Civil Engineering Report

Development Application

Port Macquarie Stage 2B

Prepared for Charles Sturt University / 26 September 2019

171878 CAAC

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1.0 Introduction

Taylor Thomson Whitting has been engaged by BVN Architects care of CSU Port Macquarie to provide the associated civil engineering design and documentation for the proposed works on the Charles Sturt University (CSU) Port Macquarie Stage 2B Project located in Port Macquarie. This report has been prepared to highlight the proposed civil engineering works.

1.1 Development Site

The works area is located within the Port Macquarie Hastings Council local government area as shown in Figure 1.1 in context of the wider CSU Port Macquarie Campus. The works area is located to the south of the Stage 2A works that are currently being constructed. The works area covers an area of approximately 7,000 m^2 and is currently largely greenfield. The works area falls from a reduced level (RL) of 9.20 at the north-west to 4.80 at the south-east of the site.

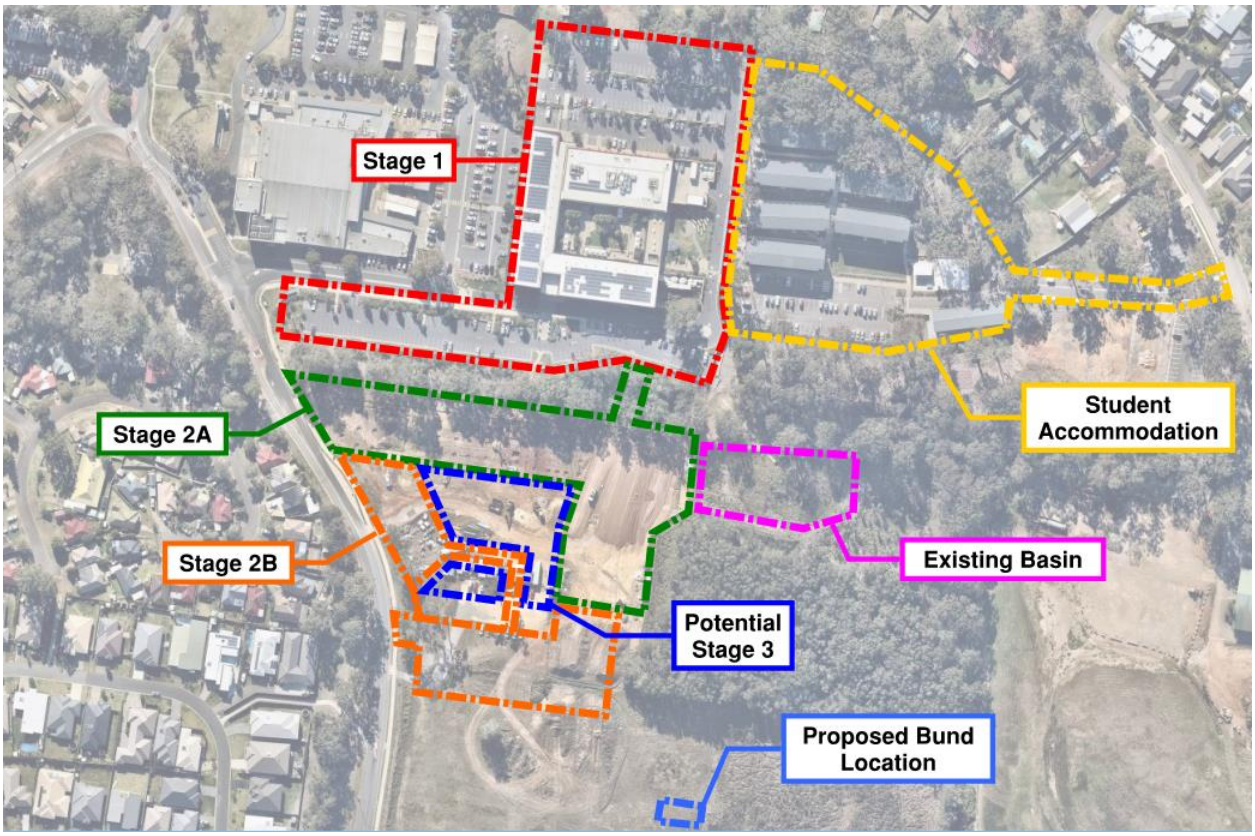

Figure 1.1: Works Area Location

1.2 Reference Documents

- Port Macquarie Hastings Council's Design Specifications D5 Stormwater Drainage Design and D7 Stormwater Management
- Port Macquarie Hastings Council's Development Control Plan 2013 and Local Environmental Plan 2013
- Previous Civil Engineering Reports prepared by TTW for the Masterplan, Stage 1 and Stage 2A of the Campus
- Stormwater Management Report Associated with 28 Kingfisher Road, Port Macquarie prepared by RHG Consulting Group dated December 2014
- Pre-DA Meeting Minutes

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2.0 Proposed Works

The proposed works include (refer to Figure 2.1):

- Construction of a new two storey building;
- Construction of a new road connection out to Major Innes Drive;
- Construction of a new car park; and
- Associated landscaping.

The civil works involved include the installation of a new in-ground pit and pipe system draining to both the existing basin and a proposed detention basin; the provision of stormwater quality measures; and pavement works associated with the road connection and car park.

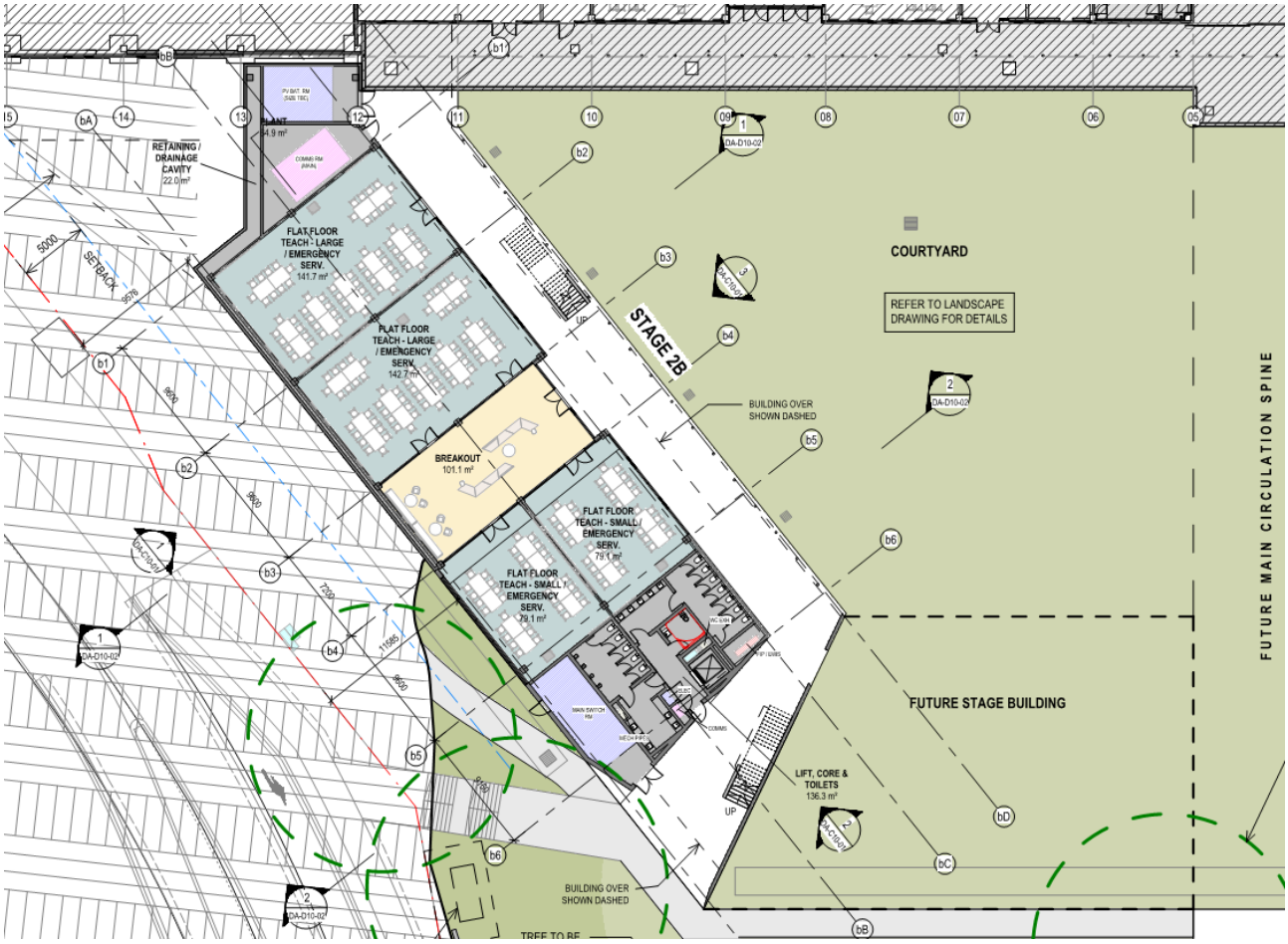

Figure 2.1: Site Plan prepared by BVN

3.0 Stormwater Quantity

The proposed stormwater design has been undertaken in accordance with Port Macquarie Hastings Council's Development Control Plan, Design Specification (D5 Stormwater Drainage Design and D7 Stormwater Management).

In accordance with Council's Design Specifications, on site detention must be designed to maintain pre-development flow rates where the pre-development site assumes a greenfield scenario.

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To meet this requirement, the site is to discharge to a combination of the existing detention basin and a new detention basin to the south-east of the site. Stormwater from the proposed roof and courtyard of Stage 2B will be conveyed to the stormwater line currently under construction for the Stage 2A works that drains to the existing detention basin. Stormwater from the proposed carpark and road network will be conveyed to a grassed swale leading to the proposed detention basin to the south-east of the site. This grassed swale will also convey stormwater that was previously bypassing detention from the Stage 2A carpark.

To determine the proposed OSD meets Council's requirements, catchments were modelled using DRAINS. The DRAINS model includes the completed Stage 1 works (completed by TTW), the currently being constructed Stage 2A works (completed by TTW) and the Student Accommodation Site catchment (parameters provided by RGH Consulting Group). The DRAINS model applies the methodology detailed within Australian Rainfall and Runoff 2016.

The pre and post development total flow rates have been detailed in Table 3.1 and an extract of the DRAINS modelling layout showing Stage 2B is shown in Figure 3.1. Note that the post development flow has been restricted to meet the total pre development flow rates for the four catchments. The post development flow includes flowrates from bypassing catchments.

Table 3.1: Pre and Post Development Flow Rates

			ARR2016		
			20% AEP	5% AEP	1% AEP
Pre Development	CSU Stage 1		0.509	0.856	1.11
	CSU Stage 2	2A	0.162	0.31	0.424
		2B	0.113	0.206	0.291
	Student Accommodation		0.513	0.936	1.34
	Total		1.297	2.308	3.165
Post Development	Existing Basin with 2A and 2B Roof		1.1	1.23	1.28
	Existing Basin Overflow		0	0.438	1.6
	Carpark Basin		0.088	0.098	0.101
	Carpark Basin Overflow		0	0.078	0.184
	Total		1.188	1.844	3.165

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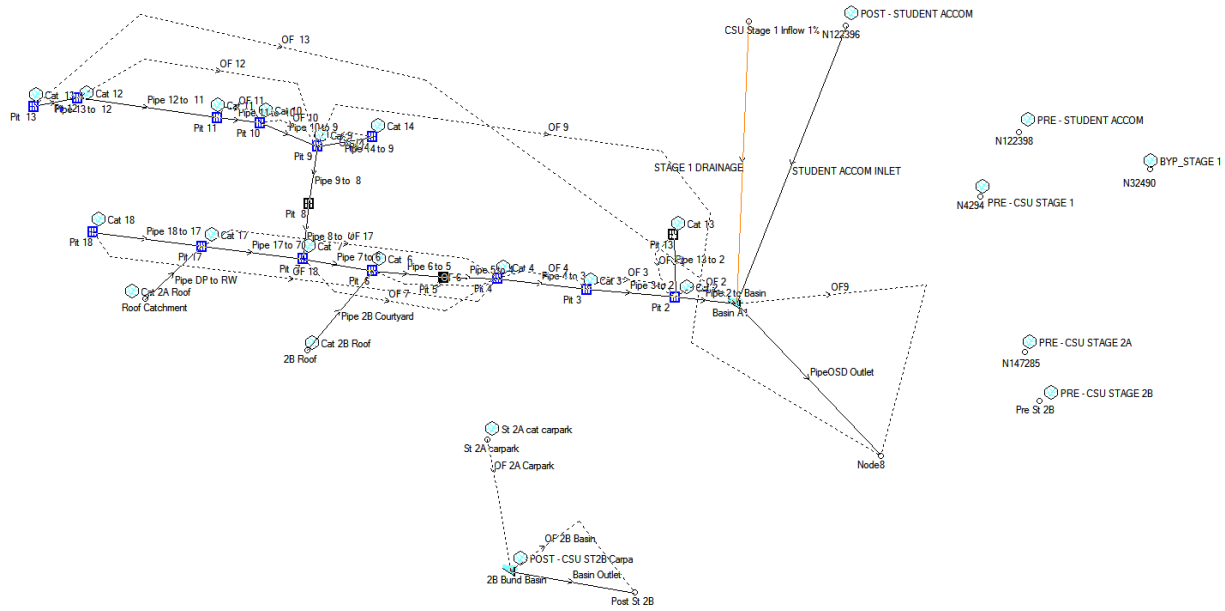

Figure 3.1: DRAINS Schematic Extract

4.0 Flood Planning

The proposed Stage 2B works contains areas within the limits of the Probable Maximum Flood (PMF) according to Flood Planning Maps contained within Council's Local Environmental Plan (Figure 4.1).

