

Water Cycle Management Strategy

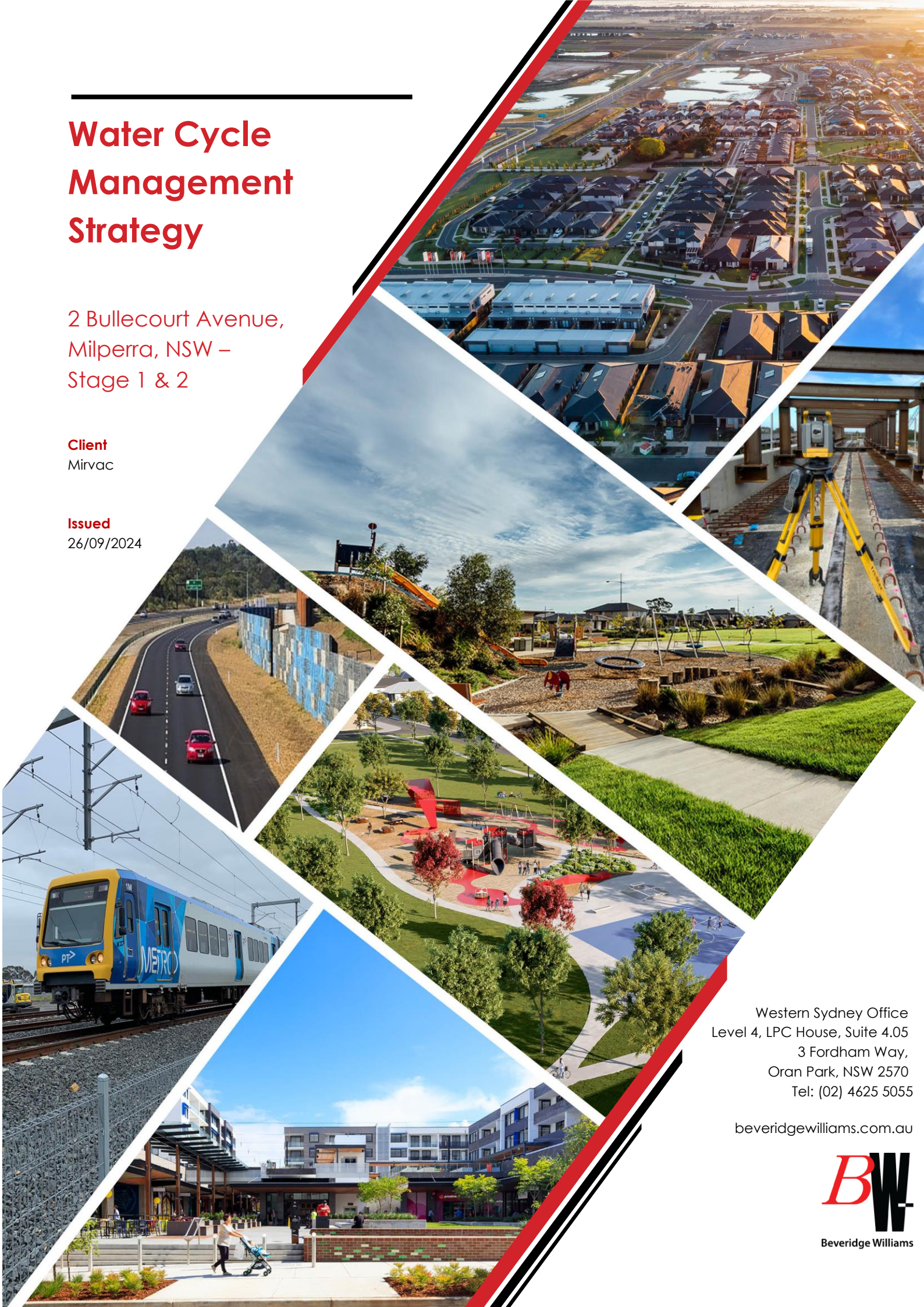
2 Bullecourt Avenue,
Milperra, NSW –
Stage 1 & 2

Client

Mirvac

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26/09/2024



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1. INTRODUCTION

Beveridge Williams has been engaged by Mirvac, to prepare a water cycle management study addressing the Stage 1 & 2 development and corresponding demolition work of the Milperra campus of Western Sydney University, located at 2 and 2A Bullecourt Avenue, Milperra - Lot 2 of DP1291984.

