Water Supply and Reuse; and
- Erosion and Sediment Control

This engineering analysis is based on development for industrial warehouse and logistic facilities consistent with the Wollondilly Shire Council policies, The Wilton Growth Area DCP, and the indicative Masterplan provided by The Altis Property Partners.

2 DEVELOPMENT SITE

2.1 Location

The proposed development is located in the suburb of Wilton on south of Wilton Park Road and Berwick Road and to the west of the Hume Highway, as shown in **Figure 2.1**.

The Nepean River is noted to the western boundary of the study area.

Access to the site is available from the Wilton Park Road and Berwick Park Road frontages on the north of the site footprint. The Hume Highway and interchange with Picton Road is noted to be on the eastern flank of the development land.

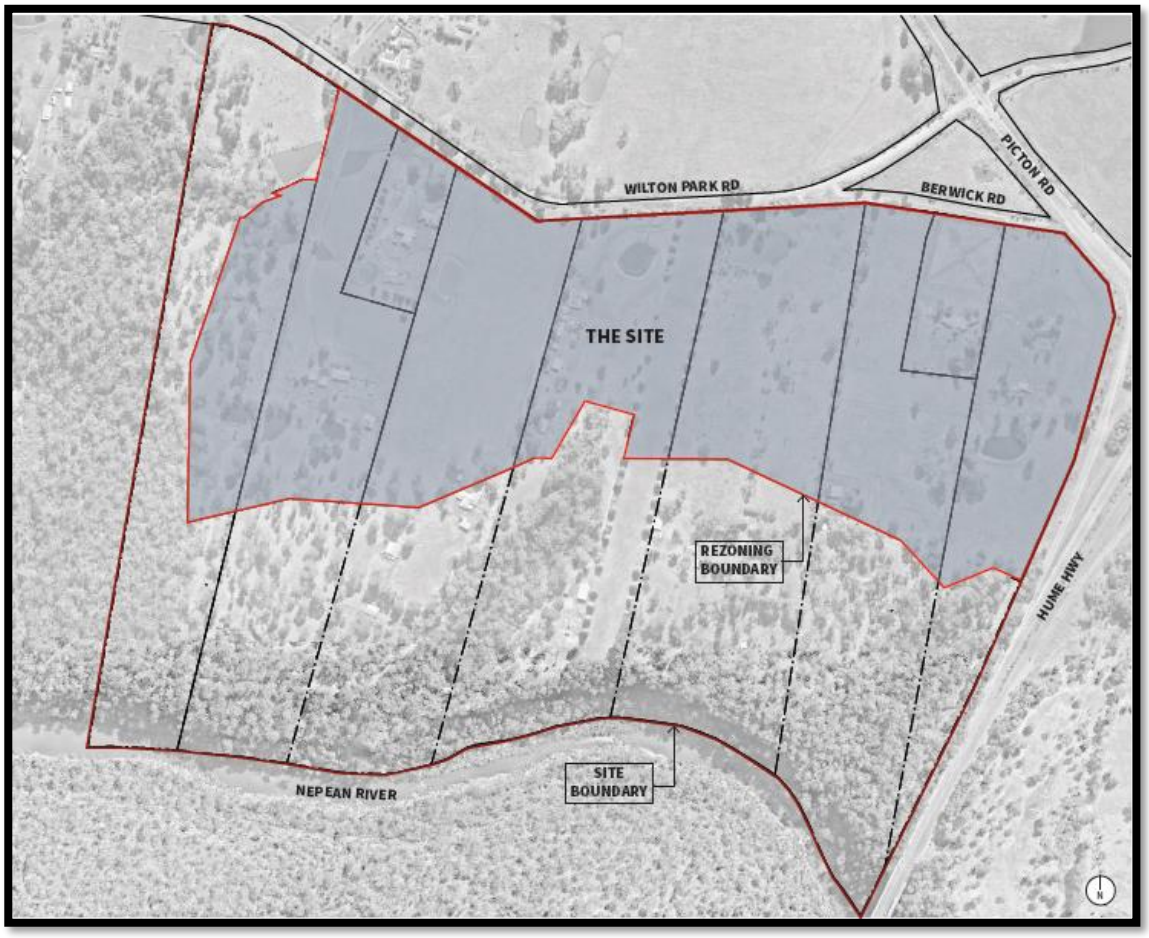


Figure 2.1 Locality Plan

2.2 Existing Site

The property currently comprises longstanding rural uses with several farms and improvements (including dwelling houses and farm sheds) on the land.

The existing topography within the proposed E4 Zoned Land is generally gently graded undulating hills with falls to the south and south-west via a series of watercourses.

The topography is noted to change from the gentle undulating topography described above, too steep with cliffs and escarpments on the far south of the site where the site interfaces with the

Nepean River. These areas are located within the avoided land identified in the Cumberland Plain Conservation Plan (See **Figure 2.2** below).

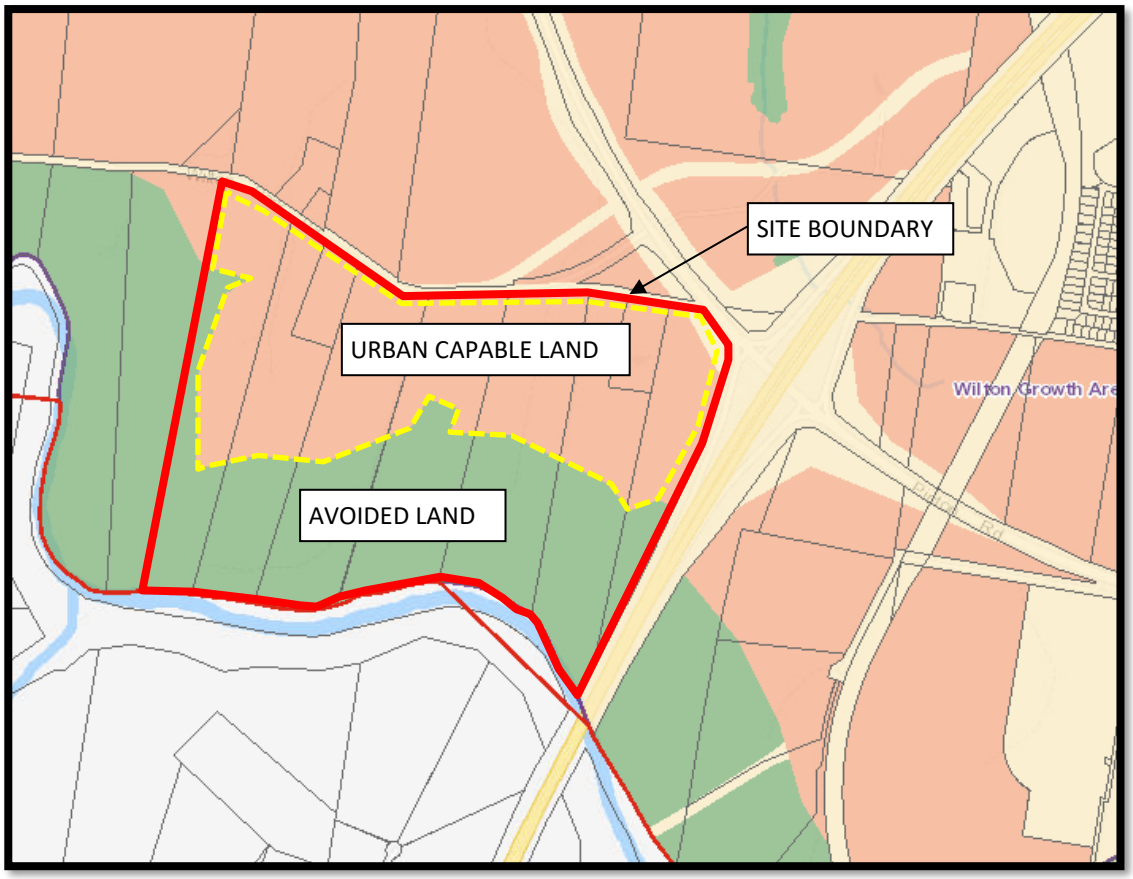


Figure 2.2 Cumberland Plain Conservation Plan (Source: https://webmap.environment.nsw.gov.au/Html5Viewer4142/index.html?viewer=CPCP_View)

Levels on the site vary between RL 205m AHD at the north-east of the land to RL 130m AHD adjacent to the Nepean River. Prior to the more steeply graded areas of the site (and within the proposed E4 rezoned parts of the site), the lower levels are noted to be in the order of RL 180m-190m AHD.

2.3 Concept Masterplan and Structure Plan

The Concept Master Plan (Master Plan) has been shaped by a comprehensive site analysis and opportunities and constraints assessment in order to ensure the appropriate and considered use of land as an employment precinct, and for ecological and landscape values to be preserved and celebrated.

The Concept Masterplan Layout is shown in **Figure 2.3** and the Concept Structure Plan as **Figure 2.4**. Infrastructure works will include bulk earthworks, provision of services, road & intersection construction, and stormwater management.

The preliminary masterplan layout provided by Altis Property Partners development lots, circa 1 Ha to 4 Ha in size. Siting of the development lots will be sympathetic to the topography of the land, access and flood planning requirements.

Access to the precinct is proposed via a centralised access roundabout on Wilton Park Road, central to the northern boundary of the precinct. This road would provide access to a local industrial road which extends east and west following its intersection with the primary access road and roundabout. The new access road and associated intersection will be constructed to the Council requirements and ultimately ownership transferred to Council.

Refer to **Section 3.6** for further discussion on roads.



Figure 2.3. Masterplan Layout (Source: Watson Young)

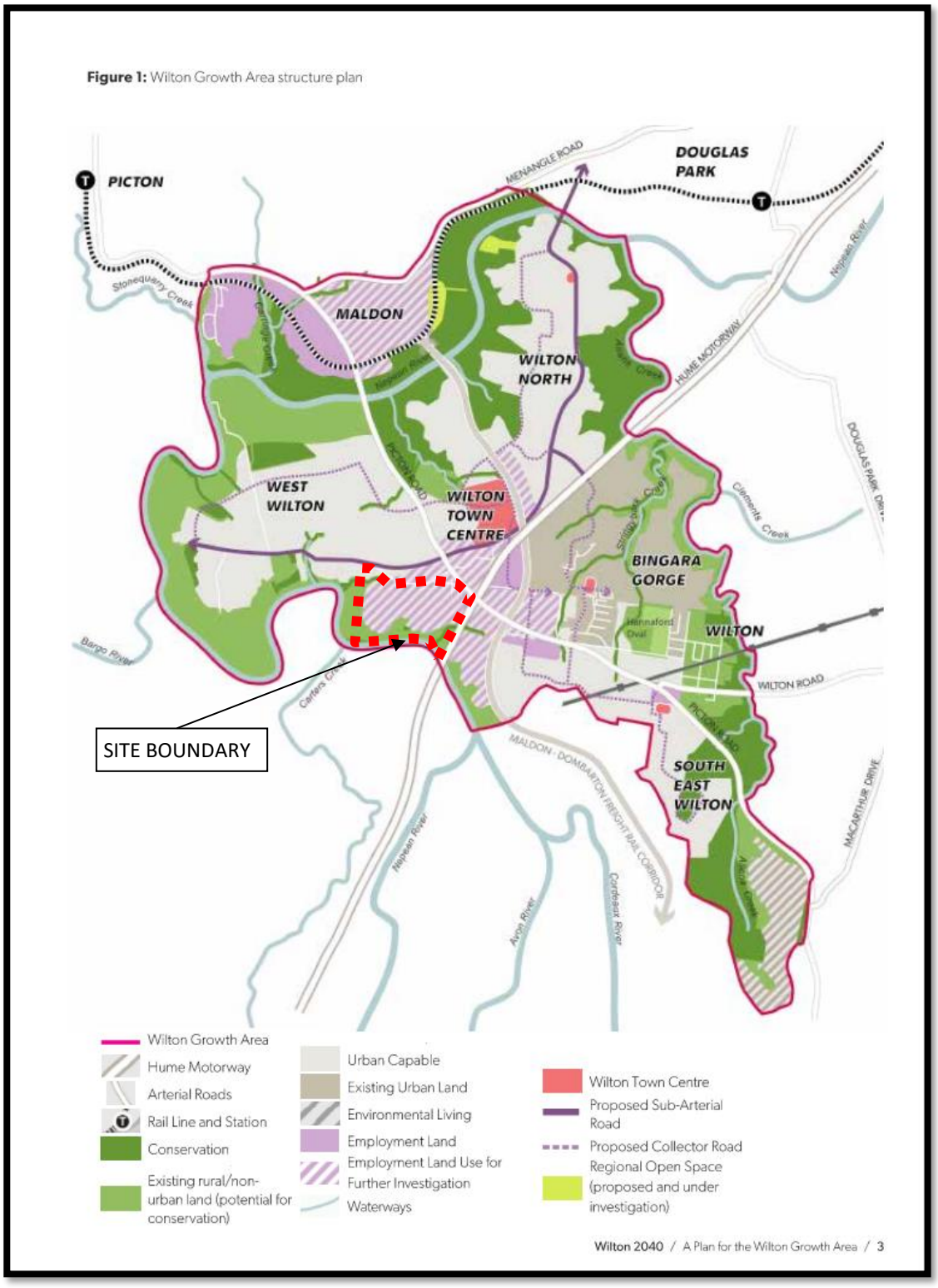


Figure 2.4. Structure Plan Layout (Source: https://www.planningportal.nsw.gov.au/sites/default/files/documents/2021/Wilton2040.PDF)

3 SITE WORKS

3.1 Soil and Geological Conditions

Initial assessments and investigations relating to soil have been undertaken by PSM (geotechnical investigation – PSM4650-004L dated 16 December 2021).

As referenced in the investigation by PSM Geotechnical the 1:100 000 Geological Series Wollongong- Port Hacking Survey of NSW 1985 indicates that the site is present within the following natural geological and soil landscapes:

- Geology:
  - (Rwb) Bringelly Shale of the Wianamatta Group comprising shale, carbonaceous claystone/claystone laminite - comprising fine to medium grained lithic sandstone with rare coal and tuff.
  - (Rh) – Hawkesbury Sandstone – medium to course grained guartz sanstone, very minor shale and laminate lenses.
- Landscape: Gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes.
- Soils: Red and brown podzolic soils on crests, shallow to moderately deep (>100 cm), hardsetting with mottled texture, grading to yellow podzolic soils on lower slopes and in drainage lines.
- Limitations: Potential for localised seasonal waterlogging, water erosion/surface movement, and can consist of moderately reactive highly plastic subsoil.

The PSM Geotechnical report confirms the above regional geometry and has advised the typical profile to comprise topsoil of 0.1-0.2m in depth over natural soils of 1.0-1.5m in depth over weathered shale and sandstone bedrock. Exposed bedrock is noted in the environmental lands toward the Nepean River.

3.2 Bulk Earthworks

Bulk earthworks will be required to facilitate the development of the precinct for industrial use. The earthworks will be undertaken to provide large flat building pads, facilitate site access from the proposed estate road, to drain the site stormwater via gravity.

Bulk earthworks on the site will be required as part of the estate infrastructure works to facilitate level building pads for the future industrial development of the land. The anticipated benching levels will vary between circa RL 202m to RL 187m AHD. The earthworks levels will be chosen to be sympathetic to the existing landform and benched throughout with the objective of achieving a cut to fill balance, to minimise retaining walls through landscaped batters and to drain the site by gravity

A preliminary assessment has been completed to provide an order of magnitude estimate of the earthwork's volumes and considerations for access, drainage and ensure that there is no excess spoil removal from the property. A variance on the quoted levels is noted to allow for minor variations in the quoted levels, at detail and post approval phase, which may result from introduction of the allowances noted above which are not fully known at the planning stage. The existing and proposed levels are shown on the Costin Roe drawings in **Appendix A.**

Earthworks and retaining wall construction will be required for the development to incorporate the architectural layout and drainage requirements of the development, and to facilitate a large flat area for the proposed warehouse buildings.

Soil Erosion and Sediment Control measures, including sedimentation basins are to be placed in accordance with submitted drawings and the *Soil and Water Management Plan* in **Appendix C** of this report.

An earthwork design and volume estimate assessment has been completed for the concept masterplan. The potential volumes are shown on drawing **Co14503.01-SK300**. It is noted that levels shown on the drawings are conceptual only showing a potential solution and order of magnitude earthworks volumes. The final levels could be subject to variance to account for unknowns in geotechnical conditions and final detail or development application design considerations. The variance allows for adjustments to be made to ensure that excessive export or import is not required in the final design arrangement.

The earthworks volume estimates are as follows in **Table 3.1**:

Item	Lower Bound (-15%)	Apparent Volume (m^3)	Upper Bound (+15%)
Cut	-505,750	-595,000	-684,250
Fill	600,100	+706,000	811,900
Topsoil Strip	--94,350	-111,000	-127,650
Detailed Excavation	--94,350	-111,000	-127,650
Diff. (fill over cut)	**NA**	**0**	**NA**

Table 3.1. Earthwork Volume Estimates

3.3 Retaining Walls

The civil engineering objective is to minimise retaining walls within the constraints of the masterplan layout, allowable grading to suit industrial development and via batters in landscaped areas where possible.

Retaining walls will be required along the western and southern boundaries at the interface of developed land and undeveloped land, and between development lots.

Location and indicative heights of retaining walls are shown on drawing **Co14503.01-SK600**.

3.4 Embankment Stability

To assist in maintaining embankment stability permanent batters in clay will be no steeper than 3-horizontal to 1-vertical while temporary batters will be no steeper than 2-horizontal to 1-vertical. Steeper batters in shale can be considered subject to geotechnical advice.

Batters within public domain will be limited to 1v:4h.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the geotechnical advice and the DRAFT *Soil and Water Management Plan* in **Appendix C** of this report.