Figure 4.1: Probable Maximum Flood Extent

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The PMF extent approximately follows the RL 5.2m contour. The building is proposed at a higher level than RL 5.2m, and therefore not expected to be impacted by the PMF and an evacuation route will be available in the event of a major storm to the north of the site. The Flood Planning Area follows approximately the 3.2m contour. While parts of the carpark are proposed to be lower than the PMF, given its use for carparking and height higher than the Flood Planning Level, it is considered to be appropriate. This is in line with Council's Flood Policy which states that open air carparks have a Flood Planning Level of the 20 year ARI Flood Level.

5.0 Stormwater Quality

Port Macquarie Hastings Council's water quality requirements are outlined in their Design Specification D7 Stormwater Management. Water quality measures must meet quality targets as detailed within Council's Design Specifications (refer to Table 5.1). Stormwater quality measures including a rainwater tank and bioretention have been designed to ensure pollutant targets are met.

Table 5.1: Council's Stormwater Quality Requirements
Source: Port Macquarie Hastings Council's Design Specification D7 Stormwater Management)

Pollutant	Objective
Suspended Solids	80% retention of average annual load.
Total Phosphorus	45% retention of average annual load.
Total Nitrogen	45% retention of average annual load.
Litter	100% retention of litter greater than 5mm for flows up to the 3 month ARI peak flow.
Sediment	100% retention of sediment greater than 0.125mm for flows up to the 3 month peak ARI flow.
Oil and Grease	No visible oils for flows up to the 3 month ARI peak flow.

Stormwater quality measures have been modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC).

As part of the site will be discharging into the existing basin and bioretention, MUSIC modelling has been conducted with the Stage 1 and Stage 2A models included. It is noted that the Student Accommodation site has been treated by a bioretention basin prior to discharge into the OSD and therefore has not been included within the MUSIC model.

The proposed carpark for Stage 2B will be treated by bioswales located within landscaped areas that will be collected and discharged to the grassed swale leading to the proposed detention bund to the south-east.

The layout of the MUSIC model and results are shown in Figure 5.1 and Figure 5.2 respectively. While the bioretention filter media included as part of the Stage 1 and Stage 2A works was designed to provide a hydraulic conductivity of 180mm/hr, a sensitivity analysis has been modelled with a hydraulic conductivity of 50mm/hr to ensure Council water quality targets are still met. The results of this sensitivity analysis are shown in Figure 5.3.

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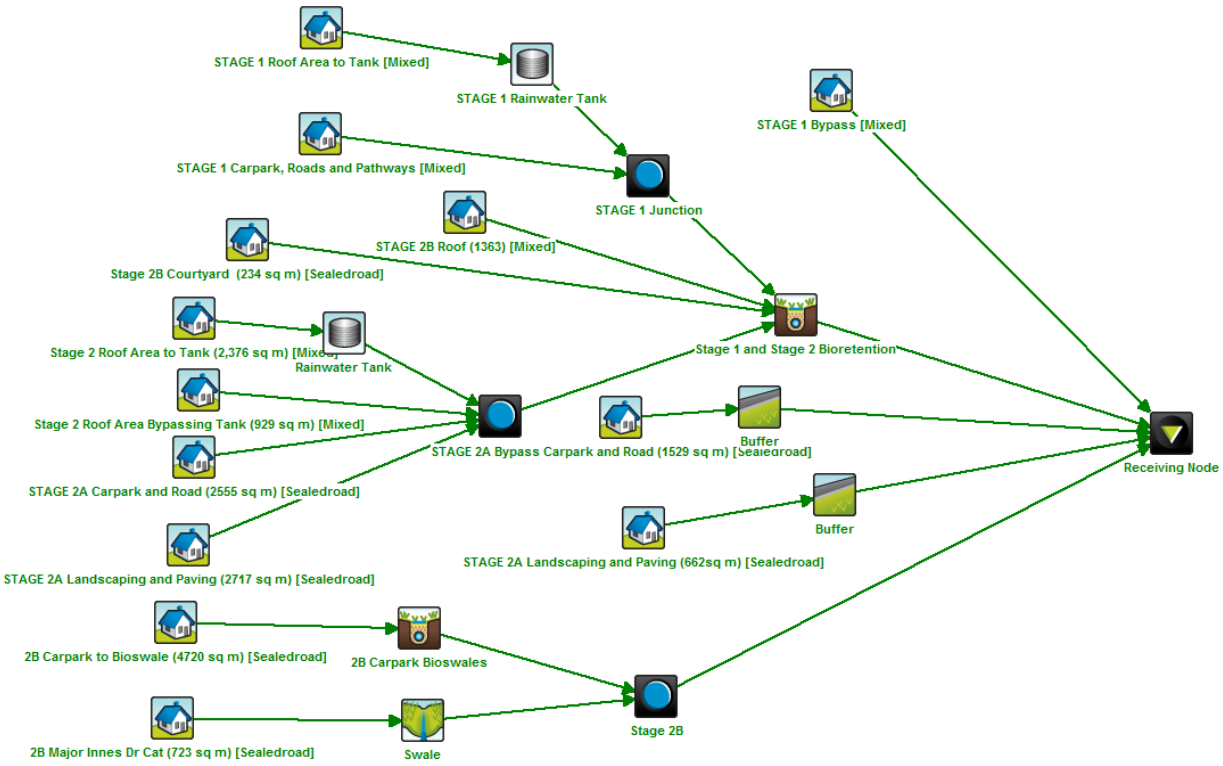

Figure 5.1: MUSIC Modelling Layout

Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	37.1	35.2	5.1
Total Suspended Solids (kg/yr)	7520	730	90.3
Total Phosphorus (kg/yr)	16.6	8.68	47.6
Total Nitrogen (kg/yr)	97.8	35.9	63.3
Gross Pollutants (kg/yr)	891	34.5	96.1

Figure 5.2: MUSIC Modelling Results

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Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	37.1	35.2	5.2
Total Suspended Solids (kg/yr)	7520	1110	85.2
Total Phosphorus (kg/yr)	16.6	8.44	49.1
Total Nitrogen (kg/yr)	97.8	46.7	52.3
Gross Pollutants (kg/yr)	891	34.5	96.1

Figure 5.3: MUSIC Modelling Results for Sensitivity Analysis

5.1 Stormwater Quality During Construction

During the construction stage of the project, an erosion and sediment control plan is to be implemented to prevent sediment laden stormwater from flowing into adjoining properties, bushland, roadways or receiving water bodies. Stormwater controls onsite are detailed in an erosion and sediment control plan which is in accordance with relevant regulatory authority guidelines including Port Macquarie Hastings Council's Design Specification and Landcom NSW's Managing Urban Stormwater, Soils and Construction ("Blue Book"). Refer to civil engineering drawings for the proposed concept erosion and sediment control plan.

6.0 Future Development

As part of the masterplan for CSU's Port Macquarie Campus, future Stage 3 works are likely to include additional buildings adjacent to the proposed Stage 2B and associated carparking. A drainage stub is provided within the Stage 2B design to allow for future stormwater connections from the Stage 3 buildings.

The Stage 3 roof and building water quality treatment train is likely to include a rainwater tank and bioswales. These swales will convey site stormwater to an extension of the proposed Stage 2B detention bund to provide detention of this roof. Carparking required as part of Stage 3 will be included to the south east of the proposed Stage 2B carpark. Additional carparking is likely to be treated with bioswales within the central landscaped areas and a grassed swale into an extension of the proposed Stage 2B bund.

A masterplan sketch detailing the above has been provided in Appendix B. Note that the proposed masterplan strategy for Stage 3 is subject to future design and calculations dependent on the finalised design. The above provides a proposal based on current projections.

7.0 Response to Pre-Development Application Minutes

A pre-lodgement meeting was held on Tuesday 25th June 2019 to discuss the proposal with Port Macquarie Hastings Council. A number of points were raised in relation to Engineering and Stormwater that have been addressed during the development of the proposed design.

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7.1 Sight Distance and Kerb Ramp Location

The location of the kerb ramps is in accordance with Australian Standards 2890 and 1428, Council's Aus-Spec Guidelines and relevant Austroads Guides. The kerb ramps direct pedestrians to the opposing ramps and are located to provide sufficient sight lines of pedestrians by drivers.

For sight lines of pedestrians, the entry sign location is set back from a 3m by 3m splay from the roadway at the kerb ramp location, allowing for sufficient sight lines in accordance with AS2890.1 Figure 3.3 (which only requires a 2m by 2.5m splay).

Sight lines of approaching vehicles are in accordance with AS2890.1 Figure 3.2 as there are no permanent high height obstructions obscuring oncoming vehicles from drivers exiting the site. The entry sign is located further to the east than the proposed exit and therefore will not provide an obstruction.

7.2 Traffic Manoeuvrability

A swept path analysis has been conducted within the site to confirm compliance with the requested criteria and with AS2890. The gradient into the site has been developed in accordance with AS2890 as shown on the long section and scraping analysis detailed in the drawings attached in Appendix A.

7.3 Stormwater Management Plan and Staging

The remainder of this report covers the requested details regarding stormwater management, including how the proposed design complies with Council's specifications D5 and D7. A future masterplan has been prepared indicating how a future Stage 3 development would be managed from a quality and quantity perspective and is discussed in Section 6.0.

8.0 Conclusion

This report provides a summary of the proposed concept civil engineering and stormwater management for the CSU Port Macquarie Stage 2B development. Stormwater is proposed to comply with Port Macquarie Hastings Council's requirements including the provision of onsite stormwater detention via an above ground basin and utilising the existing basin. Erosion and sediment control measures have been proposed for the site during construction. Stormwater quality treatment has been proposed for the development in line with Council's requirements including bioswales, the existing bioretention and grassed swales. The proposed design has been developed considering the CSU Port Macquarie Campus as a whole, and also with consideration to stormwater management of future development within the Campus.

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PAUL YANNOULATOS
Technical Director

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Appendix A

Concept Civil Engineering Drawings

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CHARLES STURT UNIVERSITY

PORT MACQUARIE, STAGE 2B

CONCEPT STORMWATER MANAGEMENT

GENERAL NOTES

1. Contractor must verify all dimensions and existing levels on site prior to commencement of works. Any discrepancies to be reported to the Engineer
2. Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
3. Make smooth connection with all existing works.
4. Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
5. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority, the Contractor is to ensure that the drawings used for construction have been approved by all relevant authorities prior to commencement site.
6. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority is to be carried out in accordance with the requirements of the relevant Authority. The Contractor shall obtain these requirements from the Authority. Where the requirements of the Authority are different to the drawings and specifications, the requirements of the Authority shall be applicable.
7. For all temporary batters refer to geotechnical recommendations.

REFERENCE DRAWINGS

1. These drawings have been based from, and to be read in conjunction with the following Consultants drawings. Any conflict to the drawings must be notified immediately to the Engineer.

Consultant	Dwg Title	Dwg No	Rev	Date
BVN Architecture	DA PLAN-STAGE 2A LEVEL 01	AR-2B-DA-B10	1	24.07.19
OCULUS	Landscape Base	S18-010	-	08.07.19
King + Campbell	Plan of Detail and Levels	5555_Detail_ Stage2	A	28.02.18

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on Taylor Thomson Whitting drawing's have been based from information received from : **King + Campbell**

Taylor Thomson Whitting makes no guarantees that the boundary or easement information shown is correct.
Taylor Thomson Whitting will accept no liabilities for boundary inaccuracies. The contractor/builder is advised to check/confirm all boundaries in relation to all proposed work prior to the commencement of construction. Boundary inaccuracies found are to be reported to the superintendent prior to construction starting.

STORMWATER DRAINAGE NOTES

1 Stormwater Design Criteria :
(A) Average exceedance probability –
1% AEP for roof drainage to first external pit
5% AEP for paved and landscaped areas
(B) Rainfall intensities –
Time of concentration: 5 minutes
1% AEP = 313 mm/hr
5% AEP = 233 mm/hr
(C) Rainfall losses –
Impervious areas: IL = 1.5 mm , CL = 0 mm/hr
Pervious areas: IL =21.9 mm , CL = 2.5 mm/hr

2. Pipes 300 dia and larger to be reinforced concrete Class "2" approved spigot and socket with rubber ring joints U.N.O.
3. Pipes up to 300 dia shall be sewer grade uPVC with solvent welded joints.
4. Equivalent strength VCP or FRP pipes may be used subject to approval.
5. Precast pits may be used external to the building subject to approval by Engineer
6. Enlargers, connections and junctions to be manufactured fittings where pipes are less than 300 dia.
7. Where subsoil drains pass under floor slabs and vehicular pavements, unslotted uPVC sewer grade pipe is to be used.
8. Grates and covers shall conform with AS 3996-2006, and AS 1428.1 for access requirements.
9. Pipes are to be installed in accordance with AS 3725. All bedding to be type H2 U.N.O.
10. Care is to be taken with levels of stormwater lines. Grades shown are not to be reduced without approval.
11. All stormwater pipes to be 150 dia at 1.0% min fall U.N.O.
12. Subsoil drains to be slotted flexible uPVC U.N.O.
13. Adopt invert levels for pipe installation (grades shown are only nominal).