This following document which is separate to this report is to be read in conjunction with the following:

- **Flood and Risk Impact Assessment**, WSU Campus Milperra, Planning Proposal, J. Wyndham Prince, Rev C May 2023

The purpose of this study is to ensure that the Stage 1 & 2 construction and demolition work is carried out in accordance with best practice floodplain and stormwater management guidelines, as well as flood and stormwater planning controls outlined in Canterbury Bankstown Development Control Plan (DCP, 2023). Specifically, this study aims to:

- ensure that floodplain and stormwater management is integrated into the development in an efficient and sustainable way
- determine whether on-site detention requirements are required for the southern portion of the site containing Stage 1 and 2
- protect receiving water quality from adverse effects of development through the implementation of Water Sensitive Urban Design (WSUD) for Stage 1 and 2

1.1. Project Background

The precinct is located within Canterbury-Bankstown Council (CBC) Local Government Area (LGA). Stages 1 and 2 are situated in the South West portion of the site along Ashford Avenue and consists of 16 and 11 lots respectively, with no new road reserve contained in the stage boundary. The proposed Stage 1 and 2 layout is presented in Figure 1 as well as on the staging plan which can be found in Appendix A. Further detail on the development context of Stage 1 and 2 is summarised in the Statement of Environmental Effects which will be lodged with the Stage 1 and Stage 2 DA.

1.2. Objectives

The objectives of this report comprises of:

- Undertaking stormwater concept design to ensure the adequacy of the pit and pipe system in safely managing runoff from Stages 1 and 2 to the discharge point in a controlled manner. Ensuring that these pit and pipe networks as well as surface runoff have optimal connectivity to the proposed temporary basin.
- Conducting a comprehensive water quantity assessment for the Stage 1 and 2 site. This includes proving that an OSD basin is not required via hydrology modelling of pre-developed and post-developed peak flows.
- Employing MUSIC modelling to determine the appropriate sizing and design of the treatment train for the Stage 1 site. This is crucial for achieving the approved water quality treatment targets.
- Designing and evaluating Compensatory Floodplain Storage solutions for the Stage 1 and 2 area impacted by Georges River regional flooding.

1.3. Study Area

The site has until recently been used as the Milperra Campus of Western Sydney University (WSU). The existing campus is spread out, consisting of a range of buildings used for learning, student housing and office administration. In addition, the Campus also possesses ancillary impervious surfaces used for parking, footpaths, as well as pervious areas of open space and vegetation.

The existing site (Lot 2 of DP1291984) consists of approximately 19.6 ha of university land (refer **Figure 1**). The site currently has access via Horsley Road in the east, Ashford Avenue in the west, and Bullecourt Avenue in the

north. The South-Western Motorway (M5) runs east-west along the southern boundary of the site. The roadway is separated by a noise attenuation fence and a vegetated batter and swale approximately 15m wide. No access is available via the southern boundary. Under the development proposal, the road network will connect to the existing roads in the east, west and north. Stage 1 consists of 16 lots with a total area of 0.603 ha and Stage 2 consists of 11 lots with an area of 0.407 ha as well as road reserve with an area of 0.06ha, with both stages fronting Ashford Ave. It is proposed that the entire residential area (1.01 ha) is collected in a common drainage pipe system and piped to a temporary rainingarden. The existing Ashford Ave road reserve is existing and drains to the existing pipe system in Ashford Ave. As this verge and the existing drainage system in Ashford Ave is existing, it is not required to and therefore has not been modelled as part of the Stage 1 and 2 Drainage Assessment.

The topography within the site area is characterised by predominantly sloping terrain from the high point in the northeast corner of the site. The westerly grade creates a ridgeline that diverts flows in two directions south/southwest and northwest. Slopes of approximately 3% - 8% fall towards Ashford Avenue in the west and M5 in the south and Bullecourt in the northwest.

The southern part of the site discharges to an existing vegetated swale within the M5 via multiple headwalls or overland. The swale runs parallel to the southern boundary which conveys flows to the existing culverts (4 x 1500mm dia. RCP) under the freeway and ultimately into the downstream watercourse on the southern side of the M5.

The process prior to the completion of the Stage 1 and 2 works is to have the majority of the site area (the Southern portion) to be demolished.



Figure 1: Site Plan (NTS)

1.4. Relevant Stormwater DCP Controls

The Stormwater objectives and controls listed in the Canterbury Bankstown Development Control Plan will be addressed for the Stage 1 and 2 design as follows:

O1: To control Stormwater runoff and minimise discharge impacts on adjoining properties and into natural drainage systems before, during and after construction

During demolition works and following the completion of Stage 1 and 2, the runoff conveyed from the Southern portion of the site will not affect natural drainage systems. The temporary sediment basin and Bioretention basin designed for Stage 1 and 2 and the Southern catchment will ensure that runoff during construction work and post-development will not increase peak flows or pollute natural drainage systems.

