



Institute of Applied Technology for Construction

2-44 O'Connell Street, Kingswood NSW 2747



CIVIL ENGINEERING: SSDA DESIGN REPORT

PREPARED FOR
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Civil Engineering: 50% Detailed Design Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
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10.02.21	2	Draft	J. Gilligan	J. Gilligan
04.03.21	3	Draft	A. Carvalhaes	J. Gilligan
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09.06.21	6	SSDA	A. Carvalhaes	J. Gilligan

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1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Gray Puksand to prepare the Civil Engineering design and documentation for the proposed Institute of Applied Technology for Construction (IATC) located at the TAFE NSW Kingswood Campus, in the suburb of Kingswood within the Penrith Local Government Area (LGA).

This report covers the works shown as the Northrop Drawing Package required for the development of the site including:

- Sediment and Soil Erosion Control
- Stormwater Management (Quantity and Quality)

In addition, some commentary has also been provided on bulk earthworks and pavements which will be further developed in the following stages of the project.

1.2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

- Design Standards as provided by Penrith City Council regarding On-site Stormwater Detention (OSD) and water quality.
- Detailed site survey plan provided by Surveying & Spatial Information Services dated 7th February 2020.
- Site survey plan provided by Rygate Surveyors dated 6th November 2020
- Geotechnical Investigation Report prepared by PSM dated 8th December 2020 (PSM4240-004L)

2. Existing Site Conditions

2.1 Subject Site

The Institute of Applied Technology for Construction is to be located at the TAFE NSW Kingswood Campus, in the suburb of Kingswood within the Penrith Local Government Area (LGA). The site is located at 2-44 O'Connell Street, Kingswood and legally described at Lot 1 in Deposited Plan (DP) 866081. It has an area of approximately 22 hectares (ha) and is bound by the Great Western Highway to the north and O'Connell Street to the west. The site directly abuts two residential properties to the south and the Western Sydney University, Werrington Campus to the east.

A proposed building location has been identified by the project Architect in the north eastern portion of the site as shown in Figure 2.



Figure 1 – Existing Site Plan (SIX Maps, 2020)

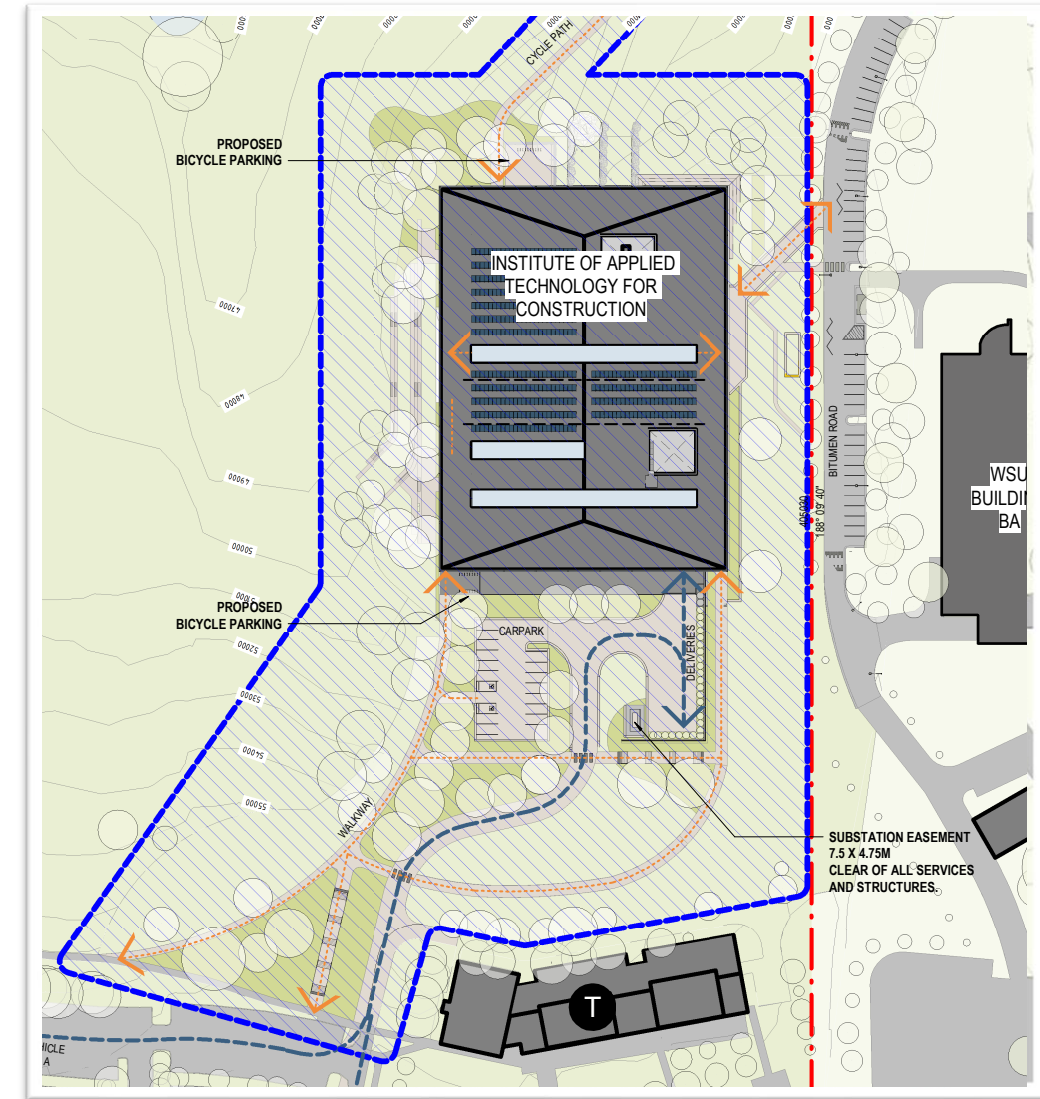


Figure 2 – Proposed Building Layout (Gray Puksand, 2021)

2.2 Site Topography

Levels in the north eastern portion of the site fall from approx. RL 56.00 AHD to RL 50.00m AHD at an approximate grade of 5-6% where the proposed building location has been identified. This corresponds to approximately 6.0m difference in elevation. Beyond the potential building locations, the surface falls at a similar grade to north west towards an existing basin with a permanent pond of water at approx. RL 47.00m AHD.

2.3 Contamination and Geotechnical Conditions

2.3.1 Geotechnical

A Geotechnical Investigation Report has been prepared by PSM dated 8th December 2020 (PSM4240-004L). A design CBR 2% has been recommended for the purposes of new pavement design subject to further testing once bulk earthworks operations have been undertaken.

Further Geotechnical Advice has been sought with regards to ground improvement methodologies to achieve CBR 3% or greater to establish new pavement profiles for the proposed development.

For the purposes of bulk earthworks calculations, a nominal 200mm depth of topsoil has been identified in the Geotechnical Investigation Report that will need to be stripped to expose the natural subgrade material. Topsoil may be stockpiled and ameliorated for reuse / spreading in open space grassed areas.

Temporary and permanent batter slope angles have been nominated in the Geotechnical Investigation Report and have been considered as part of the proposed works as summarised below:

Table 1 – Batter Slopes

Unit	Temporary	Permanent
Engineered Fill / Natural Soil	1.5H: 1V	2H: 1V
Bedrock Units	1H: 1V	1.5H: 1V

Investigation Report Engineer that will need to be revised once the project Geotechnical Engineer has reviewed the proposed earthworks design for the development.

2.3.2 Contamination

A preliminary contamination investigation and report has been undertaken by JBS&G dated 8th December 2020 (59831/134229 Rev A). The report indicates that the risk of contamination at the site is low. It further states that as fill is present at the site, given the nature of the investigation that an unexpected finds protocol for the proposed development works is considered if unidentified contamination is encountered.

2.4 Access to Site

The site has street frontages to the Great Western Highway and O'Connell Street, approximately 550m and 440m in length, respectively.

There are two vehicular entrances to the site along O'Connell Street (Gate 1 North and Gate 2 South), which provide access to internal circulation roadways and car parking however these are not connected. A circulation road extends from the Gate 2 access on O'Connell Street through the site adjacent to buildings along the southern boundary leading to an existing carpark near the proposed development area.

The existing road surfaces are made up of an asphaltic concrete wearing course overlaid on a granular road base material. The condition of the road surface wearing course is variable which has degraded over time.



Figure 3 – Gate 2 Existing Site Access

Remnants of an existing road were observed in the green space central to the existing basin / pond and the eastern boundary. It is understood that this road extended from a private road in an adjacent property to the south, through the green space and once connected with the Great Western Highway. The road is slightly elevated above the surrounding natural surface and covered in vegetation.

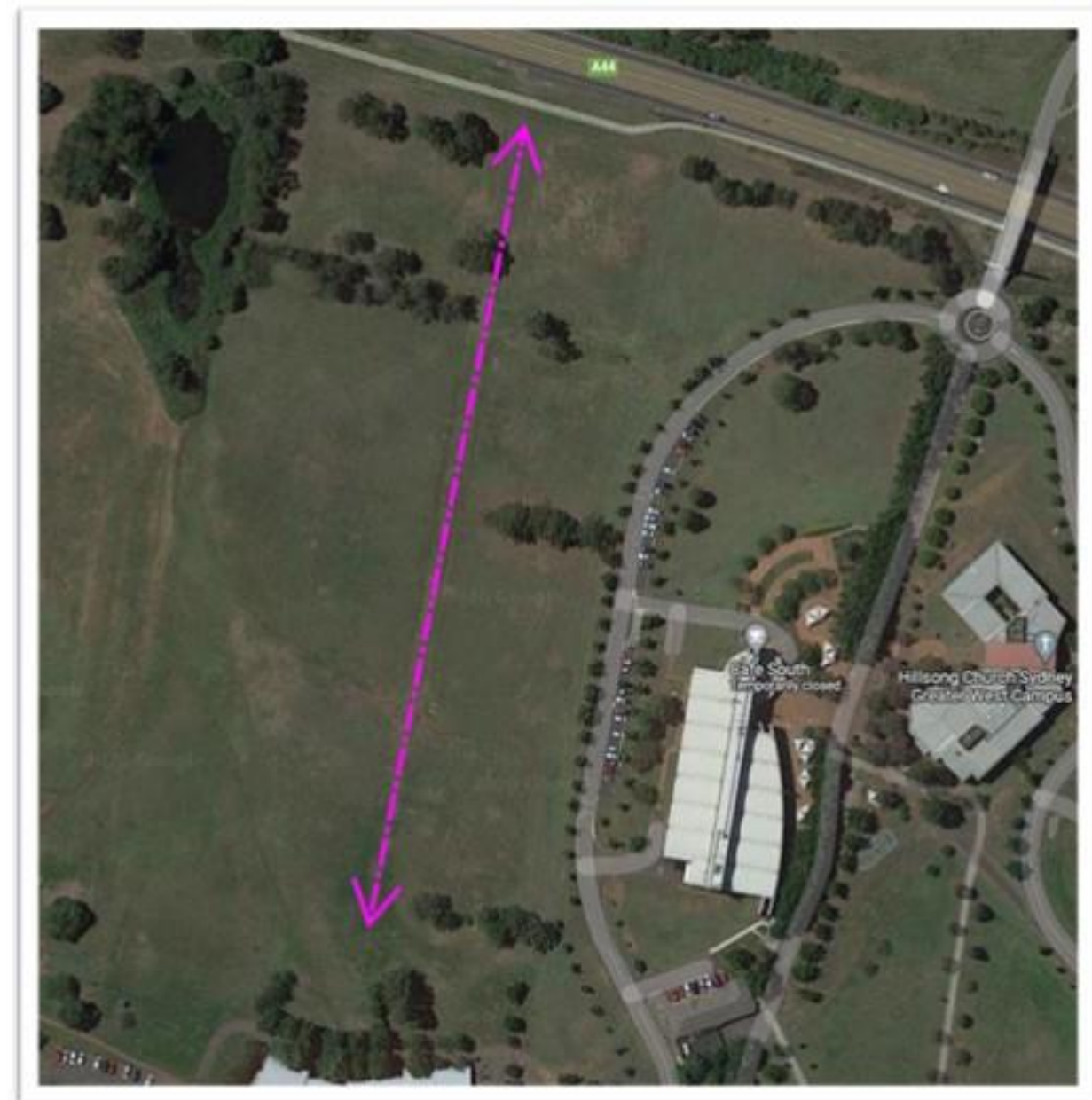


Figure 4 – Remnant Road extending from the Great Western Highway towards Block T

2.5 Existing Infrastructure

Northrop has undertaken a preliminary investigation of existing infrastructure in the vicinity of the proposed development site. Our assessment has been based on limited survey information as well as publicly available information from Penrith City Council, and site inspections undertaken on the 20th September 2020 and 29th October 2020.

2.5.1 Existing stormwater infrastructure

Four headwalls were identified along the northern edge of Building T (3 x 300mm and 1 x 450mm) discharging stormwater to the green space. From here flows are directed north west over land towards the existing basin / pond.

A single headwall was identified in the north east portion of the site discharging flows from Western Sydney University, through the green space. Flows are directed from the headwall in a natural channel west towards the existing basin / pond.

An additional headwall was identified under the remnant road (approx. 450mm diameter) to direct surface flows blocked by the remnant road towards the existing basin / pond

The outlet of the existing pond was not accessible at the time of inspection. Based on limited visibility of the pond, it is understood that water from the pond overflows to another depression outside the property boundary. From here it is piped to a smaller depression before it discharges to the north via a series of headwalls under the Great Western Highway.

On the northern side of the Great Western Highway flows continue north through private property. They are directed under St Charbel Boulevard in a series of box culverts before being conveyed further north.

From review of the Spatial Information Exchange maps data, the depression through the site, the channel extending from Western Sydney University and the basin / pond are plotted as watercourses / tributaries connecting to Werrington Creek. Further consultation with the Office of Water is to be undertaken to determine the constraints associated with these existing features.

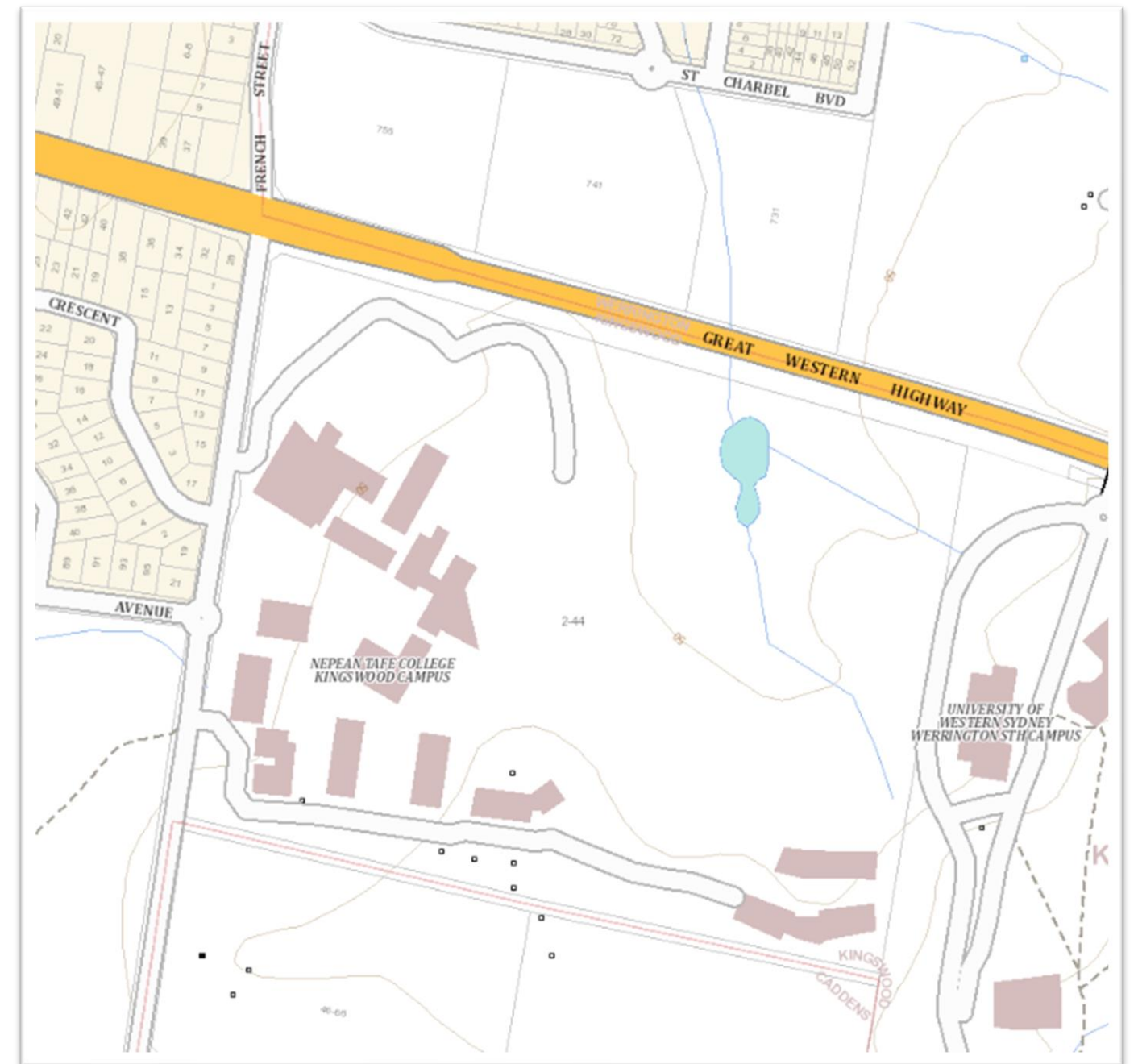


Figure 5 – Existing Site Plan nominating watercourses (SIX Maps, 2020)



Figures 6-10 (Clockwise from top left) - Headwalls near Block T, Flow path from Block T to Basin, Headwall and channel discharging flows from Western Sydney University, Outlet configuration from Basin / Pond in the verge of Great Western Highway, Culvert Crossing under Great Western Highway

2.6 Flooding

From review of the College, Orth and Werrington Creeks Catchment and Overland Flow Study commissioned by Penrith City Council, the site is flood affected to the north in the location of the existing basin / pond up to RL 47.00m AHD for the 1% AEP Flood. The project team have commissioned a Flood Consultant to provide further advice with respect to the existing conditions and the proposed development.



Figure 11 – Peak Design Flood Level for the 1% AEP Flood (College, Orth and Werrington Creeks Catchment Overland Flow Flood Study, June 2017).

3. Sediment and Soil Erosion Control

3.1 Sediment and Erosion Control

The objectives of the erosion and sediment control for the development site will be to ensure:

- Adequate erosion and sediment control measures are applied prior to the commencement of construction and are maintained throughout construction; and
- Construction site runoff is appropriately treated in accordance with Penrith City Council requirements prior to discharge.

As part of the works, the erosion and sedimentation control will need to be provided during the construction phase of the development in accordance with Penrith City Councils requirements and the NSW Department of Housing Manual, "Managing Urban Stormwater Soil & Construction" 2004 (Blue Book) - prior to any earthworks commencing on site.

3.1.1 Sediment Basin

A temporary sediment basin has been designed to capture site runoff during construction and has been located towards the north eastern side of the site, in the lowest point. The construction of the basin will be undertaken in stages to enable maximum runoff capture assisted by diversion swales and direct runoff to the basin.

Calculations to determine the concept design basin size have been based on available geotechnical information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basin is working effectively it will be maintained throughout the construction works. Maintenance includes ensuring adequate settlement times or flocculation and pumping of clean water to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

The pumped water from the sediment basin can be reused for dust control during construction.

Overflow weirs are to be provided to control overflows for rainfall events in excess of the design criteria which caters for a storm event up to and including the 1% AEP storm event.

The concept sediment basin sizing is summarised in the table below. Detailed sediment basin sizing, configuration and location shall form part of the Construction Certificate application.

The sediment basin has been located for future conversion into the permanent water quality basin.

Table 2 – Sediment Basin Volumes

Total Disturbed Area	2.5	Settling zone volume	288m ³
Soil Texture Group	F	Sediment storage volume	144 m ³
Design rainfall depth (days)	5	Total Basin Volume	432m ³
Design rainfall depth (percentile)	80		
x-day, y-percentile rainfall event	27.4		
CV	0.42		

3.1.2 Sediment and Erosion Control Measures

Prior to any earthworks commencing on site, sediment and erosion control measure shall be implemented generally in accordance with the engineering drawings and the "Blue Book". The measures are intended to be a minimum treatment only as the contractor will be required to modify and stage the erosion and sedimentation control measures to suit the construction program, sequencing, and techniques. These measures may include:

- A temporary site security/safety fence is to be constructed around the site, the site office area, and the proposed sediment basin.
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles.
- Dust control measures including covering stockpiles, installing fence hessian and watering exposed areas.
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basin as noted above.
- Stabilised site access at the construction vehicle entry/exits.

Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses or temporary overland flow paths. Sediment fences shall be installed to the downstream side of stockpiles and any embankment formation. All stockpiles and embankment formations shall be stabilised by hydroseeding or hydro mulching on formation.



Figure 12 – Sediment Fence

4. Bulk Earthworks

The proposed works will generally consist of earthworks cut and fill operations to establish working platform levels consistent and reflective of the design of the proposed Institute of Applied Technology For Construction. The levels are to be designed to optimise and balance cut to fill material across the site where possible.

4.1 Construction Sequencing

The sequence of work for the bulk earthworks will generally include:

- Provision of site establishment erosion and sediment control measures typically outlined in this report's section Erosion & Sediment Control.
- Clearing of vegetation from the proposed development site and either removal or mulching.
- Demolition of existing structures and pavements (as required).
- Stripping and stockpiling of topsoil suitable for reuse.
- Inspection of exposed natural material to ensure conformity with design assumptions and requirements.
- Placement of cut to fill layers not greater than 200mm in thickness and compacted to not less than 98% Standard Maximum Dry Density (SMDD) in accordance with the geotechnical report; and
- Spread topsoil to a maximum depth of 200mm and hydroseed or hydro mulch disturbed areas.

5. Pavements

Based on the Geotechnical Investigation Report prepared by PSM dated 8th December 2020 (PSM4240-004L) a design CBR 2% has been recommended for the purposes of new pavement design subject to further testing once bulk earthworks operations have been undertaken.

Further Geotechnical Advice has been sought with regards to ground improvement methodologies to achieve CBR 3% or greater to determine new pavement profiles for the proposed development.