SURVEY AND SERVICES INFORMATION

SURVEY

Origin of levels : PM 71691
Datum of levels : A.H.D. AUSTRALIAN HEIGHT DATUM
Coordinate system : MGA
Survey prepared by : King + Campbell
Setout Points : CONTACT THE SURVEYOR

Taylor Thomson Whitting does not guarantee that the survey information shown on these drawings is accurate and will accept no liability for any inaccuracies in the survey information provided to us from any cause whatsoever.

UNDERGROUND SERVICES - WARNING

The locations of underground services shown on Taylor Thomson Whittings drawings have been plotted from diagrams provided by service authorities. This information has been prepared solely for the authorities own use and may not necessarily be updated or accurate.

The position of services as recorded by the authority at the time of installation may not reflect changes in the physical environment subsequent to installation.

Taylor Thomson Whitting does not guarantee that the services information shown on these drawings shows more than the presence or absence of services, and will accept no liability for inaccuracies in the services information shown from any cause whatsoever.

The Contractor must confirm the exact location and extent of services prior to construction and notify any conflict with the drawings immediately to the Engineer/Superintendent.

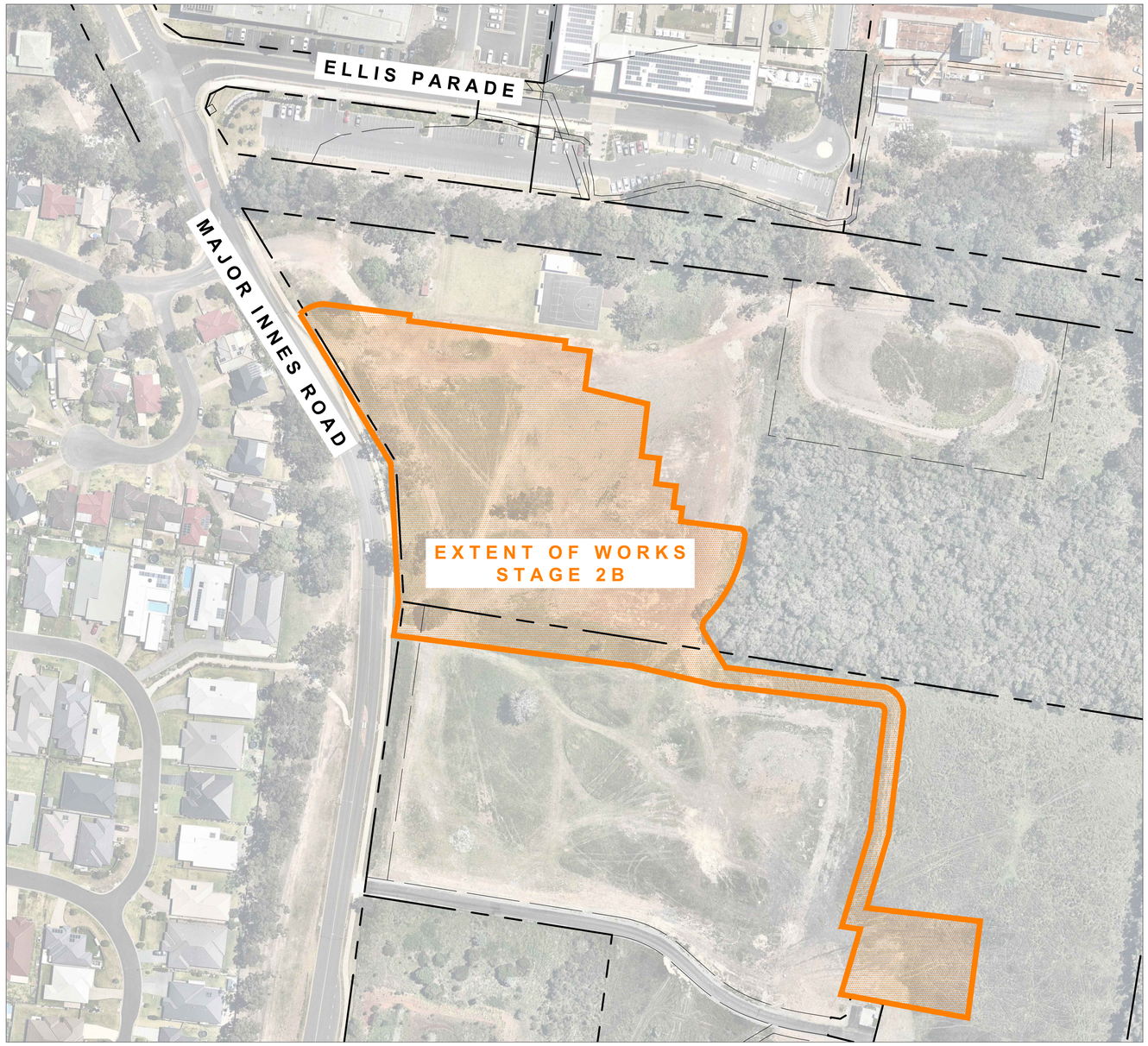
The contractor is to get approval from the relevant state survey department, to remove/adjust any survey mark. This includes but is not limited to; State Survey Marks (SSM), Permanent Marks (PM), cadastral reference marks or any other survey mark which is to be removed or adjusted in any way.
Taylor Thomson Whitting plans do not indicate the presence of any survey mark. The contractor is to undertake their own search.

SITEWORKS NOTES

1. All basecourse material to comply with RMS specification No 3051 and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1.
2. All trench backfill material shall be compacted to the same density as the adjacent material.
3. All service trenches under vehicular pavements shall be backfilled with an approved select material and compacted to a minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1

DRAWING SCHEDULE

DRG No	DRAWING TITLE
SKC400	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
SKC410	CONCEPT EROSION AND SEDIMENT CONTROL PLAN AND DETAILS
SKC420	CONCEPT OVERALL SITE PLAN
SKC421	CONCEPT SITEWORKS PLAN SHEET 1
SKC422	CONCEPT SITEWORKS PLAN SHEET 2
SKC423	CONCEPT SITEWORKS PLAN SHEET 3
SKC430	CONCEPT ROAD A LONG SECTION
SKC440	CONCEPT TURNING PATH PLAN SHEET 1
SKC441	CONCEPT TURNING PATH PLAN SHEET 2
SKC442	CONCEPT TURNING PATH PLAN SHEET 3
SKC450	CONCEPT DETAILS SHEET 1
SKC451	CONCEPT DETAILS SHEET 2



SITE LOCALITY PLAN
NOT TO SCALE – IMAGE COURTESY OF NSW SPATIAL INFORMATION EXCHANGE

FOR APPROVAL

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

Rev	Description	Eng	Draft	Date
P3	ISSUE FOR APPROVAL	GC	DM	26.09.19
P2	ISSUE FOR APPROVAL	GC	DM	09.07.19
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19

Rev Description Eng Draft Date | Rev Description Eng Draft Date

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PORT MACQUARIE, STAGE 2B

Sheet Subject
COVERSHEET, LOCALITY PLAN AND DRAWING SCHEDULE

Scale : A1 -
Drawn DM
Authorised
Job No 171878
Drawing No SKC400
Revision P3
Plot File Created: Sep 26, 2019 - 2:24pm

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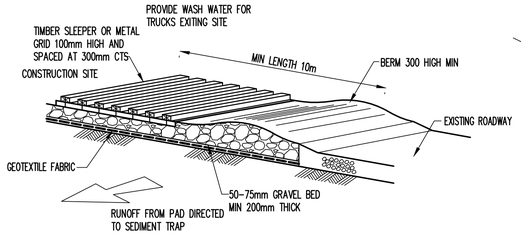
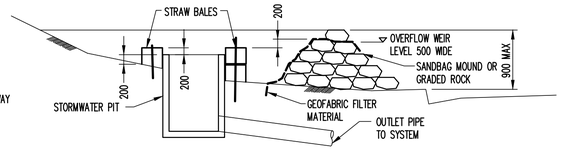
THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING SKC400



TEMPORARY CONSTRUCTION VEHICLE EXIT

NTS



SEDIMENTATION TRAP

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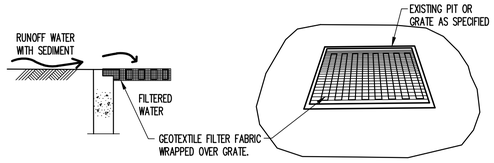

GEOTEXTILE PIT FILTER

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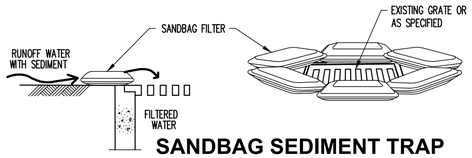

SANDBAG SEDIMENT TRAP

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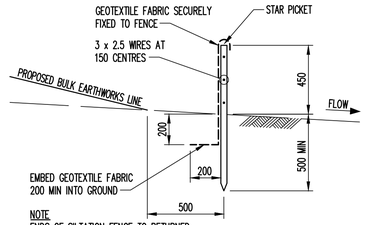
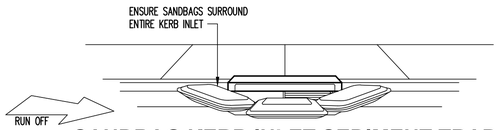


NOTE
ENDS OF SILTATION FENCE TO RETURNED UP SLOPE TO PREVENT RUNOFF

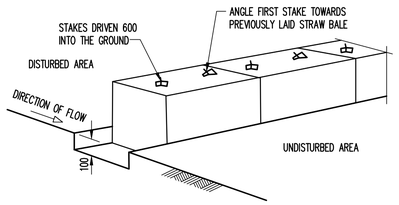
SILTATION FENCE DETAIL

SCALE 1: 20



SANDBAG KERB INLET SEDIMENT TRAP

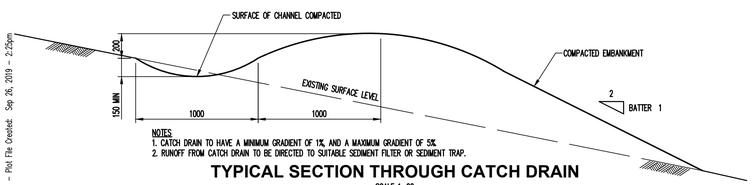
NTS



HAY BALE SEDIMENT FILTER

NTS

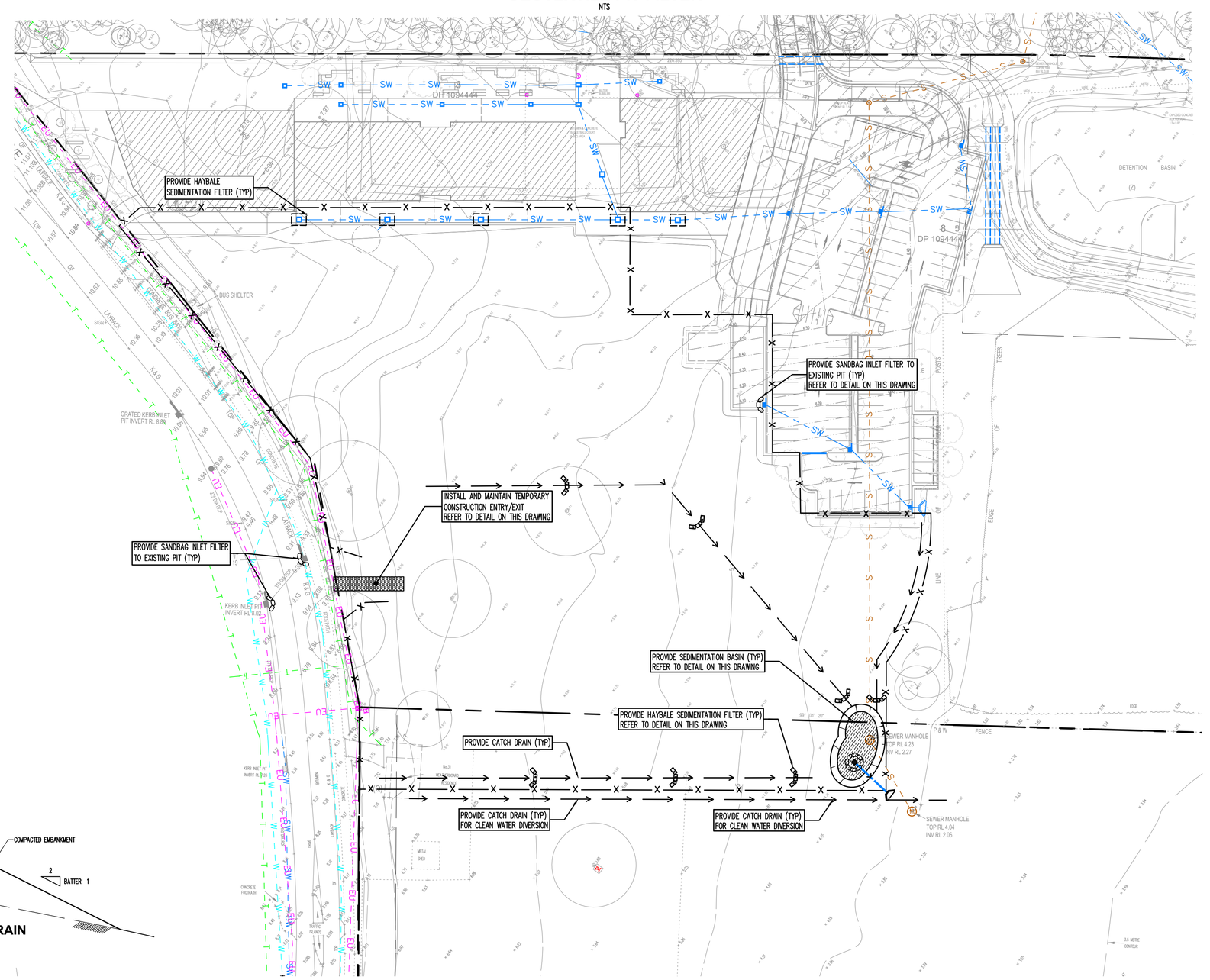
NOTE: STAKE TO BE EITHER TAR COATED STAR OR 50 x 50 HARDWOOD



NOTES
1. CATCH DRAIN TO HAVE A MINIMUM GRADIENT OF 1%, AND A MAXIMUM GRADIENT OF 5%.
2. RUNOFF FROM CATCH DRAIN TO BE DIRECTED TO SUITABLE SEDIMENT FILTER OR SEDIMENT TRAP.