O2: To prevent flood damage to the built and natural environment, inundation of dwellings and stormwater damage to properties

Stormwater assets such as pits and pipes will be appropriately placed, sized, and graded to ensure that it will convey runoff respective to the design storm being catered to. Furthermore, the road and lot layout of Stage 1 and 2 has been designed to convey runoff and prevent inundation and damage to dwellings.

O3: To ensure the design of buildings and structures does not create any unreasonable risks to life and assets

Stormwater assets have been designed to meet safety requirements such as ensuring that freeboard and runoff velocity requirements have been met. Appropriate grades and berms will be adopted for basin designs to ensure safety for maintenance vehicles and staff.

O4: To ensure that proposed development does not adversely affect the operational capacity of the downstream stormwater system

Analysis using DRAINS has been conducted to ensure the post development flow will not be greater than the corresponding predevelopment flow for the Southern portion of the site containing Stage 1 and 2. As the post development flow is not greater than the predevelopment flow, an OSD basin will not be required to reduce peak flow to the predevelopment level.

O5: To ensure an integrated water cycle management approach through water-sensitive urban design principles and does not adversely impact public recreation opportunities within the RE1 Public Recreation zoned land

The temporary basin proposed for the Southern portion of the site containing Stage 1 and 2 is located in accordance with the rezoning documents, proposed zoning and recently adopted site specific DCP.

C1: The following devices must be provided in accordance with Council's specifications and subject to Council approval:

- a) Bio Basin in Southern Open Space (Basin 1), with an area of approximately 650 sqm
- b) Bio Basin in Drainage Basin (Basin 2), with an area of approximately 210 sqm
- c) Bio Basins in Northern Open Space (Basin 3), with an area of approximately 350 sqm

All three ultimate Bio Basins stated above will be detailed in the overall Water Cycle Management Strategy report submitted following the submission of this WCMS report for Stage 1 and 2 works.

C2: All proposed dwellings must comply with Section 3.1 Development Engineering Standards of the Canterbury Bankstown Development Control Plan 2023

All stormwater runoff from future residential dwellings will be designed in accordance with Section 3.1 of the Canterbury Bankstown Development Control Plan. This will be completed under a separate DA.

C3: Drainage systems should be sized to consider increases in rainfall intensity, frequency and duration under future climate change

The design storm was determined from data obtained from the ARR using the 'Interim Climate Change Factor' which reflects the increase in rainfall intensity, frequency, and duration under future climate change. The final drainage design during the Subdivision Works Certification phase will design and detail all pipe sizes. This final design will include the 'Interim Climate Change Factor'.

C4: A local Stormwater Management Plan is to be provided with the first Development Application for proposing subdivision/construction of residential accommodation of the site

The local Stormwater Management plan is provided by the submission of this Water Cycle Management Strategy report.

2. GENERAL WATER CYCLE MANAGEMENT STRATEGY

2.1. Stage 1 & 2 Scenario

Best practice stormwater and floodplain management principles have been applied to this development to ensure that floodplain and stormwater management is integrated into the development in an efficient and sustainable way. This report investigates the implementation of water cycle management strategy for the development of Stage 1 and 2 as well as the associated demolition works.

Stage 1 and 2 are situated in the South West corner of the precinct (as depicted in **Figure 3**) with an area of 0.603 ha and 0.467 respectively. Stage 1 consists of 16 lots and Stage 2 consists of 11 lots with a small section of road reserve in between lots. A proposed temporary sediment basin is to be situated south east of Stage 1 & 2 and installed under the demolition DA1512/2023. Initially it will continue to be used as a temporary sediment basin for the Stage 1 and 2 construction works, however, once the site is stabilised and 80% of the houses are built it will be converted to a temporary bioretention (raingarden) basin to address water quality from the stage 1 and 2 development. As a result of the demolition occurring first, the existing impervious area of the site will be significantly reduced, resulting in less runoff from the site even with the Stage 1 and 2 residential development. As such, the basin is not required to have an OSD component and will only consist of the sediment basin and bioretention components.

Stormwater quantity for Stage 1 and 2 is managed using 2kL rainwater tanks on each lot, which reduces potable water requirements of future homes. Wastewater on site will be managed by future connection to the Sydney Water sewerage system. Wastewater recycling is not proposed for this development. Stormwater quantity management is explored in **Section 3**.