With consideration to traffic loading specified in the Austroads (5.5×10^5 ESAs – 40 Year Design Life), a proposed flexible pavement profile may be as follows:

- 50mm AC10 Wearing Course (Polymer Modified)
- 150mm DGB20 Base Course Material compacted to 98% MMDD
- 350mm DGS40 Subbase Material compacted to 98% MMDD
- Ground Improvement to achieve minimum CBR 3%.

Based on discussion with the broader project team it is understood that the existing road pavements may be utilised during the construction and operational phase of the development within the TAFE site and the adjacent Western Sydney University site.

Further Geotechnical Investigation of existing road pavement profiles will need to be undertaken to assess whether they are suitable for ongoing use during construction and operation of the facility or if upgrades are required.

6. Stormwater Management Strategy

6.1 Stormwater Quantity Management

6.1.1 Stormwater Policy and Guidelines

The stormwater drainage for the proposed Institute of Applied Technology for Construction has been designed to comply with the following guidelines:

- Australian Rainfall and Runoff
- Penrith City Council's Water Sensitive Urban Design (WSUD) Policy (2013)
- Penrith City Council's WSUD Technical Guidelines (2015)
- Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition, March 2004

6.1.2 Stormwater Drainage

6.1.2.1 On-Site Stormwater Detention (OSD)

According to Penrith City Council's Stormwater Drainage Guidelines for Building Developments, On-site Stormwater Detention (OSD) is generally required for all types of developments in the Penrith City Council Local Government area to limit post development flows to predevelopment rates. This is typically provided on most developments to avoid nuisance flooding of downstream properties.

To control flows generated during storm events, water is stored and released at controlled rate on the development site. Storage is typically provided either of the following:

- below ground in a purpose made holding tanks; or
- above ground in landscaped basins or on the surface of hardstand areas such as car parks.

Recent discussion with Penrith City Council has indicated that the proposed development is not required to provide On-site Stormwater Detention. As such it has not been included as a feature of the proposed design. Formal correspondence from Council regarding this matter has been requested.

6.1.2.2 Major / Minor Drainage System

The major/minor approach to stormwater drainage is the recognised drainage concept for urban catchments within the Penrith City Council Local Government Area

The minor drainage system is comprised of below ground pit and pipe network and is designed to control nuisance flooding and enable effective stormwater management for the site. Council requires the minor drainage system to be designed for the critical 5% Annual Exceedance Probability (AEP) with overland flow safely catering for the 1% AEP.

The major drainage system will be designed to control and convey flows from the critical 1% AEP event. This incorporates suitably designed overland flow paths and drainage to direct flows into the OSD, system for all events up to the critical 1% AEP storm event.

In accordance with Council's requirements, overland flow paths are to be designed to contain a 1% AEP storm flow are to be provided over all pipelines that are not designed to cater for this flow. The design of the overland flowpath must consider the velocity-depth hazard.

Modelling has been undertaken to establish a proposed stormwater pit and pipe network. The proposed stormwater network has been documented on civil engineering drawings presented in Appendix B.

6.1.2.3 Connection to Councils Drainage System

Typically outflow pipes from stormwater drainage systems connect either directly to Council's stormwater infrastructure or utilise existing site stormwater connections within the site.

In the vicinity of the proposed development area, both Council's drainage system and any existing pipes appear to be a significant distance away. Flows generated on the site are proposed to discharge via a headwall and be conveyed overland towards the existing basin / pond.

Detailed survey will be required to determine the location and size of existing infrastructure, and where the current pond discharges to the Council stormwater network. Any existing private stormwater infrastructure will have to have condition assessment and capacity modelled before being used as part of the development.

Existing stormwater lines may need to be decommissioned, replaced or extended, and/or rerouted to a suitable connection point within the site.

Ultimately, connection points (in this case analysis of the pond and its overflow / connection) will be subject to Council review and approval following verification of additional survey information.

6.1.3 Proposed System

The 12d drainage Model for the proposed site was developed based upon the following methodology

- The site pit and pipe network are proposed to discharge freely to a headwall and convey flows overland towards the existing basin.
- An indicative pit and pipe network was developed for the proposed siteworks (refer civil engineering plans for details).
- No tailwater conditions have been considered (discharge free to atmosphere).
- 70% of the roof catchment from the new building is to drain directly to rainwater harvesting tank for the 1:100-year storm event which then overflows to the piped network.
- Designs for roof drainage shall be undertaken as either conventional or siphonic drainage by a certified Hydraulic Engineer during the detail design stage of the works.
- For the purposes of modelling, the rainwater tanks are considered full during simulation.
- All paved areas are collected within grated pits and drains.
- 20yr and 100yr ARI events were considered for all standard durations; and
- For the major system (100yr ARI storm event), a conservative blockage factor of 30% has been applied to all stormwater pits within the development area in accordance with Penrith City Council's requirements.
- As part of the proposed stormwater system for the site, connections to the existing headwalls on the northern side of Block T have been proposed to drain the flows to the west of the site and discharge in direction to the pond.
- The pit DIV01\01 has been included in the design to cater for overflows of the 100% blocked upstream catchment scenario on the eastern side of the site. This pit has been designed as a sag pit, with 50% inlet capacity blockage and 50% pipe blockage. The piped system conveys the flows away from the building entrance to the northern side of the site, where it discharges via headwall.

6.1.4 Results

Iterations were performed in the 12d Drainage model to determine the size of the proposed piped network in order to satisfy major / minor system requirements in accordance with Penrith City Council standards.

The proposed piped drainage system has been designed to cater for the 1 in 20-year ARI event leading to the outlet headwall. A provision for overland flows for events greater than the 1 in 20-year ARI event has also been considered on surface not conveying the 1 in 100-year ARI event below ground.

Results indicate that the major / minor system requirements are satisfied at all proposed pits in the development area and that the piped system sufficiently conveys minor storm flows with safe provision for major system flows.

6.2 Stormwater Quality Management

The stormwater management system for the site shall comply with section 3.2 of Penrith City Council's Water Sensitive Urban Design Policy. Council's policy requires improved water quality of the stormwater flow from the developed site prior to discharge into the authority's drainage system.

Council also requires the removal of target pollutants from the site during the construction phase as vehicles that may enter or exit could generate various pollutants such as silt, oil and grease. These target pollutants can be identified into five major groups of stormwater pollutants:

- Gross Pollutants
- Coarse, medium, and fine sediments
- Oil and grease
- Heavy Metals and
- Nutrients

6.2.1 Water Quality Objectives

In accordance with section 3.2 of Penrith City Council's Water Sensitive Urban Design Policy, we note the following targets have been set in relation to stormwater quality

Table 3 – Pollutant Reduction Targets

Reduction in annual average suspended solids (SS) export load	85%
Reduction in annual average total phosphorus (TP) export load	60%
Reduction in annual average total nitrogen (TN) export load	45%
Reduction in annual average gross pollutants (GP) export load	90%

To demonstrate compliance with Penrith City Council's Water Sensitive Urban Design (WSUD) Policy (2013), treatment removal loads will be analysed from pre-to post development scenarios using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) for the main building works. It should be noted that there are some smaller areas of footpaths being provided to replace existing paths through the development site which are considered periphery works not included as part of the model.

Model development and results will be provided in subsequent reports and documentation for further review incorporating a combination of various treatment devices as described below.

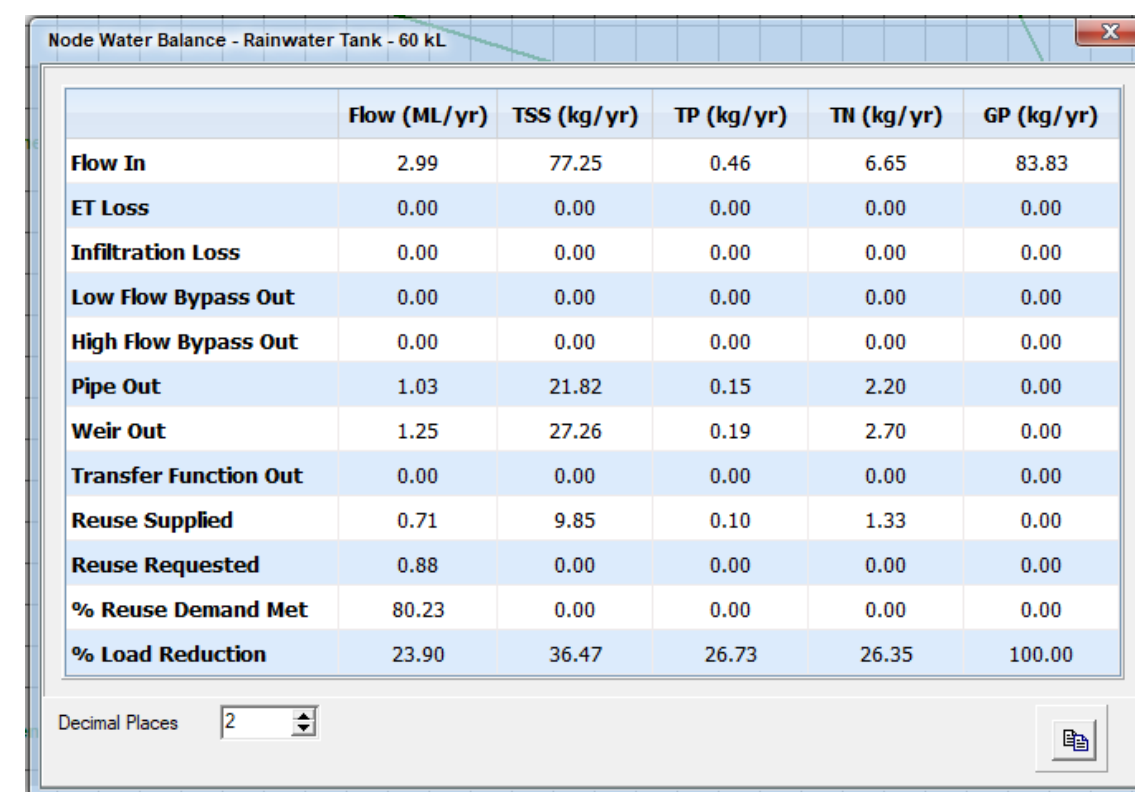
6.2.2 Proposed Treatments

Possible stormwater quality treatment devices such as StormFilter Cartridges, Ocean guard Pit Inserts and Rainwater Tanks are discussed below

6.2.2.1 Rainwater Tank

A 60 kL Rainwater Tank is proposed for this development in accordance with the Penrith's Council WSUD policy. The rainwater tank should be able to cater for at least 80% of the non-potable demand of the development.

The rainwater should provide water for flushing for the 34 toilets in the building. The adopted reuse rate is 0.1kL/day per toilet. As the site will only be occupied 5 days of the week, the daily reuse rate has been proportioned by 5/7, resulting in a reuse rate of 2.428kL/day.



	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	GP (kg/yr)
Flow In	2.99	77.25	0.46	6.65	83.83
ET Loss	0.00	0.00	0.00	0.00	0.00
Infiltration Loss	0.00	0.00	0.00	0.00	0.00
Low Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
High Flow Bypass Out	0.00	0.00	0.00	0.00	0.00
Pipe Out	1.03	21.82	0.15	2.20	0.00
Weir Out	1.25	27.26	0.19	2.70	0.00
Transfer Function Out	0.00	0.00	0.00	0.00	0.00
Reuse Supplied	0.71	9.85	0.10	1.33	0.00
Reuse Requested	0.88	0.00	0.00	0.00	0.00
% Reuse Demand Met	80.23	0.00	0.00	0.00	0.00
% Load Reduction	23.90	36.47	26.73	26.35	100.00

Figure 13: Node Water Balance Results

6.2.2.2 Stormfilter Cartridges

Filtration cartridges in the form of Stormfilters are to be provided as an end of line treatment device to treat stormwater runoff from the proposed development. The Stormfilter system targets a full range of pollutants including total suspended solids, soluble heavy metals, oil and grease and total nutrients. Each cartridge has a treatable flow rate of 1~1.6L/s and is designed to capture and treat the first flush volume of a rainfall event.

In developing the MUSIC model for the proposed works, an offline 12 x 690mm cartridge system by Ocean Protect has been proposed as an end of line treatment prior to discharge. The position of the Stormfilter units have been proposed to maximise flows and allow easy access for maintenance.

6.2.2.3 Ocean Guard Pit Inserts

Surface Inlet Pits within the development area have been designed to be provided with Ocean Guard Pit Inserts including oil absorbent media. The pit inserts will sit beneath the stormwater pit grates and will collect gross pollutants and larger sediments prior to treatment by the Stormfilter cartridges.

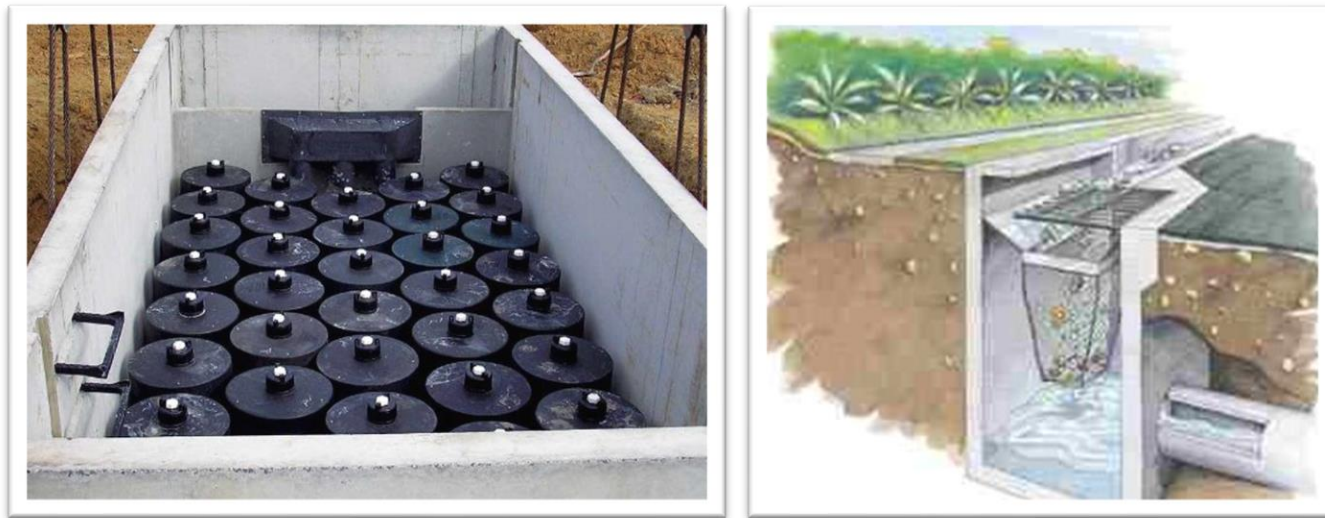


Figure 14 (Left) – Stormfilter Cartridge System, Figure 14 (Right) – Stormwater Pit Litter Basket Insert

6.2.3 Water Quality Modelling – MUSIC Model, Parameters and Methodology

A water quality modelling tool, MUSIC was utilised to simulate urban stormwater systems operating at a range of temporal and spatial scales. MUSIC Models the total amount of gross pollutants and nutrients produced within various types of catchments. It allows the user to simulate the removal rates expected with implementing removal filters to reduce the increased gross pollutant and nutrient levels created by the proposed development.

The following methodology and parameters were incorporated in the MUSIC Modelling

- The MUSIC model was created to assess the effectiveness of water quality nodes which are to be constructed as part of the proposed development
- In accordance with Council's requirements Penrith MUSIC link and standard nodes have been used in the model.
- A Music Model was established to represent the post-developed site. From architectural plans, the site was then categorized into the following areas
 - Roof
 - Road
 - Hardstand
 - Landscape

A treatment train was designed to incorporate a series of treatment nodes including a Rainwater Tank, Stormfilter Cartridges, Ocean Guard Pit Inserts. The effectiveness of the proposed treatments is summarised below.

6.2.4 Results

The following results were achieved in the model

Table 4 – Ocean Guard MUSIC Input Parameters (upstream of Stormfilter)

Pollutant	Post-Development with no WSUD measures (kg/yr.)	Post-Development with WSUD measures (kg/yr.)	Removal Rate (%)	Target Removal Rate (%)
Suspended Solids (mg/L)	914	136	85.1	85
Phosphorus (mg/L)	1.99	0.736	63.1	60
Nitrogen (mg/L)	17.3	9.35	45.9	45
Gross Pollutants (kg/ML)	179	0	100	90

Results of the MUSIC analysis indicate that the proposed treatment train consisting of a 60kL Rainwater Tank, 14 x Stormfilter Cartridges and 16 x Ocean Guard Pit Inserts generally satisfies Council's statutory requirements for target pollutant removal rates.

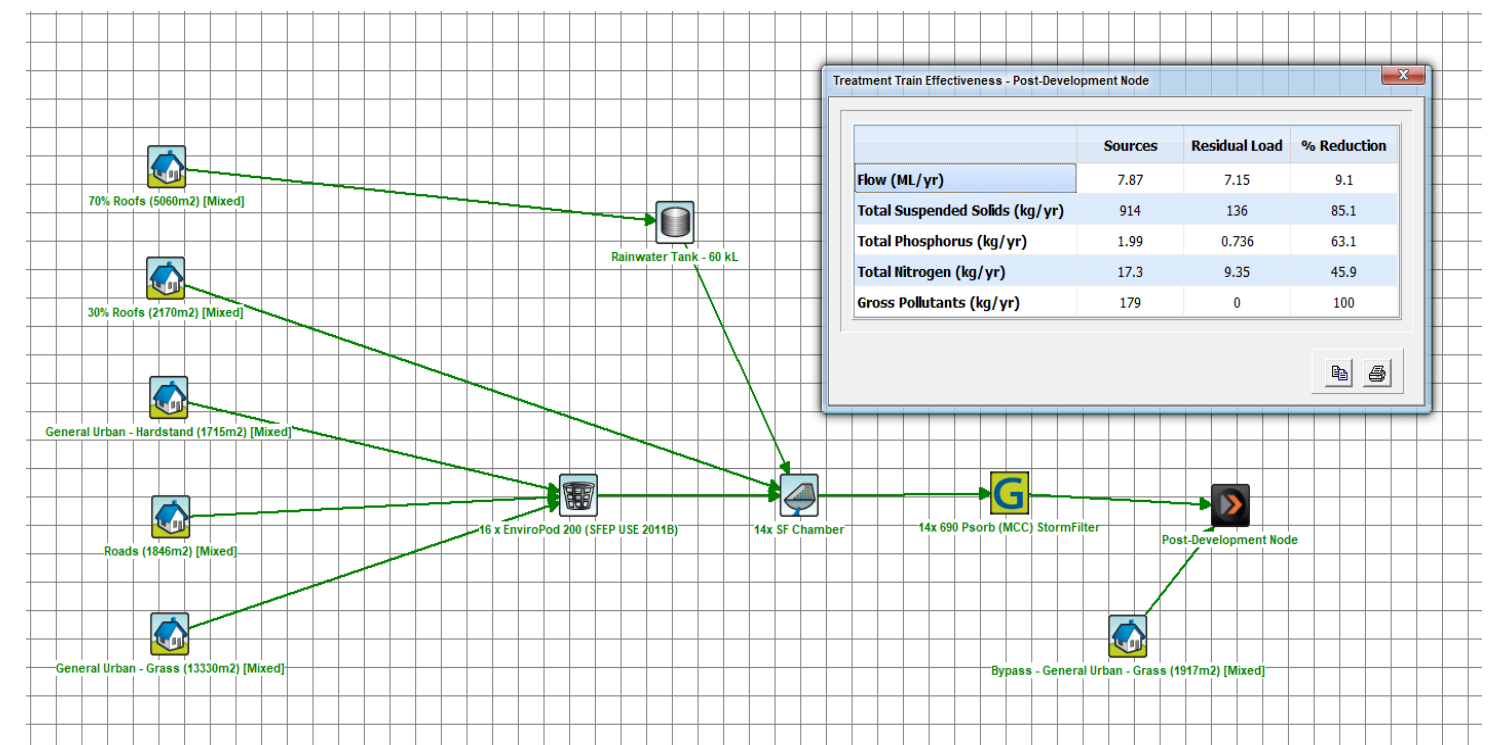


Figure 15 – MUSIC Model and Results

7. Conclusion

In summary, the requirements for the proposed development are as follows:

- Stormwater Infrastructure – OSD storage is not required based on discussion with Penrith City Council. Water Quality measures will be required for the proposed development. Water quality treatment is achieved using a rainwater tank, propriety filter cartridge devices and pit insert baskets.
- On-going maintenance of water quality and quantity systems will be required for the development. As the design for the proposed development is progressed, information regarding on-going maintenance costs will be considered by the Project Team to ensure systems are financially feasible for the operational life of the development.
- Development runoff is generally distributed to suit the drainage direction of existing catchment areas. On this basis, stormwater from the proposed development is proposed to drain over land towards the existing pond / basin to the north west before discharge to the creek in direction to the Great Western Highway.