3.5 Supervision of Earthworks

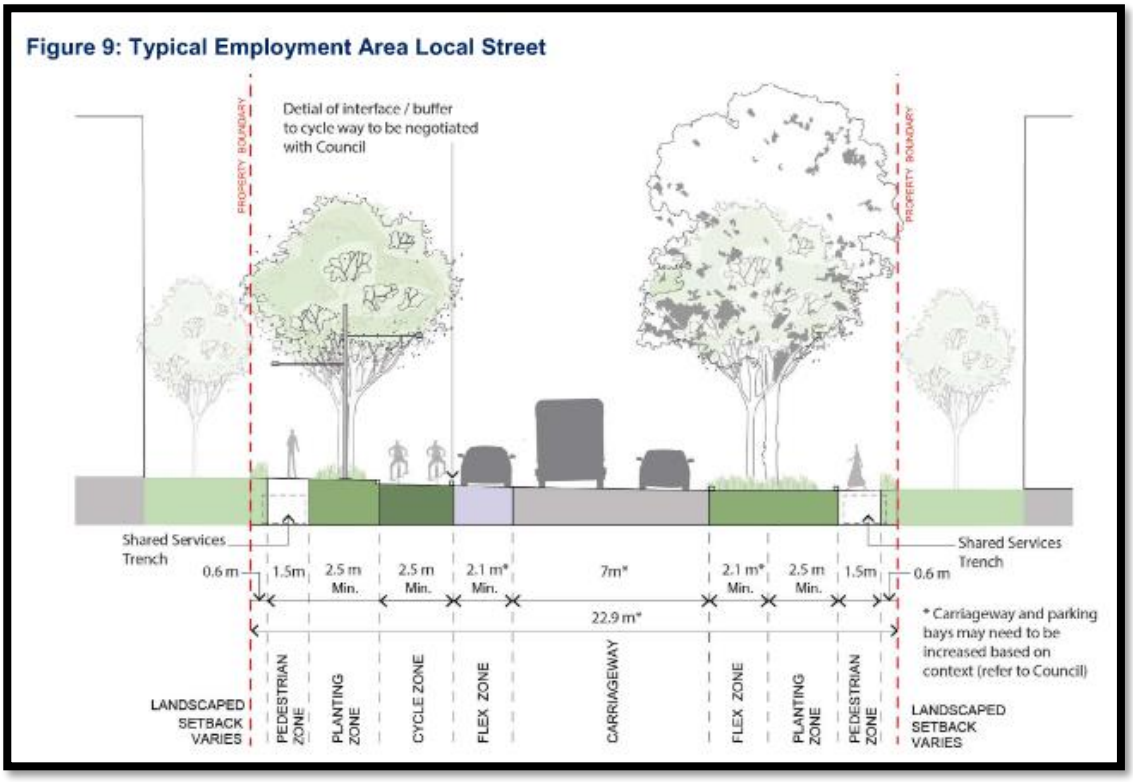
All geotechnical testing and inspections performed during the filling operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-2007.

3.6 Roads and Access

All new roads are to comprise sealed carriageway and granular road base pavement and cross sections, as a minimum, based on Wilton Growth Area DCP's proposed typical cross sections ().

The road geometry is to be in accordance with Austroads and Wollondilly Shire Council (and Wilton Growth Area DCP) design guidelines.

Figure 9: Typical Employment Area Local Street



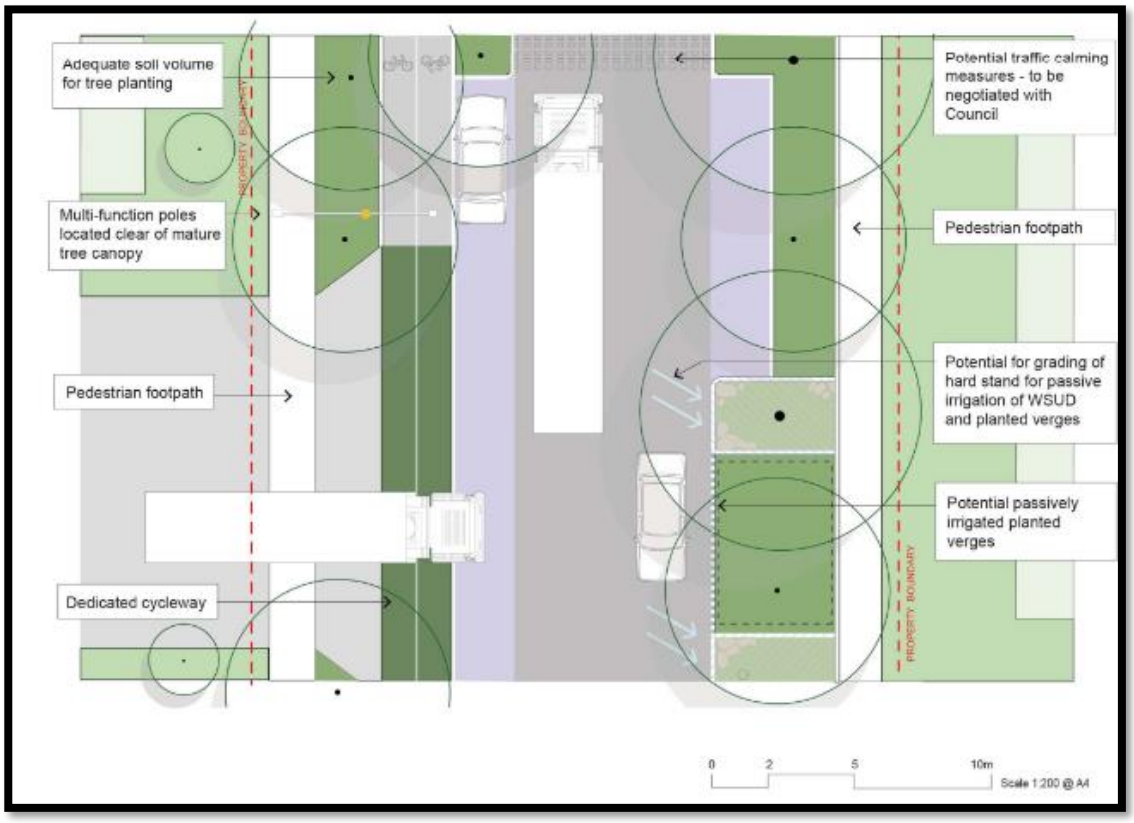


Figure 3.1. Typical Employment Area Local Street (Development Site will be E4 Zoning) (Source: Wilton Growth Area DCP – August 2021 – NSW DPIE – Section 3, page 36, Figure 9)

4 WATER CYCLE MANAGEMENT STRATEGY & DRAINAGE METHODOLOGY

4.1 Key Areas and Objectives

Water Cycle Management (WCM) is a holistic approach that addresses competing demands placed on a region's water resources, whilst optimising the social and economic benefits of development in addition to enhancing and protecting the environmental values of receiving waters.

Developing a WCMS at the planning stage of the land development process provides guidance on urban water management issues to be addressed for the estate and development as a whole. This assists urban rezoning and estate infrastructure planning for the industrial development proposed on the land.

This WCMS has been prepared to inform Council and other stakeholders that a solution to achieve the required WSUD and WCM measures can be achieved. The framework and objectives as set out below, can be implemented into the stormwater management strategy for the estate and for future development sites in the estate, subject to future designs and development application assessments. It presents guiding principles for WCM across the precinct which includes establishing water management targets and identifying management measures required for future building developments to meet these targets.

Several WCM measures have been included in the WCMS and engineering design, which are set out in this report and the attached drawings. The key WCM elements and targets which have been adopted in the design are included in **Table 4.1** following.

Table 4.1. WCM Targets

Element	Target	Reference
Water Quantity	Reduce stormwater runoff to an equivalent of between 2.5 and 3 ML/ year/ hectare	Wollondilly Shire Council WSUD Guidelines 2021
Water Quality	No Impact (Neutral or Beneficial Effect (NorBE))	Wollondilly Shire Council WSUD Guidelines 2021
Flooding	Buildings set 0.5m above the 1% AEP flood level.	Wollondilly Shire Council NSW Floodplain Development Manual.
Water Supply	Reduce Demand on non-potable water uses. Provide 70% reduction of non-potable uses.	Wollondilly Shire Council WSUD Guidelines 2021
Construction Stormwater Management &	A construction stormwater management plan and appropriate associated erosion and sedimentation control measures must be	Landcom Blue Book Council

Element	Target	Reference
Erosion and Sediment Control	described in the environmental assessment for all stages of construction to mitigate potential impacts to surrounding properties.	

A summary of the how each of the WCM objectives will be achieved are described below. Reference to the relevant sections of the report should be made for further and technical details relating to the WCM measures:

- Stormwater Quantity Management

  The intent of Stormwater Quantity Management is to reduce the impact of urban development on existing drainage system by managing post-development discharge within the receiving waters to the pre-development peak, and to ensure no affectation of upstream, downstream or adjacent properties.

  Attenuation of stormwater runoff from the development will be required to ensure increase in peak flows are limited to pre-development up to the 1% AEP storm event. Consideration to volumetric runoff controls (limiting post development runoff between 2.5-3.0 ML/Ha/yr) will be made in accordance with Wollondilly Shire Council WSUD Guidelines 2021 and a preliminary assessment via MUSIC has been completed to demonstrate the indicative WSUD system arrangements.

  It is noted the existing legal point of discharge will be via the three existing watercourses that traverse the site, which ultimately drain to the Nepean River. The intent is to maintain existing site catchments (within 10%) and discharge via the existing watercourses.

  It is also noted that there are two upstream catchments which will be conveyed through the site via the proposed drainage system. The upstream catchments will remain separate to the internal/ development systems and development stormwater management systems.

- Stormwater Quality Management

  There is a need to target pollutants that are present in stormwater runoff to minimise the adverse impact these pollutants could have on downstream receiving waters.

  The required pollutant reductions are proposed which meet acceptable pollution reductions. Preliminary MUSIC modelling will be completed to confirm the reduction objectives can be met for the planning area.

  A series of Stormwater quality improvement devises (SQID's) could be proposed for the development. A potential solution for the management strategy could include the following measures:

  - Primary treatment of external areas via gross pollutant traps (GPT's).
  - Tertiary treatment via bio-retention systems or proprietary treatment systems.

- Treatment within rainwater reuse tanks.
- Measures such as buffers, swales, ponds and reuse systems.

- Flood Management

  The proposed development will need to consider flooding and large rainfall events in relation to the nearby Nepean River, and local runoff and overland flow paths from the north.

  The site is noted to be clear of flooding relating to the Nepean River, up to and including the PMF event in the Wollondilly Shire Flood Study Broadscale Assessment (2021).

  Consideration to the local overland flow paths will be required on the north and north-west of the site. These are noted to carry limited and defined catchments and can be accommodated in the estate drainage system, or via the open channel flow path on the north-west of the property.

  The following items are to be considered in relation to the local flow paths per Council Flood Management Policy:

  - All buildings are sited 500mm above the 1% AEP design flood level of local flow paths.
  - Overland flow paths are required to manage runoff in large storm events have been made including achieving at least 500mm freeboard to building levels from the flow paths, noting that a greater level of flood immunity is provided to the building than that required by planning to ensure an appropriate level of risk to the building for the intended use.

- Water Demand Reduction/ Rainwater Reuse

  Rainwater reuse measures will be provided as part of future building development designs. Rainwater reuse will be required to reduce demand on non-potable uses by 70% per Wollondilly Shire Council WSUD Guidelines 2021. The reduction in demand will target non-potable uses such as toilet flushing and irrigation. Details and sizing of rainwater reuse systems would form part of future development application designs and assessments.

- Stormwater Management During Construction

  A construction stormwater management plan and associated erosion and sediment control measures is proposed based on Landcom document *Managing Urban Stormwater Volume 1 – Soils and Construction 2004* ("The Blue Book") and Council requirements. The management measures take a staged approach from initial site establishment, construction stages and the period between the completion of the estate infrastructure works and development of individual lots.

4.2 Existing Drainage System & Overland Flows

The site is currently undeveloped rural land with undulating topography which has been described in **Section 2.2**. There is no formal drainage currently on the site however several local depressions, natural gullies and farm dams are present. There are also several dams which are used for the currently rural farming operations on the land which lie in relation to the natural gullies.

The site is affected by overland flow from minor upstream catchments to the north of the site (Flow Path FP1) and flow path from the north-west (Flow Path FP2). Flow Path FP1 conveys flows from a catchment of approximately 11.5 Ha onto the site, via existing culvert crossing Wilton Park Road, then following a path in a south-westerly direction. Flow Path FP2 has a catchment of 15.1Ha and traverses the north-western corner of the project area.

A larger flow path with a catchment of 35Ha traverses the south-east of the property. This flow path (catchment shown in **Figure 4.2**) is noted to be within the environment zoned area and has no influence on the proposed E4 zoned land.

The upstream catchments noted above are shown on **Figure 4.1 & 4.2** below. Conveyance of these flows has been included in the estate infrastructure stormwater design.

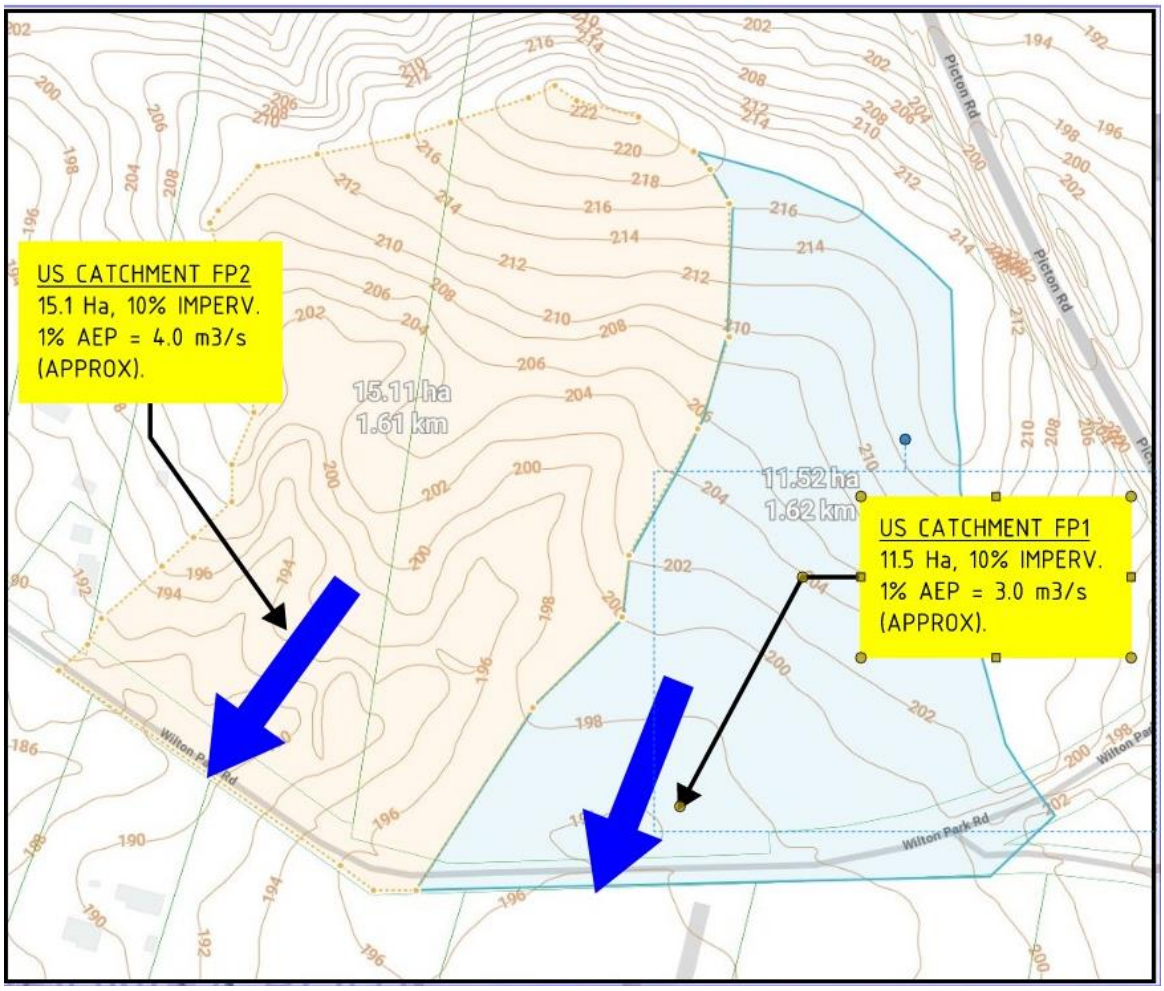


Figure 4.1. Site Catchments and external Contributing Catchment (north).

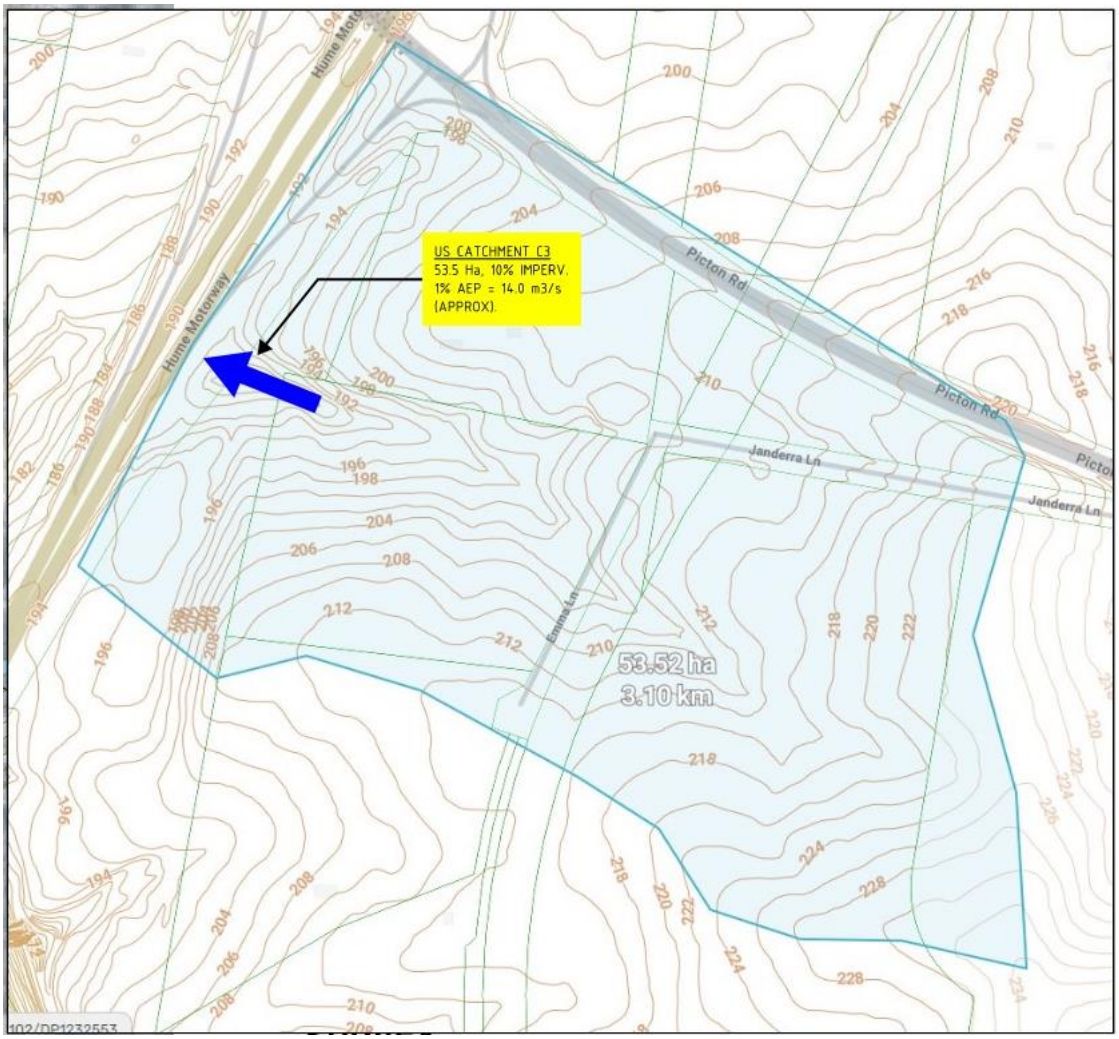


Figure 4.2. Site Catchments and external Contributing Catchment (east)

4.3 Estate Drainage System

As per general engineering practice and the guidelines of Wollondilly Shire Council, the stormwater drainage system for the development should comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This enables the piped system to convey all stormwater runoff up to and including the Q20 event. The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, the standards of Council and accepted engineering practice. Runoff from buildings will generally be designed in accordance with *AS3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage*.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "*Australian Rainfall and Runoff*" (2019 Edition), Volumes 1 and 2 (AR&R).