Stormwater drainage will be designed in accordance with Council's stormwater design manual and the major (1% AEP) – minor (10% AEP) approach recommended in Australian Rainfall and Runoff 2019 (ARR 2019). Major overflow routes will be designed to convey stormwater exceeding the capacity of the pipe network (minor storm) safely to the temporary basin for the 1% AEP event to ensure that the temporary basin can cater for all storms up to the 1%AEP. Additional consideration will be given to extreme events in the design of major overland flow routes through the subdivision. The Stage 1 and 2 concept stormwater layout is presented on the Concept Civil Engineering Plans that can be found in **Appendix B**.

A water quality treatment train has been incorporated into the proposed subdivision consisting of 2 kL rainwater tanks on each lot and a bioretention basin. Due to a lack of stormwater quality pollution removal targets from CBC, pollutant removal targets of 90% GP, 85% TSS, 65% TP, and 45% TN have been adopted from the "Flood and Risk Impact Assessment Report" prepared by J. Wyndham Prince which in turn was based on from the adjacent Liverpool City Council WSUD Technical Guidelines. Water quality modelling to determine the WSUD requirements are provided in **Section 4**.

The design of the proposed stormwater assets for the Stage 1 and 2 development is presented on the Concept Civil Engineering Plans in Appendix B. The design is based on the proposed zonings identified in the Planning Proposal Report as well as the "Flood and Risk Impact Assessment Report" prepared by J. Wyndham Prince. The proposed temporary bioretention filter has been integrated into the temporary sediment basin to minimise the amount of temporary works as much as possible.

A detailed flood assessment including 2-dimensional hydraulic modelling has been conducted by J. Wyndham Prince in the Flood and Risk Impact Assessment Report to determine the 1%AEP flood level. The report concluded that the ultimate development does not create unacceptable flood impacts external to the site, and no loss in floodplain storage occurs due to the proposed development for Stage 1 and 2. The proposed finished surface level modelling has been designed to minimise how much filling is below the Regional Flood Level of RL 5.55 and therefore limit the amount of required compensatory floodplain storage for the 1% AEP event. The assessment of floodplain management is presented in **Section 5**.

3. WATER QUANTITY MANAGEMENT

3.1. Hydrologic modelling methodology and parameters

The hydrologic modelling to determine peak flow rates discharging from the site has been conducted using the RAFTS Storage Routing model in DRAINS software package, an industry standard model for hydrological modelling. The procedures and model inputs for this assessment are consistent with the Australian Rainfall and Runoff Guidelines and the CBC DCP.

Adopted Parameters for the hydrologic modelling have been summarised in **Table 1**. The DRAINS model and results are provided in **Appendix D**.

Table 1: Hydrological Parameters and Considerations

DESIGN PARAMETER	REQUIREMENT/ASSUMPTION	COMMENT
Software Package	DRAINS Version 2021.02 – 4 Aug 2021	
Rainfall Estimation Procedures	ARR 2019	
Rainfall Runoff Model	RAFTS Storage Routing model (as applied in DRAINS)	
IFD Data	ARR 2016 Design Rainfalls	Bureau of Meteorology
Losses	Impervious Area IL = 0 mm Impervious Area CL = 0 mm/h Pervious Area IL = 29 mm Pervious Area CL = 0.8 mm/h	ARR Book 5, Section 3.5.3.1.2 ARR Datahub ARR Datahub Value x 0.4
Temporal Patterns	10 Rainfall Patterns from the East Coast South region	ARR Datahub
Mannings	Pre-Development = 0.03 Stage 1 & 2 = 0.02 Post-Development (grassed) = 0.035	

Both the pre-development and post-development models have adopted the same Pervious Area IL as both pervious areas are of the urbanised condition with similar levels of compaction.

RAFTS is a storage routing runoff model that is commonly used for the determination of hydrographs, peak flow rates and to inform the size and outlet requirements of detention basins. RAFTS is one of the recommended models under ARR2019 and is suitable for modelling a range of catchment sizes and configurations. For this report, RAFTS was selected for the catchment hydrology in preference to the DRAINS IL/CL model as it give more reliable hydrological estimates on medium to large catchment sizes, such as the lumped catchments used for this assessment.