Appendix A – MUSIC Results

MUSIC-*link* Report

Project Details		Company Details	
Project:	202025	Company:	Northrop Consulting Engineers
Report Export Date:	9/06/2021	Contact:	Jack Grinsell
Catchment Name:	21.06.08 - WSCH WSUD	Address:	Level 2, 3 Horwood Pl Parramatta
Catchment Area:	2.604ha	Phone:	0424253330
Impervious Area*:	41.43%	Email:	jgrinsell@northrop.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	Reduction	Node Type	Number	Node Type	Number
Flow	9.08%	Sedimentation Basin Node	1	Urban Source Node	6
TSS	85.1%	Rain Water Tank Node	1		
TP	63.1%	GPT Node	1		
TN	45.9%	Generic Node	1		
GP	100%				

Comments

Proprietary nodes from Ocean Protect causing non compliances

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	16 x EnviroPod 200 (SFEP USE 2011B)	Hi-flow bypass rate (cum/sec)	None	99	0.32
Post	Post-Development Node	% Load Reduction	None	None	9.08
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	45	None	45.9
Post	Post-Development Node	TP % Load Reduction	60	None	63.1
Post	Post-Development Node	TSS % Load Reduction	85	None	85.1
Rain	Rainwater Tank - 60 kL	% Reuse Demand Met	80	None	80.2323
Sedimentation	14x SF Chamber	High Flow Bypass Out (ML/yr)	None	None	0
Urban	30% Roofs (2170m2)	Area Impervious (ha)	None	None	0.217
Urban	30% Roofs (2170m2)	Area Pervious (ha)	None	None	0
Urban	30% Roofs (2170m2)	Total Area (ha)	None	None	0.217
Urban	70% Roofs (5060m2)	Area Impervious (ha)	None	None	0.506
Urban	70% Roofs (5060m2)	Area Pervious (ha)	None	None	0
Urban	70% Roofs (5060m2)	Total Area (ha)	None	None	0.506
Urban	Bypass - General Urban - Grass (1917m2)	Area Impervious (ha)	None	None	0
Urban	Bypass - General Urban - Grass (1917m2)	Area Pervious (ha)	None	None	0.192
Urban	Bypass - General Urban - Grass (1917m2)	Total Area (ha)	None	None	0.192
Urban	General Urban - Grass (13330m2)	Area Impervious (ha)	None	None	0
Urban	General Urban - Grass (13330m2)	Area Pervious (ha)	None	None	1.333
Urban	General Urban - Grass (13330m2)	Total Area (ha)	None	None	1.333
Urban	General Urban - Hardstand (1715m2)	Area Impervious (ha)	None	None	0.171
Urban	General Urban - Hardstand (1715m2)	Area Pervious (ha)	None	None	0
Urban	General Urban - Hardstand (1715m2)	Total Area (ha)	None	None	0.171
Urban	Roads (1846m2)	Area Impervious (ha)	None	None	0.185
Urban	Roads (1846m2)	Area Pervious (ha)	None	None	0
Urban	Roads (1846m2)	Total Area (ha)	None	None	0.185

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	14xSF Chamber	Notional Detention Time (hrs)	8	12	0.0909
Sedimentation	14xSF Chamber	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	14xSF Chamber	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	14xSF Chamber	Total Suspended Solids - k (m/yr)	8000	8000	1

Only certain parameters are reported when they pass validation

Appendix B – Engineering Plans

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

SCHEMATIC DESIGN CIVIL ENGINEERING PACKAGE



LOCALITY PLAN

DRAWING SCHEDULE	
DRG No.	DRAWING TITLE
C01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
C01.11	SPECIFICATION NOTES SHEET 01
C01.12	SPECIFICATION NOTES SHEET 02
C01.13	SPECIFICATION NOTES SHEET 03
C01.21	GENERAL ARRANGEMENT PLAN
C02.01	SEDIMENT AND SOIL EROSION PLAN
C02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS
C03.01	BULK EARTHWORKS CUT TO FILL PLAN
C04.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01
C04.02	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 02
C04.61	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03
C04.04	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04
C04.05	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 05
C04.21	STORMWATER LONGITUDINAL SECTIONS - SHEET 01
C04.22	STORMWATER LONGITUDINAL SECTIONS - SHEET 02
C04.23	STORMWATER LONGITUDINAL SECTIONS - SHEET 03
C04.24	STORMWATER LONGITUDINAL SECTIONS - SHEET 04
C04.25	STORMWATER LONGITUDINAL SECTIONS - SHEET 05
C04.26	STORMWATER LONGITUDINAL SECTIONS - SHEET 06
C04.51	STORMWATER CATCHMENT PLAN
C04.61	STORMWATER MANAGEMENT DEVICES


DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:
DRAWN: C. PASKE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21

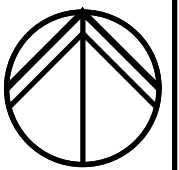


DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS
VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT




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PROJECT

INSTITUTE OF APPLIED
TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

COVER SHEET, DRAWING
SCHEDULE AND LOCALITY PLAN

JOB NUMBER

202025

DRAWING NUMBER

C01.01

REVISION

02

DRAWING SHEET SIZE = A1

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH PENRITH CITY COUNCIL DEVELOPMENT GUIDELINES .THE FOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

ACCESS AND SAFETY

1. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING TRAFFIC CONTROL.

2. THE CONTRACTOR SHALL PROVIDE TRAFFIC MANAGEMENT PLANS FOR THE PROPOSED WORKS COMPLETED BY A SUITABLY QUALIFIED PERSON AND APPROVED BY COUNCIL / REGULATORY AUTHORITY. WORK IS NOT TO COMMENCE ON SITE PRIOR TO APPROVAL OF TRAFFIC MANAGEMENT SCHEME.

3. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES ACCESS TO BUILDINGS ADJACENT THE WORKS IS NOT DISRUPTED.

4. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS THROUGH OR BY THE SITE.

5. THE CONTRACTOR SHALL ENSURE PUBLIC ACCESS EXTERNAL TO THE SITE IS IN ACCORDANCE WITH COUNCILS / AUTHORITY / SITE MANAGERS REQUIREMENTS.

TREE PROTECTION

1. REFER TO LANDSCAPE PLAN FOR TREES TO BE RETAINED AND PROTECTED.

2. ANY EXISTING/PROPOSED TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:

2.1. PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE.

2.2. ENSURING THAT NOTHING IS NAILED TO ANY PART OF THE TREE.

2.3. CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY. COUNCILS AND/OR INDEPENDENT ARBORISTS TO BE CONSULTED WHERE TREE ROOTS ARE TO BE REMOVED AND/OR CUT.

SEDIMENT AND SOIL EROSION

1. THE SEDIMENT & EROSION CONTROL PLAN PRESENTS CONCEPTS ONLY. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT & MANAGEMENT OF A DETAILED SCHEME MEETING COUNCILS AND OTHER REGULATORY AUTHORITY REQUIREMENTS AND MAKE PAYMENT OF ALL FEES.

2. THE CONTRACTOR SHALL INSTIGATE ALL SEDIMENT AND EROSION CONTROL MEASURES IN ACCORDANCE WITH STATUTORY REQUIREMENTS AND IN PARTICULAR THE 'BLUE BOOK' (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION), PRODUCED BY THE DEPARTMENT OF HOUSING AND COUNCILS POLICIES. THESE MEASURES ARE TO BE INSPECTED AND MAINTAINED ON A DAILY BASIS.

3. THE CONTRACTOR SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THE DRAWINGS AND ADHERE TO ALL REGULATORY AUTHORITY REQUIREMENTS.

4. THE CONTRACTOR SHALL INFORM ALL SUB CONTRACTORS OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSTREAM LANDS AND WATERWAYS.

5. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE;

5.1.CONSTRUCT TEMPORARY STABILISED SITE ACCESS INCLUSIVE OF SHAKE DOWN / WASH PAD.

5.2.INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ADJACENT EACH OTHER, THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE.

5.3.INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THE APPROVED PLANS.

6. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MINIMUM WORKABLE SIZE.

7. AT ALL TIMES AND IN PARTICULAR DURING WINDY AND DRY WEATHER, LARGE UNPROTECTED AREAS WILL BE STABILISED / KEPT MOIST (NOT WET) TO KEEP DUST UNDER CONTROL ENSURING CONFORMITY TO REGULATORY AUTHORITY REQUIREMENTS.

8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) SHALL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.

9. WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN STABILISED AND/OR ANY LIKELY SEDIMENT BEEN FILTERED OUT.

10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES SHALL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE STABILISED / REHABILITATED.

11. ALLOW FOR GRASS STABILISATION OF EXPOSED AREAS, OPEN CHANNELS AND ROCK BATTERS DURING ALL PHASES OF CONSTRUCTION.

12. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN REGULARLY AND AS REQUIRED, PARTICULARLY FOLLOWING RAIN EVENTS.

13. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS. CONTRACTOR TO PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.

14. IF A TEMPORARY SEDIMENT BASIN IS REQUIRED, ENSURE SAFE BATTER SLOPES IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. MAINTAIN ADEQUATE STORAGE VOLUME IN ACCORDANCE WITH PLANS. TEMPORARY PUMP 'CLEAN FLOCCULATED' WATER TO AUTHORITIES STORMWATER SYSTEM. ENSURE WHOLE DISTURBED SITE RUN-OFF IS DIRECTED TO TEMPORARY SEDIMENT BASIN.

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIAL BEFORE YOU DIG SEARCHES, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY. NOTE SERVICE AUTHORITY REQUIREMENTS FOR LOCATING OF SERVICES PRIOR TO COMMENCEMENT OF WORKS.

2. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS ARE TO BE UNDERTAKEN OVER COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.

3. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AT THE CONTRACTORS EXPENSE.

4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE ADJUSTMENT (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.

5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.

6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS ARE NOT AFFECTED BY THE WORKS AND ARE MAINTAINED AND NOT DISRUPTED.

7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.

8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.

9. THE CONTRACTOR IS TO ALLOW TO POTHOLE ANY SERVICES WITHIN A PUBLIC RESERVE. WITHIN THE EXTENT OF WORKS (E.G. STORMWATER CROSSINGS).

EARTHWORKS

1. AT THE COMMENCEMENT OF FILLING OPERATIONS FOR BULK EARTHWORKS A GEOTECHNICAL ENGINEER IS TO VISIT THE SITE & CONFIRM THE SUITABILITY OF THE METHODOLOGY OF ACHIEVING THE REQUIRED COMPACTION EARTHWORKS REQUIREMENTS. LEVEL 1 SUPERVISION IS REQUIRED FOR EARTHWORKS OPERATIONS.

2. STRIP TOPSOIL, VEGETABLE MATTER AND RUBBLE TO EXPOSE NATURALLY OCCURRING MATERIAL AND STOCKPILE ON SITE AS DIRECTED BY THE SUPERINTENDENT.

3. WHERE FILLING IS REQUIRED TO ACHIEVE DESIGN SUBGRADE, PROOF ROLL EXPOSED NATURAL SURFACE WITH A MINIMUM OF TEN PASSES OF A VIBRATING ROLLER (MINIMUM STATIC WEIGHT OF 10 TONNES) IN THE PRESENCE OF THE SUPERINTENDENT OR CERTIFYING ENGINEER.

4. THE CONTRACTOR IS TO ALLOW FOR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO PROVIDE ADVICE AND CERTIFICATION OF ANY WORKS ASSOCIATED WITH TREATING OR MANAGING UNSUITABLE GROUND CONDITIONS THROUGHOUT THE CONTRACT (e.g. STABILITY OF EXCAVATIONS, POOR SUBGRADE, THE EXISTING QUARRY AREA etc).

5. ALL SOFT, WET OR UNSUITABLE MATERIAL IS TO BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND REPLACED WITH APPROVED MATERIAL SATISFYING THE REQUIREMENTS BELOW.

6. PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.

7. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS (LOOSE) AND COMPACTED AT OPTIMUM MOISTURE CONTENT (+ OR - 2%) TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289.2.1.1, AS1289.5.7.1 AND AS1289.5.8.0 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY;

8. TESTING OF THE SUBGRADE SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. REGISTERED LABORATORY AT THE CONTRACTORS EXPENSE UNLESS AGREED DIFFERENTLY WITH THE PRINCIPAL.

9. ALLOW THE FOLLOWING COMPACTION TESTING BY N.A.T.A. REGISTERED LABORATORY FOR PLATFORMS AND FILL LAYERS IN ACCORDANCE WITH THE LATEST VERSION OF AS3798. (MINIMUM 3 TESTS PER LAYER) OR 1 TEST PER MATERIAL TYPE PER 2500sq.m OR 1 TEST.

10. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT (TYNNING FIRST AS NECESSARY) AND RETEST UNTIL SPECIFIED COMPACTION STANDARDS ARE ACHIEVED, OTHERWISE SUBGRADE REPLACEMENT IS REQUIRED IF COMPACTION STANDARDS ARE NOT ACHIEVED.

11. ALLOW FOR EXCAVATION IN ALL MATERIALS AS FOUND U.N.O. NO ADDITIONAL PAYMENTS WILL BE MADE FOR EXCAVATION IN WET OR HARD GROUND.

LOCATION

LANDSCAPED AREAS

ROADS

COUNCIL SPECIFICATIONS)

PAVED AREAS

COUNCIL SPECIFICATIONS)

COMPACTATION REQUIREMENT

98% SMDD

100% SMDD (IN ACCORDANCE WITH

100% SMDD (IN ACCORDANCE WITH COUNCIL SPECIFICATIONS)

EARTHWORKS (cont)

12. WHERE THERE IS INSUFFICIENT EXCAVATED MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING;

11. BE OF VIRGIN EXCAVATED NATURAL MATERIAL OR

12. CONTRACTOR TO PROVIDE EVIDENCE IMPORT IS SUITABLE FOR USE

13. PLASTICITY INDEX BETWEEN 2-15% AND CBR > 8

14. FREE FROM ORGANIC AND PERISHABLE MATTER

15. MAXIMUM SIZE 50mm, PASSING 75 MICRON SIEVE (<25%)

2. THE CONTRACTOR SHALL PROGRAM THE EARTHWORKS OPERATION SO THAT THE WORKING AREAS ARE ADEQUATELY DRAINED DURING THE PERIOD OF CONSTRUCTION. THE SURFACE SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLERS MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED AT THEIR COST.

12. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND CONSTRUCTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST.

DEEP EXCAVATIONS

13. PRIOR TO THE COMMENCEMENT OF EXCAVATION WORKS GREATER THAN 15m IN DEPTH, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO DETERMINE THE STABILITY OF MATERIAL BEING EXCAVATED AND BENCHING REQUIREMENTS / MINIMUM BATTER SLOPES.

14. THE CONTRACTOR MUST PROVIDE THE SUPERINTENDENT AND OR THE DESIGN ENGINEER WITH A COPY OF THE GEOTECHNICAL ENGINEERS REPORT PRIOR TO PRACTICAL COMPLETION.

15. THE CONTRACTOR IS TO PROVIDE SAFETY BARRIERS, FENCING AND THE LIKE IN ACCORDANCE WITH OH&S AND REGULATORY AUTHORITY REQUIREMENTS AND TO ENSURE THE WORK SITE IS SAFE AT ALL TIMES.

LANDSCAPING

1. REFER TO DRAWINGS BY OTHERS FOR DETAILS OF PROPOSED LANDSCAPING TREATMENT.

2. IF NO LANDSCAPING PLANS EXIST OR PLANS DO NOT SPECIFY GENERAL SURFACE STABILISATION THEN ALL DISTURBED SURFACE TO BE TEMPORARILY STABILISED WITH HYDROMULCH UPON COMPLETION OF WORKS. A 500mm STRIP OF TURF (CT2 COUCH) IS TO BE PLACED BEHIND ALL NEW KERB.

STORMWATER DRAINAGE

1. ALL PIPES SHALL BE CLASS 2 RUBBER-RING JOINTED RCP U.N.O. WHERE uPVC PIPES HAVE BEEN SPECIFIED, THE FOLLOWING CLASS PIPEWORK IS TO BE ADOPTED U.N.O. ø100mm OR LESS TO BE CLASS 'SN10' AND ABOVE ø100mm TO BE CLASS 'SN8'. CLASS 4 PIPES ARE TO BE USED WHERE COVER OVER THE PIPE IS BELOW 600mm AND BENEATH A TRAFFICABLE PAVEMENT.

2. uPVC STORMWATER LINES PASSING UNDER FLOOR SLABS TO BE CONCRETE ENCASED.

3. FRC PIPES EQUAL TO THAT OF THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED SUBJECT TO APPROVAL FROM THE SUPERINTENDENT.

4. ALL PIPE ARE TO BE LAID AT 1.0% MIN GRADE U.N.O.

5. COVERS

5.1. USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS.

5.2. ALL COVERS AND GRATES TO BE POSITIONED IN A FRAME AND MANUFACTURED AS A UNIT

5.3. ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS

5.4. OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES. CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.

5.5. UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.

5.6. ALL GRATED TRENCH DRAINS SHOULD BE 'CLASS D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.

6. ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.

7. ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH FINISH.

7. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT

8. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.

9. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.

10. BEDDING SHALL BE U.N.O TYPE HS2 UNDER ROADS AND H2 UNDER GENERAL AREAS IN ACCORDANCE WITH CURRENT RELEVANT INDUSTRY STANDARDS AND GUIDELINES.

11. THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST TO THE CONTRACT.

12. NOTE THAT THE PIT COVER LEVEL NOMINATED IN GUTTERS ARE TO THE INVERT OF THE GUTTER WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER. REFER KERB DETAILS FOR CONFIRMATION.

SUBSOIL DRAINAGE

13. ø100mm SUBSOIL DRAINAGE LINES WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;

13.1. THE HIGH SIDE OF PROPOSED TRAFFICKED PAVEMENT AREAS.

13.2. ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.

13.3. BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).

13.4. UPSTREAM OF STORMWATER PITS

13.5. BENEATH FLEXIBLE PAVEMENT ALONG A SAG PROFILE

13.6. ALL OTHER AREAS SHOWN ON DRAWINGS.

13.7. CONTRACTOR IS TO MAKE ALLOWANCE IN BOTH TENDER AND CONSTRUCTION COSTING TO ALLOW FOR SUBSURFACE DRAINAGE BEHIND ALL RETAINING WALLS / ABOVE LOCATIONS AND TO MAKE CONNECTION TO STORMWATER SYSTEM.

14. WHERE SUBSOIL DRAINAGE PASSES BENEATH BUILDINGS / PAVED AREAS AND/OR PAVEMENTS. CONTRACTOR TO ENSURE ø100mm CLASS 'SN10' uPVC DRAINAGE LINE IS USED AND THAT PROPRIETARY FITTINGS ARE USED TO RECONNECT SUBSOIL DRAINAGE LINE.

15. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS / CLEAROUTS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH COUNCIL SPECIFICATIONS. HOWEVER AS A MINIMUM THEY ARE TO BE PLACED AT MAXIMUM 30m CENTRES AND AT ALL UPSTREAM ENDPOINTS, AS WELL AS ALL CHANGES OF DIRECTION AND JUNCTIONS.

16. PROVIDE 3.0m LENGTH OF ø100 SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.

17. IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE, LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC A34.

18. THE CONTRACTOR IS TO ENSURE THAT A MINIMUM 150mm CLEARANCE IS PROVIDED BETWEEN THE INTERNAL FACE OF PIPE AND ADJACENT INTERNAL PIT WALLS

19. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK. (E.G. CLEAN 5-12mm AGGREGATE)

PRECAST STORMWATER PITS

1. THE USE OF PRE-CAST STORMWATER DRAINAGE PITS IS NOT ACCEPTED WITHOUT CONFIRMATION BETWEEN NORTHROP ENGINEERS AND THE CONTRACTOR REGARDING QUALITY CONTROL AND CERTIFICATION OF FINISHES.

2. REFER MANUFACTURERS SPECIFICATIONS FOR INSTALLATION GUIDELINES.

3. PRECAST PIT TO BE PLACED ON MINIMUM 150mm THICK CONCRETE PAD AND BED MINIMUM 50mm WHILST CONCRETE IS STILL PARTIALLY WET.

4. ENSURE PENETRATION IS CORED THROUGH PIT FACE TO ALLOW CONNECTION AND IS NOT OVERSIZED.

5. ENSURE A SEALED FINISH AT PIPE CONNECTIONS BY HAND-APPLYING MINIMUM 150mm THICK CONCRETE AROUND PIPE AT THE EXTERNAL FACE OF THE PIT. ENSURE CONCRETE DOES NOT AFFECT THE INTEGRITY OF THE SUBSOIL DRAINAGE CONNECTED TO THE PIT.

6. ENSURE A SMOOTH SEALED FINISH AT PIPE CONNECTIONS BY HAND APPLYING CONCRETE AROUND THE PIPE ON THE INTERNAL FACE OF THE PIT TO FILL IN ANY VOIDS CREATED WHEN PENETRATION FOR THE PIPE WAS CORED.

7. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT.

8. ENSURE THE OUTLET PIPE IS CONNECTED AT THE INVERT LEVEL OF THE PIT TO DRAIN. ALTERNATIVELY FILL THE BASE OF THE PIT WITH MASS CONCRETE (MIN 50mm THICK) OR APPROVED GROUTING COMPOUND (LESS THAN 50mm THICK) TO DRAIN.

9. PROVIDE CONCRETE BENCHING TO SIDES OF PIT TO SUIT PIPE DIAMETER. HEIGHT TO MATCH MINIMUM 1/3 PIPE DIAMETER.

RAINWATER REUSE

1. PROVIDE RAINWATER RE-USE SYSTEM TO SUPPLY WATER FOR IRRIGATION OR FOR OTHER USES AS NOTED.

2. GUTTER GUARD TO BE INSTALLED ON ALL EAVES GUTTERS.

3. PRESSURE PUMP / TAP TO BE PROVIDED FOR THE REUSE OF CAPTURED TANK WATER.

4. A PERMANENT SIGN IS TO BE LOCATED IN THE VICINITY OF THE TANK STATING THE WATER IS "NON POTABLE WATER" WITH APPROPRIATE HAZARD IDENTIFICATION.

5. ALL RAINWATER SERVICES SHALL BE CLEARLY LABELED "NON POTABLE WATER" WITH APPROPRIATE HAZARD IDENTIFICATION.

6. PIPEWORK USED FOR RAINWATER SERVICES SHALL BE COLOURED LILAC IN ACCORDANCE WITH AS1345.

7. ALL VALVES AND APERTURES SHALL BE CLEARLY AND PERMANENTLY LABELED WITH SAFETY SIGNS TO COMPLY WITH AS1319.

8. AN AIR GAP OR RPZD MUST BE INSTALLED TO ENSURE BACKFLOW PREVENTION (IF MAINS 'TOP UP' / BYPASS UTILISED)

9. RAINWATER TANK RETICULATION SYSTEM AND MAINS WATER BYPASS ARRANGEMENT TO BE INSTALLED IN ACCORDANCE WITH AS/NZS 3500.12-2003 AND THE NSW CODE OF PRACTICE - PLUMBING AND DRAINAGE.

10. A FIRST FLUSH FILTRATION DEVICE IS REQUIRED TO BYPASS THE FIRST 1mm OF RAINWATER.

SIGNAGE AND LINEMARKING

1. ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS 1742 / RMS STANDARDS AND SPECIFICATIONS.