TYPICAL SECTION THROUGH CATCH DRAIN

SCALE 1: 20



EROSION AND SEDIMENT CONTROL NOTES

1. All work shall be generally carried out in accordance with
   (A) Local authority requirements,
   (B) EPA – Pollution control manual for urban stormwater,
   (C) LANDCOM NSW – Managing Urban Stormwater: Soils and Construction ("Blue Book").
2. Erosion and sediment control **drawings and notes are** provided for the whole of the works. Should the Contractor stage these works then the design may be required to be modified. Variation to these details may require approval by the relevant authorities.
   The erosion and sediment control **plan** shall be implemented and adapted to meet the varying situations as work on site progresses.
3. Maintain all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
4. When stormwater pits are constructed prevent site runoff entering the pits unless silt fences are erected around pits.
5. Minimise the area of site being disturbed at any one time.
6. Protect all stockpiles of materials from scour and erosion. Do not stockpile loose material in roadways, near drainage pits or in watercourses.
7. All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
8. Control water from upstream of the site such that it does not enter the disturbed site.
9. All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
10. All vehicles leaving the site shall be cleaned and inspected before leaving.
11. Maintain all stormwater pipes and pits clear of debris and sediment. Inspect stormwater system and clean out after each storm event.
12. Clean out all erosion and sediment control devices after each storm event.

Sequence Of Works

1. Prior to commencement of excavation the following soil management devices must be installed.

1.1. Construct silt fences below the site and across all potential runoff sites.
1.2. Construct temporary construction entry/exit and divert runoff to suitable control systems.
1.3. Construct measures to divert upstream flows into existing stormwater system.
1.4. Construct sedimentation traps/basin including outlet control and overflow.
1.5. Construct turf lined swales.
1.6. Provide sandbag sediment traps upstream of existing pits.

2. Construct geotextile filter pit surround around all proposed pits as they are constructed.
3. On completion of pavement provide sand bag kerb inlet sediment traps around pits.
4. Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.

WATER QUALITY TESTING REQUIREMENTS

Prior to discharge of site stormwater, groundwater and seepage water into council's stormwater system, contractors must undertake water quality tests in conjunction with a suitably qualified environment consultant outlining the following:

- Compliance with the criteria of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- If required subject to the environmental consultants advice, provide remedial measures to improve the quality of water that is to be discharged into Councils storm water drainage system.This should include comments from a suitably qualified environmental consultant confirming the suitability of these remedial measures to manage the water discharged from the site into Councils storm water drainage system. Outlining the proposed, ongoing monitoring, contingency plans and validation program that will be in place to continually monitor the quality of water discharged from this site. This should outline the frequency of water quality testing that will be undertaken by a suitably qualified environmental consultant.

EROSION AND SEDIMENT CONTROL PUMP OUT NOTES

Any accumulated water contaminated with sediment, from a sediment basin or excavation pit, is to be flocculated or filtered in order to lower the suspended solid load to less than 50mg per litre gypsum gas or other approved flocculant should be applied within 24 hours of the end of the storm event. The gypsum must be spread evenly over the entire water surface. Pumping is not to occur for at least 36 hours and preferably 48 hours after application. Clean water is to be discharged to the water table via a hale bail sediment filter in a way that does not pick up sediment that has dropped to the bottom.
Note: gypsum is a hydrated form of calcium sulphate and is available at many swimming pool shops and hardware stores.

EROSION AND SEDIMENT CONTROL LEGEND

- Batter
- Siltation fence
- Stormwater pit with Geotextile filter surround
- Hay bale barriers
- Sandbag sediment trap
- Catch drain
- Overland flow path

FOR APPROVAL

FileName: SKC410.dwg – USER: duncanm – Plot File Created: Sep 26, 2019 - 2:25pm

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

Rev	Description	Eng	Draft	Date
P3	ISSUE FOR APPROVAL	GC	DM	26.09.19
P2	ISSUE FOR APPROVAL	GC	DM	29.07.19
P1	ISSUE FOR APPROVAL	GC	KH	05.07.19

Rev Description Eng Draft Date | Rev Description Eng Draft Date

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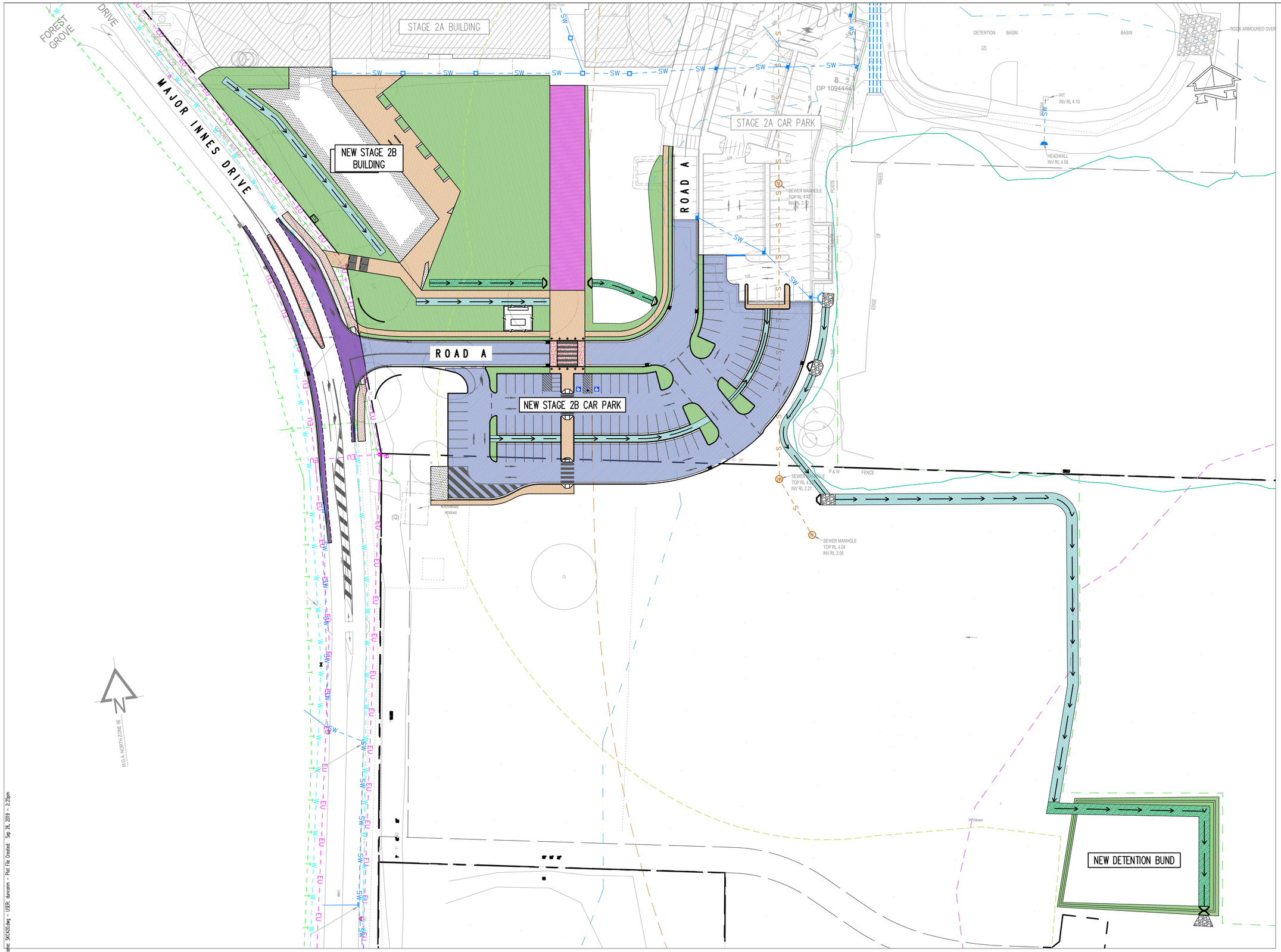
Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

Sheet Subject: CONCEPT EROSION AND SEDIMENT CONTROL PLAN AND DETAILS

Scale : A1 1:500 | Drawn DM | Authorised

Job No 171878 | Drawing No SKC410 | Revision P3

Plot File Created: Sep 26, 2019 - 2:25pm



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and line
Indicative downpipe connection

Pedestrian fence

Temporary landfill gas buffer

Proximity area for coastal wetlands

Vegetation management plan offset area

Extent of coast wetland area

0 5 10 15 20 25 30 35 40m

1:500 A1 1:1000 A3

Fileform: SKC420.dwg - USER: duncomm - Plot File Created: Sep 26, 2019 - 2:25pm

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

FOR APPROVAL

Rev	Description	Eng	Draft	Date
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P5	ISSUE FOR APPROVAL	GC	DM	15.07.19
P4	ISSUE FOR APPROVAL	GC	DM	09.07.19
P3	ISSUE FOR APPROVAL	GC	DM	05.07.19
P2	DRAFT FOR APPROVAL	GC	DM	03.07.19
P1	DRAFT FOR APPROVAL	GC	DM	21.06.19
P8	ISSUE FOR APPROVAL	GC	DM	26.09.19
P7	ISSUE FOR APPROVAL	GC	DM	25.07.19

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Project

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PORT MACQUARIE, STAGE 2B

Sheet Subject

CONCEPT OVERALL SITE PLAN

Scale : A1 1:500

Drawn DM

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Job No 171878

Drawing No SKC420

Revision P8

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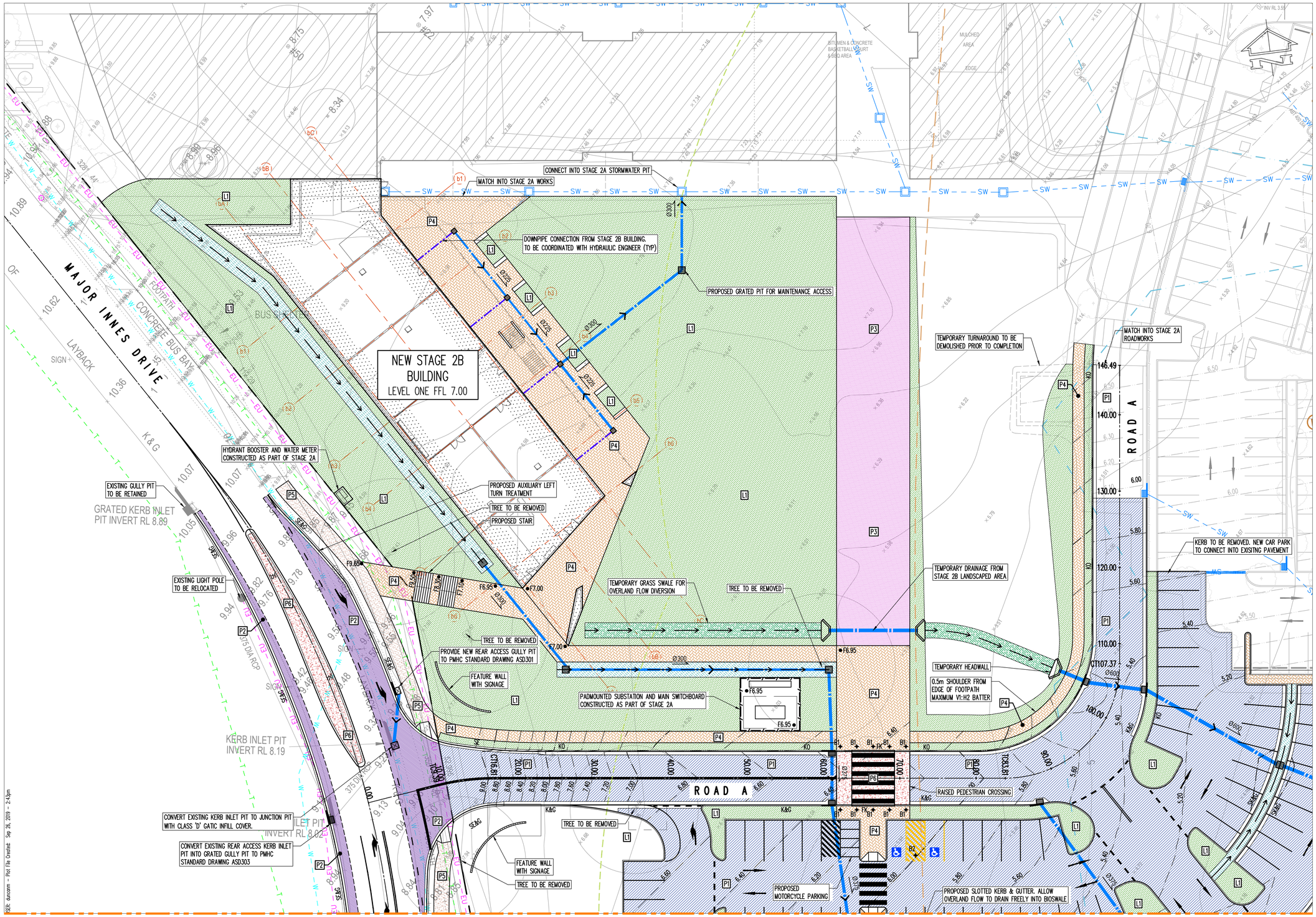