3.2. Hydrological modelling inputs

3.2.1. Pre-Development Scenario

The southern section of the site comprises two catchments, Ex1A and Ex1B, delineated in **Figure 2** below. These catchments discharge to DSP1 through the swale before reaching the existing culverts under the M5. The imperviousness of the pre-development catchment has been assessed based on current conditions i.e. existing buildings and hardstand areas being in place. Details of the pre-development catchment are tabulated in **table 2**.

3.2.2. Post-Development Ultimate Scenario

Stage 1 and 2 encompasses the development of 27 lots situated along the current Ashford Avenue in the southwestern region of the site. This stage's progression follows the complete demolition of all existing structures and pavement on the premises, as stipulated in DA1512/2023. Post-demolition, the site will undergo spray grassing and stabilization until further residential development occurs in subsequent stages. This interim measure will lead to a decrease in imperviousness and peak flows, as the site transitions to a more pervious state.

In the post-development modelling, the boundaries of catchments (refer to **Figure 3**) and the flow directions generally remain consistent. A small section of Ex1A will be transformed into the Stage 1 and 2 residential lots. An imperviousness of 85% was adopted as a conservative approach. The proposed demolition will remove hard surfaces from the remaining Ex1A and the majority of Ex1B. Consequently, the total imperviousness of the DSP1 catchments (southern portion of the site) will decrease from 41.3% to 15.34%. This reduction indicates an anticipation of lower peak flow rates in the subsequent drainage modelling. Details of the post-development catchment are tabulated in **table 3**.