2. LINE MARKING AND PAINT SHALL BE IN ACCORDANCE WITH AS1742.3 AND RMS STANDARDS.

3. PAINT SHALL BE TYPE 3 CLASS 'A' AND THE COLOUR SHALL BE WHITE AND NOT SUBJECT TO DISCOLOURATION BY BITUMEN FROM ROAD SURFACE. ALL PAINT TO BE APPLIED BY MECHANICAL SPRAYER. LINE MARKING SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm

4. PAINT SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm.

5. CARPARK LINEMARKING TO BE 80mm WIDE.

6. WHEEL STOPS TO BE PROVIDED FOR PARKING SPOTS ADJACENT TO A WALL WITHIN 1.1m OF THE FACE OF KERB IN ACCORDANCE WITH AS1428.1

7. REFER TO AUSTRROADS FOR REMOVAL OF LINEMARKING.

SITEWORKS

1. ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL / REGULATORY AUTHORITIES REQUIREMENTS, ALL SPECIFICATIONS AND AUSTRALIAN STANDARDS. CONFLICTS BETWEEN SAID DOCUMENTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.

2. THE CONTRACTOR IS TO REVIEW THE DRAWINGS PRIOR TO PRICING AND COMMENCEMENT AND REPORT ANY DISCREPANCIES TO NORTHROP

3. ANY PRODUCTS SPECIFIED OR USED TO BE VERIFIED BY THE CONTRACTOR AS BEING SAFE AND APPROPRIATE FOR USE. NORTHROP DO NOT TAKE ANY RESPONSIBILITY FOR THE USE OF UNSAFE PRODUCTS

4. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCIL REGULATIONS AND REQUIREMENTS.

5. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.

6. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.

7. ON COMPLETION OF ANY TRENCHING WORKS, ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL, GRASSED AREAS AND ROAD PAVEMENTS.

8. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.THE CONTRACTOR IS TO ENSURE THAT SURVEY BOUNDARIES ARE DERIVED FROM A CADASTRAL SURVEY RATHER THAN A DETAIL SURVEY.

9. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMENT OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.

10. DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.

11. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

12. WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.

13. TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MIN 50mm IN BITUMINOUS PAVING.

14. ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.

15. NOTES ON DETAILS PROVIDED TAKE PRECEDENCE OVER SPECIFICATION NOTES UNLESS IN CONTRADICTION WITH COUNCIL/AUTHORITY SPECIFICATIONS/DETAILS. CONTRACTOR TO CONSULT WITH NORTHROP FOR ANY DISCREPANCIES.

16. IF THE CONTRACTOR DISCOVERS HAZARDOUS/CONTAMINATED MATERIAL THE CONTRACTOR SHALL CONSULT WITH AN ENVIRONMENTAL SPECIALIST.

17. THE CONTRACTOR IS RESPONSIBLE FOR DEALING WITH COMMUNITY COMPLAINTS ASSOCIATED WITH THE WORKS UNDER THE CONTRACT AND TO COMPENSATE FOR/RECTIFY ANY DAMAGE REASONABLY CAUSED BY THE CONTRACTOR.

18. THE TERM 'MAKE GOOD' OR 'MAKE NEAT' IS IN REFERENCE TO THE SATISFACTION OF NORTHROP OR CERTIFYING ENGINEER. THE CONTRACTOR IS TO SEEK CLARIFICATION FROM NORTHROP OR THE CERTIFYING ENGINEER IF NECESSARY

19. TOLERANCES TO BE IN ACCORDANCE WITH COUNCIL/AUTHORITY REQUIREMENTS.

SERVICE TRENCHES

20. SAWCUT EXISTING SURFACES PRIOR TO EXCAVATION. BACKFILL ALL TRENCHES UNDER EXISTING ROADS, PAVEMENTS AND PATHS WITH STABILISED SAND 5% CEMENT OR DGS40 MATERIAL (5% CEMENT) COMPACTED IN 200mm THICK LAYERS TO 98% MMDD TO UNDERSIDE OF PAVEMENT.

21. BACKFILL ALL TRENCHES NOT UNDER ROADS, PAVEMENTS, PATHS AND BUILDINGS WITH APPROVED EXCAVATED OR IMPORTED MATERIAL COMPACTED TO 95% SMDD.

NOT FOR CONSTRUCTION

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH PENRITH CITY COUNCIL DEVELOPMENT GUIDELINES .THE AFOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

ENGINEERING CERTIFICATION

1.

TO CERTIFY THE CONSTRUCTED CIVIL WORKS, A QUALIFIED EXPERIENCED ENGINEER IS TO VISIT THE SITE TO OBSERVE CONSTRUCTION TECHNIQUES AND VARIOUS ELEMENTS THAT MAY BE CONCEALED WHEN THE WORKS ARE COMPLETE.

2.

THIS SPECIFICATION ALLOWS FOR CERTIFICATION OF WORKS CONTROLLED BY A PRIVATE CERTIFIER FOR LAND DEVELOPMENT WORKS. THIS SPECIFICATION DOES NOT COVER CERTIFICATION REQUIREMENTS FOR AUTHORITIES SUCH AS COUNCIL, RMS OR OFFICE OF WATER. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND PROVIDE ALL PROJECT SPECIFIC CONSTRUCTION COMPLIANCE (WORKS AS EXECUTED) INFORMATION TO THE SATISFACTION OF THE STAKEHOLDER / AUTHORITY. DISCREPANCIES BETWEEN THIS SPECIFICATION AND SPECIFICATIONS OF OTHER EXTERNAL STAKEHOLDERS / AUTHORITIES IS TO BE REPORTED TO THE SUPERINTENDENT FOR CLARIFICATION.

3.

THE CONTRACTOR IS TO AGREE WITH THE ENGINEER AN APPROPRIATE SITE VISIT SCHEDULE AND FEE ARRANGEMENT PRIOR TO COMMENCEMENT OF THE WORKS. THE CONTRACTOR SHALL ENSURE THAT THE ENGINEER CAN SAFELY ACCESS ALL CIVIL ELEMENTS TO BE REVIEWED. SITE VISITS ARE CONDUCTED DURING NORMAL BUSINESS HOURS. WE REQUIRE TWO (2) WORKING DAY NOTICE FOR ANY SITE VISIT.

4.

TO PROVIDE CERTIFICATION THE ENGINEER MUST VISIT THE SITE TO OBSERVE.

4.1.

PAVEMENTS

4.1.1.

POOR SUBGRADE CONDITIONS

4.1.2.

PROOF ROLLING OF SUB-GRADE

4.1.3.

PLACEMENT OF SUB-BASE COURSE, BASE COURSE AND WEARING COURSE.

4.1.4.

PLACEMENT OF STEEL REINFORCEMENT , DOWELS AND JOINT CRADLES PRIOR TO POURING OF CONCRETE

4.2.

EARTHWORKS

4.2.1.

TOPSOIL STRIP

4.2.2.

EARTHWORKS BATTER

4.2.3.

FILLING

4.3.

STORMWATER DRAINAGE

4.3.1.

DRAINAGE TRENCHES PRIOR TO BACKFILLING

4.3.2.

LEGAL POINT OF CONNECTION PRIOR TO BACKFILLING

4.3.3.

ANY OTHER DRAINAGE STRUCTURE THAT MAY BE CONCEALED DURING THE COURSE OF THE WORKS

4.4.

CONCRETE STRUCTURES

4.4.1.

PLACEMENT OF ANY STEEL REINFORCEMENT PRIOR TO CONSTRUCTION.

5.

THE CONTRACTOR SHALL PROVIDE SURVEYED LEVELS, PREPARED BY A QUALIFIED SURVEYOR FOR SUBGRADE, SUB-BASE COURSE, BASE COURSE AND WEARING COURSE.

6.

THE CONTRACTOR SHALL PROVIDE WORKS AS EXECUTED (WAE) DOCUMENTATION PREPARED BY A QUALIFIED PRACTISING SURVEYOR. THE WAE DRAWINGS SHALL CLEARLY SHOW STORMWATER GRATE/ COVER LEVELS, STORMWATER PIT INVERT LEVELS AND CORRESPONDING INVERT LEVELS OF ANY INCOMING OR OUTGOING PIPES, DIAMETER OF ALL PIPES, DIMENSIONS AND VOLUME OF ON-SITE DETENTION FACILITIES, INVERT LEVELS OF ORIFICE PLATES, OVERFLOW WEIRS, BASE OF TANK FINISHED LEVELS OF PAVEMENTS. THE WAE SHALL SHOW WHERE THE SIZE AND QNGNMENT OF CIVIL ENGINEERING ELEMENTS WHEN THEY DEViate FROM THE DESIGN DOCUMENTATION.

7.

THE WAE DRAWINGS SHALL BE STAMPED WITH THE FOLLOWING STATEMENT "THESE WAE DRAWINGS HAVE BEEN PREPARED BY [COMPANY NAME] AND ARE A TRUE AND ACCURATE REPRESENTATION OF THE CONSTRUCTED WORKS". EACH DRAWING SHALL BE SIGNED AND DATED BY THE SURVEYOR WHO PREPARED THE DRAWINGS.

THESE WAE DRAWINGS HAVE BEEN PREPARED BY [COMPANY NAME] AND ARE A TRUE AND ACCURATE REPRESENTATION OF THE CONSTRUCTED WORKS.

SIGNED.....

DATE.....

NAME.....

POSITION.....

8.

WAE SHALL BE PROVIDED IN BOTH AUTOCAD AND PDF FORMAT. NORTHROP CONSULTING ENGINEERS WILL PROVIDE ENGINEERING PLANS TO THE CONTRACTOR IN AUTOCAD FORMAT TO AID PREPARATION OF WAE DOCUMENTATION.

9.

IF THE WORKS ARE SUBJECT TO APPROVAL BY THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) THE CONTRACTOR IS TO ABIDE BY THE UPRCT APPROVAL CHECKLIST.

10.

CONTRACTOR IS TO UNDERTAKE A CCTV INSPECTION OF ALL STORMWATER DRAINAGE PIPELINES AND PROVIDE TO THE ENGINEER FOR APPROVAL.

11.

THE CONTRACTOR SHALL PROVIDE ALL RELEVANT TEST CERTIFICATES PROGRESSIVELY THROUGHOUT THE DURATION OF THE WORKS. ALL TEST CERTIFICATES SHALL BE PREPARED BY A NATA REGISTERED LABORATORY. TEST CERTIFICATES ARE REQUIRED FOR PROOF ROLLING, SUBGRADE COMPACTION, COMPACTION OF PAVEMENT LAYERS, COMPACTION OF FILLING OPERATIONS, CONCRETE SLUMP TEST, AND CONCRETE STRENGTH TESTS. THE CONTRACT SHALL PROVIDE ALL RELEVANT VALIDATIONS BY A GEOTECHNICAL ENGINEER FOR ALL IMPORTED FILL

12.

EACH TEST CERTIFICATE WILL NOMINATE THE DATE AND TIME OF THE TEST AND PROVIDE A LOCATION OF WHERE THE TEST SAMPLE WAS TAKEN FROM.

13.

THE CONTRACTOR SHALL ARRANGE FOR THE ENGINEER TO CONDUCT A FINAL VISIT TO REVIEW OF THE CONSTRUCTED WORKS. THIS WILL REVIEW WILL NOT TAKE PLACE UNTIL THE WAE DOCUMENTATION AND RELEVANT TEST CERTIFICATES HAVE BEEN RECEIVED.

14.

IF DEFECTIVE OR INCOMPLETE WORK IS FOUND DURING THE FINAL INSPECTION ANOTHER INSPECTION MAY BE REQUIRED AT THE CONTRACTORS EXPENSE TO VERIFY THE RECTIFICATION WORKS HAVE BEEN COMPLETED.

BITUMEN SEALING

1.

PAVEMENT PREPARATION

1.1.

THE SURFACE TO BE SEALED SHALL BE DRY AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL, FOREIGN OR LOOSE MATTER.

1.2.

IF APPROVED BY THE MANAGING CONTRACTOR, ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT TO GENERAL LEVEL OF PAVEMENT WITH ASPHALT CONCRETE BEFORE SEALING COMMENCES.

2.

MATERIALS

2.1.

BINDER SHALL BE CLASS 170 TO AS 2008 OR APPROVED PROPRIETARY MATERIAL FOR PRIMING AND PRIME SEALING.

2.2.

AGGREGATE SHAPE, DURABILITY AND WET TO DRY STRENGTH SHALL COMPLY TO AS2758 FOR CLASS 'N' AGGREGATES. A 20kg SAMPLE TO BE APPROVED BY THE MANAGING CONTRACTOR PRIOR TO USE.

2.3.

AGGREGATES SHALL BE DELIVERED UNIFORMLY PRECOATED, EXCESSIVE PRECOATING WILL RESULT IN AGGREGATES BEING REJECTED.

2.4.

FOR TWO COAT FLUSH SEALS, THE SIZE OF THE AGGREGATE FOR THE SECOND COAT, WHILE NORMALLY HALF THAT OF THE FIRST COAT, SHALL BE DIMENSIONALLY COMPATIBLE WITH THAT OF THE FIRST COAT.

2.5.

PRECOATING AGENTS SHALL BE COMPATIBLE WITH THE AGGREGATES AND BINDER TO BE USED.

3.

DESIGN

3.1.

DESIGN OF SPRAYED BITUMINOUS SEALS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE AUSTRADS (NAASRA) PUBLICATION "PRINCIPLES AND PRACTICE OF BITUMINOUS SURFACING, VOLUME 1 - SPRAYED WORK".

3.2.

WHERE NOT INDICATED ON THE DRAWINGS, PRIMES AND PRIMER SEALS SHALL BE DESIGNED TO REMAIN INTACT UNTIL FINAL SEALING TAKES PLACE, HAVING REGARD FOR THE TRAFFIC AND CLIMATIC CONDITIONS.

3.3.

UNLESS OTHERWISE SPECIFIED, BINDER APPLICATION RATES SHALL BE SELECTED TO FILL 85% OF THE THEORETICAL VOIDS OF THE MAT.

4.

BITUMEN FLUSH SEALING

4.1.

BITUMEN FLUSH SEALS SHALL BE EITHER SINGLE OR DOUBLE COAT AS SHOWN ON THE DRAWINGS. eg 14/7 INDICATES A DOUBLE COAT FLUSH SEAL USING TWO APPLICATIONS OF BITUMEN AND AGGREGATE. THE FIRST AGGREGATE LAYER BEING OF 14mm NOMINAL SIZE, THE SECOND 7mm.

4.2.

COVER AGGREGATE SHALL BE SPREAD IMMEDIATELY AFTER SPRAYING OF BINDER. IN NO CASE SHALL SPREADING BE DELAYED MORE THAN 8 MINUTES.

5.

RECORDS

5.1.

ALL SPRAY RECORDS AND AGGREGATE SUPPLY TONNAGE RECEIPTS SHALL BE RETAINED AND PASSED ON TO THE CONSULTING ENGINEER AS PART OF QUALITY ASSURANCE PROCEDURES.

5.2.

GENERALLY FLUSH SEALING SHALL BE CARRIED OUT COMPLETE AND IN ACCORDANCE WITH THE RELEVANT RMS STANDARD.

ASPHALTIC CONCRETE

1.

GENERAL

1.1.

ALL ASPHALTIC CONCRETE (AC) WORK TO BE PREPARED AND CARRIED OUT IN ACCORDANCE WITH GOOD ASPHALTIC PAVING PRACTICE AS DESCRIBED IN AS2150-2005 "ASPHALT (HOT-MIXED) PAVING - GUIDE TO GOOD PRACTICE" AND CURRENT RMS SPECIFICATIONS.

2.

PAVEMENT PREPARATION

2.1.

THE FINISHED PAVEMENT SURFACE TO BE SEALED SHALL BE WITHIN +/- 2% OF THE OPTIMUM AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL FOREIGN MATTER.

2.2.

PRIME ALL SURFACES TO BE SEALED. ALLOW PRIME TO SETTLE FOR A MINIMUM OF 3 DAYS BEFORE APPLYING TACK COAT AND ASPHALT.

2.3.

SWEEP PRIMED SURFACES BEFORE APPLYING TACK COAT.

2.4.

ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT UP TO GENERAL LEVEL OF PAVEMENT WITH ASPHALTIC CONCRETE BEFORE LAYING OF MAIN COURSE.

2.5.

ALL DEFECTS IN THE BASE COURSE INCLUDING CRACKS, SURFACE DEFORMATION AND THE LIKE SHALL BE REPAIRED AS DIRECTED BY THE SUPERINTENDENT PRIOR TO PLACEMENT OF TACK COAT AND/OR AC COURSES.

3.

PLACEMENTS

3.1.

ALL ASPHALT SHALL BE PLACED UTILISING APPROVED MECHANICAL PAVING MACHINES. DO NOT HAND PLACE ASPHALT WITHOUT PRIOR APPROVAL FROM ENGINEER.

4.

JOINTS

4.1.

THE DENSITY AND SURFACE FINISH AT JOINTS SHALL BE SIMILAR TO THOSE OF THE REMAINDER OF THE LAYER.

5.

COMPACTION

5.1.

ALL COMPACTION SHALL BE UNDERTAKEN USING SELF PROPELLED ROLLERS.

5.2.

INITIAL ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 105°C USING A STEEL DRUM ROLLER HAVING A MINIMUM WEIGHT OF 8 TONNES AND A MAXIMUM UNIT LOAD ON THE REAR DRUM EQUIVALENT TO 55kN/m WIDTH OF DRUM.

5.3.

SECONDARY ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 80°C USING A PNEUMATIC TYRED ROLLER OF AT LEAST 10 TONNES MASS. A MINIMUM TYRE PRESSURE OF 550kPa AND A MINIMUM TOTAL LOAD OF 1 TONNE ON EACH TYRE.

5.4.

ROLLED SURFACES SHALL BE SMOOTH AND FREE OF UNDULATIONS. BONY AND/OR UNEVEN SURFACES WILL BE REJECTED.

5.5.

PROVIDE 2 No. MINIMUM COMPACTION TESTS.

6.

FINISHED SURFACE PROPERTIES

6.1.

FINISHED SURFACES SHALL BE SMOOTH, DENSE AND TRUE OF SHAPE AND SHALL NOT VARY MORE THAN;

6.1.1.

3mm FROM THE SPECIFIED PLAN LEVEL AT ANY POINT.

6.1.2.

3mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID TRANSVERSELY.

6.1.3.

5mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID LONGITUDINALLY.

6.1.4.

MINUS 0 TO PLUS 2mm ADJACENT TO OTHER ELEMENTS SUCH AS KERBS AND THE LIKE TO AVOID POOLING OF SURFACE WATER.

6.1.5.

MINUS 0 FROM THE SPECIFIED THICKNESS.

7.

DO NOT STORE PLANT EQUIPMENT OR TRAFFIC NEWLY LAID ASPHALTIC CONCRETE PAVEMENTS WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

8.

DO NOT APPLY MARKING PAINTS UNTIL ASPHALT HAS CURED IN ACCORDANCE WITH PAINT MANUFACTURERS SPECIFICATIONS.

CONCRETE PAVEMENTS

1.

THIS SECTION REFERS TO CIVIL CONCRETE WORKS AND DOES NOT INCLUDE STRUCTURAL ELEMENTS SUCH AS BUILDINGS, BELOW GROUND STRUCTURES OR RETAINING WALLS.

2.

ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

3.

CONCRETE QUALITY AND REINFORCING COVER

ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

4.

CONCRETE PROPERTIES SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS

4.1.

MINIMUM CEMENT CONTENT 250 kg/m³

4.2.

MAXIMUM 56 DAY SHRINKAGE STRAIN - AS AS NOMINATED ABOVE

4.3.

PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.

5.

ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS. PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.

6.

CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL.

7.

PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.

8.

ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE CIVIL ENGINEER FOR REVIEW.

9.

ALL CONCRETE IS TO BE CONTINUOUSLY CURED FOR A MINIMUM PERIOD OF 10 DAYS AFTER PLACING. CURING TO COMMENCE IMMEDIATELY AFTER FINISHING. SPRAY ON CURING COMPOUNDS TO COMPLY WITH AS3799.

10.

PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM THE CIVIL ENGINEER.

11.

FALLS IN SLAB AS SHOWN ON PLAN MAINTAIN MINIMUM SLAB THICKNESS AS SHOWN.

12.

NO ADMXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE DESIGN ENGINEER.

13.

THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS.

14.

FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:

15.

ALL PENETRATIONS TO HAVE 2/N12 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 700 BEYOND PENETRATION. MAINTAIN 40mm COVER TOP AND BOTTOM.

16.

FORMWORK CLASS SHALL BE IN ACCORDANCE WITH AS3600.

17.

SURFACE FINISHES:

ELEMENT

FORMWORK CLASS

STORMWATER PIT

OFF FORM

PAVEMENTS

MACHINE FLOAT OR BROOM FINISH

KERBS

STEEL FLOAT OR TROWEL

AUTHORITY SPECIFICATIONS TAKE PRECEDENCE

18.

REINFORCEMENT SYMBOLS:

N

DENOTES GRADE 450 N BARS TO AS1302 GRADE N

R

DENOTES 230 R HOT ROLLED PLAIN BARS TO AS1302

SL

DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS1304

NUMBER OF BARS IN GROUP

NOMINAL BAR SIZE IN mm

17 N

20 250

BAR GRADE AND TYPE

SPACING IN mm THE FIGURE

CONCRETE CURING

19.

THE CURING PROCESS FOR NEW CONCRETE IS TO INCORPORATE THE FOLLOWING ASPECTS, GENERALLY AS ORDERED;

19.1.

SPRAY CURING COMPOUND

19.2.

SAWCUT JOINTS AS LOCATED AND SPECIFIED AS SOON AS CURING PERMITS.

COVER NEW PAVING WITH HESSIAN AND BLACK PLASTIC SHEETS TAPED AT JOINTS ON COMPLETION OF SAWCUTTING. NOTE COVERING IS TO EXTENT MIN 5m BEYOND PAVEMENT BEING CURED. OVER ADJOINING (EXISTING) PAVEMENT AREAS, MAINTAIN CURING AS SPECIFIED.

PAVEMENTS

ALL PAVEMENT MATERIALS SHALL COMPLY WITH CURRENT RMS SPECIFICATIONS. PROVIDE MECHANICAL ANALYSIS FOR EACH BATCH OF PAVEMENT MATERIAL TO ENSURE CONFORMITY.

1.

COMPACTION STANDARDS

BASE

98% MODIFIED MAXIMUM DRY DENSITY

SUBBASE

98% MODIFIED MAXIMUM DRY DENSITY

SUBGRADE

100% STANDARD MAXIMUM DRY DENSITY

2.

THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGN ENGINEER.

3.

ALLOW FOR COMPACTION TESTING BY A N.A.T.A. REGISTERED LABORATORY FOR BASE LAYER, SUBBASE LAYER AND SUBGRADE LAYER IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS (MINIMUM 2 TESTS PER LAYER). ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER.