Water quality and re-use are to be considered in the design to ensure that any increase in the detrimental effects of pollution is mitigated, Council Water Quality Objectives are met and that the demand on potable water resources is reduced.

The proposed drainage system will be required to convey the overland flow from upstream catchments east of the property through the site.

The legal point of discharge is a point specified by Council where stormwater from a property can be discharged. The legal point of discharge is usually Council's stormwater infrastructure (where available), the street kerb and channel for smaller developments or downstream receiving waters like an existing stream or gully, lake, pond, or waterbody.

Legal discharge for the site will be via the existing watercourses which drains to the Nepean River.

The drainage system recommended, though subject to future designs and development application assessments, can be described as follows:

- Road drainage system designed to the 5% AEP (1 in 20yr ARI);
- Stub connections for all development lots connecting to road drainage.
- All road drainage and development site drainage directed to the stormwater management systems;
- Stormwater management basins comprising stormwater detention to limit post development runoff to pre-development runoff and bio-retention system to complete final stormwater polishing.
- Flow Path FP1 will be realigned to be conveyed within a new trunk diversion pipe, sized to convey the 1% AEP with 50% blockage allowance;
- Flow Path FP2 will generally remain per the existing conditions, noting that modification to suit the ultimate alignment and stormwater management system configuration.
- Stormwater management systems proposes integration of bio-retention elements and water storage/ retention elements within the stormwater detention basins. Detailing of on-site detention systems and bio-retention elements will be completed such that effective operation and infrequent inundation greater than the extended detention elements occur.

4.4 Hydrologic Modelling and Analysis

4.4.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Wollondilly City Council and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with *AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage*.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI events will be assessed.

4.4.2 Minor/ Major System Design

The piped stormwater drainage (minor) system will be designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

4.4.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, will be sourced from The Bureau of Meteorology Online IFD Tool.

4.4.4 Runoff Models

In accordance with the recommendations and standards of Wollondilly Shire Council, the calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS (noting DRAINS assessments would form part of future detail designs or development approval designs and do not form part of the current documentation scope).

Detailed hydraulic assessment of the internal drainage system will be calculated at detail/ construction certificate stage.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and parameters for the area and are included in **Table 4.2** as follows.

Table 4.2. DRAINS Parameters

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	

4.5 Hydraulics

4.5.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.5.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building/ development pads.

4.5.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.5.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.5.5 Overland Flow (development lots)

Dedicated flow paths have been designed to convey all storms up to and including the

100-year ARI. These flow paths will convey stormwater from the site to the detention systems prior to discharge.

4.6 External Catchment and Flooding

There are several external catchments which affect the development site as described in **Section 4.2** and shown in **Figure 4.1**.

A desktop assessment of flooding was written as a report (Co14503.01-04.rpt) and should be referenced for a detailed discussion on overland flows and flood impacts.

5 WATER QUANTITY MANAGEMENT

5.1 Water Quantity Management Objectives

The requirements pertaining to stormwater quantity management and discharge have been discussed and documented in **Table 4.1** of this report. These requirements address both peak flow runoff (consistent with the principles of traditional of water quantity management or "On-site Detention (OSD)"), flow duration and annual stormwater runoff. The measures adopted in the precinct are to ensure the cumulative effect of development does not have a detrimental effect on the existing stormwater infrastructure and watercourses located within their LGA downstream from the precinct, consistent with the Wollondilly Shire Council requirements.

At the planning stage, OSD and peak flow management assessments have been based on simplified assessments and site storage rate (SSR) assessment and are included in **Section 5.2**.

Stream health and overall discharge, including annual stormwater runoff assessments, are included in **Section 5.3**.

5.2 Peak Flow Quantity Management

A high-level analysis was undertaken to estimate the impact of the development of the site on peak flows at the downstream extent of the site. Modelling of stormwater runoff was considered for the pre-existing case and for the operational phase of the development.

A simplified SSR method has been used to prepare initial sizing of detention systems, in conjunction with the annual stormwater runoff assessment completed in **Section 5.3**. The adopted SSR is as follows:

SSR = 350m^3/ Ha

The final SSR would be refined in future detail design exercises using DRAINS hydrological model or similar platform to estimate peak flows from catchments on the site for various storm durations for Q2 year ARI to Q100 year ARI events. The final SSR may vary plus or minus 20% from the quoted value.

Table 5.1 Concept OSD Detention Characteristics

Catchment	Area (Ha)	Volume (m3)
1	10.95	3,830
2	21.20	7,420
3	8.75	3,065
4	8.23	2,880
Total	49.13	17,195

Reference to drawings included in **Appendix A** should be made for the general arrangement of basins and interaction between the active detention provided to address peak flow management, in addition to the retention requirements for annual stormwater runoff reduction.

5.3 Stream Health Assessment (Reduction of the annual stormwater runoff)

5.3.1 Stream Health Introduction

Stream health has been assessed for this development based on the requirements of Wollondilly Shire Council. An assessment of the annual stormwater runoff has been completed in MUSIC.

MUSIC model parameters and model layout are included in **Appendix B**. We note differing models are used for assessing annual stormwater runoff to those for assessing stormwater quality due to the catchments and purpose of the model.

5.3.2 Annual stormwater runoff Assessment

Assessment of estate runoff volumes has been completed. The model is based on the proposed rezoning application layout with estate basins which would contain dead storage (or stormwater retention) which will be utilised for estate-level reuse. The discharge controls are noted on the drawings in **Appendix A**, while the irrigation, re-use and usage allowances are detailed below.

The following yearly water demand is estimated to reduce the annual runoff volumes to the required 3ML/Ha/yr:

Catchment 1 (Basin)	Estimated Reuse	55,350 kL/year
Catchment 2A (Basin)	Estimated Reuse	44,800 kL/year
Catchment 2B (Basin)	Estimated Reuse	30,950 kL/year
Catchment 2C (Basin)	Estimated Reuse	22,150 kL/year
Catchment 3 (Basin)	Estimated Reuse	35,600 kL/year
Catchment 4 (Underground Tank)	Estimated Reuse	37,550 kL/year

Reuse may take the form of either irrigation (landscaped areas on the development lots, landscaped areas within the road corridors, undeveloped land to the south of the development site up to the Nepean river), misting, trickle discharge, toilet flushing or other evaporative uses, with these measures forming part of future individual development approvals subject to assessment of the assessment authorities.

5.3.3 Annual stormwater runoff Basin Sizing

Annual stormwater runoff management basins have been designed, using MUSIC software to assess the discharge and usage metrics. The model includes the calculated base water usages and water balance within the estate.

The use of rainwater & stormwater reduces the mains water demand and the volume of stormwater runoff. By collecting the rainwater run-off from the site, storage basins provide a valuable water source suitable for landscape irrigation, dust suppression, and evaporative misting of the development.

System	Catchment (m^2)	Dead Storage Vol. (m^3)	Active Storage Vol. (m^3)	Surface Area* (m^2)
Basin 1	10.95	5,000	3,830	5,840

Basin 2A	9.70	4,500	3,395	5,200
Basin 2B	6.70	3,125	2,345	3,600
Basin 2C	4.80	2,240	1,680	2,560
Basin 3	8.75	4,000	3,060	4,700
Tank 4	8.23	-	2,880	Under Ground

Table 5.2. Management System Key Parameters

Table 5.3 provides confirmation of target requirements and those achieved. We note that the final configuration and sizing of the stormwater management systems and rainwater tanks is subject to detail design considerations and optimum site utilisation.

Table 5.3. Confirmation of Estate Annual stormwater runoff volumes

Objective	Required Parameter	Result
Annual stormwater runoff volume	2.5-3.0 ML/ha/year	3.00 ML/ha/year

As demonstrated in **Table 5.3**, the requirements of Council and West Wilton DCP have been met.

6 STORMWATER QUALITY, REUSE AND MAINTENANCE

6.1 Stormwater Quality Objectives

There is a need to provide a design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Council.

Wollondilly Shire Council has nominated, in their Water Sensitive Urban Design Guidelines 2020 and Integrated Water Management Strategy 2020, the requirements for stormwater quality to be performed on a catchment wide basis. The water quality requirements are included in **Table 4.1** and presented in terms of either annual percentage pollutant reductions on a developed catchment or achieving net zero impact (i.e. Neutral or Beneficial Effect – NorBE).

6.2 Proposed Stormwater Treatment System

Developed impervious areas including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. The STM's for the development shall be based on a treatment train approach to ensure that all the objectives above are met.

Components of the treatment train for the development are as follows:

- Future lots' roof water from buildings or warehouses will be conveyed to rainwater tanks for reuse. Treatment of roof water will occur through first flush and settlement within the tanks.
- Future lot drainage from each separate catchment will discharge into the proposed in-ground estate drainage infrastructure within the estate road reserve, which will discharge into an end-of-line catchment Gross Pollutant Trap (GPT) (designed and sized accordingly).
- Stormwater runoff (Tertiary treatment) from the estate roads and future development lots will occur at an end-of-line catchment bioretention basin to each catchment.

6.3 Stormwater Treatment Measure Estimates

A concept stormwater management system has been included I drawings in **Appendix A**. These drawings show the general arrangement of the system which could meet the NorBE requirements.

The treatment system is anticipated to contain a minimum of the following measures:

- Primary treatment using Gross Pollutant Trap (GPT) prior to discharging into the end-of-line catchment bioretention basin.
- Tertiary treatment using proprietary filters or bio-retention within stormwater management basins/in-ground tanks.
- WSUD measures such as buffers, raingardens, swales, sediment ponds and other site specific measures if necessary.

MUSIC modelling would need to be performed as part of future designs and development application assessment to refine and confirm the effectiveness of the water quality treatment trains and to ensure that the pollutant retention requirements of Council's WSUD documents have been met. The modelling would need to demonstrate that NorBE has been met, including

for 10% improvement for all pollutants (except GP's which have no pre-development load) as required of NorBE SCA requirements.

6.4 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas, or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation. The aim is to reduce the water demand for the development by 70%.

In general terms the rainwater harvesting system will be an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system. This however would be subject to future detail design. The general arrangement of rainwater tanks, per Wollondilly Shire Council *WSUD Guidelines Figure 2*, is presented as **Figure 6.1** below.

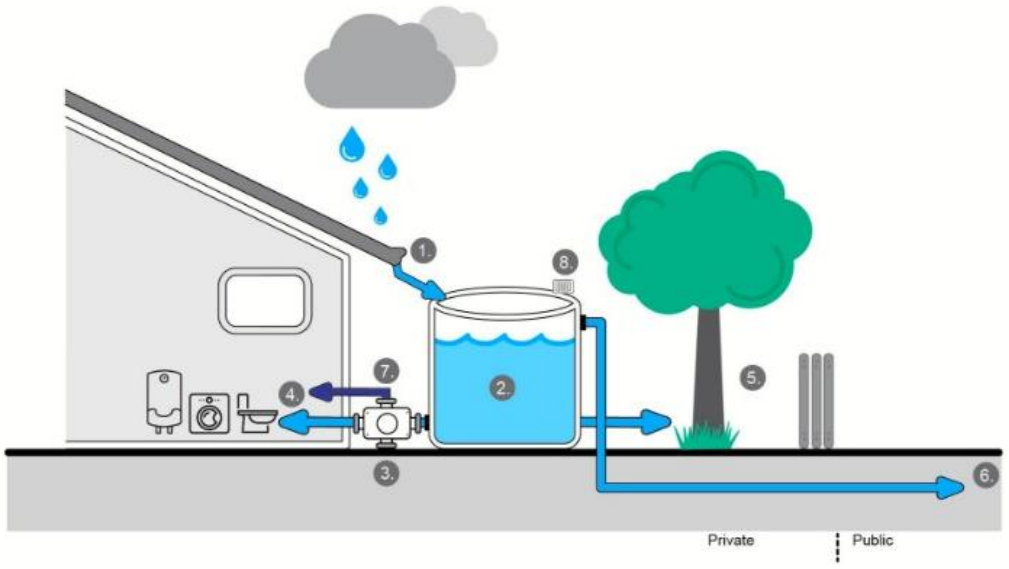


Figure 2. Schematic of preferred design of rainwater harvesting system

Some specific notes as highlighted in Figure 2 above are:

1. Gutter guards and first flush systems are important in preventing leaves and sticks and other pollutants entering rainwater tank
2. Smart tank technology is encouraged (see Section 4.2 for definition)
3. Pumps and filters, with potable back up
4. Internal uses of rainwater should include toilet flushing, laundry and hot water
5. All outdoor watering should use rainwater as its primary source. This includes a 'slow leak' that slowly and consistently releases water to a defined area of the garden planted with vegetation that thrives in damp soils.
6. Overflow systems to central median swales should be plumbed as per NCC Volume 3 Plumbing Code. Overflows can also drain to a tree pit in the road reserve, pending agreement with Council.

Figure 6.1. Rainwater Tank General Arrangement

Rainwater tanks are to be sized based on Wollondilly Shire Council *WSUD Guidelines* as presented as **Table 6.1** below.

Table 6.1. Wollondilly Shire Council Rainwater Tank Requirements

Size of roof (sqm)	Minimum size of rainwater tank (litres)	Minimum average daily demand (litres/ day) *
100	4,000	600
200	8,000	1,200
300	12,000	1,800
500	20,000	3,000
1000	40,000	6,000
5000	200,000	30,000

* A slow leak (or variations to the leaking rate above 0.33 l / m^2 of impervious area) to a garden area can be used to increase 'water demand', but proponents must provide detail for Council to review to ensure there is not an excess of leaking to a landscape / vegetated area that is of insufficient size to absorb the rainwater.

We note that the final configuration and sizing of the rainwater tanks is subject to detail design considerations depending on building sizes and Basix requirements.

6.5 Maintenance and Monitoring

It is important that each component of the stormwater system and water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, a maintenance schedule should form part of any future development approval submissions.

Inspection frequency may vary depending on site specific attributes and rainfall patterns in the area.

7 CONSTRUCTION SOIL AND WATER MANAGEMENT

7.1 Soil and Water Management General

Without any mitigation measures and during typical construction activities, site runoff would be expected to convey a significant sediment load. A *Soil and Water Management Plan* (SWMP) and *Erosion and Sediment Control Plan* (ESCP), or equivalent, would be implemented for the construction of the Proposal. The SWMP and ESCPs would be developed in accordance with the principles and requirements of *Managing Urban Stormwater – Soils & Construction Volume 1 ('Blue Book')(Landcom, 2004)* with a staged approach.

In accordance with the principles included in the Blue Book, a number of controls have been incorporated into a preliminary Staged ESCP (refer to accompanying Drawings in **Appendix A**) and draft SWMP in **Appendix C**. The Staged ESCP considers initial site establishment, requirements during construction of roads and infrastructure and estate earthworks, completion of estate works and the period between this and development of individual lots.

Section 1 provides a summary of the construction works for the Proposal. While all construction activities have the potential to impact on water quality, the key activities are:

- Erosion and sediment control installation.
- Grading of existing earthworks to suit building layout, drainage layout and pavements.
- Stormwater and drainage works.
- Service installation works.
- Building construction works.

The sections below outline the proposed controls for management of erosion and sedimentation during construction of the Proposal. The staged approach would need to consider initial site establishment, construction of the estate and the period between completed of the estate infrastructure works and development of individual lots in the estate.

7.2 Typical Management Measures

Sediment Basins

Sediment basins have been sized (based on 5 day 85th percentile rainfall) and located to ensure sediment concentrations in site runoff are within acceptable limits. Preliminary basin sizes have been calculated in accordance with the Blue Book and are based on 'Type F' soils. These soils are fine grained and require a relatively long residence time to allow settling.

Sediment basins for 'Type F' soils are typically wet basins which are pumped out following a rainfall event when suspended solids concentrations of less than 50 mg/L have been achieved.

Sediment Fences

Sediment fences are located around the perimeter of the site to ensure no untreated runoff leaves the site. They have also been located around the existing drainage channels to minimise sediment migration into waterways and sediment basins.

Stabilised Site Access

For the proposal, stabilised site access is proposed at one location at the entry to the works area. This will limit the risk of sediment being transported onto surrounding public roads.

7.3 Other Management Measures

Other management measures that will be employed are expected to include:

- Minimising the extent of disturbed areas across the site at any one time.
- Progressive stabilisation of disturbed areas or previously completed earthworks to suit the proposal once trimming works are complete.
- Regular monitoring and implementation of remedial works to maintain the efficiency of all controls.

It is noted that the controls included in the preliminary ESCP are expected to be reviewed and updated as the design, staging and construction methodology is further developed for the Proposal.

8 CONCLUSION

This Civil Engineering Report has been prepared to support a planning application for the rezoning of several properties in Wilton, NSW.

A set of recommended stormwater management objectives has been included in this report, based on industry best practice, Wollondilly Shire Council and other relevant stakeholder policies.

A potential civil engineering strategy for the site has been included which shows how a best practice solution can be implemented when considering the constraints of the existing landform and proposed development layout.

The hydrological assessment proves local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge will not adversely affect any land, drainage system or watercourse as a result of the development.

During the construction phase, a Sediment and Erosion Control Plan would be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

During the operational phase of the development, a treatment train incorporating the use of a primary and tertiary water quality treatment systems will be required to mitigate increased stormwater pollutant loads generated by the development.

Stream health and annual stormwater runoff volume estimate has been completed to ensure the Wollondilly Shire Council discharge requirements are met.

It is recommended the management objectives in this report are used as part of precinct DCP's, and form the basis for future detailed or development application designs.