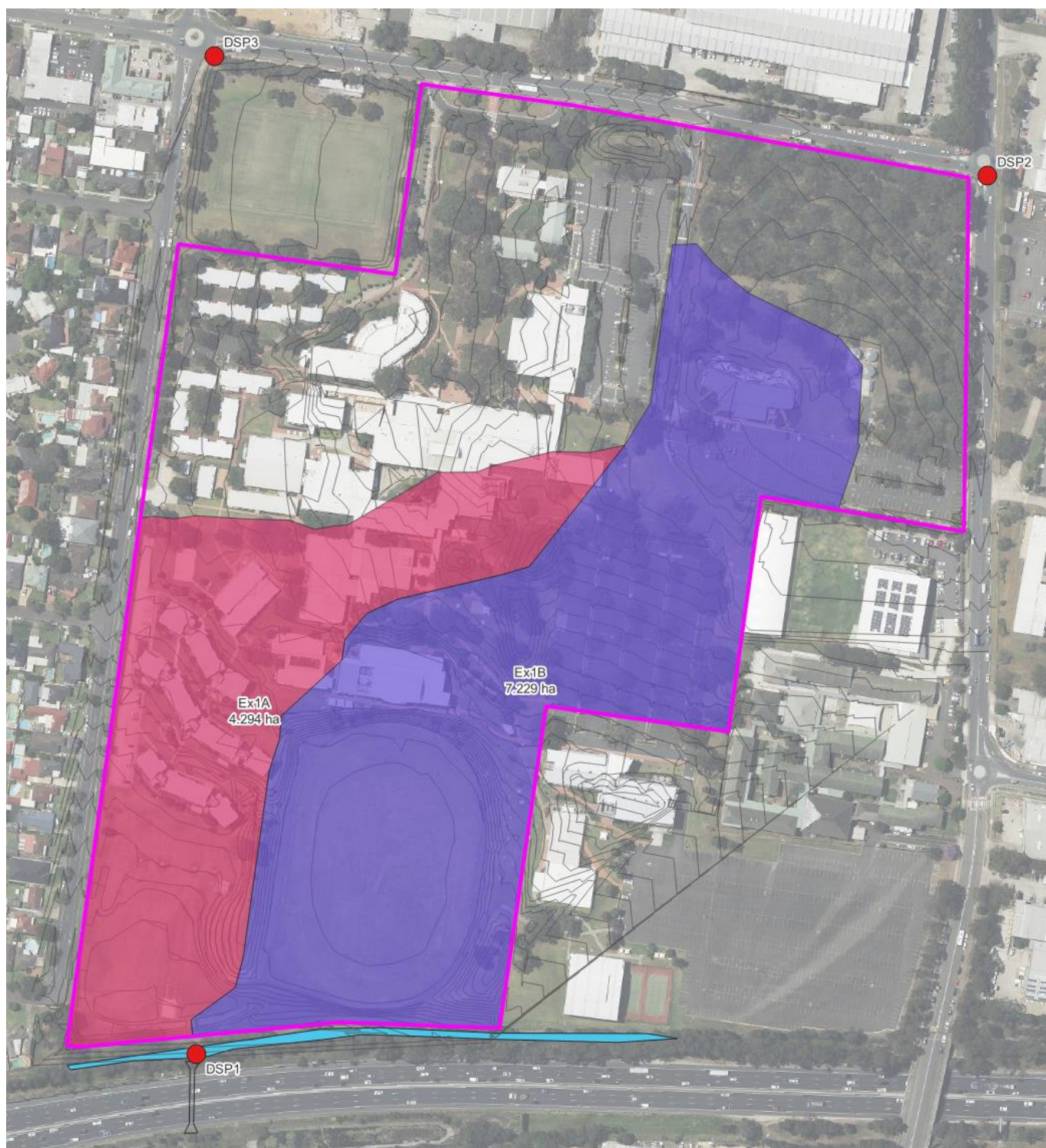


Figure 2: Pre-Development Catchment Plan

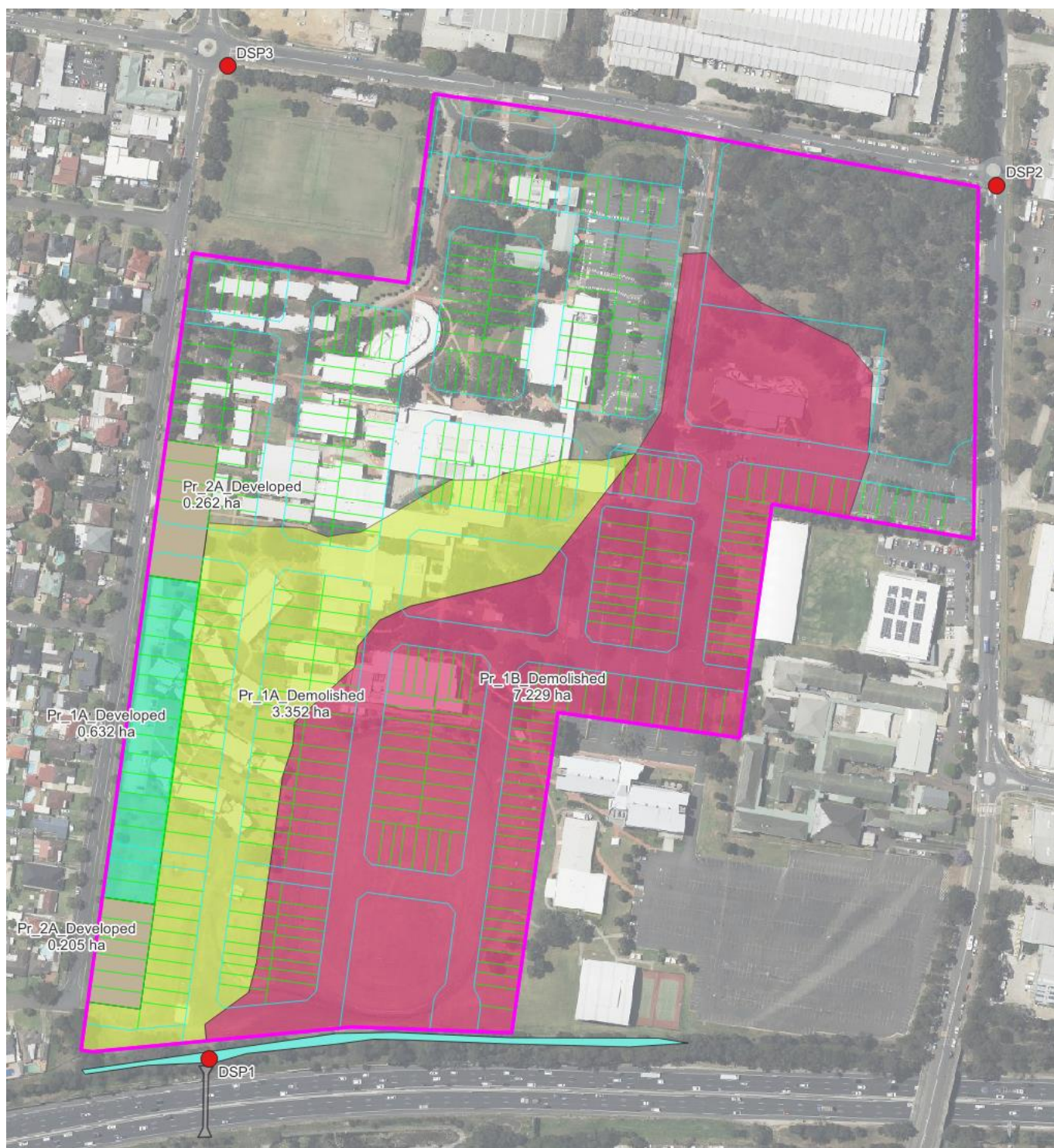


Figure 3: Post-Development catchment Plan

Table 2: Existing Catchment Properties

DISCHARGE POINT	CATCHMENT	AREA (ha)	IMPERVIOUSNESS (%)
DSP1	Ex1A	4.294	47
	Ex1B	7.229	37.9
	Total Area	11.523	41.3

Table 3: Proposed Catchment Properties

DISCHARGE POINT	CATCHMENT	AREA (ha)	IMPERVIOUSNESS (%)
DSP1	Pr_1A_Developed	0.632*	85
	Pr_2A_Developed	0.467	86
	Pr_1A_Demolished	3.352	0
	Pr_1B_Demolished	7.229	11.8
	Total Area	11.68	15.34

*Pr_1A_Developed has accounted for the future public reserve (0.029 ha in between lots 1014 and 1015). The area for stage 1 is 0.603 ha. Please refer to Appendix B for lot configuration of Stage 1

3.3. Hydrological modelling Results

3.3.1. Pre-Development Scenario

The existing model was simulated for all nominated design events - a range of storm durations. The critical storm was selected as maximum duration with the temporal pattern just above the median selected from each set of 10 temporal patterns as recommended in the ARR2019 guidelines. Existing critical storm peak flow rates are summarised in **Table 4**. Peak flow rates of 2.49 m³/s and 3.87 m³/s were calculated for the 10% and 1% AEP events respectively.

3.3.2. Post-Development Scenario

With the total imperviousness of the DSP1 catchments reduced from 41.3% to 15.34%, and considering the unchanged catchment boundary and flow direction, the peak flow rates have reduced in the hydrological modelling results. Specifically, the peak flow rates have decreased from 2.491 m³/s and 3.87 m³/s to 1.32 m³/s and 2.22 m³/s, in the 10% and 1% AEP respectively. This comparison is detailed in **Table 4**. As a consequence of the demolition activities, including the transformation of 27 residential lots along with the remaining pervious site, the resultant peak flows are anticipated to be lower than those observed under existing conditions. Consequently, an OSD is deemed unnecessary for the Stage 1 and 2 development.