SITEWORKS LEGEND

● F22.20	Finished surface level
F22.00	Finished contour
MTE	Match neatly into existing
10.00	Road centreline and chainage
SE	RMS 'Type SE' Layback
SE&G	RMS 'Type SE' Layback kerb & gutter
K&G	Kerb and gutter
KO	Kerb only
SK&G	Slotted kerb and gutter
FK	Flush kerb
	Stormwater pit, flow direction and line
	Indicative downpipe connection
	Pedestrian fence
	Temporary landfill gas buffer
	Proximity area for coastal wetlands
	Vegetation management plan offset area
	Extent of coast wetland area
	LEP Probable maximum flood level
	LEP flood planning area

PAVEMENT LEGEND

NOTES

1. Asphaltic concrete shall conform to AS2150 and the specification
2. Pavement based on geotechnical report by Pells Sullivan Meynink

P1	Asphalt road pavement
P2	Asphalt road pavement to PMHC Standard
P3	Unsealed pedestrian pavement
P4	Pedestrian pavement
P5	Concrete footpath pavement to PMHC Standard ASD103
P6	Concrete road pavement
L1	Landscaping
	Grass swale
	Bio-swale
	Rock energy dissipater

0 2.5 5 7.5 10 12.5 15 17.5 20m

1:250 A1 1:500 A3

FileName: SKC421.dwg - SEB: dunsmm - Plot File Created: Sep 26, 2019 - 2:43pm

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

FOR APPROVAL

Rev	Description	Eng	Draft	Date
P6	ISSUE FOR APPROVAL	GC	DM	16.07.19
P5	ISSUE FOR APPROVAL	GC	DM	15.07.19
P4	ISSUE FOR APPROVAL	GC	DM	09.07.19
P3	ISSUE FOR APPROVAL	GC	DM	05.07.19
P2	DRAFT FOR APPROVAL	GC	DM	03.07.19
P1	DRAFT FOR APPROVAL	GC	DM	21.06.19
P8	ISSUE FOR APPROVAL	GC	DM	26.09.19
P7	ISSUE FOR APPROVAL	GC	DM	29.07.19

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Civil Engineer: TTW Taylor Thomson Whitting — 612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

Sheet Subject: CONCEPT SITEWORKS PLAN SHEET 1

Scale : A1	Drawn	Authorised
1:250	DM	

Job No	Drawing No	Revision
171878	SKC421	P8

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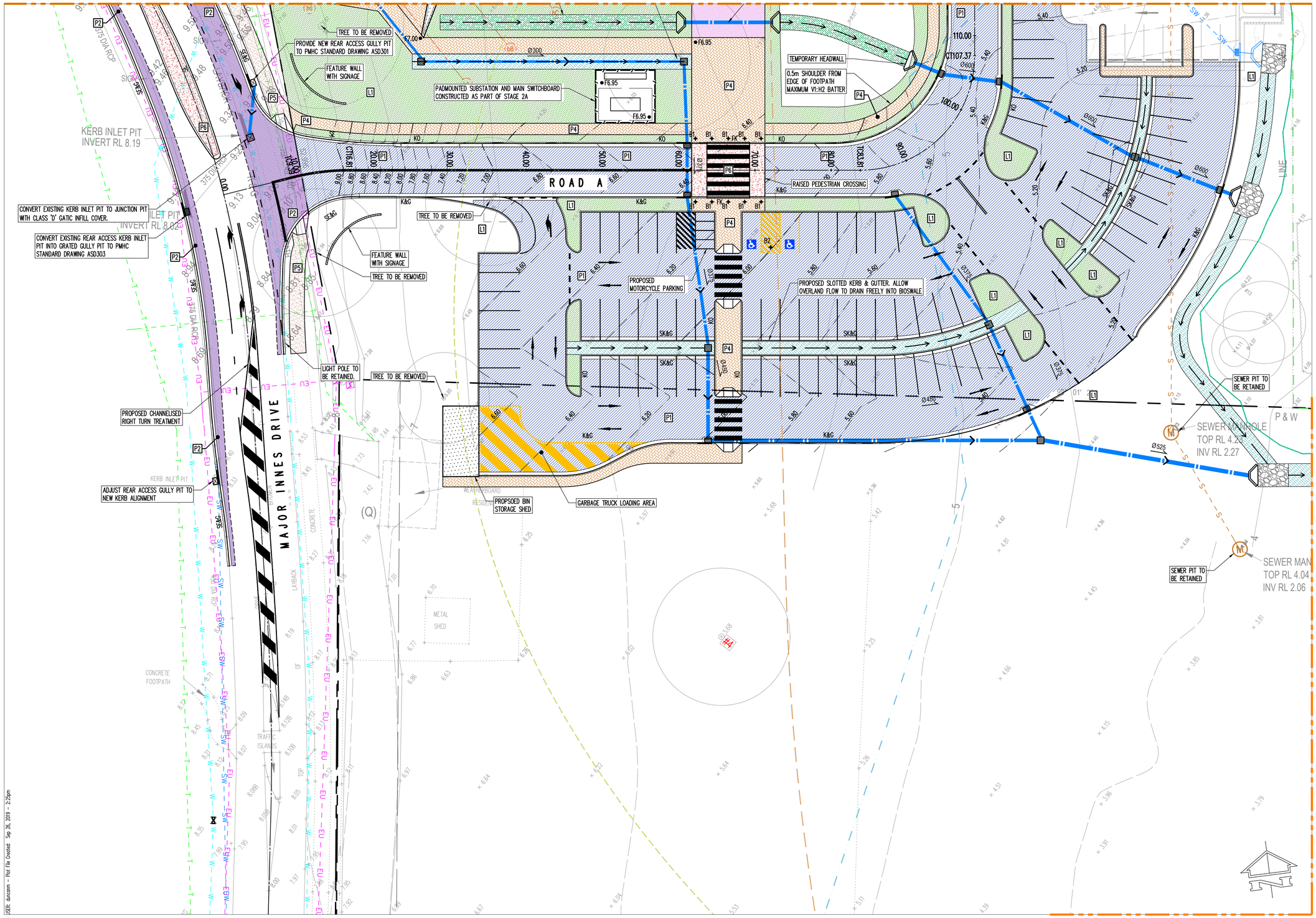
FOR CONTINUATION REFER TO DRAWING SKC421



FOR CONTINUATION REFER TO DRAWING SKC423

SITEWORKS LEGEND

- F22.20 — Finished surface level
- F22.00 — Finished contour
- MTE — Match neatly into existing
- 100.00 — Road centreline and chainage
- SE — RMS 'Type SE' Layback
- SE&G — RMS 'Type SE' Layback kerb & gutter
- K&G — Kerb and gutter
- KO — Kerb only
- SK&G — Slotted kerb and gutter
- FK — Flush kerb
- Stormwater pit, flow direction and line
- Indicative downpipe connection
- Pedestrian fence
- Temporary landfill gas buffer
- Proximity area for coastal wetlands
- Vegetation management plan offset area
- Extent of coast wetland area
- LEP Probable maximum flood level
- LEP flood planning area

PAVEMENT LEGEND

NOTES

1. Asphaltic concrete shall conform to AS2150 and the specification
2. Pavement based on geotechnical report by Pells Sullivan Meynink

- P1 — Asphalt road pavement
- P2 — Asphalt road pavement to PMHC Standard
- P3 — Unsealed pedestrian pavement
- P4 — Pedestrian pavement
- P5 — Concrete footpath pavement to PMHC Standard ASD103
- P6 — Concrete road pavement
- L1 — Landscaping
- Grass swale
- Bio-swale
- Rock energy dissipater

0 2.5 5 7.5 10 12.5 15 17.5 20m

1:250 A1 1:500 A3

FileName: SKC422.dwg - JSER: duncanm - Plot File Created: Sep 26, 2019 - 2:29pm

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

FOR APPROVAL

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
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P5	ISSUE FOR APPROVAL	GC	DM	15.07.19										
P4	ISSUE FOR APPROVAL	GC	DM	09.07.19										
P3	ISSUE FOR APPROVAL	GC	DM	05.07.19										
P2	DRAFT FOR APPROVAL	GC	DM	03.07.19	P8	ISSUE FOR APPROVAL	GC	DM	26.09.19					
P1	DRAFT FOR APPROVAL	GC	DM	21.06.19	P7	ISSUE FOR APPROVAL	GC	DM	29.07.19					

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Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

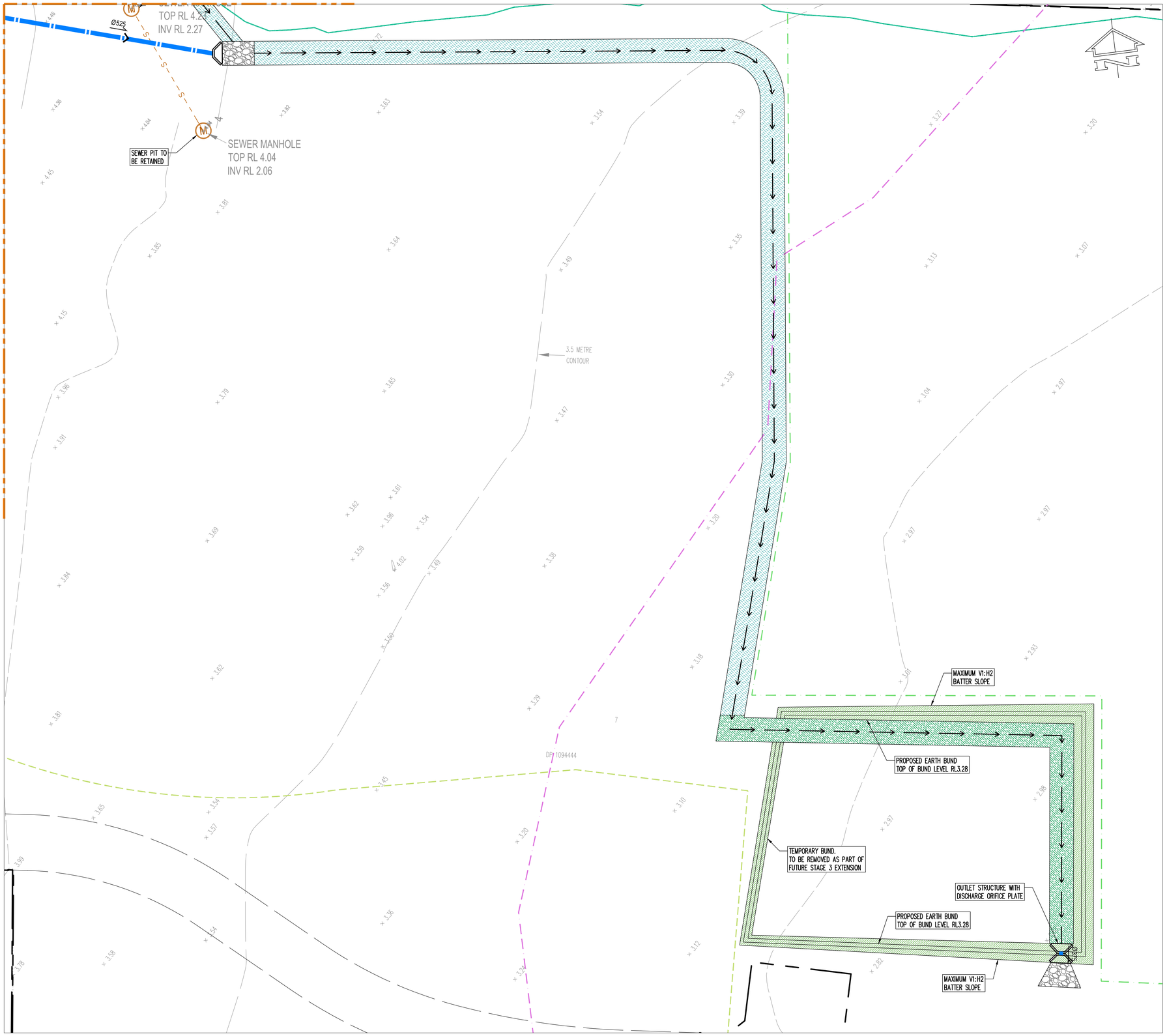
Sheet Subject: CONCEPT SITEWORKS PLAN SHEET 2

Scale : A1: 1:250 | Drawn: DM | Authorised:

Job No: 171878 | Drawing No: SKC422 | Revision: P8

Plot File Created: Sep 26, 2019 - 2:25pm

FOR CONTINUATION REFER TO DRAWING SKC422



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SITEWORKS LEGEND

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- F22.00 — Finished contour
- MTE — Match neatly into existing
- 10.00 — Road centreline and chainage
- SE — RMS 'Type SE' Layback
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- K&G — Kerb and gutter
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- LEP Probable maximum flood level
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PAVEMENT LEGEND