9 REFERENCES

- Water Sensitive Urban Design Guidelines – Nov 2020 (Wollondilly Shire Council)
- Integrated Water Management Strategy – Dec 2020 (Wollondilly Shire Council)
- NSW Government (2005). *Floodplain Development Manual.*
- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
- Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
- Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
- Landcom (2004). *Managing Urban Stormwater – Soils and Construction* – 4th Edition.
- Water Sensitive Urban Design – "Technical Guidelines for Western Sydney" by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PLANNING APPLICATION
WILTON PARK ROAD, WILTON, NSW, 2571
CIVIL WORKS PACKAGE

DRAWING LIST

DRAWING NO.	DRAWING TITLE
C014502.01-SK 100	DRAWING LIST AND LOCALITY PLAN
C014502.01-SK 300	BULK EARTHWORKS PLAN
C014502.01-SK 310	CUT/FILL PLAN
C014502.01-SK 350	BULK EARTHWORKS SECTIONS - SHEET 1
C014502.01-SK 351	BULK EARTHWORKS SECTIONS - SHEET 2
C014502.01-SK 400	STORMWATER DRAINAGE KEY PLAN
C014502.01-SK 410	PRE-DEVELOPMENT CATCHMENTS
C014502.01-SK 411	POST-DEVELOPMENT CATCHMENTS
C014502.01-SK 450	STORMWATER MANAGEMENT DETAILS - SHEET 1
C014502.01-SK 451	STORMWATER MANAGEMENT DETAILS - SHEET 2
C014502.01-SK 452	STORMWATER MANAGEMENT DETAILS - SHEET 3
C014502.01-SK 600	PRELIMINARY RETAINING WALLS

B

GENERAL NOTES:

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
3. ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE. ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS. ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT. REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
4. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
5. UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
6. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.



SITE LOCATION PLAN
NTS

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR PLANNING APPLICATION	23.11.22	B
ISSUED FOR INFORMATION	02.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK100

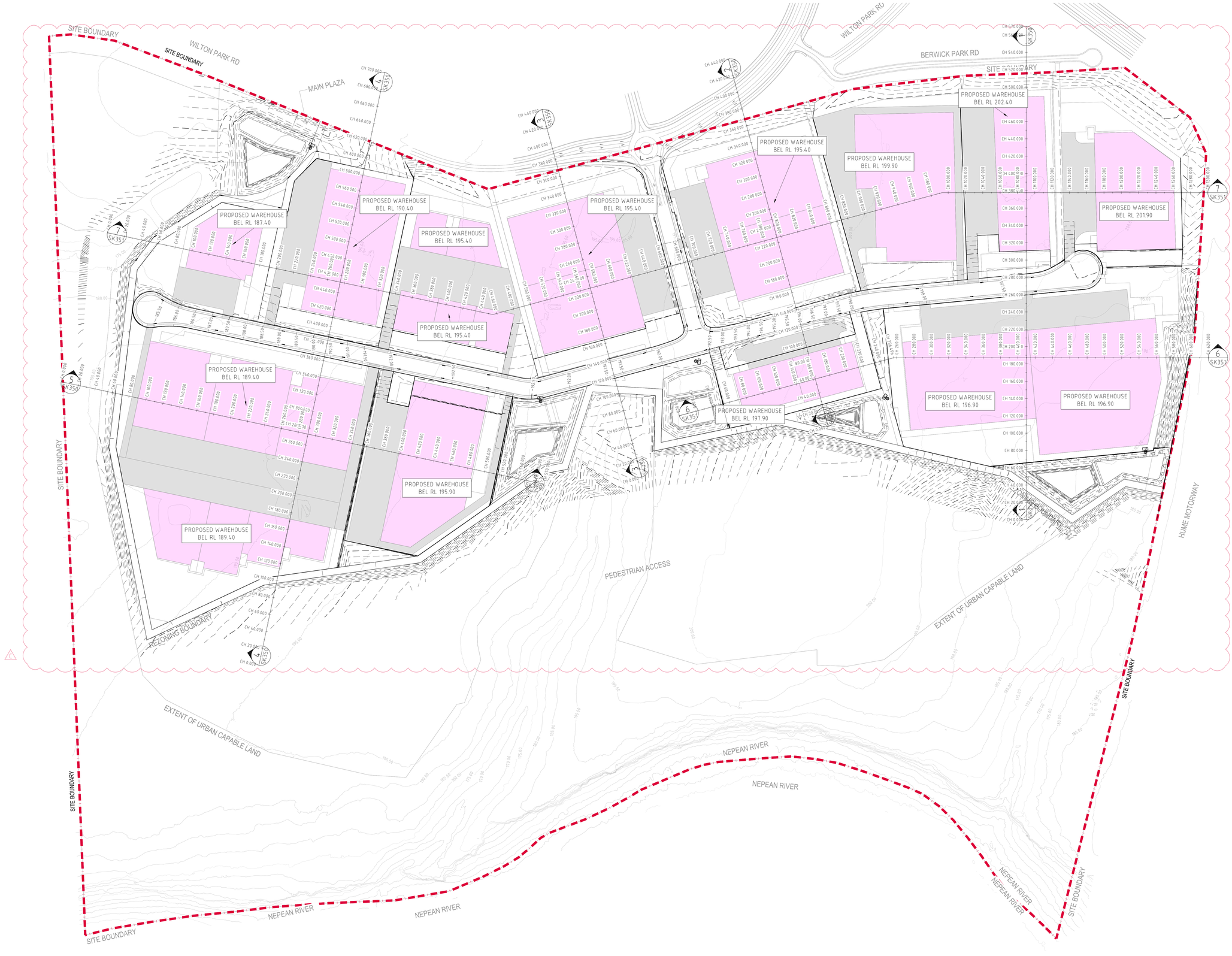
CONSULT AUSTRALIA

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e: mail@costinroe.com.au w: costinroe.com.au

COSTIN ROE CONSULTING | CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: DRAWING LIST AND LOCALITY PLAN

DRAWING NO: C014503.01-SK100 ISSUE: B

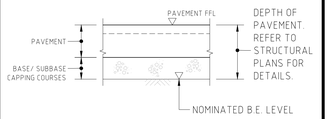


LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY ON POINT UTILITY LOCATING PTY LTD DATED 10/06/22.

- 55.00 – EXISTING CONTOUR (5.0m INTERVAL)
- 57.50 – B.E.L. CONTOUR (MAJOR 2.5m)
- 55.00 – B.E.L. CONTOUR (MINOR 0.50m)
- +58.00 – B.E.L. SPOT LEVEL



NOMINATED B.E.L. DETAIL
NTS

EARTHWORK ESTIMATES

SITE AREA	= 55.5Ha
TOPSOIL STRIP (200mm OVER 55.5 Ha)	=(~111,000m³) (TO BE EXPORTED/REUSED)
CUT	= ~595,000m³
FILL	= +706,000m³
ALLOWANCES	
DETAILED EXCAVATION (2,000m³/Ha)	= ~111,000m³
DIFFERENCE	= 0m³ (i.e. CUT OVER FILL)

NOTE:
VOLUMES BASED ON 200mm TOPSOIL STRIP OVER THE NOMINATED AREA.

EARTHWORKS VOLUMES ARE APPROXIMATE ONLY.

NO ALLOWANCE HAS BEEN MADE FOR DELETERIOUS MATERIAL, EROSION AND SEDIMENT CONTROL, BULKING OR COMPACTION OF FILLED SOILS, THE REMOVAL OF UNCONTROLLED OR CONTAMINATED MATERIAL OR ANY OTHER UNSPECIFIED EXCAVATION RELATED TO CONSTRUCTION ACTIVITIES. NO ALLOWANCE HAVE BEEN MADE FOR RETAINING WALLS.

DETAILED EXCAVATION ALLOWANCE IS APPROXIMATE ONLY AND ACCOUNTS FOR STORMWATER/SERVICES TRENCHING AND FOUNDATIONS. THE DETAILED EXCAVATION VOLUMES ARE TO BE CONFIRMED BY THE CONTRACTOR. REFER ANY CONCERNS TO ENGINEER.

NOTE:
THE CIVIL ENGINEERING DESIGN, INCLUDING STORMWATER LAYOUT, STORMWATER MANAGEMENT ELEMENTS, LEVELS AND EARTHWORKS, ARE CONCEPTUAL IN NATURE ONLY. THE INTENT OF THE PRESENTED ENGINEERING DESIGN PACKAGE IS TO DEMONSTRATE THAT A SUITABLE ENGINEERING SOLUTION CAN BE ACHIEVED ON THE SUBJECT LAND. ALL ELEMENTS ARE SUBJECT TO FURTHER DESIGNS AND ASSESSMENTS TO BE COMPLETED AS PART OF FUTURE DEVELOPMENT APPLICATIONS, OR OTHER DESIGN/ APPROVAL PHASES OF THE DEVELOPMENT

MASTERPLAN BULK EARTHWORKS PLAN
SCALE 1:1500

15m 0 15 30 45 60 75 90 105 120 135 150m
SCALE 1:1500 AT A0 SIZE SHEET

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
UPDATED ARCHITECTURAL LAYOUT	21.04.23	C
ISSUED FOR PLANNING APPLICATION, REVISED EARTHWORKS QUANTITIES	24.11.22	B
ISSUED FOR INFORMATION	02.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK300

CONSULT AUSTRALIA

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CRC COSTIN ROE CONSULTING — CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: BULK EARTHWORKS PLAN

DRAWING No: C014503.01-SK300 ISSUE: C

DEPTH RANGE

No.	FROM DEPTH	TO DEPTH	COLOUR	DEPTH RANGE VOLUME
1	-15.000	-10.000		164m³
2	-10.000	-5.000		18131m³
3	-5.000	0.000		632815m³
4	0.000	5.000		560077m³
5	5.000	10.000		83007m³
6	10.000	15.000		5809m³

SITE BOUNDARY
WILTON PARK RD
MAIN PLAZA
BERWICK PARK RD
HUME MOTORWAY
EXTENT OF URBAN CAPABLE LAND
NEPEAN RIVER
PROPOSED BEL RL 187.40
PROPOSED BEL RL 189.40
PROPOSED BEL RL 190.40
PROPOSED BEL RL 195.40
PROPOSED BEL RL 195.90
PROPOSED BEL RL 196.90
PROPOSED BEL RL 197.90
PROPOSED BEL RL 199.90
PROPOSED BEL RL 201.90
PROPOSED BEL RL 202.40

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON LIDAR INFORMATION OBTAINED FROM ELVIS (ELEVATION AND DEPTH - FOUNDATION SPATIAL DATA)

- 50.00 – EXISTING CONTOUR (1.0m INTERVAL)
- 55.00 – B.E.L. CONTOUR (MAJOR 5.0m)
- 51.00 – B.E.L. CONTOUR (MINOR 1.0m)
- PROPOSED BEL RL 83.00 – PROPOSED PAD EARTHWORKS LEVEL
- – PRECINCT BOUNDARY

NOTE:
THE CIVIL ENGINEERING DESIGN, INCLUDING STORMWATER LAYOUT, STORMWATER MANAGEMENT ELEMENTS, LEVELS AND EARTHWORKS, ARE CONCEPTUAL IN NATURE ONLY. THE INTENT OF THE PRESENTED ENGINEERING DESIGN PACKAGE IS TO DEMONSTRATE THAT A SUITABLE ENGINEERING SOLUTION CAN BE ACHIEVED ON THE SUBJECT LAND. ALL ELEMENTS ARE SUBJECT TO FURTHER DESIGNS AND ASSESSMENTS TO BE COMPLETED AS PART OF FUTURE DEVELOPMENT APPLICATIONS, OR OTHER DESIGN/ APPROVAL PHASES OF THE DEVELOPMENT

MASTERPLAN CUT/FILL PLAN
SCALE 1:1500

FOR PLANNING APPLICATION

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SCALE 1:1500 AT A0 SIZE SHEET

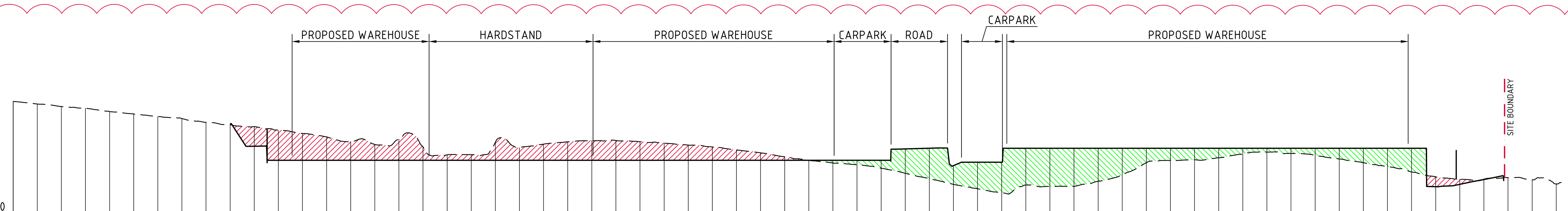
AMENDMENTS	DATE	ISSUE
UPDATED ARCHITECTURAL LAYOUT	21.04.23	C
UPDATED LEVELS ACCROSS SITE, ISSUED FOR PLANNING APPLICATION	24.11.22	B
ISSUED FOR INFORMATION	02.11.22	A

ARCHITECT: watson young
CLIENT: ALTIS PROPERTY PARTNERS
PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK310

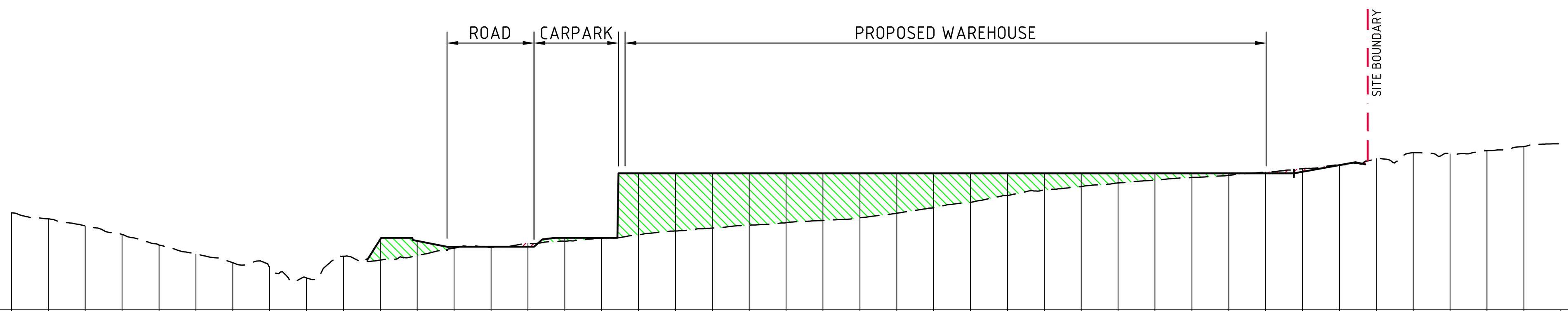
CONSULT AUSTRALIA
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PO Box R419 Sydney NSW 1220
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COSTIN ROE CONSULTING | CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: CUT/FILL PLAN
DRAWING NO: C014503.01-SK310
ISSUE: C



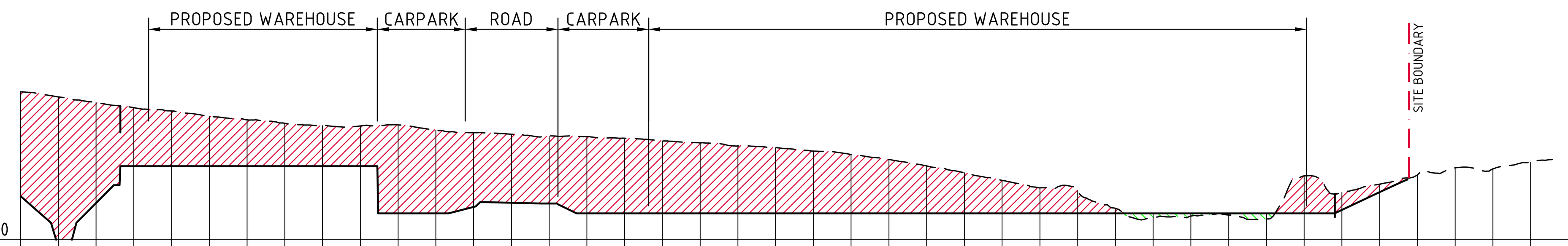
CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			194.29
10.000			194.081
20.000			193.869
30.000			193.732
40.000			193.458
50.000			193.254
60.000			193.046
70.000			192.869
80.000			192.557
90.000			192.361
100.000	-1.625	190.571	192.196
110.000	-2.511	189.400	191.911
120.000	-2.235	189.400	191.635
130.000	-1.944	189.400	191.344
140.000	-1.542	189.400	190.942
150.000	-1.310	189.400	190.710
160.000	-1.759	189.400	191.159
170.000	-1.110	189.400	190.510
180.000	-0.455	189.400	189.855
190.000	-0.469	189.400	189.869
200.000	-1.495	189.400	190.895
210.000	-1.045	189.400	190.445
220.000	-1.343	189.400	190.743
230.000	-1.537	189.400	190.937
240.000	-1.642	189.400	191.042
250.000	-1.637	189.400	191.037
260.000	-1.544	189.400	190.944
270.000	-1.436	189.400	190.836
280.000	-1.262	189.400	190.662
290.000	-1.114	189.400	190.514
300.000	-0.867	189.400	190.267
310.000	-0.620	189.400	190.020
320.000	-0.292	189.400	189.692
330.000	0.004	189.400	189.396
340.000	0.224	189.400	189.176
350.000	0.382	189.400	189.018
360.000	0.655	189.400	188.745
370.000	2.023	190.346	188.323
380.000	2.528	190.405	187.877
390.000	1.556	188.957	187.400
400.000	2.216	189.243	187.027
410.000	2.546	189.243	186.697
420.000	3.056	190.400	187.344
430.000	3.174	190.400	187.226
440.000	3.168	190.400	187.232
450.000	2.751	190.400	187.649
460.000	2.213	190.400	188.187
470.000	1.194	190.400	189.206
480.000	1.012	190.400	189.388
490.000	0.959	190.400	189.441
500.000	0.791	190.400	189.609
510.000	0.482	190.400	189.918
520.000	0.315	190.400	190.085
530.000	0.429	190.400	189.971
540.000	0.583	190.400	189.817
550.000	0.889	190.400	189.511
560.000	1.205	190.400	189.195
570.000	1.547	190.400	188.853
580.000	1.972	190.400	188.428
590.000	-0.829	187.205	188.034
600.000	-0.415	187.402	187.816
610.000	-0.025	187.804	187.829
620.000			187.957
630.000			187.775
640.000			187.425
650.000			
660.000			
670.000			
680.000			
690.000			
700.000			