Table 4: Pre Development versus Post Development Peak Flow Rates Comparison

DISCHARGE POINT	10% AEP(m3/s)	1% AEP(m3/s)
Existing DSP1 (Ex1A+ Ex1B)	2.49	3.87
Proposed DSP1(Pr_1A&2A_Developed + Pr_1A_Demolished+ Pr_1B_Demolished)	1.32	2.22
Change (Post minus Pre)	-1.17	-1.65

4. WATER QUALITY MANAGEMENT

4.1. Ultimate Scenario

4.1.1. Water Quality Management Strategy

A stormwater quality treatment train has been assessed utilising the MUSIC software package. Assets within the treatment train have been selected and sized to meet the targets specified in the "Flood and Risk Impact Assessment Report" prepared by J. Wyndham Prince which in turn was based on from the adjacent Liverpool City Council WSUD Technical Guidelines. Targets are as per the below:

- 85% reduction in the post-development mean annual load of Total Suspended Solids (TSS)
- 45% reduction in the post-development mean annual load of Total Nitrogen (TN)
- 65% reduction in the post-development mean annual load of Total Phosphorous (TP)
- 90% reduction in the post-development mean annual load of Gross Pollutants (GP)

The proposed treatment train consists of lot scale rainwater tanks (2 kL RWTs), followed by a temporary bioretention basin.

4.1.2. Model Configuration

Rainfall input into the model was using MUSIC-link file for Liverpool City Council (Clay). The Liverpool City Council MUSIC-link file was implemented due to the proximity to Canterbury Bankstown Council. A conservative estimation of Clay soil has been assumed in the modelling in lieu of the Georges River sandy loam option.

Source node, and RWT inputs into the model have been adopted from Water NSW's Using MUSIC in Sydney's Drinking Water Catchment (2019) or left as recommended model defaults. Design parameters for the temporary bioretention basin have been adopted following the recommendations of Bioretention Technical Design Guidelines (Water by Design, 2014) and Advancing the Design of Stormwater Biofiltration (FAWB, 2008).