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- P4 — Pedestrian pavement
- P5 — Concrete footpath pavement to PMHC Standard ASD103
- P6 — Concrete road pavement
- L1 — Landscaping
- Grass swale
- Bio-swale
- Rock energy dissipater

FOR CONTINUATION REFER INSET PLAN

0 2.5 5 7.5 10 12.5 15 17.5 20m

1:250 A1 1:500 A3

FOR APPROVAL

FileName: SKC423.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

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

Rev	Description	Eng	Draft	Date
P1	ISSUE FOR APPROVAL	GC	DM	26.09.19

Rev Description Eng Draft Date | Rev Description Eng Draft Date

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Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

Sheet Subject: CONCEPT SITEWORKS PLAN SHEET 2

Scale : A1: 1:250 | Drawn: DM | Authorised:

Job No: 171878 | Drawing No: SKC423 | Revision: P1

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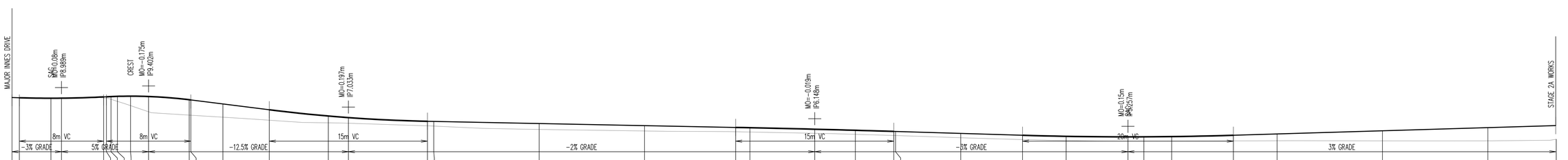

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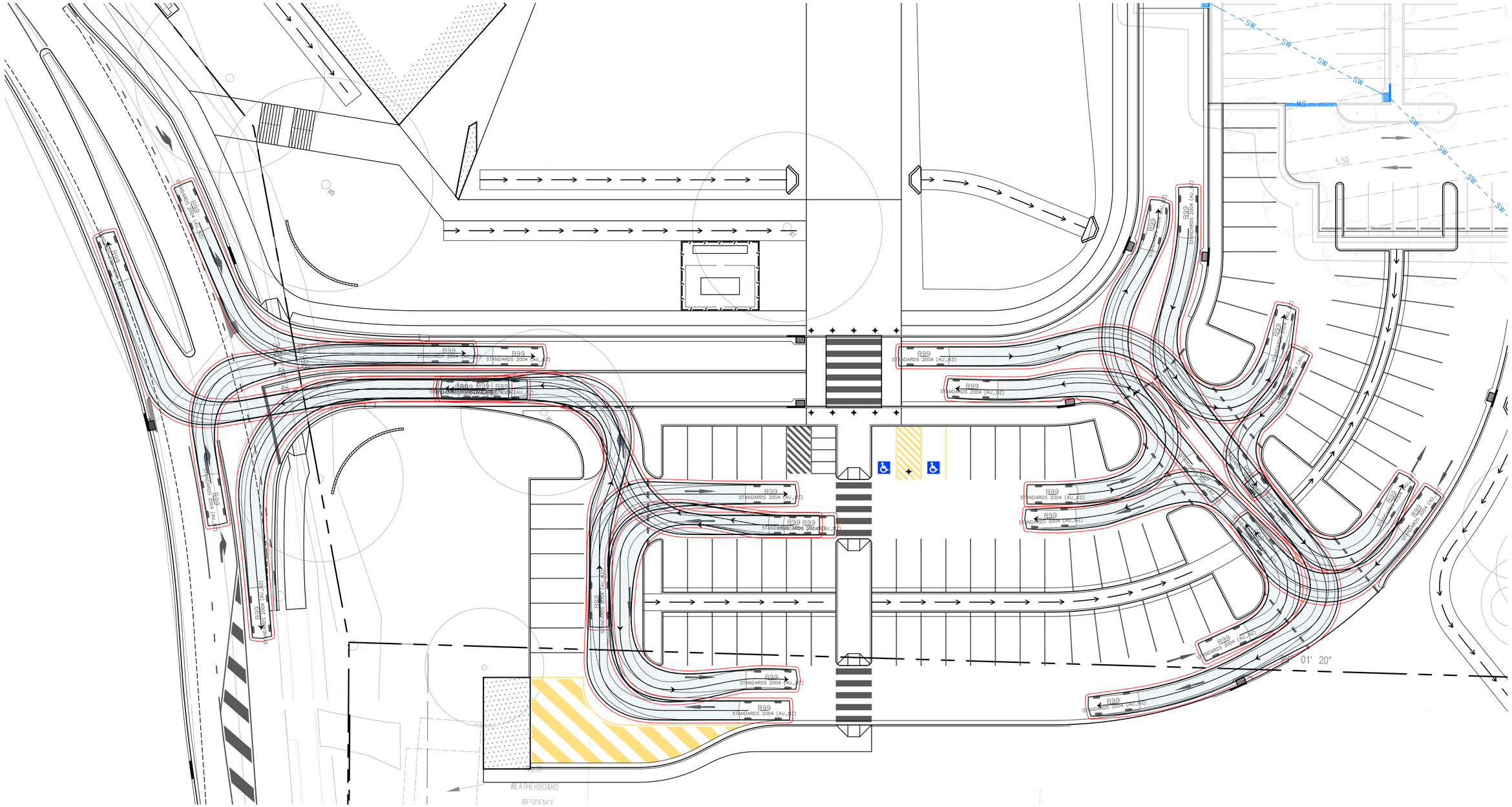

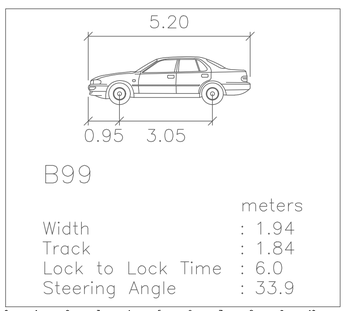

0 2 4 6 8 10 12 14 16m

1:200 A1 1:400 A3

FileName: SKC440.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

FOR APPROVAL

Rev	Description	Eng	Draft	Date
P6	ISSUE FOR APPROVAL	GC	DM	26.09.19
P5	ISSUE FOR APPROVAL	GC	DM	29.07.19
P4	ISSUE FOR APPROVAL	GC	DM	16.07.19
P3	ISSUE FOR APPROVAL	GC	DM	15.07.19
P2	ISSUE FOR APPROVAL	GC	DM	09.07.19
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19

Rev Description Eng Draft Date | Rev Description Eng Draft Date

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CHARLES STURT UNIVERSITY
PORT MACQUARIE, STAGE 2B

Sheet Subject

CONCEPT TURNING PATH PLAN
SHEET 1

Scale : A1 1:200 | Drawn DM | Authorised

Job No 171878 | Drawing No SKC440 | Revision P6

Plot File Created: Sep 26, 2019 - 2:25pm

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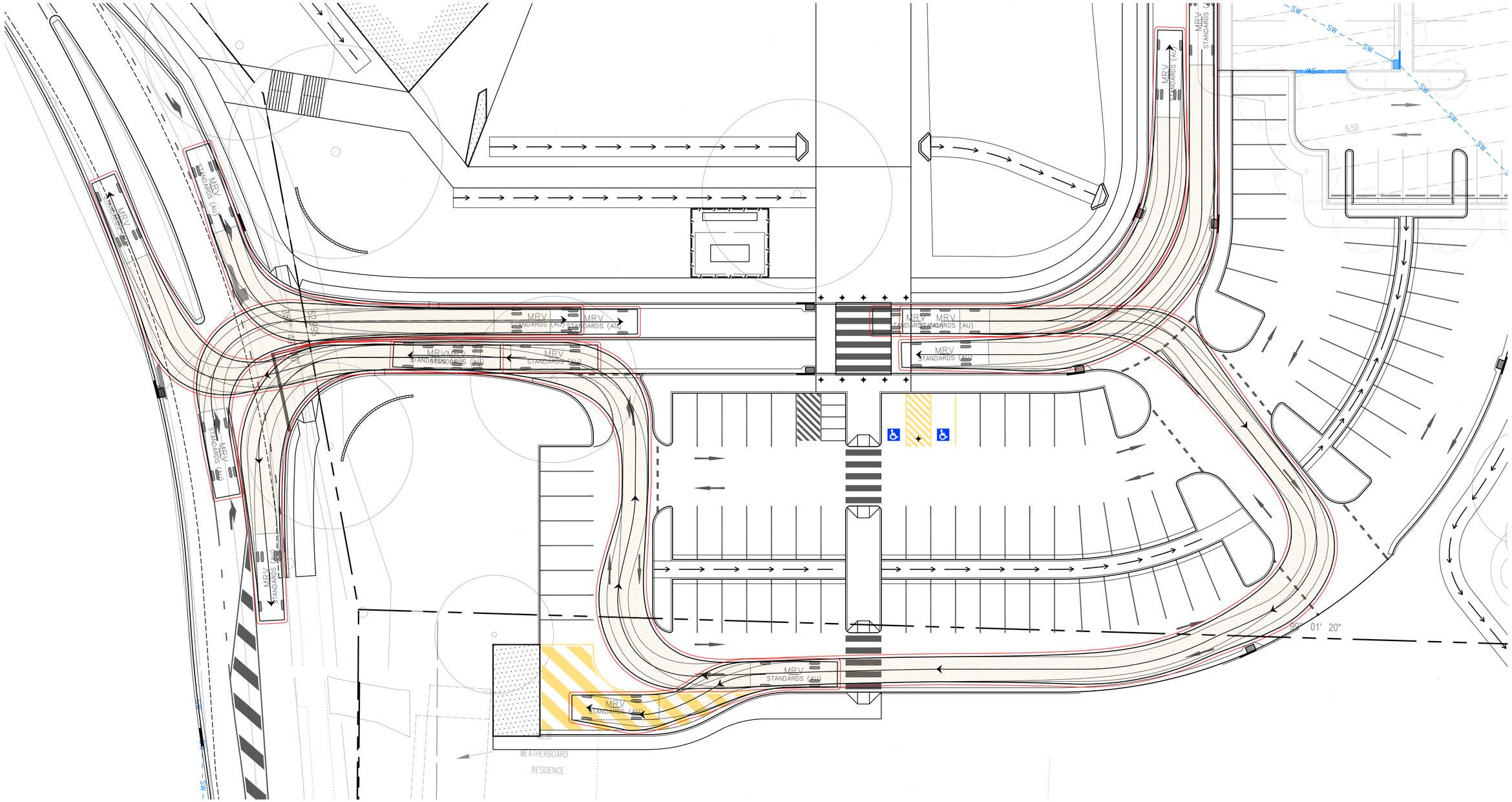

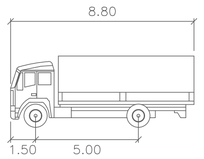

MRV

	meters
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Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

0 2 4 6 8 10 12 14 16m

1:200 A1 1:400 A3

FileName: SKC441.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

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FOR APPROVAL

Rev	Description	Eng	Draft	Date
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P5	ISSUE FOR APPROVAL	GC	DM	29.07.19
P4	ISSUE FOR APPROVAL	GC	DM	16.07.19
P3	ISSUE FOR APPROVAL	GC	DM	15.07.19
P2	ISSUE FOR APPROVAL	GC	DM	09.07.19
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19