SECTION 4
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



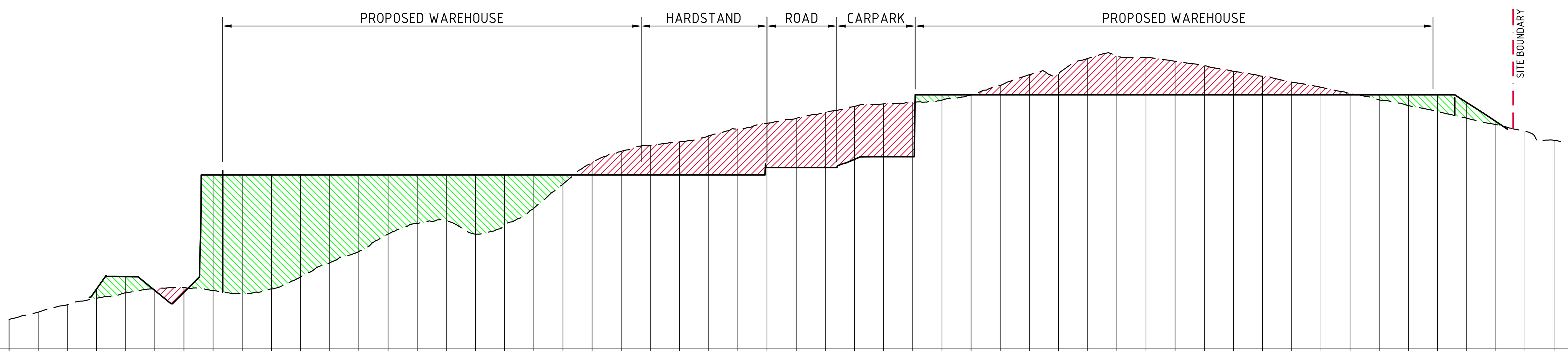
CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			193.26
10.000			192.933
20.000			192.547
30.000			192.086
40.000			191.518
50.000			191.018
60.000			190.555
70.000			190.307
80.000			189.728
90.000			190.904
100.000	1.127	191.825	190.698
110.000	0.790	191.738	190.949
120.000	0.073	191.416	191.343
130.000	0.025	191.416	191.391
140.000	-0.180	191.418	191.598
150.000	0.181	191.900	191.719
160.000	0.027	191.900	191.873
170.000	3.331	195.400	192.069
180.000	3.126	195.400	192.274
190.000	2.968	195.400	192.432
200.000	2.815	195.400	192.585
210.000	2.679	195.400	192.721
220.000	2.561	195.400	192.839
230.000	2.415	195.400	192.985
240.000	2.163	195.400	193.237
250.000	1.863	195.400	193.537
260.000	1.575	195.400	193.825
270.000	1.197	195.400	194.203
280.000	0.900	195.400	194.500
290.000	0.718	195.400	194.682
300.000	0.521	195.400	194.879
310.000	0.361	195.400	195.039
320.000	0.228	195.400	195.172
330.000	0.103	195.400	195.297
340.000	-0.067	195.400	195.467
350.000	-0.166	195.485	195.650
360.000	0.005	195.844	195.839
370.000			196.197
380.000			196.525
390.000			196.453
400.000			196.627
410.000			196.848
420.000			
430.000			
440.000			

SECTION 3
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
10.000	-7.977	193.606	201.583
20.000	-5.332	195.947	201.278
30.000	-3.110	197.900	201.010
40.000	-2.939	197.900	200.839
50.000	-2.653	197.900	200.553
60.000	-2.467	197.900	200.367
70.000	-2.281	197.900	200.181
80.000	-2.156	197.900	200.056
90.000	-2.138	197.900	200.038
100.000	-4.697	195.400	200.097
110.000	-4.427	195.400	199.827
120.000	-3.940	195.740	199.681
130.000	-3.639	195.963	199.602
140.000	-3.577	195.926	199.503
150.000	-4.068	195.400	199.468
160.000	-3.989	195.400	199.389
170.000	-3.849	195.400	199.249
180.000	-3.744	195.400	199.144
190.000	-3.576	195.400	198.976
200.000	-3.485	195.400	198.885
210.000	-3.304	195.400	198.704
220.000	-3.124	195.400	198.524
230.000	-2.861	195.400	198.261
240.000	-2.519	195.400	197.919
250.000	-2.157	195.400	197.557
260.000	-1.750	195.400	197.150
270.000	-1.357	195.400	196.757
280.000	-1.188	195.400	196.588
290.000	-0.265	195.400	195.665
300.000	0.237	195.400	195.163
310.000	0.144	195.400	195.256
320.000	0.089	195.400	195.311
330.000	0.298	195.400	195.102
340.000	-1.989	195.400	197.389
350.000	-0.924	195.585	196.509
360.000	-0.427	196.524	196.951
370.000			197.438
380.000			197.820
390.000			197.761
400.000			198.102
410.000			
420.000			
430.000			
440.000			

SECTION 2
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



CHAINAGE	CUT/FILL DEPTH	BULK EARTHWORKS LEVEL	EXISTING SURFACE LEVEL
0.000			186.97
10.000			187.474
20.000			187.981
30.000	0.632	189.060	188.428
40.000	1.118	189.915	188.797
50.000	-0.097	188.960	189.057
60.000	-0.343	188.838	189.181
70.000	7.936	196.900	188.964
80.000	8.192	196.900	188.708
90.000	7.831	196.900	189.069
100.000	6.995	196.900	189.905
110.000	6.037	196.900	190.863
120.000	5.256	196.900	191.644
130.000	4.068	196.900	192.832
140.000	3.328	196.900	193.572
150.000	3.132	196.900	193.768
160.000	4.068	196.900	192.832
170.000	3.473	196.900	193.427
180.000	2.290	196.900	194.610
190.000	0.632	196.900	196.268
200.000	-0.851	196.900	197.751
210.000	-1.615	196.900	198.515
220.000	-2.029	196.900	198.929
230.000	-2.282	196.900	199.182
240.000	-2.684	196.900	199.584
250.000	-3.160	196.900	200.060
260.000	-3.051	197.400	200.451
270.000	-3.383	197.400	200.783
280.000	-3.782	197.400	201.182
290.000	-3.636	197.971	201.607
300.000	-3.632	198.150	201.782
310.000	-3.755	198.150	201.905
320.000	0.362	202.400	202.038
330.000	0.018	202.400	202.382
340.000	-0.650	202.400	203.050
350.000	-1.383	202.400	203.783
360.000	-1.425	202.400	203.825
370.000	-2.495	202.400	204.895
380.000	-2.633	202.400	205.033
390.000	-2.540	202.400	204.940
400.000	-2.307	202.400	204.707
410.000	-2.000	202.400	204.400
420.000	-1.616	202.400	204.016
430.000	-1.267	202.400	203.667
440.000	-0.877	202.400	203.277
450.000	-0.522	202.400	202.922
460.000	-0.095	202.400	202.495
470.000	0.346	202.400	202.054
480.000	0.736	202.400	201.664
490.000	1.145	202.400	201.255
500.000	1.085	201.879	200.795
510.000	0.218	200.574	200.356
520.000			199.913
530.000			199.282
540.000			
550.000			
560.000			
570.000			

SECTION 1
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

LEGEND:

- DENOTES BULK EARTHWORKS PROFILE
- DENOTES EXISTING PROFILE
- DENOTES AREA IN CUT
- DENOTES AREA IN FILL

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT A0 SIZE SHEET

3m 0 5 10 15 20 25 30m
SCALE 1:300 AT A0 SIZE SHEET

B

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
UPDATED LEVELS ACROSS SITE, ISSUED FOR PLANNING APPLICATION	23.11.22	B
ISSUED FOR INFORMATION	02.11.22	A

AMENDMENTS	DATE	ISSUE

AMENDMENTS

ARCHITECT
watson young

CLIENT
ALTIS PROPERTY PARTNERS

PROJECT
ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK350

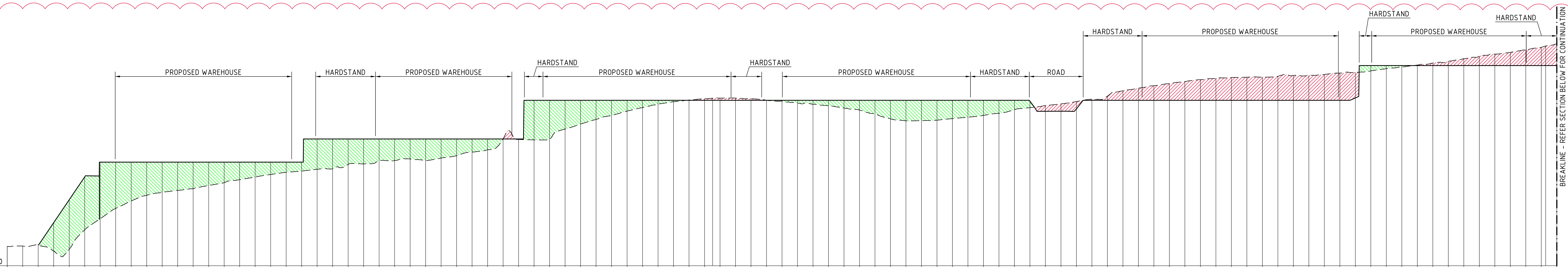
CONSULT AUSTRALIA

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CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
BULK EARTHWORKS SECTIONS
SHEET 1

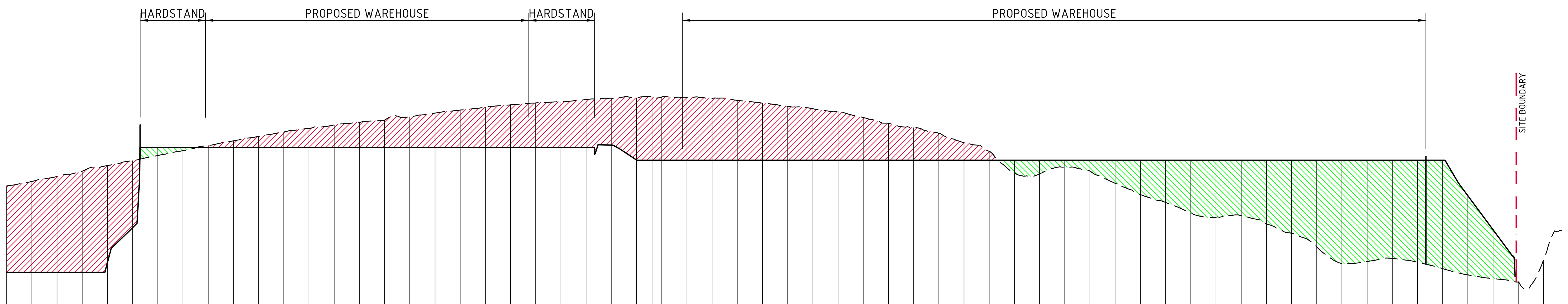
DRAWING No C014503.01-SK350
ISSUE B



DATUM 174.00

CHAINAGE	EXISTING SURFACE LEVEL	BULK EARTHWORKS LEVEL	CUT/FILL DEPTH
0.000	176.50		
10.000	176.547		
20.000	176.649	176.714	0.066
30.000	175.895	179.569	3.674
40.000	176.131	182.531	6.400
50.000	178.643	185.492	6.849
60.000	180.074	187.400	7.326
70.000	181.419	187.400	5.981
80.000	182.375	187.400	5.025
90.000	183.113	187.400	4.287
100.000	183.485	187.400	3.915
110.000	183.743	187.400	3.657
120.000	183.957	187.400	3.443
130.000	184.378	187.400	3.022
140.000	184.748	187.400	2.652
150.000	185.127	187.400	2.273
160.000	185.476	187.400	1.924
170.000	185.800	187.400	1.600
180.000	186.084	187.400	1.316
190.000	186.256	187.400	1.144
200.000	186.481	190.400	3.919
210.000	186.544	190.400	3.856
220.000	187.112	190.400	3.288
230.000	187.170	190.400	3.230
240.000	187.571	190.400	2.829
250.000	187.606	190.400	2.794
260.000	187.812	190.400	2.588
270.000	187.620	190.400	2.780
280.000	187.932	190.400	2.468
290.000	188.231	190.400	2.169
300.000	188.704	190.400	1.696
310.000	189.000	190.400	1.400
320.000	190.410	190.400	-0.010
330.000	190.335	190.400	0.065
340.000	190.283	195.400	5.117
350.000	190.352	195.400	5.048
360.000	191.681	195.400	3.719
370.000	192.327	195.400	3.073
380.000	192.930	195.400	2.470
390.000	193.439	195.400	1.961
400.000	193.997	195.400	1.403
410.000	194.472	195.400	0.928
420.000	194.907	195.400	0.493
430.000	195.221	195.400	0.179
440.000	195.444	195.400	-0.044
450.000	195.606	195.400	-0.206
460.000	195.684	195.400	-0.284
470.000	195.695	195.400	-0.295
480.000	195.623	195.400	-0.223
490.000	195.404	195.400	-0.004
500.000	195.291	195.400	0.109
510.000	195.065	195.400	0.335
520.000	194.895	195.400	0.505
530.000	194.700	195.400	0.700
540.000	194.410	195.400	0.990
550.000	194.147	195.400	1.253
560.000	193.643	195.400	1.757
570.000	193.003	195.400	2.397
580.000	192.755	195.400	2.645
590.000	192.782	195.400	2.618
600.000	192.834	195.400	2.566
610.000	193.029	195.400	2.371
620.000	193.205	195.400	2.195
630.000	193.447	195.400	1.953
640.000	193.718	195.400	1.682
650.000	194.186	195.400	1.214
660.000	194.451	195.291	0.840
670.000	194.733	193.985	-0.748
680.000	194.936	193.993	-0.944
690.000	195.246	194.281	-0.966
700.000	195.539	195.400	-0.139
710.000	195.938	195.400	-0.538
720.000	196.638	195.400	-1.238
730.000	196.967	195.400	-1.567
740.000	197.279	195.400	-1.879
750.000	197.569	195.400	-2.169
760.000	197.825	195.400	-2.425
770.000	198.072	195.400	-2.672
780.000	198.231	195.400	-2.831
790.000	198.346	195.400	-2.946
800.000	198.394	195.400	-2.994
810.000	198.394	195.400	-2.994
820.000	198.505	195.400	-3.105
830.000	198.622	195.400	-3.222
840.000	198.599	195.400	-3.199
850.000	198.747	195.400	-3.347
860.000	198.927	195.400	-3.527
870.000	199.018	195.705	-3.313
880.000	199.208	199.900	0.692
890.000	199.503	199.900	0.397
900.000	199.728	199.900	0.172
910.000	199.965	199.900	-0.065
920.000	200.228	199.900	-0.328
930.000	200.455	199.900	-0.555
940.000	200.790	199.900	-0.890
950.000	201.117	199.900	-1.217
960.000	201.380	199.900	-1.480
970.000	201.595	199.900	-1.695
980.000	201.938	199.900	-2.038
990.000	202.251	199.900	-2.351
1000.000	202.742	199.900	-2.842

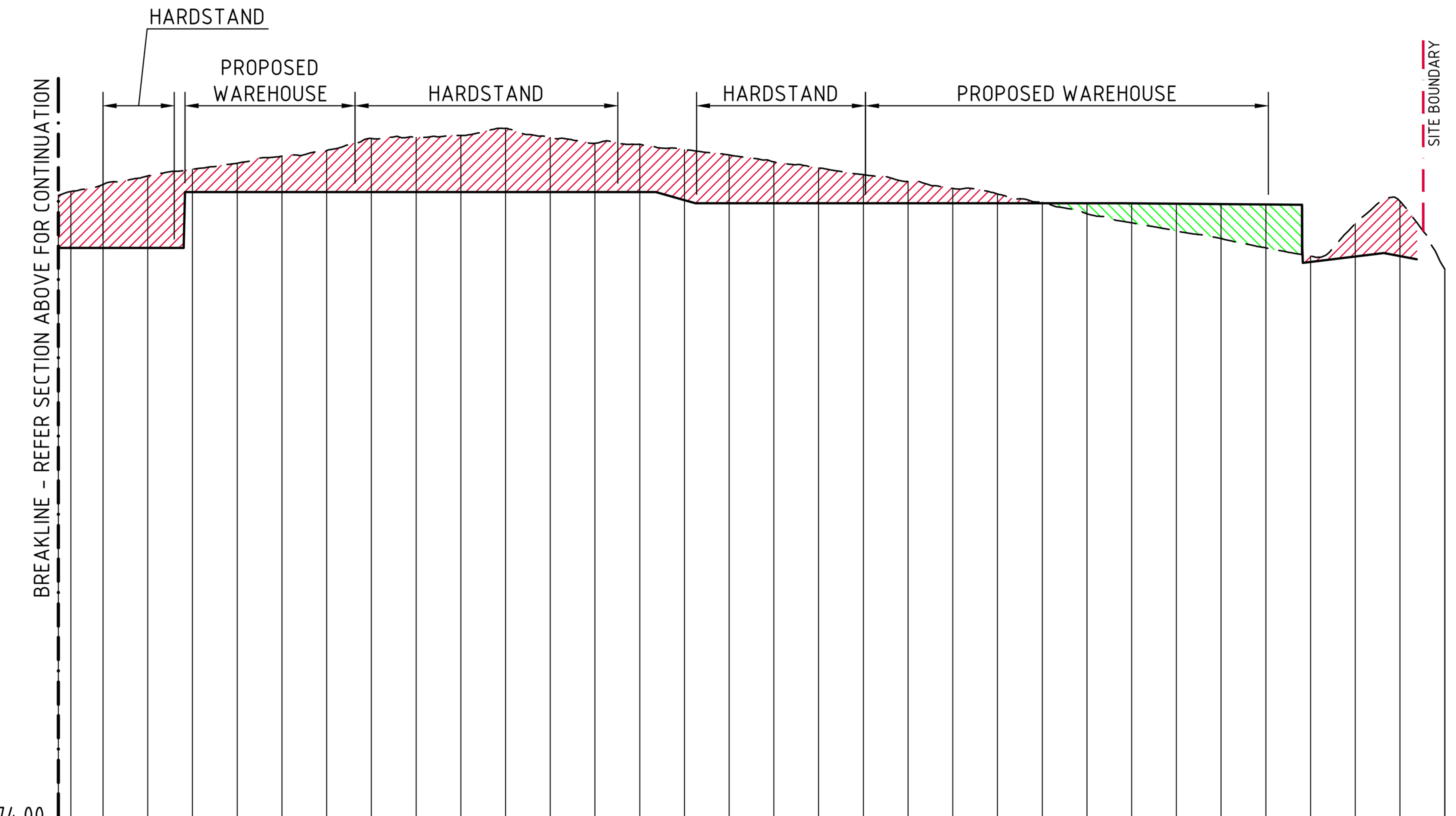
SECTION 7
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