4.

MATCH NEW PAVEMENTS NEATLY AND FLUSH WITH EXISTING

5.

AFTER BASE IS APPROVED, SWEEP CLEAN AND PRIME AT NOMINAL RATE OF 1.0L PER 1.0 sq.m.

6.

PAVEMENT HOLD POINTS

6.1.

SUB-GRADE PROOF ROLL PRIOR TO SET-UP AND FORM FOR CONCRETE POUR.

6.2.

INSPECTION OF FORMWORK / STEEL PRIOR TO CONCRETE POUR.

PAVEMENT JOINTS

1.

PROVIDE 10mm ABLEFLEX BETWEEN NEW CONCRETE WORKS AND EXISTING STRUCTURES.

2.

LOCAL AUTHORITY REQUIREMENTS SHALL TAKE PRECEDENCE WITHIN THE PUBLIC ROAD RESERVE.

3.

DOWELS TO BE PLACED ON PROPRIETARY CRADLES TO ENSURE CORRECT SPACING AND ALIGNMENT.

4.

PEDESTRIAN PAVEMENTS

ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

5.

EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.

6.

WEAKENED PLANE JOINTS (SAWN OR TOOL JOINTS) ARE TO BE LOCATED AT A MAX. SPACING OF 15m x WIDTH OF THE PAVEMENT.

7.

WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.

8.

TYPICAL PEDESTRIAN PAVEMENT JOINT DETAIL

EJ

SJ/TJ

SJ/TJ

EJ

SJ/TJ

W

6.0m MAX.

1.5 x W

9.

VEHICULAR PAVEMENTS

ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

10.

TIED KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED LONGITUDINALLY AT A MAX. OF 6.0m CENTRES.

11.

SAWN JOINTS SHOULD GENERALLY BE LOCATED Laterally AT A MAX. OF 6.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX. 18.0m CENTRES.

12.

TYPICAL VEHICULAR PAVEMENT JOINT DETAIL.

EJ

SJ

SJ

EJ

SJ

SJ

EJ

SJ

SJ

EJ

6.0m MAX.

18.0m MAX.

13.

KERB EXPANSION JOINTS SHALL BE FORMED FROM 10mm ABLEFLEX FOR FULL DEPTH OF SECTION.

14.

KERB EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, TANGENT POINTS OF CURVES / CORNERS AND AT 12m MAX CENTRES.

15.

KERB TOOLED JOINTS TO BE MIN 3mm WIDE AND LOCATED AT MAX 3m CENTRES.

16.

INTEGRAL KERB JOINTS SHALL MATCH THE LOCATION OF PAVEMENT JOINTS.

CONCRETE

1.

CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH AS3600 AND NATSPEC CONCRETE STANDARDS.

2.

CONCRETE PROPERTIES AND COVER TO REINFORCING:

ELEMENT

CONCRETE STRENGTH f'c (MPa)

MAX. 56 DAY DRYING SHRINKAGE

COVER (mm)

SLABS ON GROUND

32

650microns

TOP 40

BTM 40

TANK LID

40

700microns

TOP 40

BTM 40

MAXIMUM AGGREGATE SIZE

= 20mm U.N.O.

SLUMP DURING PLACING

= 75mm

EXPOSURE CLASSIFICATION

= B1

NO ADMXTURES SHALL BE USED IN CONCRETE MIX UNLESS APPROVED BY STRUCTURAL ENGINEER IN WRITING.

3.

CONCRETE PROPERTIES FOR SLABS AND BEAMS SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS:

-

MINIMUM CEMENT CONTENT 250kg/cu.m.

-

PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST

RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.

4.

SUBMIT FOR APPROVAL THE FOLLOWING TO THE STRUCTURAL ENGINEER:

-

CURING PROCEDURE (PVA MEMBRANES NOT PERMITTED)

-

STRIPPING PROCEDURE

-

DETAILS AND LOCATION OF CAST IN SERVICES

-

CONDUITS, PENETRATIONS AND CONSTRUCTION JOINT LOCATIONS

5.

ALL CONCRETE MIXES SHALL BE DESIGNED BY A RECOGNISED TESTING LAB AND SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.

6.

ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW.

7.

PROJECT CONTROL TESTING SHALL BE CARRIED OUT ON ALL CONCRETE IN ACCORDANCE WITH AS1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.

8.

ALL CONCRETE IS TO BE CONTINUOUSLY CURED FOR A MINIMUM PERIOD OF 10 DAYS AFTER PLACING. CURING TO COMMENCE IMMEDIATELY AFTER FINISHING. SPRAY ON CURING COMPOUNDS TO COMPLY WITH AS3799.

9.

FOR TENDER PURPOSES ASSUME MINIMUM STRIPPING TIMES AND EXTENT OF BACK PROPPING AS PER AS3610-1995 SECTION 5.0 AND AS PER GENERAL NOTES FOR FORMWORK AND PROPPING.

10.

FORMWORK FINISH CLASSIFICATION TO AS3600:

ELEMENT

CLASS

-

INGROUND FOOTINGS

5

-

RETAINING WALLS

5

-

RETAINING WALLS

3

-

COLUMNS

2

-

BEAMS AND SLABS

2

11.

SURFACE FINISHES:

-

COLUMNS AND WALLS OFF FORM

12.

COMPACT ALL CONCRETE INCLUDING FOOTINGS AND SLABS, USING MECHANICAL VIBRATORS.

13.

PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM THE STRUCTURAL ENGINEER.

14.

CONCRETE PROFILES:

-

BEAM DEPTHS ARE WRITTEN FIRST AND INCLUDE THE SLAB THICKNESS.

-

SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.

-

NO HOLES, CHASES OR EMBEDMENT OF PIPES OTHER THAN SHOWN IN THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER.

-

PROVIDE DRIP GROOVES AT ALL EXPOSED EDGES, CHAMFERS, DRIP GROOVES, REGLETS ETC TO BE TO ARCHITECTS DETAILS.

15.

ALL PENETRATIONS TO HAVE 2-N16 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 600 BEYOND PENETRATION.

16.

SETDOWNS OR FALLS IN FLOOR SURFACES ARE NOT PERMITTED UNLESS SHOWN ON DRAWINGS. MAINTAIN MINIMUM SLAB THICKNESS SHOWN ON PLAN WHERE FALLS OCCUR.

NOT FOR CONSTRUCTION

VERIFIER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

JOB MANAGER: J. GILLIGAN

REVISION

DESCRIPTION

ISSUED

VER'D

APP'D

DATE

01

50% DETAILED DESIGN

TB

JG

20.05.21

02

ISSUED FOR INFORMATION - 100%

JG

JG

09.06.21

CLIENT

NSW GOVERNMENT

TAFE NSW

GRAY PUKSAND

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

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NORTHROP

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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SPECIFICATION NOTES - SHEET 02

JOB NUMBER

202025

DRAWING NUMBER

C01.12

REVISION

02

DRAWING SHEET SIZE = A1

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH PENRITH CITY COUNCIL DEVELOPMENT GUIDELINES. THE AFOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

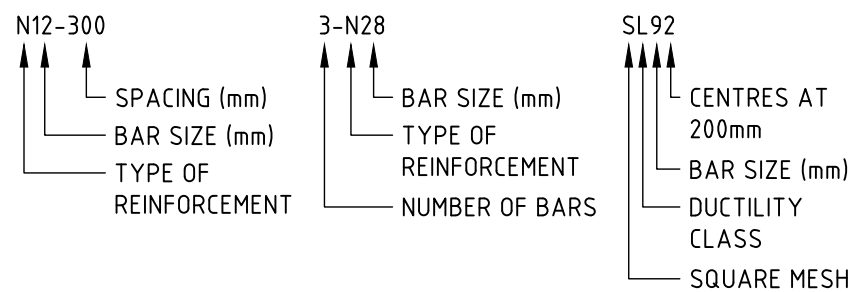
CONCRETE (cont)

17. REINFORCEMENT GRADE AND NOTATION:

SYMBOL	BAR SHAPE	STRENGTH GRADE (MPa)	DUCTILITY CLASS	TO COMPLY WITH AUST. STANDARD
N	DEFORMED RIB BAR	500	NORMAL	AS4671
R	PLAIN ROUNDED BAR	250	NORMAL	AS4671
RL	RECTANGULAR MESH OF DEFORMED RIB BAR	500	LOW	AS4671
SL	SQUARE MESH OF DEFORMED RIB BAR	500	LOW	AS4671
L-TM	TRENCH MESH	500	LOW	AS4671

ALL REINFORCING BARS SHALL BE GRADE D500N TO AS4671 AND ALL MESH SHALL BE GRADE 500L TO AS4671 U.N.O. CLASS L REINFORCEMENT SHALL NOT BE USED U.N.O.

REINFORCEMENT LABELS:



18. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY, AND NOT NECESSARILY IN TRUE PROJECTION. BARS SHOWN ARE INDICATIVE ONLY AND LENGTHS MAY VARY. BEAM ELEVATIONS TAKE PRECEDENCE OVER SECTIONS. SLAB PLANS TAKE PRECEDENCE OVER SECTIONS. REFER TO SECTIONS FOR EXTRA BARS THAT MAY BE REQUIRED.

19. USE ONLY ALL PLASTIC OR CONCRETE CHAIRS AT EXTERNAL SURFACES.

20. SITE BENDING OF REINFORCEMENT BARS SHALL BE DONE WITHOUT HEATING USING A RE-BENDING TOOL. THE BARS SHALL BE RE-BENT AGAINST A FLAT SURFACE OR A PIN WITH A DIAMETER NOT LESS THAN THE MINIMUM PIN SIZE PRESCRIBED IN AS3600-2001.

21. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN ON THE STRUCTURAL DRAWINGS OR IN POSITIONS OTHERWISE APPROVED IN WRITING BY THE STRUCTURAL ENGINEER. LAPS SHALL BE IN ACCORDANCE WITH AS3600 SECTION 13 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR.

22. FOR LAPS IN MESH REFER TO SLAB ON GROUND NOTES.

23. WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER

24. AT EXTERNALLY EXPOSED SURFACES NO METALLIC ITEMS INCLUDING FORM BOLTS, FORM SPACERS, METALLIC BAR CHAIRS AND TIE WIRE ARE TO BE PLACED IN THE COVER ZONE.

25. ALL REINFORCEMENT, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN POSITION AND INSPECTED BY THE STRUCTURAL ENGINEER PRIOR TO PLACING CONCRETE.

26. HOLD DOWN BOLTS SHALL BE HOT DIPPED GALVANISED.

27. U.N.O, ALL MASONRY ANCHORS INTO CONCRETE SHALL BE RAMSET TRUBOLTS (LONGEST VERSION) OR APPROVED EQUIVALENT. BOLTS SHALL BE GALVANISED WHERE THEY ARE ADJOINING NON FERROUS OR PREPARED MEMBERS. PROVIDE STAINLESS STEEL BOLTS FOR ALL EXTERNAL CONDITIONS, OR WHERE EXPOSED TO THE WEATHER.

SCOUR PROTECTION ROCK

1. ROCK USED IN THE SCOUR PROTECTION SHALL CONSIST OF MATERIAL WHICH COMPLIES WITH THESE NOTES AND THE DRAWINGS. THIS REQUIREMENT APPLIES TO BOTH IMPORTED ROCK AND IN-SITU ROCK WHICH IS RE-USED.
2. INDIVIDUAL ROCKS SHALL BE FREE FROM CRACKS, CLEAVAGE PLANES, SEAMS AND DEFECTS WHICH WOULD RESULT IN THE BREAKDOWN OF THE ROCK IN SERVICE.
3. ROCK UNITS SHALL BE EITHER SEDIMENTARY ROCK ONLY OR IGNEOUS ROCK ONLY AND AS A MINIMUM, SHALL SATISFY THE FOLLOWING CRITERIA:

- ROCK SHALL BE ROUGH AND ANGULAR
- ROCK SHALL HAVE A MINIMUM DRY DENSITY OF 2200 kg/m³
- IGNEOUS ROCK SHALL HAVE NO MORE THAN 10% (BY VOLUME) GLUEING MATERIAL AND SHALL EXHIBIT NO ZONES OF SECONDARY ALTERATION SUCH AS CHLORITISATION. SEDIMENTARY ROCK SHALL HAVE A MINIMUM SODIUM SULPHATE SOUNDNESS WEIGHT LOSS NOT EXCEEDING 25%
- ROCK SHALL HAVE A SATURATED POINT LOAD STRENGTH INDEX (IS₅₀) NO LESS THAN 5.0 MPa FOR IGNEOUS ROCK AND 1.5 MPa FOR SEDIMENTARY ROCK
- THE RATIO OF THE MAXIMUM DIMENSION TO THE MINIMUM DIMENSION, MEASURED AT RIGHT ANGLES TO THE MAXIMUM DIMENSION SHALL NOT EXCEED 2.5

4. THE ROCK UNITS SHALL BE PLACED SUCH THAT THE SPECIFIED REQUIREMENTS FOR SIZE, FINISHED SIDE SLOPES, TOP AND TOE LEVELS AND DENSITY REQUIREMENTS, ARE SATISFIED. IN ADDITION, ROCKS SHALL BE WEDGED AND LOCKED TOGETHER SUCH THAT THEY ARE NOT FREE TO MOVE. ROCK UNITS SHALL NOT BE ROLLED OR DROPPED INTO POSITION, THEY SHALL BE PLACED.
5. THE METHOD OF ROCK PLACEMENT SHALL BE SUCH AS TO MINIMISE ITS BREAKDOWN ON HANDLING AND THE PRODUCTION OF FINES.
6. A NON-WOVEN GEOTEXTILE (BIDIM A66 OR EQUIVALENT) SHALL BE PLACED UNDERNEATH AND BEHIND ALL ROCK ARMOUR AND EXTEND 0.5m ABOVE THE EXTENT OF THE WORKS OR AS OTHERWISE SHOWN ON THE DRAWINGS. THE GEOTEXTILE IS TO BE LAID ON A NEATLY TRIMMED BATTER THAT IS FREE OF HOLLOWES OR SHARP OBJECTS.
7. GEOTEXTILE LAYERS SHALL EITHER OVERLAP ON ANOTHER BY 1000mm OR BE SEWN TOGETHER (WITH A NON-BIODEGRADABLE THREAD) WITH AN OVERLAP OF 100mm.
8. ROCK SUB-ARMOUR SHALL BE PLACED UPON THE GEOTEXTILE IN A LAYER NO LESS THAN 150mm THICK UNLESS NOTED OTHERWISE ON DRAWINGS.
9. ROCK ARMOUR SHALL BE SELECTIVELY HAND PLACED UPON THE SUB-ARMOUR TO ENSURE A SNUG FIT SUCH THAT INDIVIDUAL ROCKS ARE NOT TO MOVE. THE PLACING OF ANY ARMOUR ROCK SHALL BE COMPLETED IN SUCH A MANNER TO MINIMISE THE DISTURBANCE OR DISLODGEMENT OF THE SUB-ARMOUR.
10. THE ROCK ARMOUR SHALL BE NO LESS THAN 375mm THICK UNLESS NOTED OTHERWISE ON THE DRAWINGS.
11. THE ARMOUR ROCK AND SUB-ARMOUR ROCK SHALL BE PLACED TO THE CONSTRUCTION TOLERANCES SHOWN ON THE DRAWINGS.
12. AT LEAST FOURTEEN (14) DAYS PRIOR TO THE SUPPLY OF ANY ROCK, THE CONTRACTOR SHALL PROVIDE DOCUMENTATION TO DEMONSTRATE THAT THE ROCK TO BE SUPPLIED COMPLIES WITH THE REQUIREMENTS OF THE SPECIFICATION.

3D INFORMATION DISCLAIMER

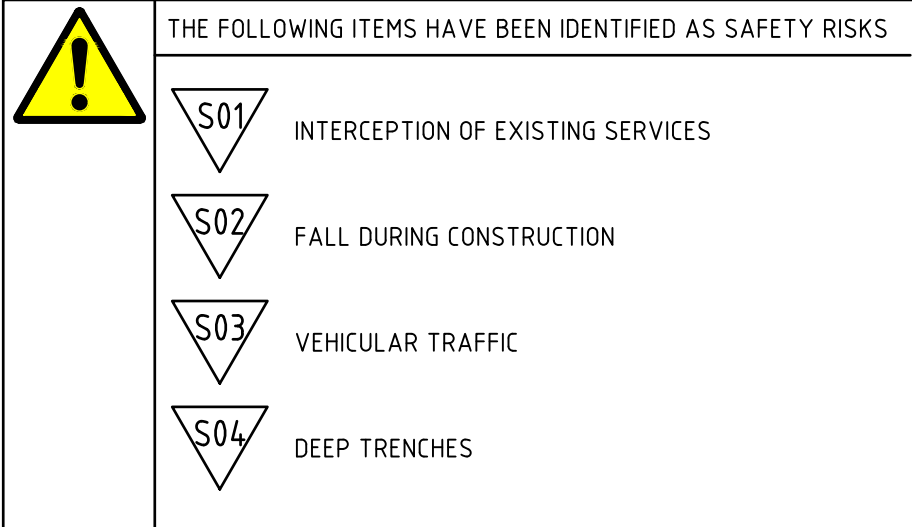
PLEASE BE ADVISED 12D DESIGN FILE, IF SUPPLIED, IS DEEMED TO BE AN ACCURATE REFLECTION OF NORTHROP'S DESIGN AT THE TIME OF FINAL DESIGN DEVELOPMENT AND MAY NOT FULLY REFLECT THE DESIGN SURFACE AS PRESENTED. HOWEVER THIS INFORMATION SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO INCORPORATION IN THE CONSTRUCTION WORKS.

YOU ARE FURTHER ADVISED THAT ISSUED HARDCOPY/PDF PLANS AND DOCUMENTS TAKE PRECEDENCE OVER THE SUPPLIED ELECTRONIC INFORMATION AND ANY INCONSISTENCIES SHOULD IMMEDIATELY BE REPORTED TO NORTHROP CONSULTING ENGINEERS FOR VERIFICATION PRIOR TO THEIR INCORPORATION IN THE WORKS.

NORTHROP CONSULTING ENGINEERS TAKES NO RESPONSIBILITY FOR USE OF NON-VERIFIED 3D DESIGN INFORMATION USED IN THE WORKS.

THE USE OF THE 3D MODEL INFORMATION SHALL CONSTITUTE
ACKNOWLEDGMENT AND ACCEPTANCE OF THE ABOVE STATEMENTS BY
THE RECIPIENT.

SAFETY IN DESIGN



CONCEPT SOIL & WATER MANAGEMENT NOTES

1. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT ORDINANCES AND REGULATIONS; NOTE IN PARTICULAR THE REQUIREMENTS OF LANDCOMS MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION' (THE 'BLUE BOOK'). THIS SOIL AND WATER MANAGEMENT PLAN DETAILS THE ACTIONS TO BE TAKEN FOR THE MANAGEMENT AND DETERIORATION OF STORMWATER DURING CONSTRUCTION OF THE PROPOSED BUILDING.
2. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
3. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
4. INSTALL SEDIMENT FENCING AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT.
5. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
6. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB & GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION. REFER ARCHITECTS PLANS FOR TREES TO BE KEPT.
7. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
8. STEEP SLOPES IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED, ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
9. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
10. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
11. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
12. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION & SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS & SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ ALL MAINTENANCE, CLEANING & BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
14. GROUNDWATER SEEPAGE RATES AND QUALITY TO BE MONITORED AND TREATED IF REQUIRED DURING CONSTRUCTION IN ACCORDANCE WITH REQUIREMENTS OF SUPERVISING GEOTECHNICAL ENGINEER.

BASIN MANAGEMENT NOTES

1. PRIOR TO ANY FORECAST WEATHER EVENT, LIKELY TO RESULT IN SEDIMENT LADEN RUNOFF ON THE SITE, ANY EXISTING DETENTION BASINS/TRAPS SHALL BE DEWATERED TO PROVIDE SUFFICIENT CAPACITY TO CAPTURE SEDIMENT LADEN WATER FROM THE SITE.
2. ANY SEDIMENT LADEN WATER (CAPTURED ON-SITE MUST BE TREATED TO ENSURE IT WILL ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES PRIOR TO ITS RELEASE FROM SITE. A SAMPLE OF THE RELEASED TREATED WATER MUST BE KEPT ON-SITE IN A CLEAR CONTAINER WITH THE SAMPLE DATE RECORDED.
3. NO ALUMINUM BASED PRODUCTS MAY BE USED TO TREAT TURBID WATER (FLOCCULANT/COAGULANTS) ON-SITE WITHOUT THE PRIOR WRITTEN PERMISSION FROM AN APPROPRIATE COUNCIL OFFICER. THE APPLICANT MUST HAVE DEMONSTRATED ABILITY TO USE SUCH PRODUCTS CORRECTLY AND WITHOUT ENVIRONMENTAL HARM PRIOR TO ANY APPROVAL.
4. THE CHEMICAL/ AGENT (FLOCCULATING/COAGULANTS) USED IN TYPE D AND TYPE F BASINS TO TREAT TURBID WATER CAPTURED IN THE BASIN MUST BE APPLIED IN CONCENTRATIONS SUFFICIENT TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES (TSS < 50mg/L, TURBIDITY < 60 NTU, 6.5 - pH < 8.5) WITHIN THE 5-DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
5. ALL MANUFACTURERS INSTRUCTIONS MUST BE FOLLOWED FOR THE USE OF ANY CHEMICALS/AGENTS USED ON-SITE, EXCEPT WHERE APPROVED BY THE RESPONSIBLE PERSON OR AN APPROPRIATE COUNCIL OFFICER.
6. SUFFICIENT QUANTITIES OF CHEMICALS/AGENTS TO TREAT TURBID WATER (FLOCCULATING/COAGULANTS) MUST BE PLACED SUCH THAT WATER ENTERING THE BASINS/SEDIMENT TRAP MIXES WITH THE CHEMICALS/AGENTS AND IS CARRIED INTO THE BASIN/TRAP.
7. CHEMICALS/AGENTS MUST BE USED AS SOON AS PRACTICAL, ONCE WATER CAPTURED IN THE BASIN ACHIEVES COUNCIL'S WATER QUALITY OBJECTIVES.
8. INSPECT THE SEDIMENT BASINS AFTER EACH RAINFALL EVENT AND/OR WEEKLY. ENSURE THAT ALL SEDIMENT IS REMOVED ONCE THE SEDIMENT STORAGE ZONE IS FULL. ENSURE THAT OUTLET AND EMERGENCY SPILLWAY WORKS ARE MAINTAINED IN A FULLY OPERATIONAL CONDITION AT ALL TIMES.