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

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CHARLES STURT UNIVERSITY
PORT MACQUARIE, STAGE 2B

Sheet Subject

CONCEPT TURNING PATH PLAN
SHEET 2

Scale : A1 1:200

Drawn DM

Authorised

Job No 171878

Drawing No SKC441

Revision P6

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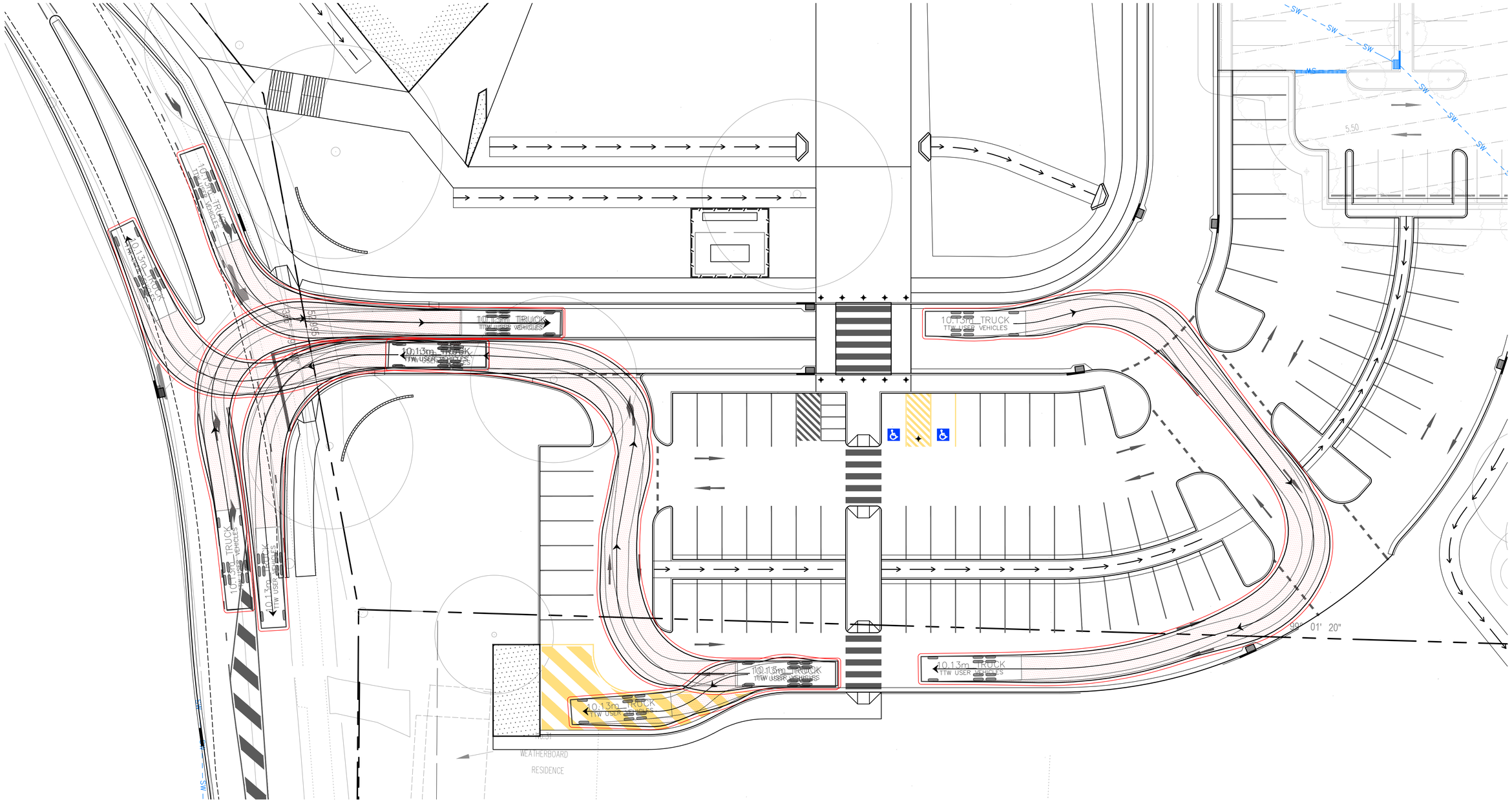

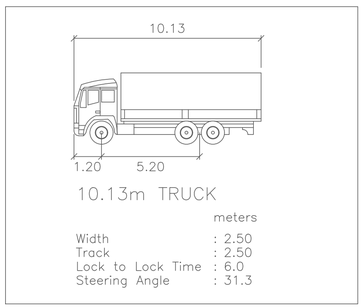

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FOR APPROVAL

FileName: SKC442.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

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

Rev	Description	Eng	Draft	Date
P1	ISSUE FOR APPROVAL	GC	DM	26.09.19

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Project

CHARLES STURT UNIVERSITY
PORT MACQUARIE, STAGE 2B

Sheet Subject

CONCEPT TURNING PATH PLAN
SHEET 3

Scale : A1 1:200

Drawn DM

Authorised

Job No 171878

Drawing No SKC442

Revision P1

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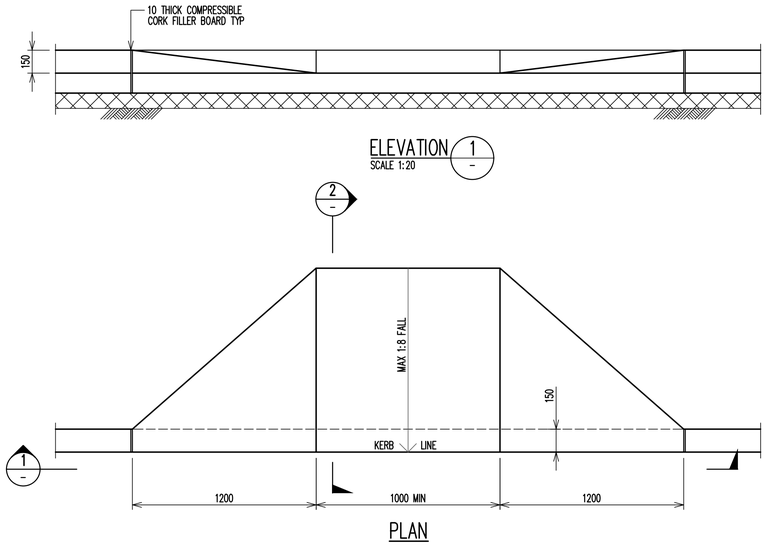

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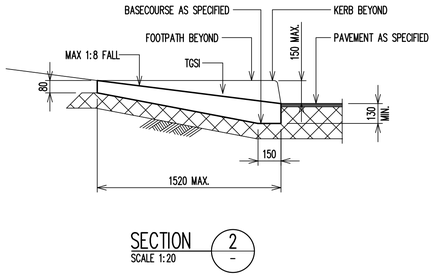
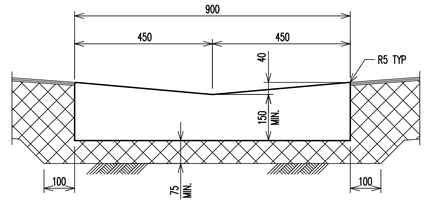
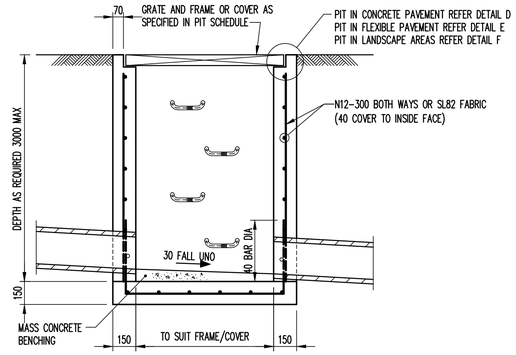
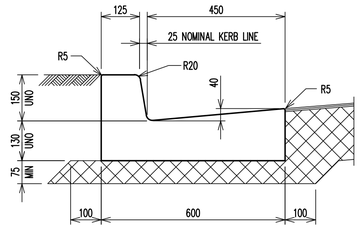




DISH DRAIN (DD)
SCALE 1:10



NOTE:IF REINFORCING FABRIC IS TO BE USED REFER TO WALL AND CORNER DETAILS



KERB AND GUTTER (K&G)
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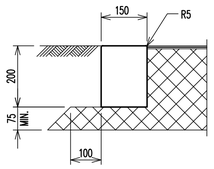
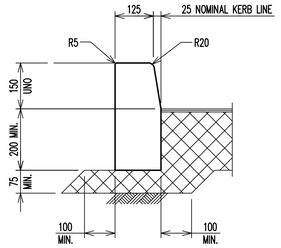


FLUSH KERB (FK)
SCALE 1:10



KERB ONLY (KO)
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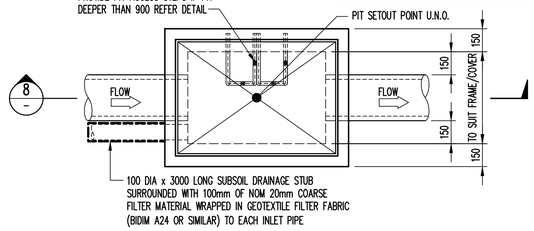
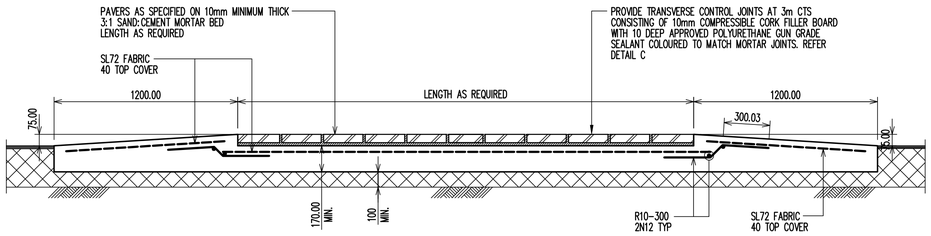
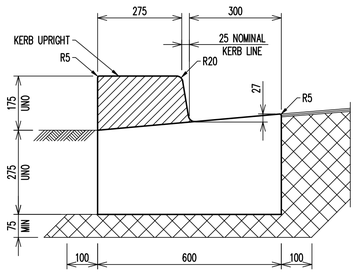


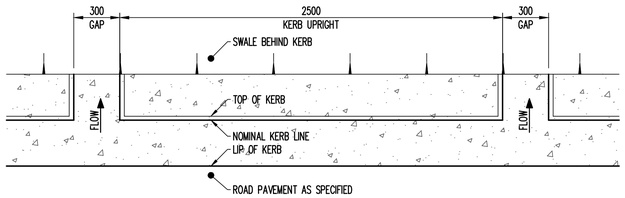
PIT TYPE B & C



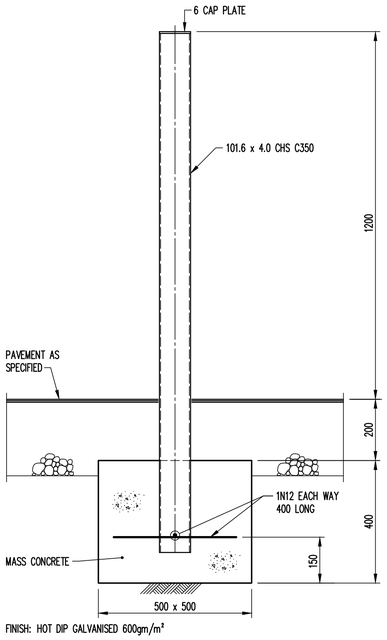
RAISED CROSSING DETAIL
SCALE 1:20



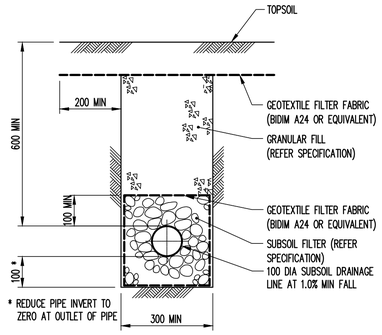
SLOTTED KERB AND GUTTER (SK&G)
SCALE 1:10



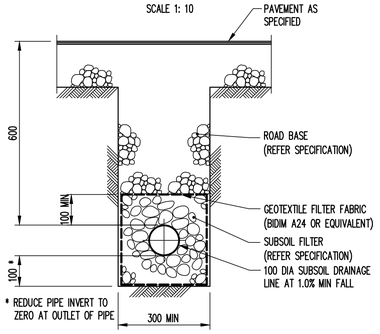
SLOTTED KERB ARRANGEMENT
SCALE 1:20



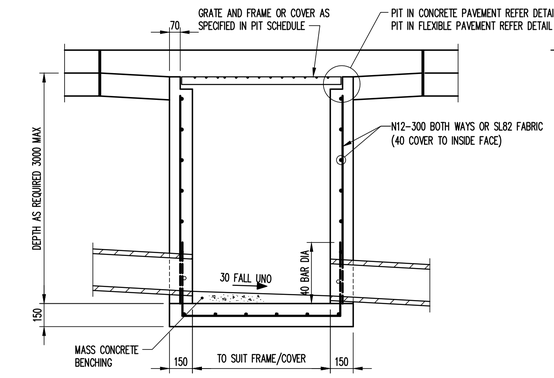
FIXED BOLLARD TO FLEXIBLE PAVEMENT
SCALE 1: 10

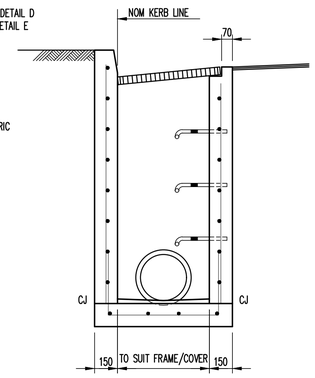


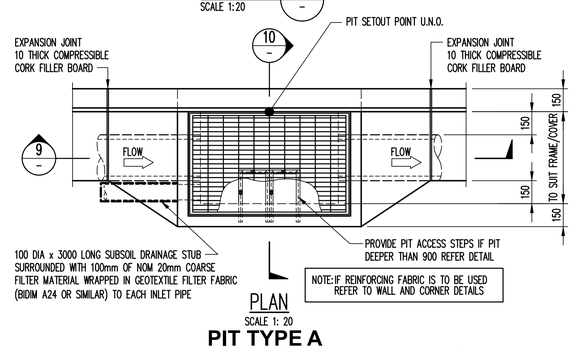
SUBSOIL IN LANDSCAPED AREAS
SCALE 1: 10



SUBSOIL IN PAVED AREAS
SCALE 1: 10







NOTE:IF REINFORCING FABRIC IS TO BE USED REFER TO WALL AND CORNER DETAILS

PIT TYPE A

FOR APPROVAL

FileName: SKC450.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

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

Rev	Description	Eng	Draft	Date
P2	ISSUE FOR APPROVAL	GC	DM	26.09.19
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19

Rev Description Eng Draft Date | Rev Description Eng Draft Date

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Civil Engineer: TTW Taylor Thomson Whitting — 612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