DATUM 185.00

CHAINAGE	EXISTING SURFACE LEVEL	BULK EARTHWORKS LEVEL	CUT/FILL DEPTH
10.000	195.214	188.000	-7.214
20.000	195.621	188.000	-7.621
30.000	196.029	188.000	-8.029
40.000	196.468	188.775	-7.693
50.000	196.854	191.551	-5.303
60.000	197.264	197.900	0.636
70.000	197.660	197.900	0.240
80.000	198.055	197.900	-0.155
90.000	198.433	197.900	-0.533
100.000	198.785	197.900	-0.885
110.000	199.129	197.900	-1.229
120.000	199.415	197.900	-1.515
130.000	199.690	197.900	-1.790
140.000	199.895	197.900	-1.995
150.000	200.079	197.900	-2.179
160.000	200.333	197.900	-2.433
170.000	200.632	197.900	-2.732
180.000	200.877	197.900	-2.977
190.000	201.109	197.900	-3.209
200.000	201.287	197.900	-3.387
210.000	201.436	197.900	-3.536
220.000	201.524	197.900	-3.624
230.000	201.711	197.900	-3.811
240.000	201.818	198.093	-3.725
250.000	201.838	196.916	-4.921
260.000	201.909	196.900	-5.009
270.000	201.880	196.900	-4.980
280.000	201.802	196.900	-4.902
290.000	201.639	196.900	-4.739
300.000	201.422	196.900	-4.522
310.000	201.176	196.900	-4.276
320.000	200.981	196.900	-4.081
330.000	200.786	196.900	-3.886
340.000	200.286	196.900	-3.386
350.000	199.818	196.900	-2.918
360.000	199.471	196.900	-2.571
370.000	199.028	196.900	-2.128
380.000	198.297	196.900	-1.397
390.000	197.600	196.900	-0.700
400.000	195.875	196.900	1.025
410.000	195.832	196.900	1.068
420.000	196.338	196.900	0.562
430.000	196.034	196.900	0.866
440.000	195.068	196.900	1.832
450.000	194.174	196.900	2.726
460.000	193.553	196.900	3.347
470.000	192.715	196.900	4.185
480.000	192.378	196.900	4.522
490.000	192.522	196.900	4.378
500.000	191.847	196.900	5.053
510.000	191.109	196.900	5.791
520.000	190.027	196.900	6.873
530.000	188.706	196.900	8.194
540.000	188.861	196.900	8.039
550.000	189.123	196.900	7.777
560.000	188.802	196.900	8.098
570.000	188.299	196.900	8.601
580.000	187.799	194.075	6.276
590.000	187.510	191.377	3.867
600.000	187.241		
610.000	188.966		
620.000			

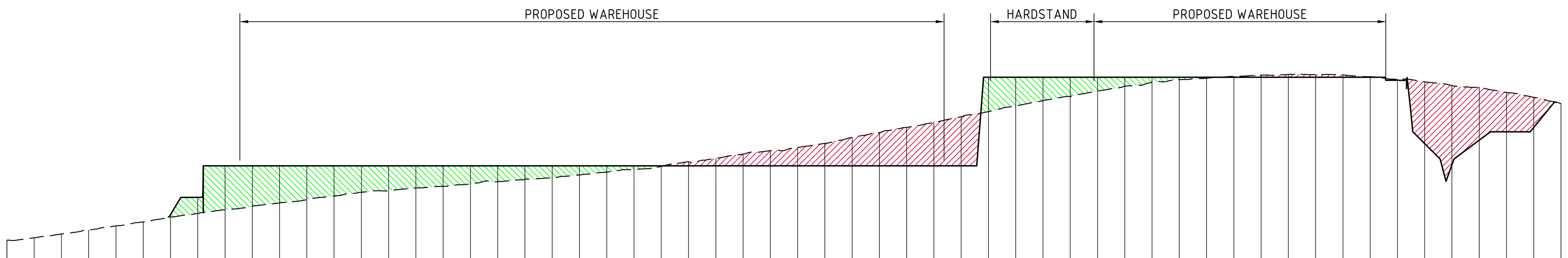
SECTION 6
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



DATUM 174.00

CHAINAGE	EXISTING SURFACE LEVEL	BULK EARTHWORKS LEVEL	CUT/FILL DEPTH
1000.000	202.742	199.900	-2.842
1010.000	203.119	199.900	-3.219
1020.000	203.420	202.400	-1.020
1030.000	203.685	202.400	-1.285
1040.000	204.004	202.400	-1.604
1050.000	204.252	202.400	-1.852
1060.000	204.795	202.400	-2.395
1070.000	204.849	202.400	-2.449
1080.000	204.931	202.400	-2.531
1090.000	205.248	202.400	-2.848
1100.000	204.839	202.400	-2.439
1110.000	204.584	202.400	-2.184
1120.000	204.535	202.400	-2.135
1130.000	204.292	202.038	-2.255
1140.000	204.055	201.900	-2.155
1150.000	203.749	201.900	-1.849
1160.000	203.485	201.900	-1.585
1170.000	203.180	201.900	-1.280
1180.000	202.873	201.900	-0.973
1190.000	202.560	201.900	-0.660
1200.000	202.315	201.900	-0.415
1210.000	201.949	201.900	-0.049
1220.000	201.429	201.900	0.471
1230.000	201.023	201.896	0.873
1240.000	200.655	201.879	1.224
1250.000	200.320	201.862	1.542
1260.000	199.906	201.844	1.938
1270.000	199.538	199.271	-0.267
1280.000	200.990	199.515	-1.475
1290.000	201.989	199.532	-2.457
1300.000	198.95		

SECTION 7 - CONTINUED
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200



DATUM 182.00

CHAINAGE	EXISTING SURFACE LEVEL	BULK EARTHWORKS LEVEL	CUT/FILL DEPTH
0.000	183.94		
10.000	184.120		
20.000	184.395		
30.000	184.683		
40.000	184.993		
50.000	185.284		
60.000	185.624	185.813	0.189
70.000	185.901	187.086	1.185
80.000	186.172	189.400	3.228
90.000	186.437	189.400	2.963
100.000	186.680	189.400	2.720
110.000	186.924	189.400	2.476
120.000	187.182	189.400	2.218
130.000	187.458	189.400	1.942
140.000	187.577	189.400	1.823
150.000	187.779	189.400	1.621
160.000	187.894	189.400	1.506
170.000	188.080	189.400	1.320
180.000	188.235	189.400	1.165
190.000	188.406	189.400	0.994
200.000	188.527	189.400	0.873
210.000	188.729	189.400	0.671
220.000	188.936	189.400	0.464
230.000	189.150	189.400	0.250
240.000	189.358	189.400	0.042
250.000	189.692	189.400	-0.292
260.000	189.945	189.400	-0.545
270.000	190.260	189.400	-0.860
280.000	190.514	189.400	-1.114
290.000	190.749	189.400	-1.349
300.000	191.047	189.400	-1.647
310.000	191.491	189.400	-2.091
320.000	191.839	189.400	-2.439
330.000	192.225	189.400	-2.825
340.000	192.589	189.400	-3.189
350.000	193.007	189.400	-3.607
360.000	193.382	195.900	2.518
370.000	193.805	195.900	2.095
380.000	194.182	195.900	1.718
390.000	194.498	195.900	1.402
400.000	194.892	195.900	1.008
410.000	195.234	195.900	0.666
420.000	195.519	195.900	0.381
430.000	195.724	195.900	0.176
440.000	195.835	195.900	0.065
450.000	195.969	195.900	-0.069
460.000	196.059	195.900	-0.159
470.000	196.109	195.900	-0.209
480.000	196.105	195.900	-0.205
490.000	196.074	195.900	-0.174
500.000	195.940	195.900	-0.040
510.000	195.758	195.681	-0.076
520.000	195.565	191.027	-4.538
530.000	195.297	189.487	-5.810
540.000	195.175	191.286	-3.889
550.000	194.788	191.900	-2.888
560.000	194.432	192.219	-2.213
570.000	193.96		

SECTION 5
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

LEGEND:

- DENOTES BULK EARTHWORKS PROFILE
- DENOTES EXISTING PROFILE
- DENOTES AREA IN CUT
- DENOTES AREA IN FILL

10m 0 10 20 30 40 50 60 70 80 90 100m
SCALE 1:1000 AT A0 SIZE SHEET

2m 0 5 10 15 20m
SCALE 1:200 AT A0 SIZE SHEET

B

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
UPDATED LEVELS ACROSS SITE, ISSUED FOR PLANNING APPLICATION	23.11.22	B
ISSUED FOR INFORMATION	02.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK351

CONSULT AUSTRALIA

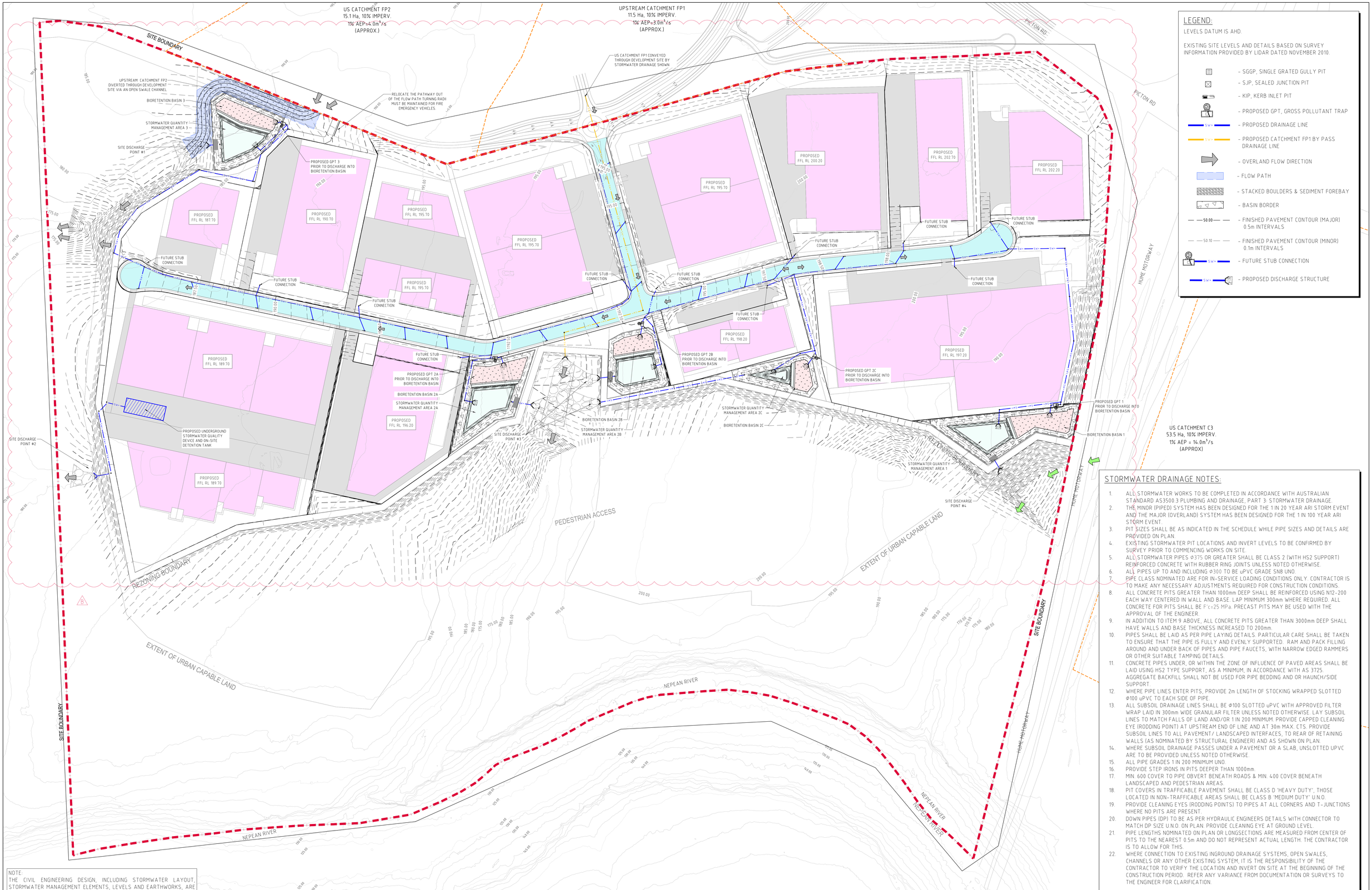
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CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: BULK EARTHWORKS SECTIONS SHEET 2

DRAWING No: C014503.01-SK351

ISSUE: B



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LIDAR DATED NOVEMBER 2010.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED GPT, GROSS POLLUTANT TRAP
- PROPOSED DRAINAGE LINE
- PROPOSED CATCHMENT FP1 BY PASS DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FLOW PATH
- STACKED BOULDERS & SEDIMENT FOREBAY
- BASIN BORDER
- 50.00 – FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 – FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- FUTURE STUB CONNECTION
- PROPOSED DISCHARGE STRUCTURE

STORMWATER DRAINAGE NOTES:

1. ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
3. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
4. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
5. ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
6. ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE SN8 UNO.
7. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
8. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'_c=25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
9. IN ADDITION TO ITEM 9 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
10. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
11. CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
12. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
13. ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
14. WHERE SUBSOIL DRAINAGE PASSES UNDER A PAVEMENT OR A SLAB, UNSLOTTED UPVC ARE TO BE PROVIDED UNLESS NOTED OTHERWISE.
15. ALL PIPE GRADES 1 IN 200 MINIMUM UNO.
16. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
17. MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
18. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
19. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
20. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
21. PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.
22. WHERE CONNECTION TO EXISTING INGROUND DRAINAGE SYSTEMS, OPEN SWALES, CHANNELS OR ANY OTHER EXISTING SYSTEM, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION AND INVERT ON SITE AT THE BEGINNING OF THE CONSTRUCTION PERIOD. REFER ANY VARIANCE FROM DOCUMENTATION OR SURVEYS TO THE ENGINEER FOR CLARIFICATION.

NOTE:
THE CIVIL ENGINEERING DESIGN, INCLUDING STORMWATER LAYOUT, STORMWATER MANAGEMENT ELEMENTS, LEVELS AND EARTHWORKS, ARE CONCEPTUAL IN NATURE ONLY. THE INTENT OF THE PRESENTED ENGINEERING DESIGN PACKAGE IS TO DEMONSTRATE THAT A SUITABLE ENGINEERING SOLUTION CAN BE ACHIEVED ON THE SUBJECT LAND. ALL ELEMENTS ARE SUBJECT TO FURTHER DESIGNS AND ASSESSMENTS TO BE COMPLETED AS PART OF FUTURE DEVELOPMENT APPLICATIONS, OR OTHER DESIGN/ APPROVAL PHASES OF THE DEVELOPMENT.

BULK EARTHWORKS PLAN
SCALE 1:1500

15m 0 15 30 45 60 75 90 105 120 135 150m
SCALE 1:1500 AT A0 SIZE SHEET

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
UPDATED ARCHITECTURAL LAYOUT	21.04.23	B
ISSUED FOR PLANNING APPLICATION	24.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

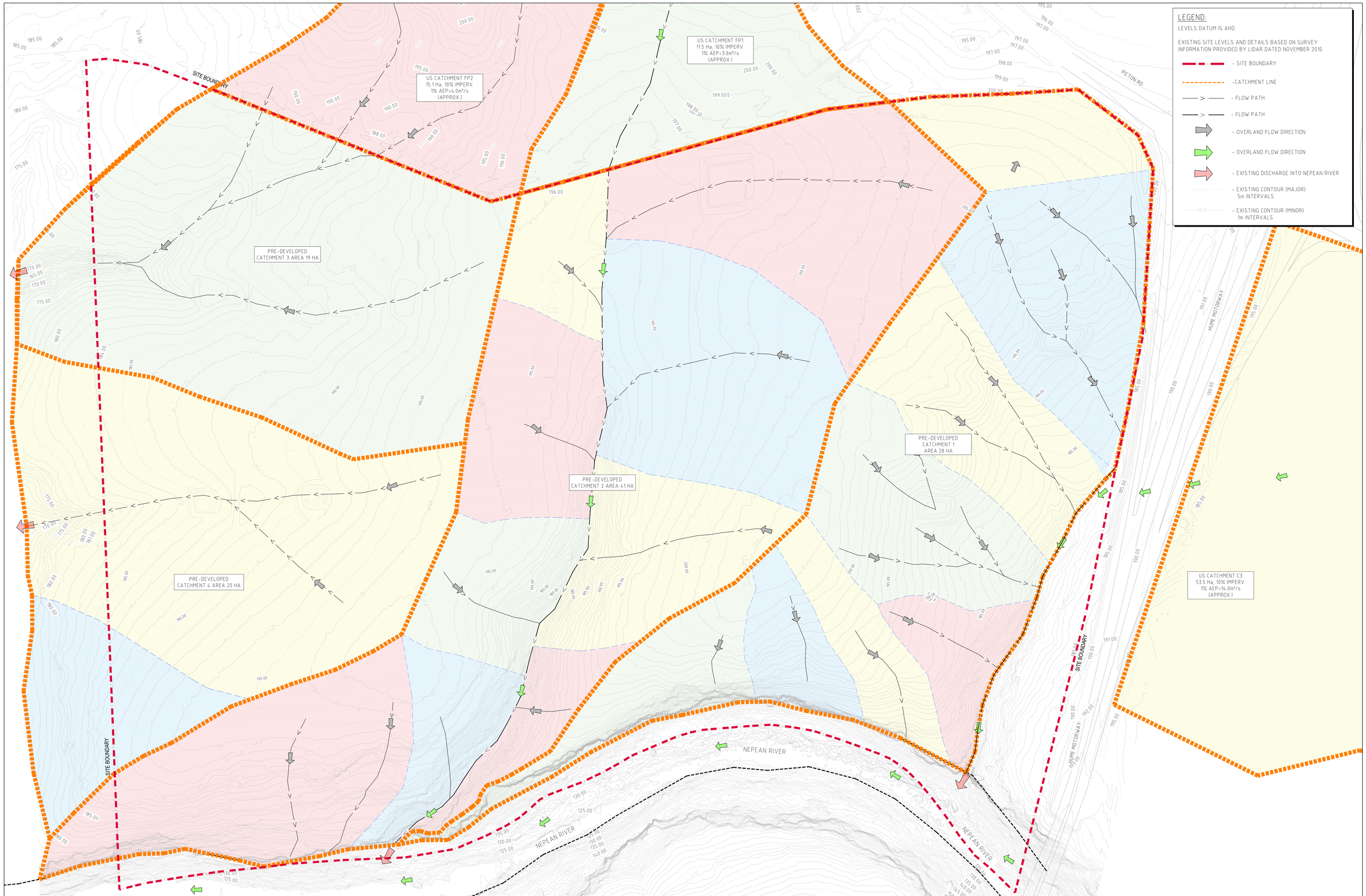
DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK 03

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COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE: STORMWATER DRAINAGE KEY PLAN

DRAWING No: C014503.01-SK400 ISSUE: B



BULK EARTHWORKS PLAN
SCALE 1:1500

FOR PLANNING APPLICATION

15m 0 15 30 45 60 75 90 105 120 135 150m
SCALE 1:1500 AT A0 SIZE SHEET

AMENDMENTS	DATE	ISSUE
ISSUED FOR PLANNING APPLICATION	23.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PB	PB	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK 410

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DRAWING TITLE: PRE-DEVELOPMENT CATCHMENTS

DRAWING NO: C014503.01-SK 410 ISSUE: A

SITE BOUNDARY
WILTON PARK RD
MAIN PLAZA
BERWICK PARK RD
WILTON PAL
PICTON RD
HUME MOTORWAY
PEDESTRIAN ACCESS
REZONING BOUNDARY
EXTENT OF URBAN CAPABLE LAND
NEPEAN RIVER

US CATCHMENT FP2
DIVERTED THROUGH DEVELOPMENT
SITE VIA AN OPEN SWALE CHANNEL

US CATCHMENT FP2
15.1 Ha, 10% IMPERV.
1% AEP=4.0m³/s
(APPROX.)