SEDIMENT BASIN SIZING CALCULATION

THE SITE IS LOCATED WITHIN THE GOROKAN SOIL LANDSCAPE AND PRIMARILY CONSISTS OF SANDS AND SANDY CLAYS (AS PER THE SITE SPECIFIC GEOTECHNICAL INVESTIGATION), WHICH HAS THE FOLLOWING PROPERTIES (IN ACCORDANCE WITH TABLE C17 OF THE "BLUE BOOK"):

SITE PARAMETERS	
CONSTRAINT	VALUE
SEDIMENT TYPE	D
SOIL HYDROLOGY GROUP	C
K = SOIL ERODIBILITY (K-FACTOR)	0.050
R = RAINFALL EROSIVITY (R-FACTOR)	3157
S = 2 YEAR, 6 HOUR STORM INTENSITY	12.1 mm/hr (LAKE HAVEN)
LS = SLOPE LENGTH/GRADE	0.87 (150m SLOPE @ 3% GRADE)
P = EROSION CONTROL PRACTICE (P-FACTOR)	13 (TYPICAL)
C = GROUND COVER (C-FACTOR)	1.0 (TYPICAL FOR STRIPPED SITE)
SOIL LOSS (RUSLE METHOD) (tonnes/ha/yr)	179
EROSION HAZARD (TABLE 4.2 BLUE BOOK)	LOW BASIN/TANKS REQUIRED

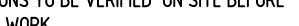



SEDIMENT BASIN/TANKS SIZING		
CONSTRAINT	VALUE	UNITS
CV = VOLUMETRIC RUNOFF COEFFICIENT	0.42	
R = 5 DAY, 75 TH PERCENTILE RAINFALL	26.8	mm/hr
A = CATCHMENT AREA	2.4	ha
SETTLING ZONE VOLUME (10xCVxRxAX)	270	m ³
SOIL LOSS (CALC ABOVE)	138	m ³ /ha/yr
AZ = DISTURBED CATCHMENT AREA	2.4	ha
SEDIMENT STORAGE VOLUME (0.17xSOIL LOSSxAZ)	57	m ³
TOTAL BASIN/TANKS VOLUME REQUIRED	327	m ³

VERIFIER:

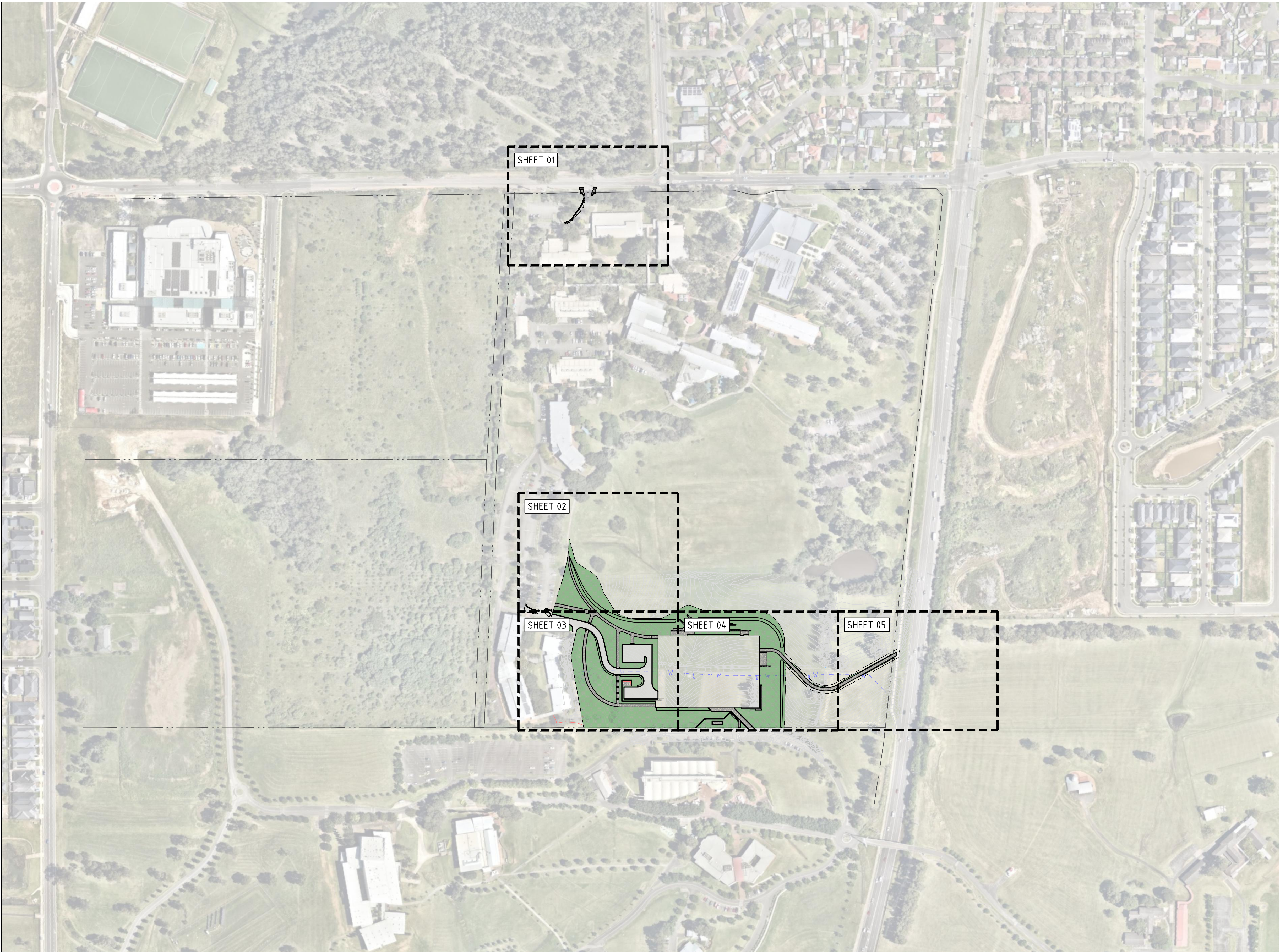
JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT		PROJECT	DRAWING TITLE	JOB NUMBER
01	50% DETAILED DESIGN	TB		JG	20.05.21	 		 <p>Sydney Level 11 345 George Street, Sydney NSW 2000 Ph (02) 9241 4188 Fax (02) 9241 4324 Email sydney@northrop.com.au ABN 81 094 433 100</p>	INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION	CIVIL ENGINEERING PACKAGE	202025
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21						
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DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	EASEMENT LINE
	REDUNDANT BOUNDARY LINE
	EXISTING CONTOURS

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
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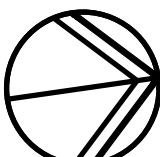
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ARCHITECT

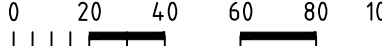
GRAY PUKSAND

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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

GENERAL ARRANGEMENT PLAN

JOB NUMBER

202025

DRAWING NUMBER

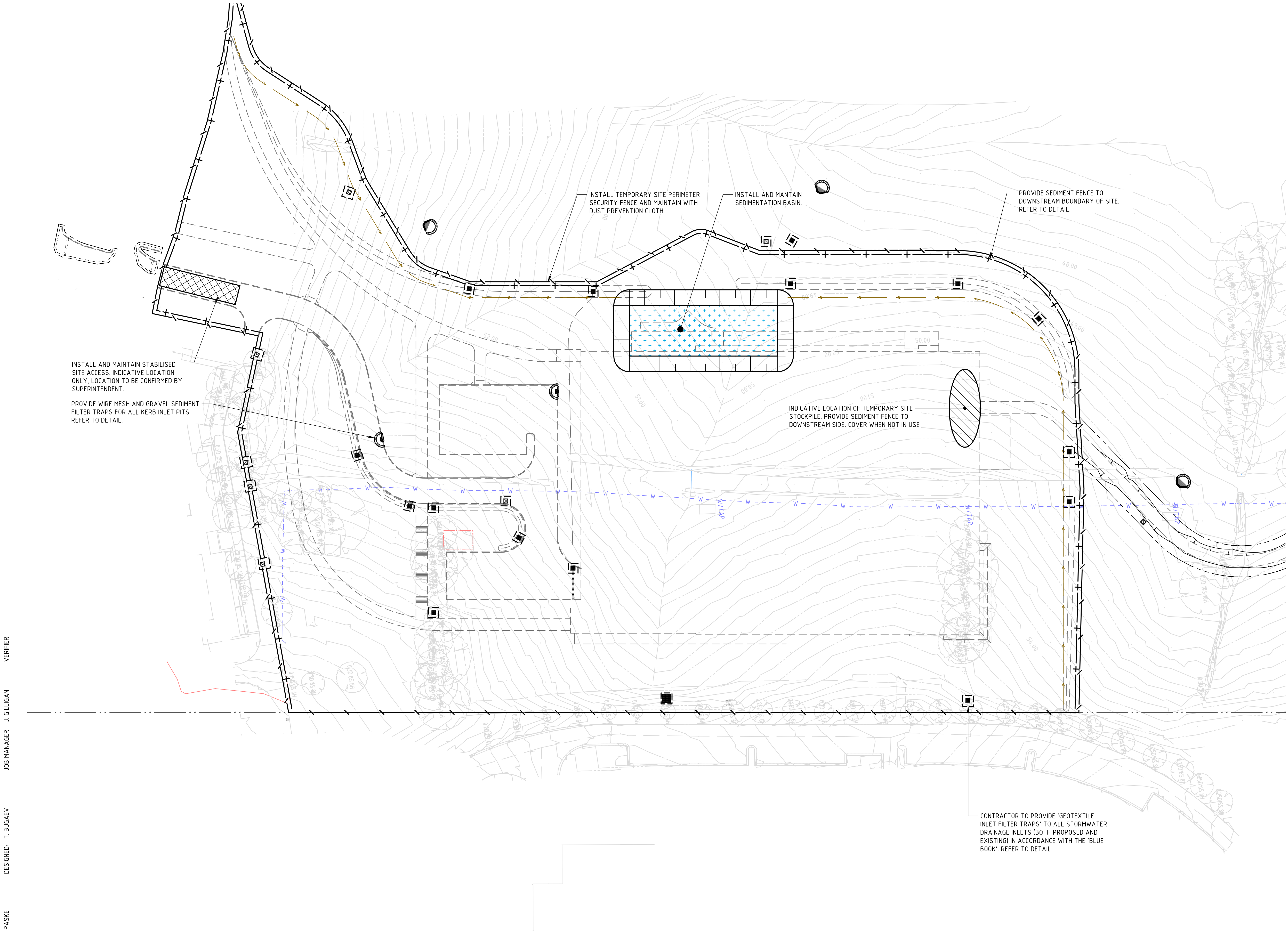
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REVISION

02

DRAWING SHEET SIZE = A1

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	EXISTING CONTOURS
	SEDIMENT FENCE
	SECURITY FENCE
	MESH AND GRAVEL INLET FILTER
	GEOTEXTILE INLET FILTER
	STABILISED SITE ACCESS
	STOCKPILE
	SEDIMENT BASIN
	TEMPORARY SWALE

SITE PARAMETERS	
CONSTRAINT	VALUE
TOTAL DISTURBED AREA (Ha)	2.7
SOIL TEXTURE GROUP	F
DESIGN RAINFALL DEPTH (DAYS)	5.0
DESIGN RAINFALL DEPTH (PERCENTILE)	80.0
X-DAY,Y-PERCENTILE RAINFALL EVENT	27.4
Cv	0.4
SETTLING ZONE VOLUME (m³)	305
SEDIMENT STORAGE VOLUME (m³)	152
TOTAL BASIN VOLUME (m³)	457

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ARCHITECT

GRAY PUKSAND

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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SEDIMENT AND SOIL EROSION CONTROL PLAN

JOB NUMBER

202025

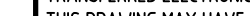


DRAWING NUMBER

C02.01

REVISION

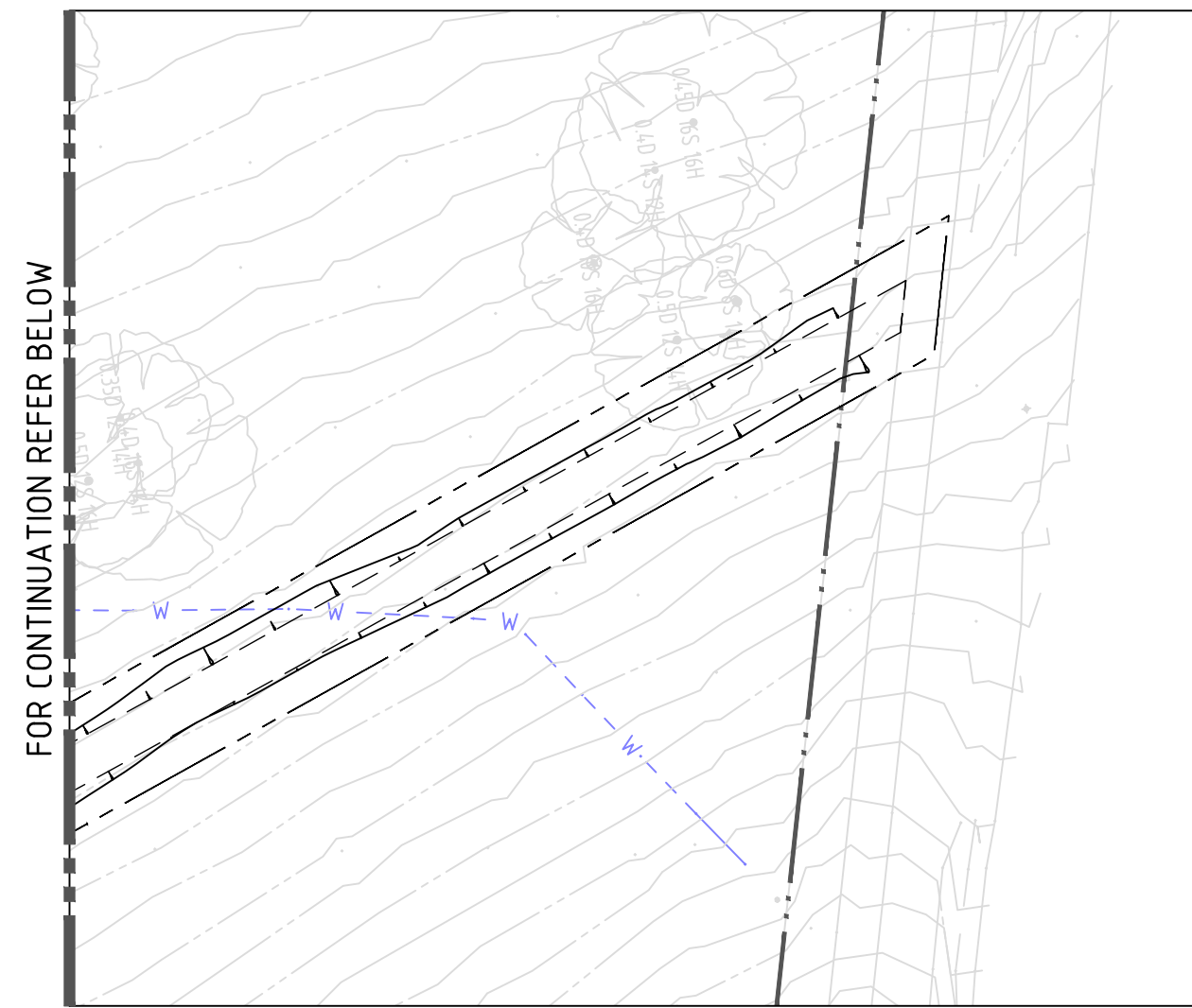
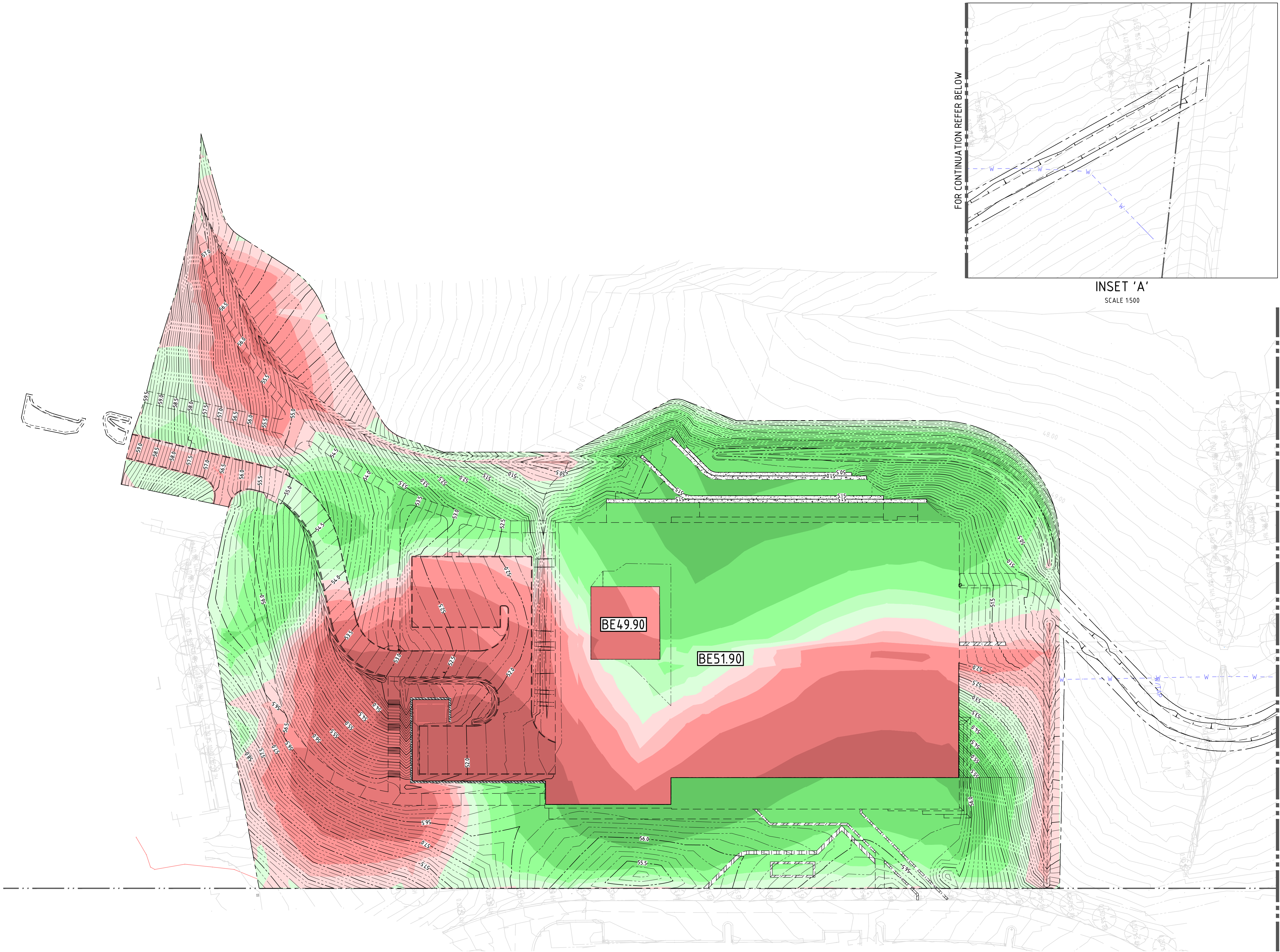
02

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT		PROJECT	DRAWING TITLE	JOB NUMBER
01	50% DETAILED DESIGN	TB		JG	20.05.21	 	GRAY PUKSAND	 <p>Sydney Level 11 345 George Street, Sydney NSW 2000 Ph (02) 9241 4188 Fax (02) 9241 4324 Email sydney@northrop.com.au ABN 81 094 433 100</p>	INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION	CIVIL ENGINEERING PACKAGE SEDIMENT AND SOIL EROSION CONTROL DETAILS	202025
02	ISSUED FOR INFORMATION - 100%	JG		09.06.21	DRAWING NUMBER						REVISION
					C02.11						02
					DRAWING SHEET SIZE = A1						
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DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

DRAWN: C. PASKE



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	BEXX.XX BULK EARTHWORKS SPOT HEIGHT
	+ eRLXX.XX EXISTING SPOT HEIGHT
	BULK EARTHWORKS PAD LEVEL
	DIRECTION OF GRADE
	BATTERS
	CONTOURS
DEPTH OF CUT	
	- 99m TO - 15m
	- 15m TO - 10m
	- 10m TO - 5m
	- 5m TO - 2m
	- 2m TO - 1m
	- 1m TO - 0.5m
	- 0.5m TO - 0.25m
	- 0.25m TO - 0.0m
DEPTH OF FILL	
	0.0m TO 0.25m
	0.25m TO 0.5m
	0.5m TO 1m
	1m TO 2m
	2m TO 5m
	5m TO 10m
	10m TO 15m
	15m TO 99m

GENERAL NOTES:	
1.	ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
2.	CAD FILES / DTM FILES TO BE SUPPLIED IN AUTOCAD FORMAT FOR SETOUT PURPOSES (UPON REQUEST).
3.	NO ALLOWANCE HAS BEEN MADE FOR BULKING FACTORS. NOTE ALL VOLUMES DEPICTED ARE SOLID VOLUMES ONLY AND MAY NOT REFLECT DETAILED EARTHWORKS.
4.	NO ALLOWANCE HAS BEEN MADE FOR DETAILED EARTHWORKS, ie SERVICE TRENCHING, DETAILED EXCAVATION, FOOTINGS, RETAINING WALLS AND THE LIKE. CONTRACTOR IS TO ALLOW FOR REMOVAL OF ALL EXCESS MATERIAL GENERATED BY THE WORKS.
5.	THE CONTRACTOR SHALL USE FINAL SURFACE LEVELS AND TYPICAL PAVEMENT DETAILS FOR ACTUAL EARTHWORKS LEVELS.
6.	BULK EARTHWORKS ARE BASED ON THE FOLLOWING DEPTHS FROM FINISHED SURFACE LEVELS:
6.1.	LANDSCAPE AREA 200mm
6.2.	BUILDING SLAB 300mm (REFER STRUCTURAL DWGS)
6.3.	FOOTPATH PAVEMENT 150mm
6.4.	ROAD PAVEMENT 520mm
6.5.	SAND PIT 2300mm
7.	APPROXIMATE BULK EARTHWORK VALUES AS FOLLOWS:
7.1.	CUT 12,390 cu.m
7.2.	FILL 14,255 cu.m
7.3.	BALANCE 1,865 cu.m (EXCESS FILL OVER CUT)
7.4.	NOTE: A SITE STRIP OF 200mm HAS BEEN CONSIDERED. APPROX VOLUME 5,174cu.m.