Sheet Subject: CONCEPT DETAILS SHEET 1

Scale : A1 NTS | Drawn DM | Authorised

Job No 171878 | Drawing No SKC450 | Revision P2

Plot File Created: Sep 26, 2019 - 2:25pm

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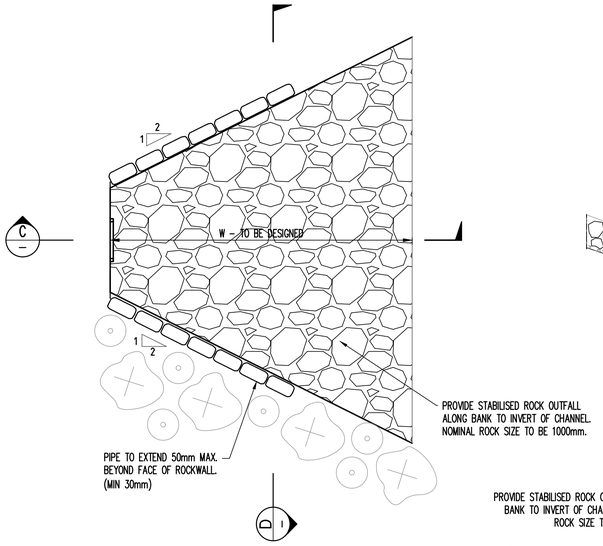
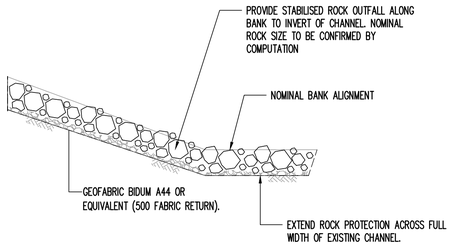
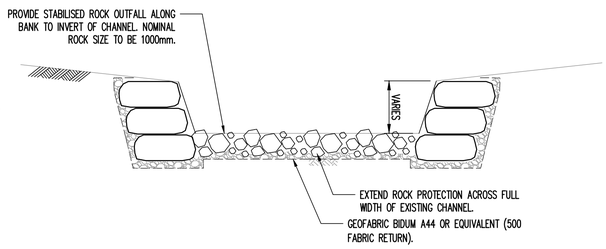


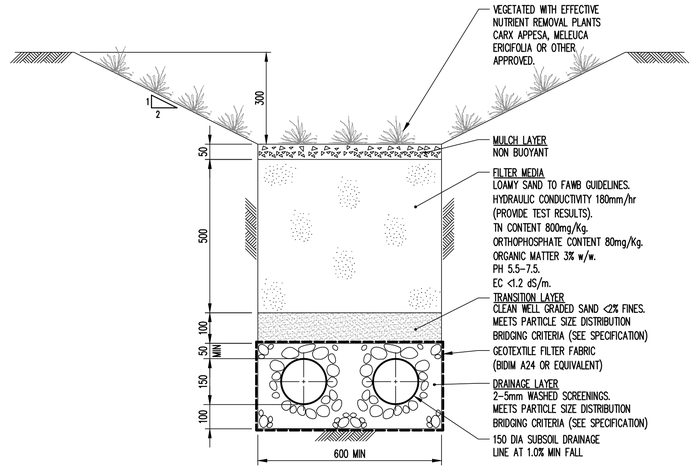
TYPICAL ROCK ENERGY DISSIPATER DETAIL (TYPE 1)
SCALE 1:50



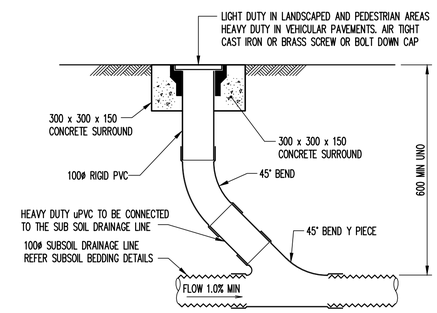
SECTION C
SCALE 1:50



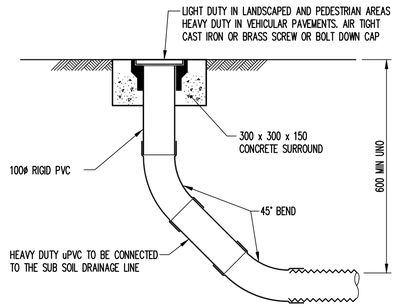
SECTION D
SCALE 1:50



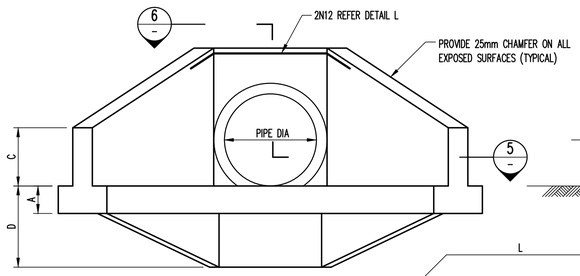
BIO-SWALE DETAIL
SCALE 1: 10



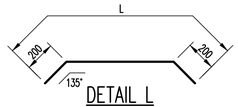
INTERMEDIATE RISER (IR)
SCALE 1: 10
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED



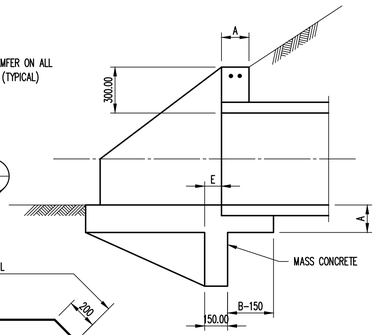
FLUSHING POINT (FP)
SCALE 1: 10
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED



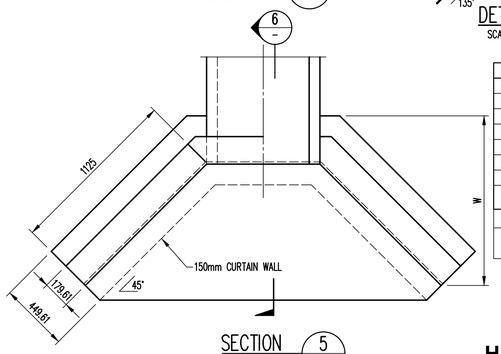
ELEVATION 7
SCALE 1:20



DETAIL L
SCALE 1: 20



SECTION 6
SCALE 1:20

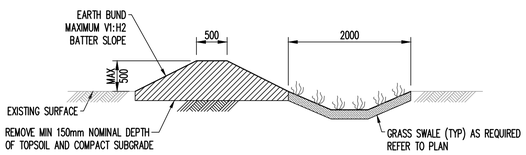


SECTION 5
SCALE 1:20

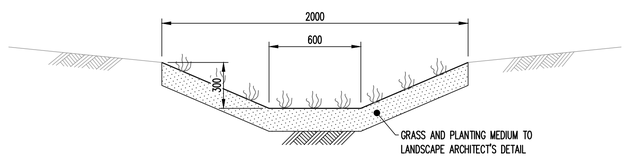
PIPE DIAMETER		300	375	450	525	600	750	900
A		150	150	150	150	180	205	230
B		300	300	300	300	450	450	450
C		300	300	300	300	380	380	380
D		380	380	380	380	530	530	530
E		75	75	75	75	110	110	110
W		690	690	840	990	1120	1450	1780
L		840	840	915	990	1100	1250	1400
CONCRETE QUANTITY (cubic metres)		0.25	0.27	0.325	0.38	0.67	1.02	1.40
REINFORCEMENT DIAMETER		10	10	10	10	12	12	12
REINFORCEMENT	LENGTH (mm)	1680	1680	1830	1845	2200	2500	2800
	MASS (kg)	1.1	1.1	1.2	1.3	2.0	2.6	2.95

NOTE
COMPRESSIVE STRENGTH (F'c) FOR CAST IN-SITU CONCRETE TO BE A MINIMUM OF 25MPa AT 28 DAYS.

HEADWALL - PIT TYPE F



EARTH BUND DETAIL
SCALE 1:50



GRASS SWALE DETAIL
SCALE 1:20

FileName: SKC451.dwg - USER: duncanm - Plot File Created: Sep 26, 2019 - 2:25pm

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

Rev	Description	Eng	Draft	Date
P2	ISSUE FOR APPROVAL	GC	DM	26.09.19
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19

FOR APPROVAL

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Civil Engineer: TTW Taylor Thomson Whitting — 612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project: CHARLES STURT UNIVERSITY PORT MACQUARIE, STAGE 2B

Sheet Subject: CONCEPT DETAILS SHEET 1

Scale : A1: NTS
Drawn: DM
Authorised:
Job No: 171878
Drawing No: SKC451
Revision: P2
Plot File Created: Sep 26, 2019 - 2:25pm

Appendix B

Concept Masterplan Stormwater Management

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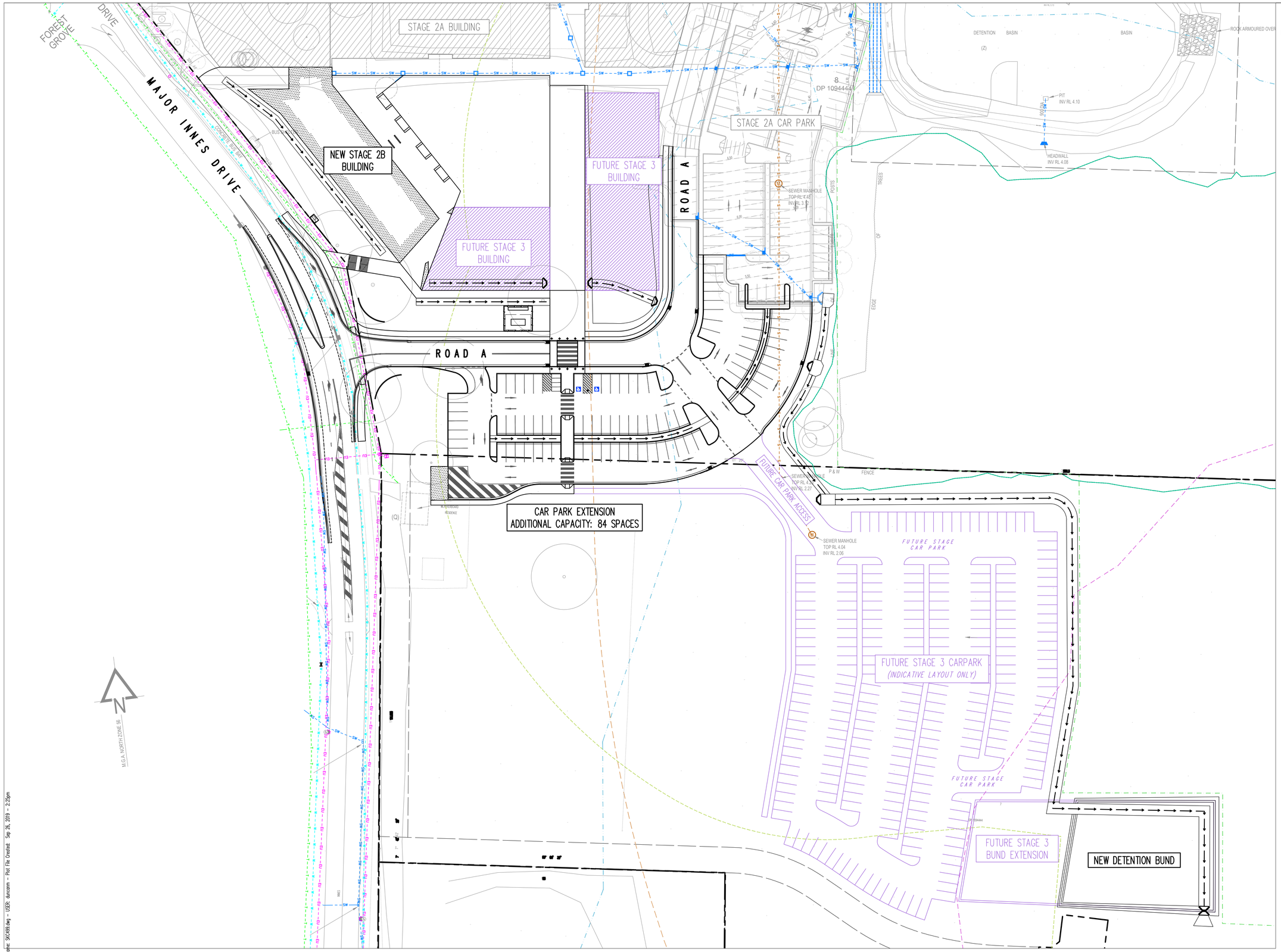

0 5 10 15 20 25 30 35 40m

1:500 A1 1:1000 A3

FILENAME: SKC499.dwg – USER: duncomm – Plot File Created: Sep 26, 2019 - 2:25pm

FOR APPROVAL

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

Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date	Rev	Description	Eng	Draft	Date
P6	ISSUE FOR COORDINATION	GC	DM	20.09.19										
P5	ISSUE FOR COORDINATION	GC	DM	16.09.19										
P4	ISSUE FOR COORDINATION	GC	DM	04.09.19										
P3	ISSUE FOR APPROVAL	GC	DM	29.07.19										
P2	ISSUE FOR APPROVAL	GC	DM	09.07.19										
P1	ISSUE FOR APPROVAL	GC	DM	05.07.19	P7	ISSUE FOR APPROVAL	GC	DM	26.09.19					

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Project

CHARLES STURT UNIVERSITY
PORT MACQUARIE, STAGE 2B

Sheet Subject

CONCEPT MASTERPLAN

Scale : A1 1:500

Drawn DM

Authorised

Job No 171878

Drawing No SKC499

Revision P7

Plot File Created: Sep 26, 2019 - 2:25pm