RELOCATE THE PATHWAY OUT OF THE FLOW PATH TURNING RADII MUST BE MAINTAINED FOR FIRE EMERGENCY VEHICLES.

US CATCHMENT FP1
11.5 Ha, 10% IMPERV.
1% AEP=3.0m³/s
(APPROX.)

US CATCHMENT FP1
TO BE CONVEYED THROUGH DEVELOPMENT SITE BY STORMWATER DRAINAGE SHOWN

PROPOSED DISCHARGE FROM CATCHMENT 3 INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER

PROPOSED FFL RL 187.70
PROPOSED FFL RL 190.70
PROPOSED FFL RL 195.70
PROPOSED FFL RL 195.70
PROPOSED FFL RL 195.70
PROPOSED FFL RL 198.20
PROPOSED FFL RL 200.20
PROPOSED FFL RL 202.70
PROPOSED FFL RL 202.20
PROPOSED FFL RL 197.20
PROPOSED FFL RL 189.70
PROPOSED FFL RL 189.70
PROPOSED FFL RL 196.20

POST DEVELOPMENT CATCHMENT 3 AREA= 8.75 Ha
POST DEVELOPMENT CATCHMENT 2A AREA = 9.70 Ha EXCL. BIORETENTION BASINS
POST DEVELOPMENT CATCHMENT 2B AREA = 6.70 Ha EXCL. BIORETENTION BASINS
POST DEVELOPMENT CATCHMENT 2C AREA = 4.80 Ha EXCL. BIORETENTION BASINS
POST DEVELOPMENT CATCHMENT 4, AREA = 8.23 Ha
POST DEVELOPMENT CATCHMENT 5 AREA = 55.80 Ha CATCHMENT REMAIN UNDEVELOPED

PIPE FOR UPSTREAM FLOW CONVEYANCE (1950mm) BYPASSES ALL ESTATE TREATMENT SYSTEMS

PROPOSED UNDERGROUND STORMWATER QUALITY STORAGE DEVISE

PROPOSED DISCHARGE FROM CATCHMENT 2A INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER
PROPOSED DISCHARGE FROM CATCHMENT 2B INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER
PROPOSED DISCHARGE FROM CATCHMENT 2C INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER
PROPOSED DISCHARGE FROM CATCHMENT 4 INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER
PROPOSED DISCHARGE FROM CATCHMENT 1 INTO EXISTING DRAINAGE SWALE TO NEPEAN RIVER

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LIDAR DATED NOVEMBER 2010.

- SITE BOUNDARY
- RIDGE LINE
- EXISTING DISCHARGE INTO NEPEAN RIVER
- OVERLAND FLOW DIRECTION
- EXISTING CONTOUR (MAJOR) 5m INTERVALS
- EXISTING CONTOUR (MINOR) 1m INTERVALS
- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- PROPOSED GPT, GROSS POLLUTANT TRAP
- PROPOSED DRAINAGE LINE
- PROPOSED CATCHMENT FP1 BY PASS DRAINAGE LINE
- FLOW PATH
- STACKED BOULDERS & SEDIMENT FOREBAY
- BASIN BORDER
- FUTURE STUB CONNECTION
- PROPOSED DISCHARGE STRUCTURE

NOTE:
THE CIVIL ENGINEERING DESIGN, INCLUDING STORMWATER LAYOUT, STORMWATER MANAGEMENT ELEMENTS, LEVELS AND EARTHWORKS, ARE CONCEPTUAL IN NATURE ONLY. THE INTENT OF THE PRESENTED ENGINEERING DESIGN PACKAGE IS TO DEMONSTRATE THAT A SUITABLE ENGINEERING SOLUTION CAN BE ACHIEVED ON THE SUBJECT LAND. ALL ELEMENTS ARE SUBJECT TO FURTHER DESIGNS AND ASSESSMENTS TO BE COMPLETED AS PART OF FUTURE DEVELOPMENT APPLICATIONS, OR OTHER DESIGN/ APPROVAL PHASES OF THE DEVELOPMENT

BULK EARTHWORKS PLAN
SCALE 1:1500

FOR PLANNING APPLICATION

15m 0 15 30 45 60 75 90 105 120 135 150m
SCALE 1:1500 AT A0 SIZE SHEET

AMENDMENTS	DATE	ISSUE
UPDATED ARCHITECTURAL LAYOUT	21.04.23	B
ISSUED FOR PLANNING APPLICATION	24.11.22	A

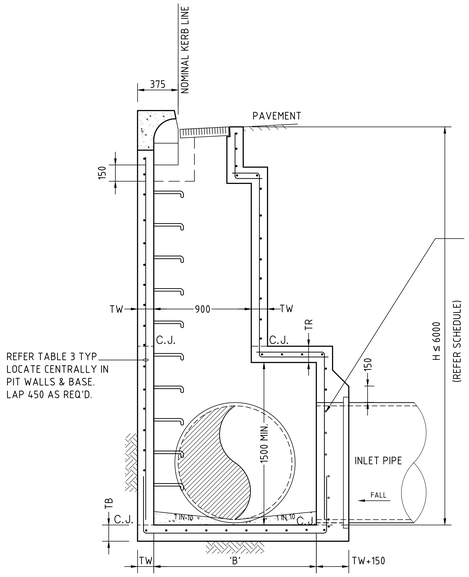
ARCHITECT: watson young
CLIENT: ALTIS PROPERTY PARTNERS
PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV '22	LDV	A0	AS SHOWN	C014503.01-SK 411

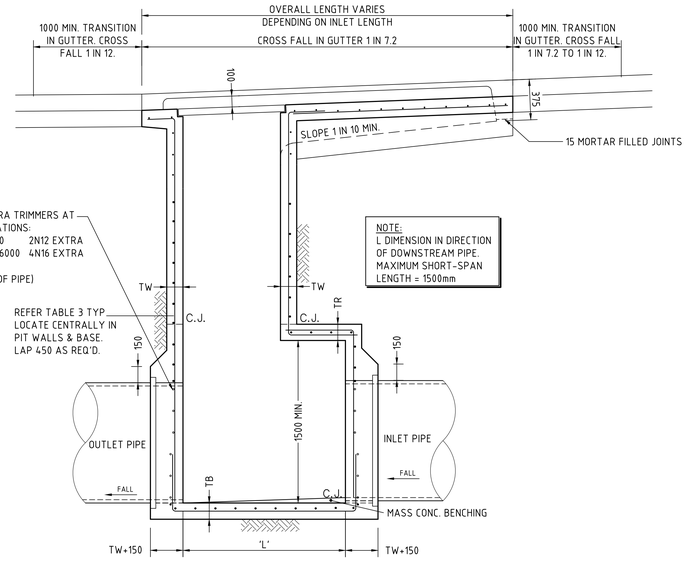
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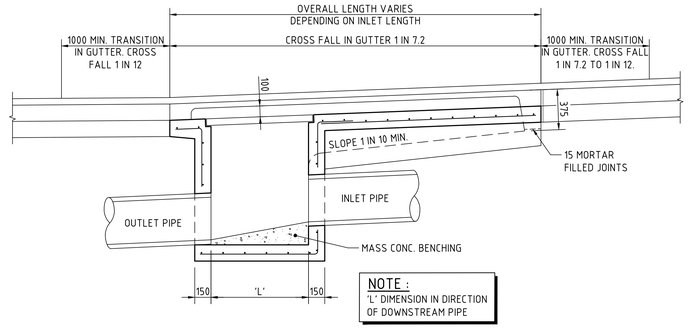
DRAWING TITLE: POST-DEVELOPMENT CATCHMENTS
DRAWING NO: C014503.01-SK 411
ISSUE: B



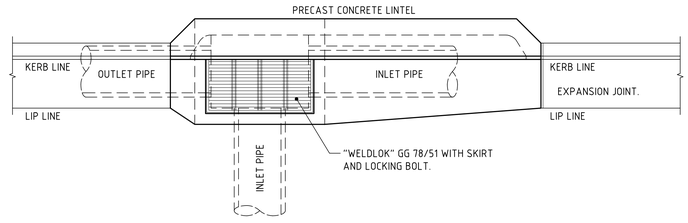
CROSS SECTION.
SCALE 1:20



LONG SECTION.
SCALE 1:20



LONG SECTION
SCALE 1:20



PLAN
SCALE 1:20

PLAN
SCALE 1:20

TAPERED KERB INLET PIT - KIP

SUBSOIL NOT SHOWN
FOR CLARITY.

TABLE 3 - TAPERED CLASS D PIT REINFORCEMENT & WALL THICKNESS						
DEPTH 'H'	WALL THICKNESS 'TW'	WALL REINFORCEMENT	ROOF THICKNESS 'TR'	ROOF REINFORCEMENT	BASE THICKNESS 'TB'	BASE REINFORCEMENT
<1.5m	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY
1.5m-3.0m	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY	150mm	N12-200 EACH WAY
3.0m-4.5m	200mm	N16-200 EACH WAY	200mm	N16-200 EACH WAY	200mm	N12-200 EACH WAY
4.5-6.0	250mm	N16-200 EACH WAY	250mm	N16-200 EACH WAY	250mm	N16-200 EACH WAY

CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	25

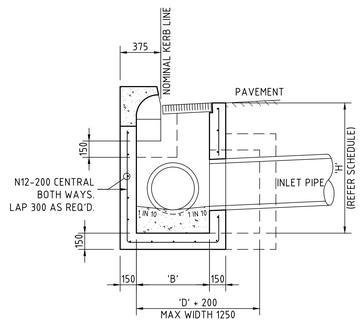
NOTES:

1. WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
2. SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
3. ALL REINFORCING TO HAVE 30 MIN. CLEAR CONCRETE COVER.
4. FOR PITS DEEPER THAN 1200mm STEP IRONS SHALL BE PROVIDED.
5. FOR ALL PITS IN ITV PAVEMENT AREAS, PIT WALLS ARE TO BE INCREASED IN THICKNESS BY 50mm AND REINFORCEMENT TO BE N16 BARS IN LIEU OF N12

KERB INLET PIT - KIP

NOTE :

1. WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
2. SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
3. ALL REINFORCING TO HAVE 30 MIN. CLAER CONCRETE COVER.
4. FOR PITS DEEPER THAN 1000mm CLIMB RAILS SHALL BE PROVIDED.



CROSS SECTION
SCALE 1:20

CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	32

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT B1 SIZE SHEET

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR PLANNING APPLICATION	23.11.22	A

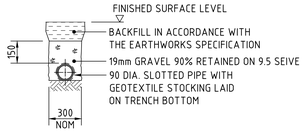
ARCHITECT: watson young
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PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK450

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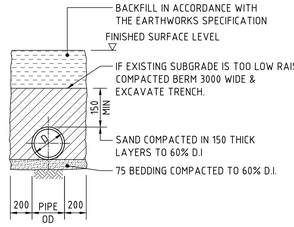
DRAWING TITLE: STORMWATER MANAGEMENT DETAILS SHEET 1
DRAWING No: C014503.01-SK450
ISSUE: A



SUPPORT TO AGRICULTURAL DRAIN

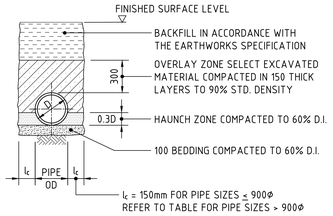
SCALE 1:20

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0



SUPPORT TO uPVC PIPES (<300mm)

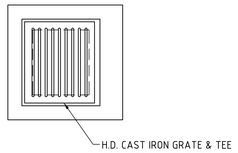
SCALE 1:20



TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS

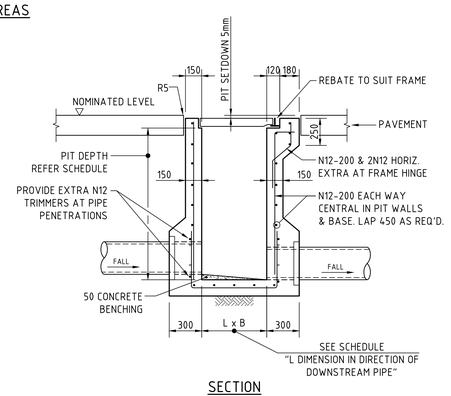
SCALE 1:20

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	20 TO 0



PLAN

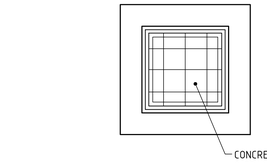
SCALE 1:20



SECTION

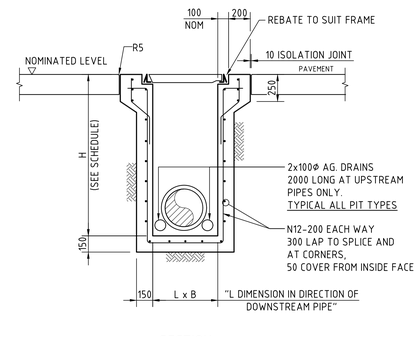
SCALE 1:20

SINGLE GRATED GULLY PIT - SGGP



PLAN

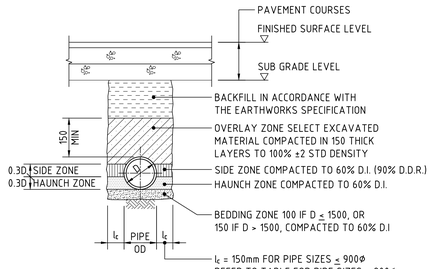
SCALE 1:20



SECTION

SCALE 1:20

SEALED JUNCTION PIT - SJP



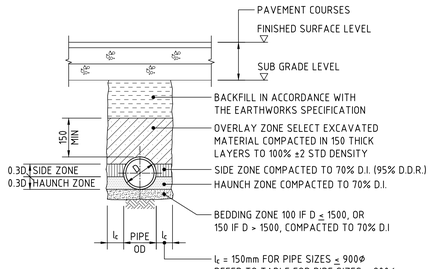
TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20

D ≤ 1350, MAX FILL = 4.0m

D > 1350, MAX FILL = 3.0m

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0



TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

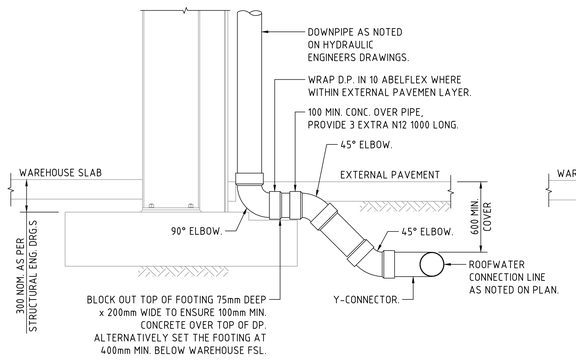
SCALE 1:20

D ≤ 1050, MAX FILL = 6.0m

D > 1050, MAX FILL = 4.8m

SIDE ZONE WIDTH	
PIPE SIZE (mm)	l_c (mm)
≤ 900Φ	150
1050Φ	175
1200Φ	200
1350Φ	225
1500Φ	250
1650Φ	275
1800Φ	300
ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Φ	

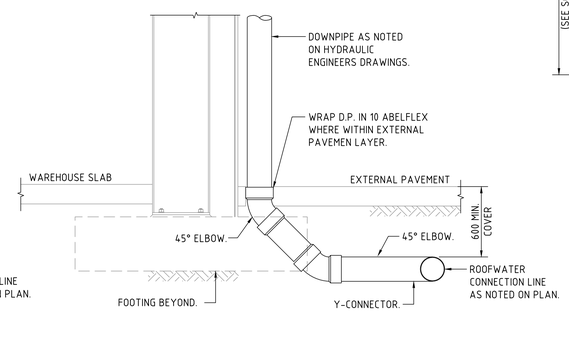
SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0
SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725	



DOWNPIPE TURN-UP DETAIL A

(AT FOOTING LOCATION)

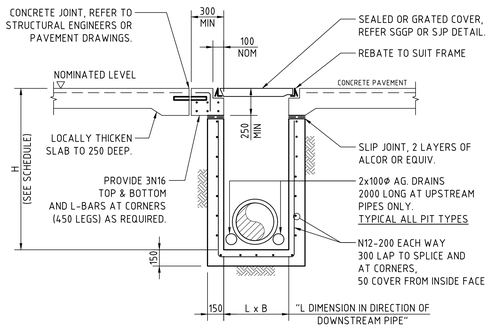
SCALE 1:20



DOWNPIPE TURN-UP DETAIL B

(CLEAR OF FOOTING)

SCALE 1:20

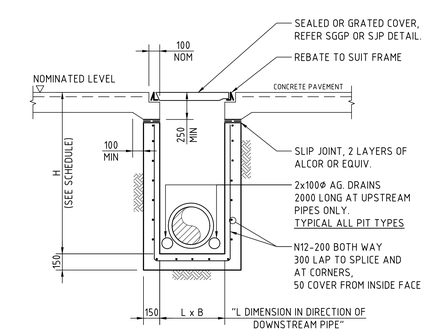


SECTION

SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

(ADOPT IN CONCRETE PAVEMENT FOR SGGP's & SJP's, WHERE PITS ARE LOCATED IN THE CORNER OF SLAB PANELS OR ADJACENT TO SLAB PANEL JOINTS)



SECTION

SCALE 1:20

SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

(ADOPT IN CONCRETE PAVEMENTS FOR SGGP's & SJP's, WHERE JOINTS ARE NOT LOCATED WITHIN PROXIMITY OF THE GRATE)

FOR PLANNING APPLICATION

200mm 0 500 1000 1500 2000mm

SCALE 1:20 AT B1 SIZE SHEET

AMENDMENTS	DATE	ISSUE
ISSUED FOR PLANNING APPLICATION	23.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK451

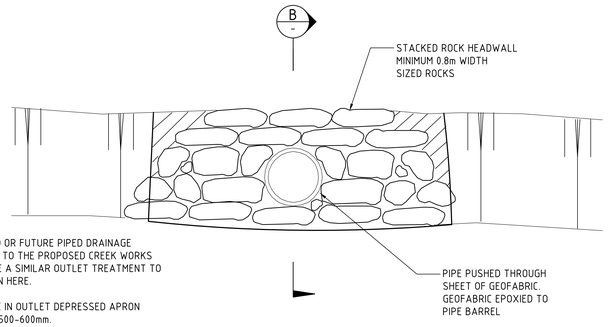
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DRAWING TITLE: STORMWATER MANAGEMENT DETAILS SHEET 2

DRAWING No: C014503.01-SK451 ISSUE: A

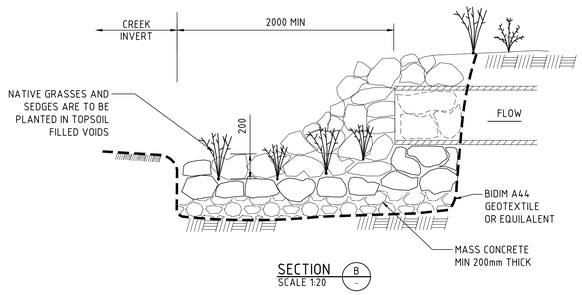


APPLICABILITY:

1) ALL PROPOSED OR FUTURE PIPED DRAINAGE CONNECTIONS TO THE PROPOSED CREEK WORKS SHOULD HAVE A SIMILAR OUTLET TREATMENT TO THOSE SHOWN HERE.