NOT FOR CONSTRUCTION

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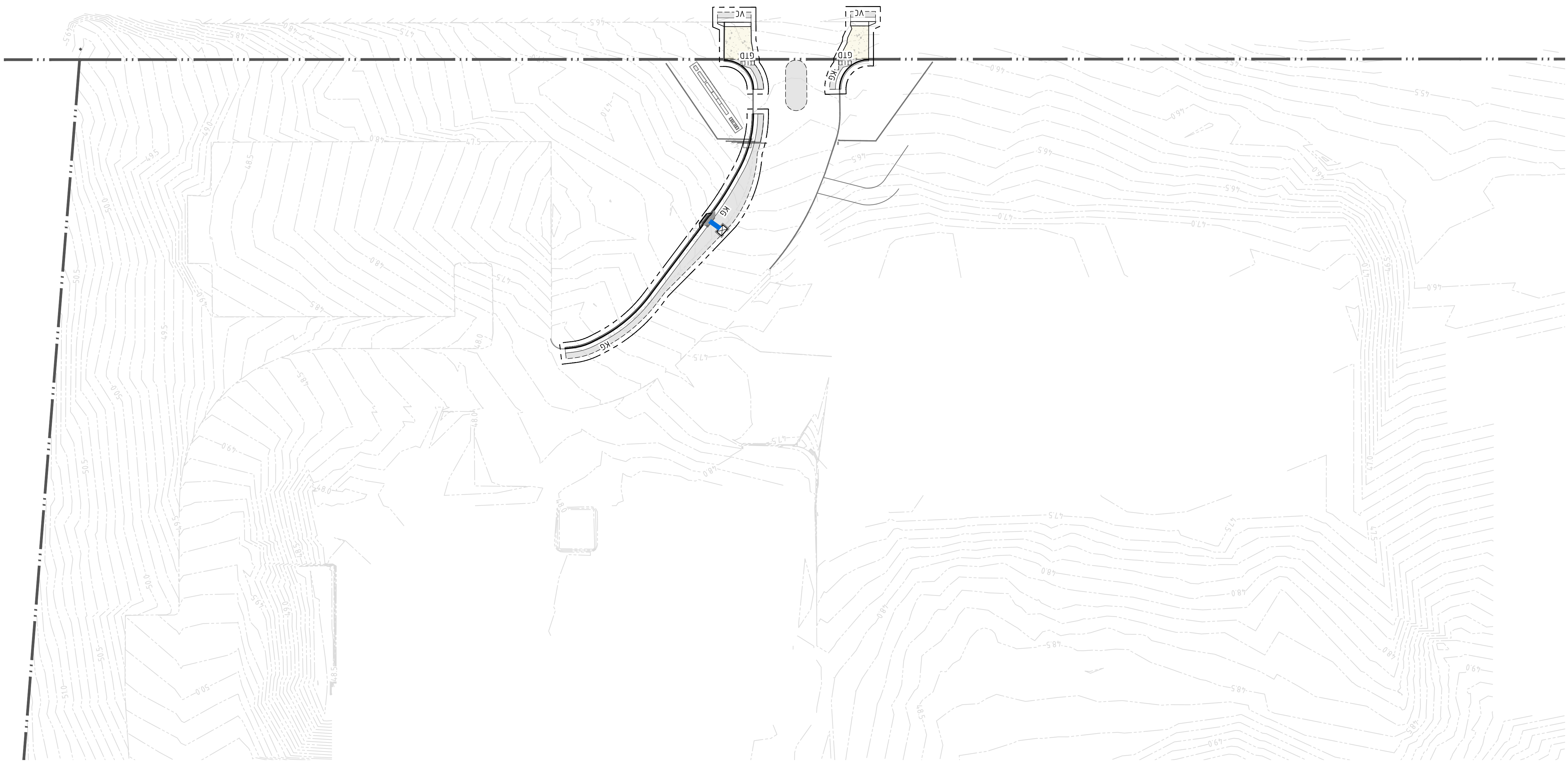
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Ph (02) 9241 4188	Fax (02) 9241 4324
Email sydney@northrop.com.au	ABN 81 094 433 100

PROJECT	INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION
---------	--

DRAWING TITLE	CIVIL ENGINEERING PACKAGE
BULK EARTHWORKS CUT TO FILL PLAN	

JOB NUMBER	202025
DRAWING NUMBER	C03.01
REVISION	02
DRAWING SHEET SIZE = A1	

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
KO	KERB ONLY
KG	KERB AND GUTTER
IK	INTEGRAL KERB
DD	DISH DRAIN
VC	VEHICULAR CROSSING
KR	KERB RAMP
WS	WHEEL STOP
MTE	MATCH TO EXISTING
• RLXX.XX	PROPOSED SPOT HEIGHT
× eRLXX.XX	EXISTING SPOT HEIGHT
FFLXX.XX	PROPOSED FINISHED FLOOR LEVEL
	BATTERS
	CONTOURS
	EXISTING CONTOURS
	DRAINAGE SWALE
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	STORMWATER PIT TAG STRUCTURE No / LINE ID
	ROCK HEADWALL

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
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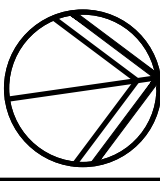
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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01

JOB NUMBER

202025

DRAWING NUMBER

C04.01

REVISION

02

DRAWING SHEET SIZE = A1

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
	KO KERB ONLY
	KG KERB AND GUTTER
	IK INTEGRAL KERB
	DD DISH DRAIN
	VC VEHICULAR CROSSING
	KR KERB RAMP
	WS WHEEL STOP
	MTE MATCH TO EXISTING
	• RLXX.XX PROPOSED SPOT HEIGHT
	× eRLXX.XX EXISTING SPOT HEIGHT
	FFLXX.XX PROPOSED FINISHED FLOOR LEVEL
	BATTERS
	CONTOURS
	EXISTING CONTOURS
	DRAINAGE SWALE
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	1 A STORMWATER PIT TAG STRUCTURE No / LINE ID
	ROCK HEADWALL

HEADWALL DISCHARGE AND
SCOUR PROTECTION.
SUBJECT TO DETAILED DESIGN

FOR CONTINUATION REFER TO SHEET 03

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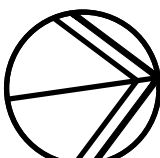


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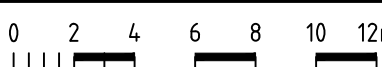
ARCHITECT

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SCALE 1:250@ A1



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PROJECT

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TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITeworks AND STORMWATER
MANAGEMENT PLAN - SHEET 02

JOB NUMBER

202025

DRAWING NUMBER

C04.02

REVISION

02

DRAWING SHEET SIZE = A1

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
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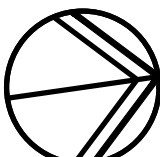


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DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITeworks AND STORMWATER
MANAGEMENT PLAN - SHEET 03

JOB NUMBER

202025

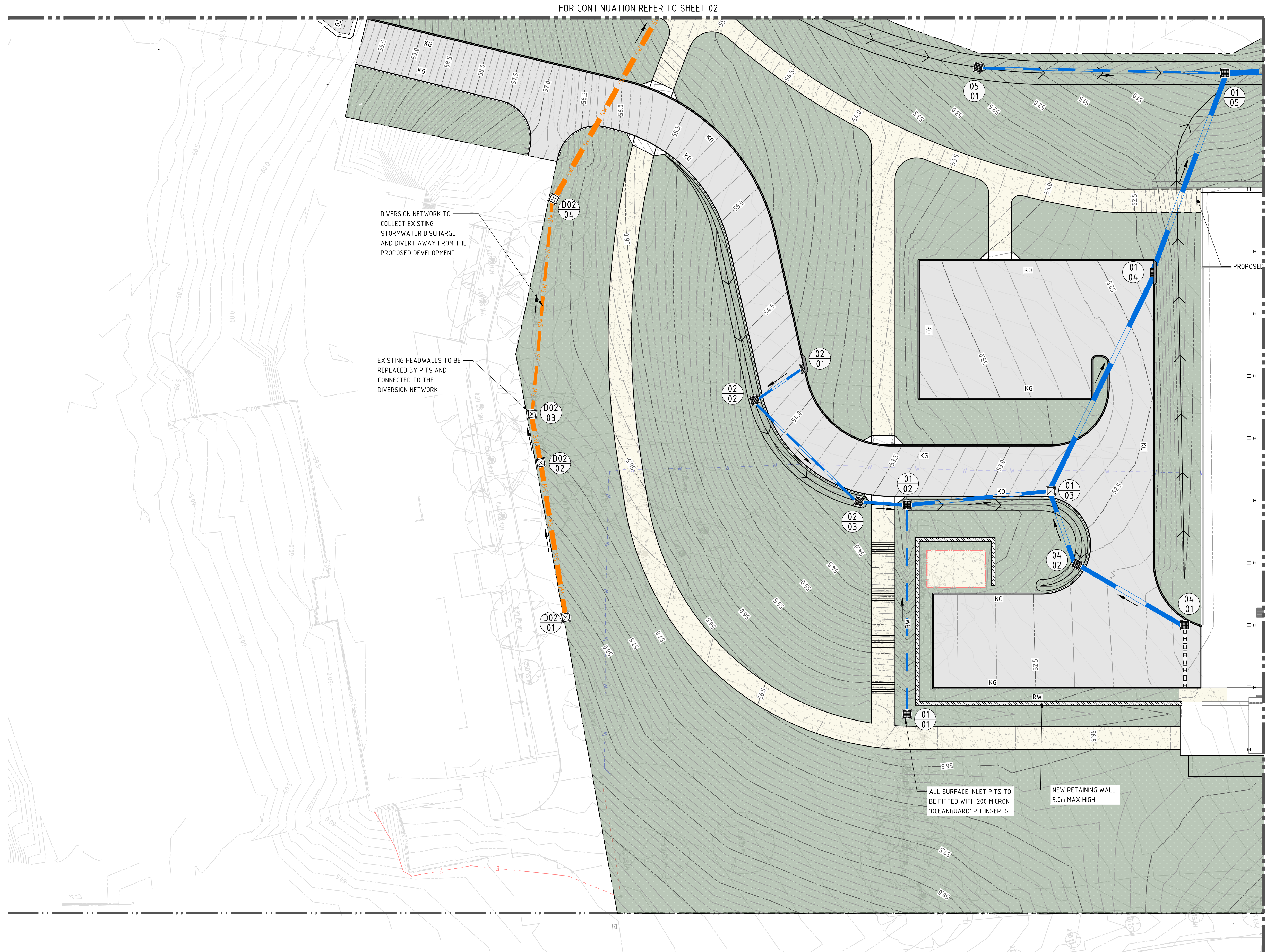
DRAWING NUMBER

C04.03


REVISION

02


DRAWING SHEET SIZE = A1




LEGEND




PROPOSED BOUNDARY LINE




EXISTING BOUNDARY LINE




PROPOSED KERB



EXISTING KERB




SAWCUT AND PAVEMENT INFILL




KO

KERB ONLY




KG

KERB AND GUTTER




IK

INTEGRAL KERB




DD

DISH DRAIN




VC

VEHICULAR CROSSING




KR

KERB RAMP




WS

WHEEL STOP




MTE

MATCH TO EXISTING




RLXX.XX

PROPOSED SPOT HEIGHT




eRLXX.XX

EXISTING SPOT HEIGHT




FFLXX.XX


PROPOSED FINISHED FLOOR LEVEL




BATTERS




CONTOURS




EXISTING CONTOURS




DRAINAGE SWALE



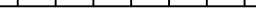
DRAINAGE STRUCTURE WITH
EXTENDED CHAMBER (NEW / EXTG)




GRADED INLET PIT (NEW / EXTG)



KERB INLET PIT (NEW / EXTG)




JUNCTION PIT (NEW / EXTG)




1
A

STORMWATER PIT TAG



STRUCTURE No / LINE ID



ROCK HEADWALL

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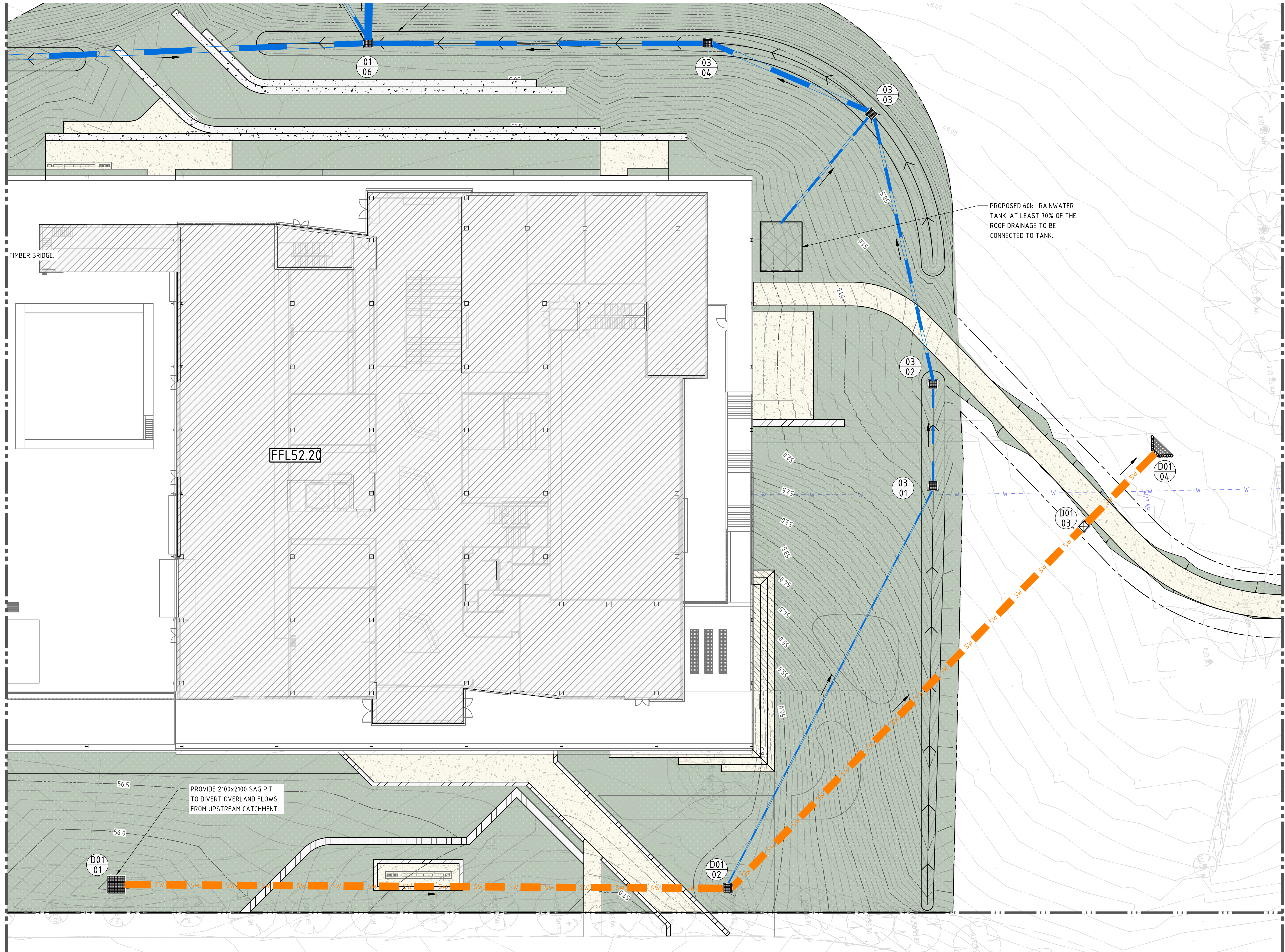
FOR CONTINUATION REFER TO SHEET 03

VERIFIER:

JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE



FOR CONTINUATION REFER TO SHEET 05

LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
	KERB ONLY
	KERB AND GUTTER
	INTEGRAL KERB
	DISH DRAIN
	VEHICULAR CROSSING
	KERB RAMP
	WHEEL STOP
	MATCH TO EXISTING
	PROPOSED SPOT HEIGHT
	EXISTING SPOT HEIGHT
	PROPOSED FINISHED FLOOR LEVEL
	BATTERS
	CONTOURS
	EXISTING CONTOURS
	DRAINAGE SWALE
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	STORMWATER PIT TAG STRUCTURE No / LINE ID
	ROCK HEADWALL

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ARCHITECT

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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITeworks AND STORMWATER MANAGEMENT PLAN - SHEET 04

JOB NUMBER

202025

DRAWING NUMBER

C04.04

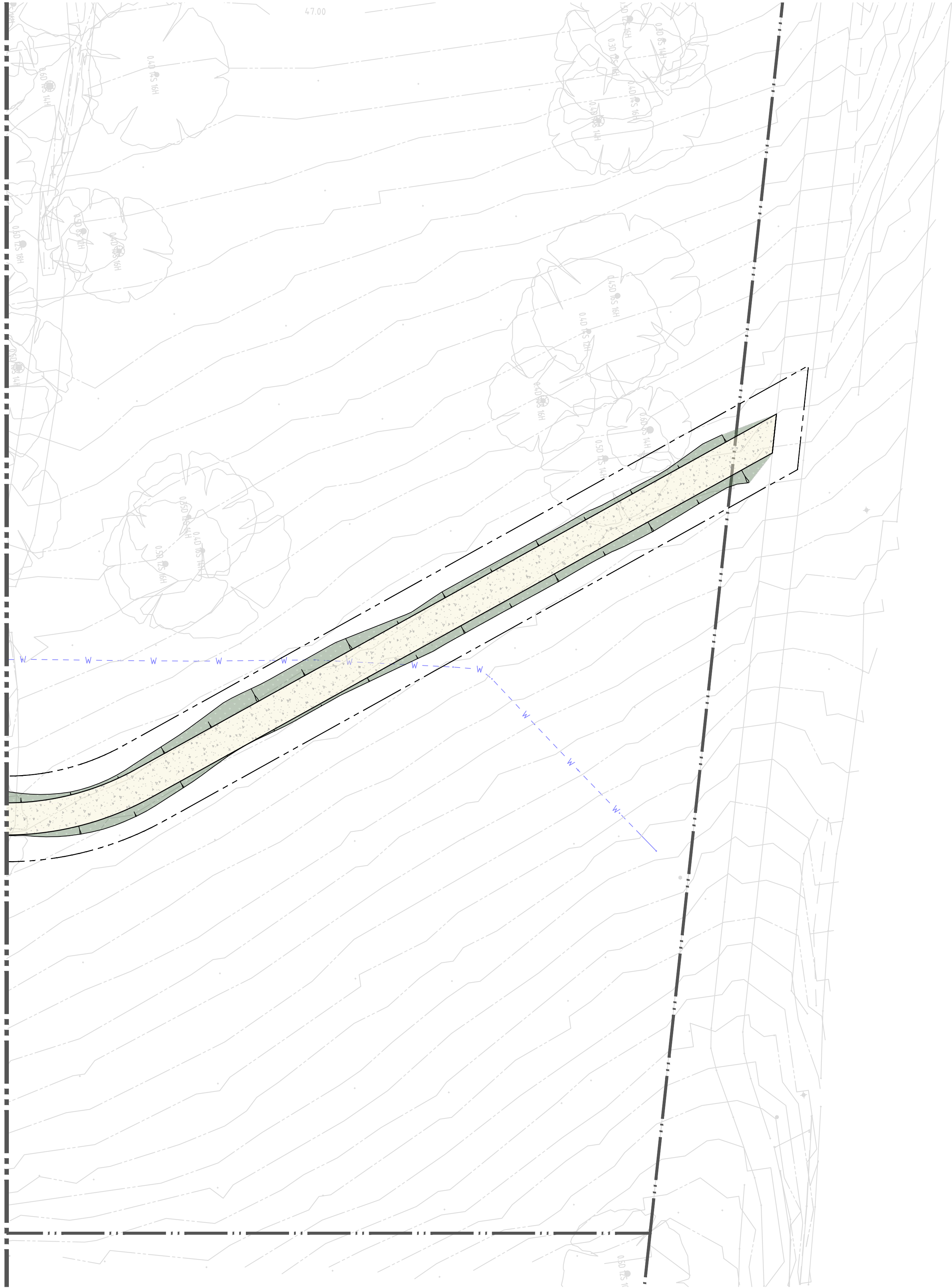
REVISION

02

DRAWING SHEET SIZE = A1

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

FOR CONTINUATION REFER TO SHEET 04



LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
K0	KERB ONLY
KG	KERB AND GUTTER
IK	INTEGRAL KERB
DD	DISH DRAIN
VC	VEHICULAR CROSSING
KR	KERB RAMP
WS	WHEEL STOP
MTE	MATCH TO EXISTING
• RLXX.XX	PROPOSED SPOT HEIGHT
× eRLXX.XX	EXISTING SPOT HEIGHT
	PROPOSED FINISHED FLOOR LEVEL
	BATTERS
	CONTOURS
	EXISTING CONTOURS
	DRAINAGE SWALE
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	STORMWATER PIT TAG STRUCTURE No / LINE ID
	ROCK HEADWALL

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DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITeworks AND STORMWATER MANAGEMENT PLAN - SHEET 05

JOB NUMBER

202025

DRAWING NUMBER

C04.05

REVISION

02

DRAWING SHEET SIZE = A1

VERIFIER:

JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

PIPE CLASS
PIPE GRADE (%)
PIPE SIZE (mm)
MINIMUM COVER (m)
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)
Q (5% A.E.P.) - PIPE FLOW (L/s)
Q (1% A.E.P.) - PIPE FLOW (L/s)

DATUM RL
H.G.L. (5% A.E.P.)
H.G.L. (1% A.E.P.)
FINISHED SURFACE
NATURAL SURFACE
PIPE INVERT LEVEL
DEPTH TO INVERT
CHAINAGE

01\01
900x900 G.S.I.P. SAG
EASTING 290704.305
NORTHING 6261488.473

01\02
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290677.726
NORTHING 6261592.886

01\03
900x900 J.P.
EASTING 290678.611
NORTHING 6261592.886

01\04
G.G.P. 7.4m E.K.I. SAG
EASTING 290652.663
NORTHING 6261527.863

01\05
900x900 G.S.I.P. SAG
EASTING 290628.673
NORTHING 6261540.509

01\06
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290633.832
NORTHING 6261591.090

01\07
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290622.887
NORTHING 6261592.902

LINE 01

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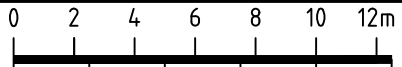
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GRAY PUKSAND

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SCALE 1:100 @ A1





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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL SECTIONS - SHEET 01

DRAWING NUMBER

202025

REVISION

C04.21

02

DRAWING SHEET SIZE = A1

VERIFIER:

JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

PIPE CLASS
PIPE GRADE (%)
PIPE SIZE (mm)
MINIMUM COVER (m)
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)
Q (5% A.E.P.) - PIPE FLOW (L/s)
Q (1% A.E.P.) - PIPE FLOW (L/s)

DATUM RL		32.0
H.G.L. (5% A.E.P.)	47.951	47.951
H.G.L. (1% A.E.P.)	48.169	47.935
FINISHED SURFACE	48.321	47.794
NATURAL SURFACE	48.321	47.794
PIPE INVERT LEVEL	47.104	46.917
DEPTH TO INVERT	1.216	0.877
CHAINAGE	165.648	179.862

LINE 01

LINE 02

LINE 03

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21



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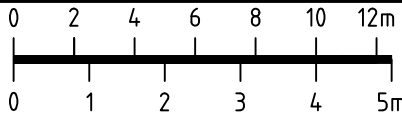
ARCHITECT

GRAY PUKSAND

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PROJECT

INSTITUTE OF APPLIED
TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL
SECTIONS - SHEET 02

JOB NUMBER

202025

DRAWING NUMBER

04.22

REVISION

02

DRAWING SHEET SIZE = A1

VERIFIER:

JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

PIPE CLASS
PIPE GRADE (%)
PIPE SIZE (mm)
MINIMUM COVER (m)
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)
Q (5% A.E.P.) - PIPE FLOW (L/s)
Q (1% A.E.P.) - PIPE FLOW (L/s)

DATUM RL	34.0
H.G.L. (5% A.E.P.)	50.017 49.995
H.G.L. (1% A.E.P.)	50.351 50.317 50.333
FINISHED SURFACE	50.704
NATURAL SURFACE	51.014
PIPE INVERT LEVEL	49.896 49.819
DEPTH TO INVERT	0.809 0.885
CHAINAGE	70.056

LINE 03

03\02
900x900 G.S.I.P. SAG
EASTING 290686.439
NORTHING 6261655.552

03\03
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290651.713
NORTHING 6261655.391

03\04
900x900 G.S.I.P. SAG
EASTING 290639.918
NORTHING 6261633.460

01\06
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290633.832
NORTHING 6261633.460

04\01
G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290698.065
NORTHING 6261512.830

04\02
900x900 G.S.I.P. SAG
EASTING 290688.375
NORTHING 6261512.830

01\03
900x900 J.P.
EASTING 290678.611
NORTHING 6261633.460

RRJ2
RRJ2
1.0%
1.0%
450
450
0.60
1.17
Vf=1.47
Vf=1.35
Vf=1.46
Vf=1.33
Q=133
Q=144
Q=177
Q=198

DATUM RL	38.0
H.G.L. (5% A.E.P.)	51.287 51.266
H.G.L. (1% A.E.P.)	51.795 51.786
FINISHED SURFACE	52.038
NATURAL SURFACE	54.045
PIPE INVERT LEVEL	50.966 50.816 50.766
DEPTH TO INVERT	1.071 1.527 1.577
CHAINAGE	0.000 15.964 26.074

LINE 04

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01	50% DETAILED DESIGN	TB		JG	20.05.21
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21



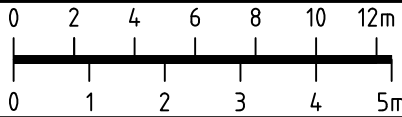
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ARCHITECT

GRAY PUKSAND

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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL SECTIONS - SHEET 03

JOB NUMBER

202025

DRAWING NUMBER

04.23

REVISION

02

DRAWING SHEET SIZE = A1

VERIFIER:

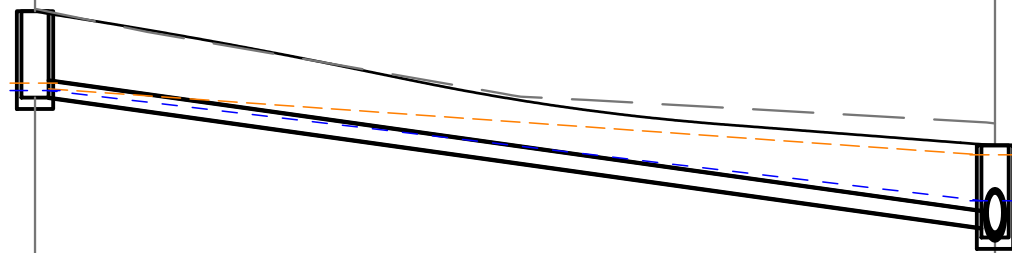
JOB MANAGER: J. GILLIGAN

DESIGNED: T. BUGAEV

DRAWN: C. PASKE

05\01

G.S.I.P. 900x900 1m GRASS SWALE
EASTING 290623.402
NORTHING 6261509.299



PIPE CLASS	UPVC
PIPE GRADE (%)	5.6%
PIPE SIZE (mm)	225
MINIMUM COVER (m)	0.60
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=2.00
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=2.17
Q (5% A.E.P.) - PIPE FLOW (L/s)	Q=39
Q (1% A.E.P.) - PIPE FLOW (L/s)	Q=62

DATUM RL		36.0		
H.G.L. (5% A.E.P.)	51.068	51.068	49.610	49.610
H.G.L. (1% A.E.P.)	51.166	51.090	50.217	49.937
FINISHED SURFACE	52.117		50.343	
NATURAL SURFACE	52.148		50.631	
PIPE INVERT LEVEL	50.973		49.247	49.123
DEPTH TO INVERT	1.144		1.096	1.220
CHAINAGE	0.000		31.746	

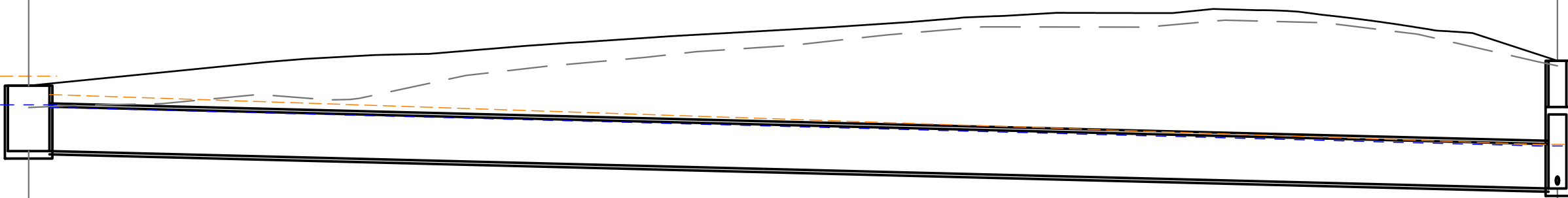
LINE 05

01\05

900x900 G.S.I.P. SAG
EASTING 290628.423
NORTHING 6261544.609

DIV01\01

2100x2100 G.S.I.P. SAG
EASTING 290734.586
NORTHING 6261544.401



RRJ2
1.0%
900
0.40
Vf=1.38
Vf=1.88
Q=4.21
Q=596

39.0	55.048	54.997	54.214	54.214
55.628	55.256	54.246	54.246	
55.435		55.941		
54.993		55.837		
54.111		53.354	53.354	
1.324		2.587		
0.000		77.252		

LINE DIV01

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21



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PROJECT
**INSTITUTE OF APPLIED
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DRAWING TITLE
CIVIL ENGINEERING PACKAGE

**STORMWATER LONGITUDINAL
SECTIONS - SHEET 04**

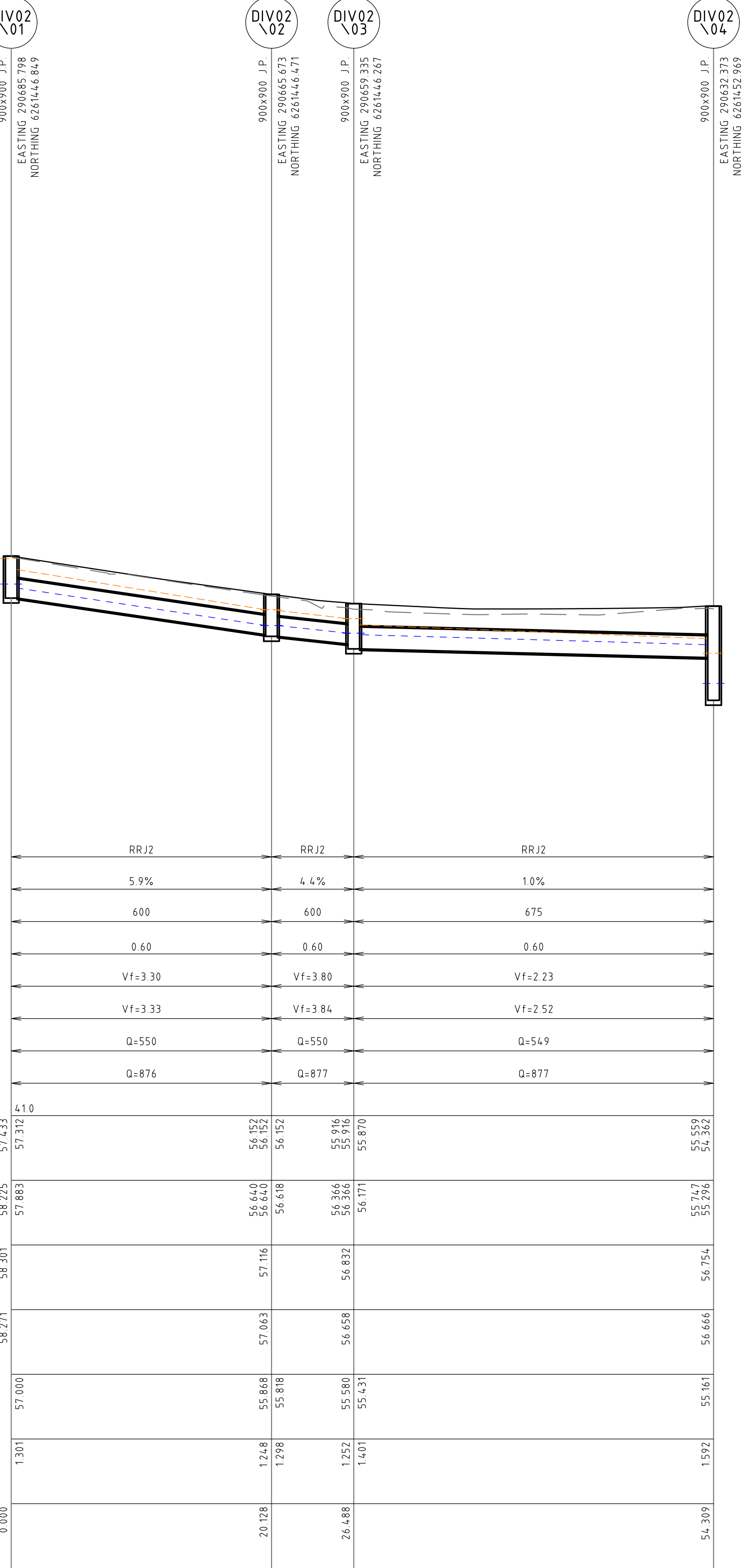
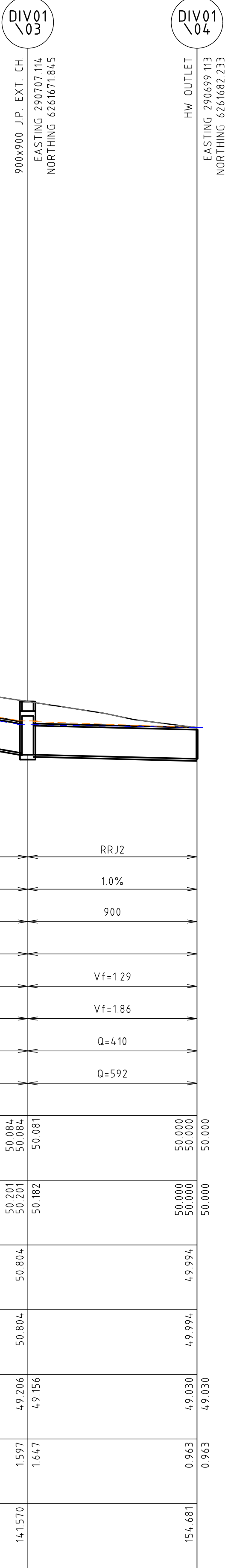
JOB NUMBER 202025	REVISION
DRAWING NUMBER C04.24	02
DRAWING SHEET SIZE = A1	

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

PIPE CLASS
PIPE GRADE (%)
PIPE SIZE (mm)
MINIMUM COVER (m)
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)
Q (5% A.E.P.) - PIPE FLOW (L/s)
Q (1% A.E.P.) - PIPE FLOW (L/s)

DATUM RL	38.0				
H.G.L. (5% A.E.P.)	54.214	54.214			
H.G.L. (1% A.E.P.)	54.246	54.246			
FINISHED SURFACE	55.941	55.941			
NATURAL SURFACE	55.837	55.837			
PIPE INVERT LEVEL	53.354	53.354			
DEPTH TO INVERT	2.587	2.287			
CHAINAGE	77.252				

LINE DIV01



LINE DIV02

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	50% DETAILED DESIGN	TB		JG	20.05.21
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21

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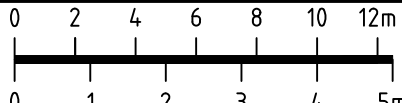
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PROJECT

INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL SECTIONS - SHEET 05

JOB NUMBER

202025

DRAWING NUMBER
C04.25

REVISION
02

DRAWING SHEET SIZE = A1

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

PIPE CLASS
PIPE GRADE (%)
PIPE SIZE (mm)
MINIMUM COVER (m)
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)
Q (5% A.E.P.) - PIPE FLOW (L/s)
Q (1% A.E.P.) - PIPE FLOW (L/s)

DATUM RL	40.0		
H.G.L. (5% A.E.P.)	55.559 54.362	54.318	53.500 53.500
H.G.L. (1% A.E.P.)	55.747 55.296	55.022	54.286 54.286 54.105
FINISHED SURFACE	56.754		55.158
NATURAL SURFACE	56.666		55.479
PIPE INVERT LEVEL	55.161 53.840		53.370 53.320
DEPTH TO INVERT	1.592 2.914		1.788 1.838
CHAINAGE	54.309		102.182

LINE DIV02

DIV02
04
900x900 J/P
EASTING 290532.373
NORTHING 626152.969

DIV02
05
900x900 J/P
EASTING 290594.534
NORTHING 6261482.291

DIV02
06
HW. OUTLET
EASTING 290605.393
NORTHING 6261500.343

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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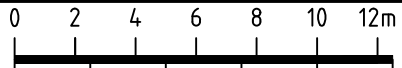
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PROJECT

INSTITUTE OF APPLIED
TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL
SECTIONS - SHEET 06

JOB NUMBER

202025

DRAWING NUMBER

C04.26

REVISION

01

DRAWING SHEET SIZE = A1

LEGEND

LIMIT OF WORKS

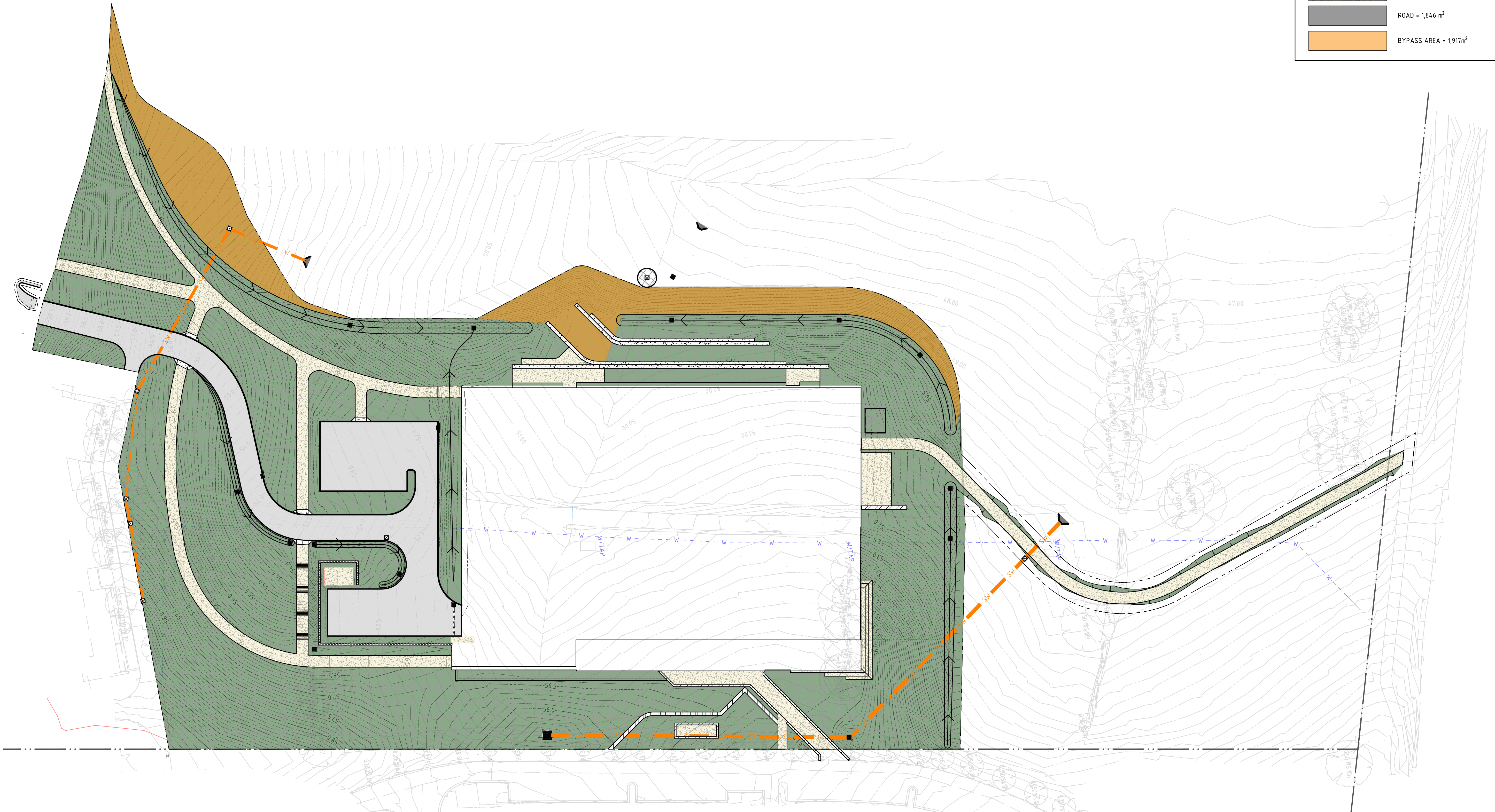
LANDSCAPED AREA = 13,330 m²

ROOF = 7,227 m²

FOOTPATH = 1,715 m²

ROAD = 1,846 m²

BYPASS AREA = 1,917m²



DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

DRAWN: C. PASKE

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21

CLIENT

NSW GOVERNMENT

TAFE NSW

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SCALE 1:500@A1

0

5

10

15

20

25m

NORTHROP

Sydney

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PROJECT

INSTITUTE OF APPLIED
TECHNOLOGY FOR CONSTRUCTION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
STORMWATER CATCHMENT PLAN

JOB NUMBER

202025

DRAWING NUMBER

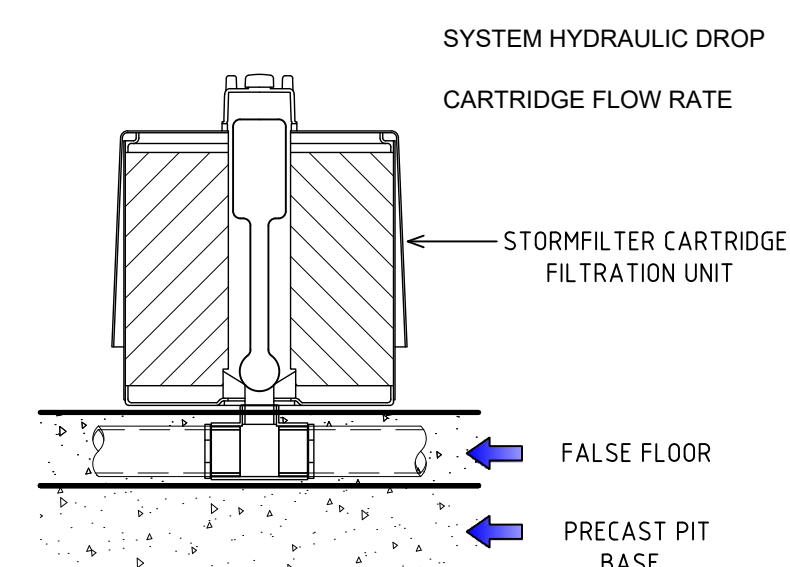
C04.51

REVISION

01

DRAWING SHEET SIZE = A1




DRAWN: C. PASKE



SECTION



PLAN LAYOUT

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT		DRAWING TITLE	JOB NUMBER	
01	50% DETAILED DESIGN	TB		JG	20.05.21	 	GRAY PUKSAND	 Sydney Level 11 345 George Street, Sydney NSW 2000 Ph (02) 9241 4188 Fax (02) 9241 4324 Email sydney@northrop.com.au ABN 81 094 433 100	INSTITUTE OF APPLIED TECHNOLOGY FOR CONSTRUCTION	CIVIL ENGINEERING PACKAGE	202025	
02	ISSUED FOR INFORMATION - 100%	JG		JG	09.06.21							
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											DRAWING SHEET SIZE = A1	

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