2) MIN. ROCK SIZE IN OUTLET DEPRESSED APRON SHOULD BE ⌀500-600mm.

TYPICAL STACKED ROCK HEADWALL TREATMENT
SCALE 1:20



SECTION B
SCALE 1:20

BIO-RETENTION NOTES :

FILTER MEDIA TO BE LOAMY SAND WITH A PERMEABILITY NOT LESS THAN 200mm/hr. FILTER MEDIA TO BE FREE OF RUBBISH, DELETERIOUS MATERIAL, TOXICANTS, DECLARED PLANTS AND LOCAL WEEDS, AND IS TO NOT BE HYDROPHOBIC.

FILTER MEDIA TO HAVE THE FOLLOWING COMPOSITION RANGE:

CLAY & SILT (<0.05mm)	<3%
VERY FINE SAND (0.05-0.15mm)	5-30%
FINE SAND (0.15-0.25mm)	10-30%
MEDIUM TO COARSE SAND (0.25-1.00mm)	40-60%
COARSE SAND (1.0-2.0mm)	7-10%
FINE GRAVEL (2.0-3.4mm)	<3%

FILTER MEDIA THAT DOES NOT MEET THE FOLLOWING CRITERIA SHALL BE REJECTED:

a. ORGANIC MATTER CONTENT TO BE IDEALLY WITHIN 1% TO 3% (W/W) AND TO BE NO GREATER THAN 5%(W/W).
b. PH TO BE BETWEEN 5.5 AND 7.5
c. PHOSPHOROUS CONTENT TO BE NO GREATER THAN 35mg/kg

FILTER MEDIA TO BE ASSESSED BY QUALIFIED HORTICULTURALIST TO ENSURE CAPABILITY OF SUPPORTING PLANT LIFE.

DRAINAGE LAYER TO BE CLEAN GRAVEL 5-7mm.

PLANTS TO BE IN ACCORDANCE WITH WHITTLESEA COUNCIL AND MELBOURNE WATER REQUIREMENTS.

PROVIDE 100mm TOPSOIL AND TEMPORARY EROSION PROTECTION (JUTEMASTER OR EQUIV) TO SWALE BATTER SLOPES AND ADJACENT LANDSCAPED AREAS. NOTE THAT NO TOPSOIL IS TO BE PLACED OVER FILTRATION MEDIA. PROVIDE SILT FENCE TO TOP OF BANK UNTIL SUCH TIME AS THIS STABILISING AND VEGETATION HAS BEEN COMPLETED.

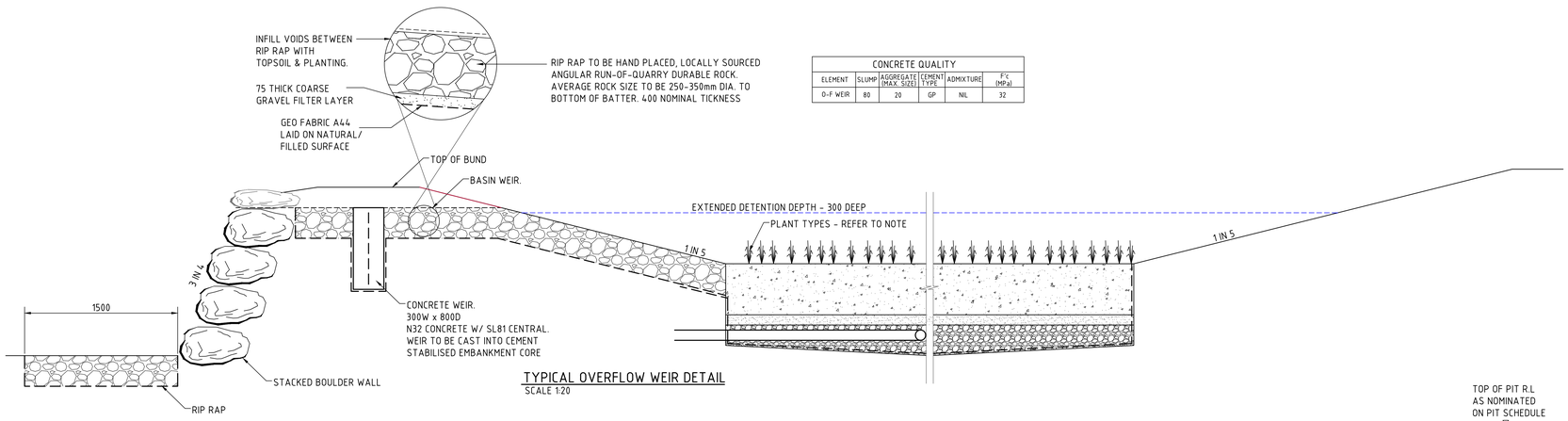
BIO-RETENTION TO BE PARTIALLY INSTALLED, FOLLOWING COMPLETION OF ROADWORKS, WITH THE TOP 75-100mm OF FILTER MEDIA REPLACED WITH A FINE TO COARSE SAND UNDERLAIN WITH A GEOTEXTILE LAYER (REFER TO DETAIL). FOLLOWING COMPLETION OF THE UPSTREAM DEVELOPMENT AND SITE STABILISATION, THE SAND IS TO BE REMOVED, REPLACED WITH FILTER MATERIAL AND PLANTED OUT. REFER TO TEMPORARY BIO-BASIN DETAIL

PRIOR TO PLANTING, THE TOP 100mm OF THE BIORETENTION FILTER MEDIA IS TO BE AMELIORATED WITH APPROPRIATE ORGANIC MATTER, FERTILISER AND TRACE ELEMENTS TO AID PLANT ESTABLISHMENT AS PER THE TABLE BELOW:

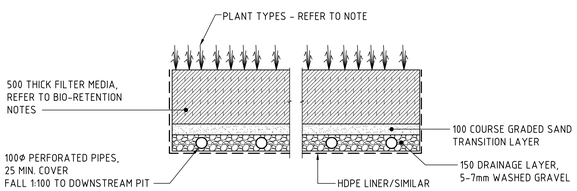
TABLE: RECIPE FOR AMELIORATING TOP 100mm OF BIORETENTION FILTER MEDIA

CONSTITUENT	QUANTITY (kg/m2 OF FILTER AREA)
GRANULATED POULTRY MANURE FINES	50
SUPERPHOSPHATE	2
MAGNESIUM SULPHATE	3
POTASSIUM SULPHATE	2
TRACE ELEMENT MIX	1
FERTILISER NPK (16.4.14)	4
LIME	20

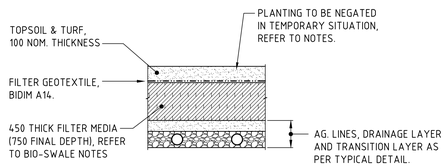
CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
O-F WEIR	80	20	GP	NIL	32



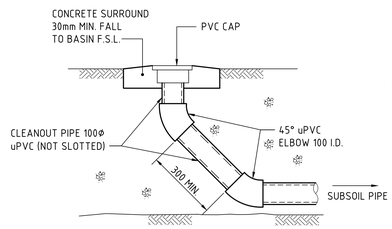
TYPICAL OVERFLOW WEIR DETAIL
SCALE 1:20



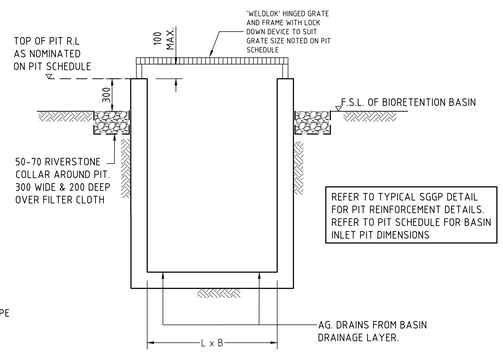
TYPICAL BIO-RETENTION DETAIL
SCALE 1:20



TEMPORARY BIO-RETENTION PROTECTION DETAIL
SCALE 1:20
TEMPORARY CONSTRUCTION REQUIREMENT DETAIL - REFER TO NOTES FOR IMPLEMENTATION PERIODS.



BIORETENTION CLEANOUT EYE ELEVATION
SCALE 1:20
DENOTED C.E. ON PLAN



SECTION
SCALE 1:20

BASIN INLET PIT - BIP

BIO-RETENTION BASIN DETAILS

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT B1 SIZE SHEET

FOR PLANNING APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR PLANNING APPLICATION	23.11.22	A

ARCHITECT: watson young

CLIENT: ALTIS PROPERTY PARTNERS

PROJECT: ALTIS WILTON PARK ROAD
WILTON PARK ROAD, WILTON, NSW, 2571

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
PR	PR	NOV'22	LDV	A0	AS SHOWN	C014503.01-SK453

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DRAWING TITLE: STORMWATER MANAGEMENT DETAILS SHEET 3

DRAWING No: C014503.01-SK452 ISSUE: A

Appendix B

MUSIC MODEL CONFIGURATION & PARAMETERS

B.1 Introduction

The MUSIC modelling software was chosen to model water stream health and annual stormwater runoff volumes. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The NorBE water quality criteria nominated in **Section 4** of this report would be assessed as part of detail designs or future development approval designs.

The MUSIC model "*Co14503.01_Rev.B.sqz*" was set up to examine the annual stormwater runoff volumes.

The model was set up using the template files received from Wollondilly Council, with modelling parameters nominated in the Sydney Catchment Management Authority (SCA) document *Using Music in Sydney's Drinking Water Catchment – A Sydney Catchment Authority Standard (2012)* and *Draft NSW MUSIC Modelling Guidelines (2011),* as required by the Wollondilly Shire Council WSUD Guidelines.

The layout of the MUSIC model is presented below.

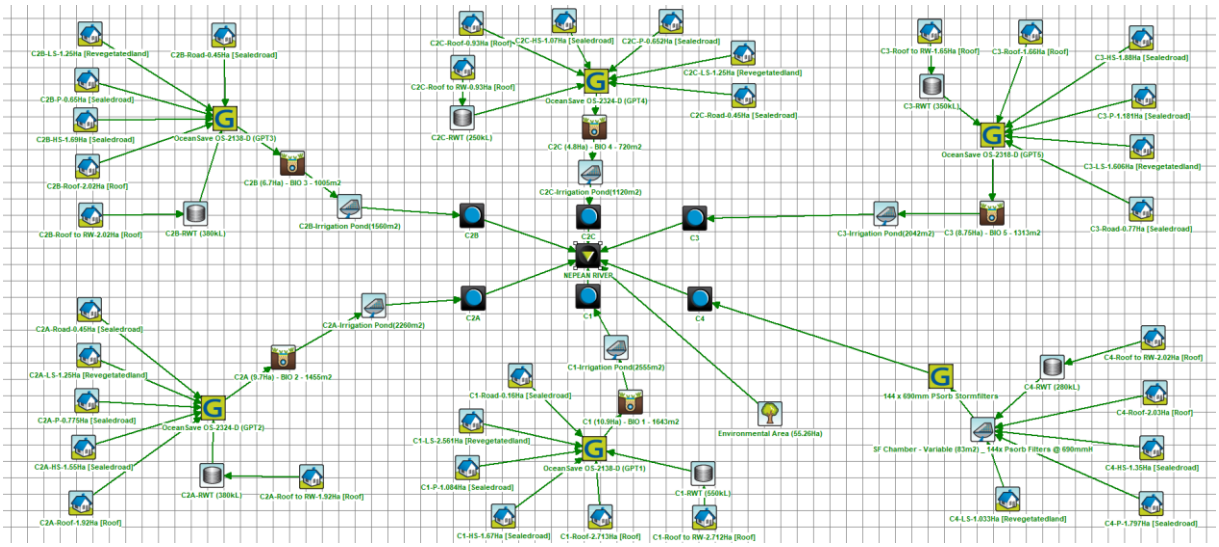


Figure B1.1. Planning application MUSIC model layout

B.2 Rainfall Data

As per the recommendation of Attachment 3 of the Wollondilly Shire Council WSUD Guidelines, and as modelled in the MUSIC template received from Council, climatic data from BoM's Rockwood weather station was used in the model. The period 1/1/1975 to 31/12/1984 is used as it was identified by Council that this data set best represents the region and best match long-term

meteorological records in terms of mean annual rainfall and the 90th percentile of rainfall. Rainfall data sets for stormwater treatment systems include this 10-year period as a minimum with a 6 minute time step.

Input	**Data Used**
Rainfall Station	Rockwood
Rainfall Period	1/1/1975 to 31/12/1984 (10 years)
Mean Annual Rainfall (mm)	940
Mean Annual Evapo- transpiration (mm)	1184
Model Time step	6 minutes

B.3 Rainfall Runoff Parameters

Parameter	Value
Rainfall Threshold for roads/paths	1.50
Rainfall Threshold for roofs	0.30
Soil Storage Capacity (mm)	142
Initial Storage (% capacity)	25
Field Capacity (mm)	94
Infiltration Capacity Coefficient a	180
Infiltration Capacity exponent b	3.0
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	25
Daily Seepage Rate (%)	0

B.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on parameters adopted by the SCA as per **Table B.1**.

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	-*	-*	-*	-*	-*	-*
	Roads	-*	-*	-*	-*	-*	-*
	Other Impervious Areas	-*	-*	-*	-*	-*	-*
	Pervious Areas	1.15	0.17	-1.22	0.19	-0.05	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19
	Other Impervious Areas	2.43	0.32	-0.30	0.25	0.34	0.19
	Pervious Areas	1.95	0.32	-0.66	0.25	0.30	0.19

Table B.1. Pollutant Concentrations

B.5 Nodes

Rainwater tanks, grass buffers and bio-retention swales (noting no nutrient uptake vegetation was included in the model) treatment nodes have been used in the modelling of the development as per SCA guidelines and Wollondilly Shire Council WSUD Guideline 2020.

Refer submitted model for details.

Appendix C

DRAFT SOIL AND WATER MANAGEMENT PLAN

C.1 Introduction

An erosion and sediment control plan (ESCP) is shown on drawing **Co14503.01-SK200** with details on **SK250**. These are conceptual plans only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

The Staged ESCP considers initial site establishment, requirements during construction of roads and infrastructure and estate earthworks, completion of estate works and the period between this and development of individual lots.

C.2 General Conditions

1. The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in *Managing Urban Stormwater, Soils and Construction (1998) "The Blue Book"* and Council specifications.
3. All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

C.3 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in Table C.1.

Table C.1 Limitations to access

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.

Remaining lands	Entry prohibited except for essential management works	

C.4 Erosion Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
2. Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils remain on the surface at the completion of works.
3. Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
4. Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
5. Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:
   - 2H:1V where slope length is less than 7 metres
   - 2.5H:1V where slope length is between 7 and 10 metres
   - 3H:1V where slope length is between 10 and 12 metres
   - 4H:1V where slope length is between 12 and 18 metres
   - 5H:1V where slope length is between 18 and 27 metres
   - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
9. During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

C.5 Pollution Control Conditions

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways. Silt/ sediment fences and appropriate stabilisation of stockpiles are to be provided as detailed on the drawings.

2. Sediment fences will:

   a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.

   b) Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and

   c) Provide a return of 1 metre upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20-year t_c discharge.

3. Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.

4. Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.

5. Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

C.6 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

C.7 Site Inspection and Maintenance

1. A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:

   - At least weekly.
   - Immediately before site closure.
   - Immediately following rainfall events in excess of 5mm in any 24-hour period.

The self-audit will include:

- Recording the condition of every sediment control device
- Recording maintenance requirements (if any) for each sediment control device
- Recording the volumes of sediment removed from sediment retention systems, where applicable
- Recording the site where sediment is disposed
- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information

2. In addition, a suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report. The responsible person will ensure that:
   - The plan is being implemented correctly
   - Repairs are undertaken as required
   - Essential modifications are made to the plan if and when necessary

The report shall carry a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. Proper drainage will be maintained. To this end drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that,
   - No low points exist that can overtop in a large storm event
   - Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams of installing additional diversion upslope.
   - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include and areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.
6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good, working condition. In particular, attention will be given to:
   a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them
   b) Degradable products to ensure they are replaced as required, and
   c) Sediment removal, to ensure the design capacity or less remains in the settling zone.
9. Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.
10. Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.
11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

EROSION AND SEDIMENT CONTROL
WEEKLY SITE INSPECTION SHEET

LOCATION .....
INSPECTION OFFICER ..... **DATE** .....
SIGNATURE .....

Legend: ☐ OK ☐ Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope "clean" water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of "rill" erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing "around" the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....