The proposed per lot assumptions for Stage 1 and 2 have adopted a total percentage impervious of 85% and are determined as per the following assumptions:

- Roof Area = 300m²
- Roof Area contributing to Rainwater Tank (RWT) = 75% of the Roof Area
- Roof Area that overflows to drainage system (ex RWT) = 25% of the Roof Area
- Yard area = Lot Area – Roof area
- Effective Impervious of Roof = 100%
- Effective Impervious of Yard = 21 - 26%
- Effective Impervious of Road Reserves = 95%

Inputs into the model are as follows:

- Catchment properties adopted in the model are summarised in **Table 5**.
- Soil parameters in the model are summarised in **Table 6**.
- Pollutant generation parameters are summarised in **Table 7**.
- RWT input parameters are summarised in **Table 8**.
- Bioretention input parameters are summarised in **Table 9**.

Table 5: MUSIC Catchment Properties

Node Inputs												
Catchment	Total Catchment Area (ha)	Lot Area (ha)	No. of Lots	Avg Lot Size (m2)	Road Reserve Area (ha)	Active Open Space (ha)	Passive Open Space/RG (ha)	Commercial (ha)	Roof to RWT (ha)	Roof ex RWT (ha)	Yard (ha)	Effective % Impervious
Stage 1	0.603	0.603	16	377	0	0	0	0	0.36	0.12	0.123	85.00
Stage 2	0.467	0.407	11	370	0.06	0	0	0	0.25	0.08	0.077	86.28

Table 6: MUSIC Soil Properties

PARAMETER	VALUE
Rainfall Threshold (mm)	0.3
Soil Storage Capacity (mm)	187
Initial Storage (%)	30
Field Capacity (mm)	127
Infiltration Capacity Coefficient A	135
Infiltration Capacity Coefficient B	4
Initial Depth (mm)	10
Daily Recharge Rate (%)	10
Daily Baseflow Rate (%)	10
Daily Deep Seepage Rate (%)	0

Table 7: MUSIC Pollutant Generation Parameters

PARAMETER	ROOF	RESIDENTIAL	SEALED ROAD
TSS Baseflow Mean (Log mg/L)	1.1	1.2	1.2
TSS Baseflow Std Dev (Log mg/L)	0.17	0.17	0.17
TSS Stormflow Mean (Log mg/L)	1.3	2.15	2.43
TSS Stormflow Std Dev (Log mg/L)	0.32	0.32	0.32
TP Baseflow Mean (Log mg/L)	-0.82	-0.85	-0.85
TP Baseflow Std Dev (Log mg/L)	0.19	0.19	0.19
TP Stormflow Mean (Log mg/L)	-0.89	-0.6	-0.3
TP Stormflow Std Dev (Log mg/L)	0.25	0.25	0.25
TN Baseflow Mean (Log mg/L)	0.32	0.11	0.11
TN Baseflow Std Dev (Log mg/L)	0.12	0.12	0.12
TN Stormflow Mean (Log mg/L)	0.3	0.3	0.34
TN Stormflow Std Dev (Log mg/L)	0.19	0.19	0.19

Table 8: Rainwater Tank Parameters

CATCHMENT	NUMBER OF TANKS	VOLUME (L)	TOTAL DAILY DEMAND* (kL/d)	OUTLET PIPE DIAMETER (m)
Stage 1	16	2000 per tank	7.52	0.1 per tank
Stage 2	11	2000 per tank	5.17	0.1 per tank

*Total Daily Demand is based on 0.47kL/d per household lot

Table 9: Bioretention Parameters

PARAMETER	TEMP BASIN
Low Flow Bypass (m ³ /s)	0
High Flow Bypass (m ³ /s)	100
Extended Detention Depth (m)	0.30
Surface Area (m ²)	675
Filter Area (m ²)	68
Saturated Hydraulic Conductivity (mm/h)	200
Filter Depth (m)	0.40
TN Content of Filter Media (mg/kg)	600
Orthophosphate Content of Filter Media (mg/kg)	30
Base Lined?	No
Unlined Filter Media Perimeter (m)	0.01
Exfiltration Rate (mm/hr)	0
Vegetation Properties	Effective Nutrient Removal Plants
Overflow Weir Width (m)	3.4
Underdrain Present?	Yes
Submerged Zone Present?	No

4.2. Stage 1 & 2

4.2.1. Input and Results

Model setup of Stage 1 and 2 development is presented in **Figure 4** below and results are presented in **Table 10** below. Three catchments comprising of: Roof to RWT, Roof ex RWT and Yard have been utilised for the MUSIC modelling of treatment performance in Stages 1 and 2.

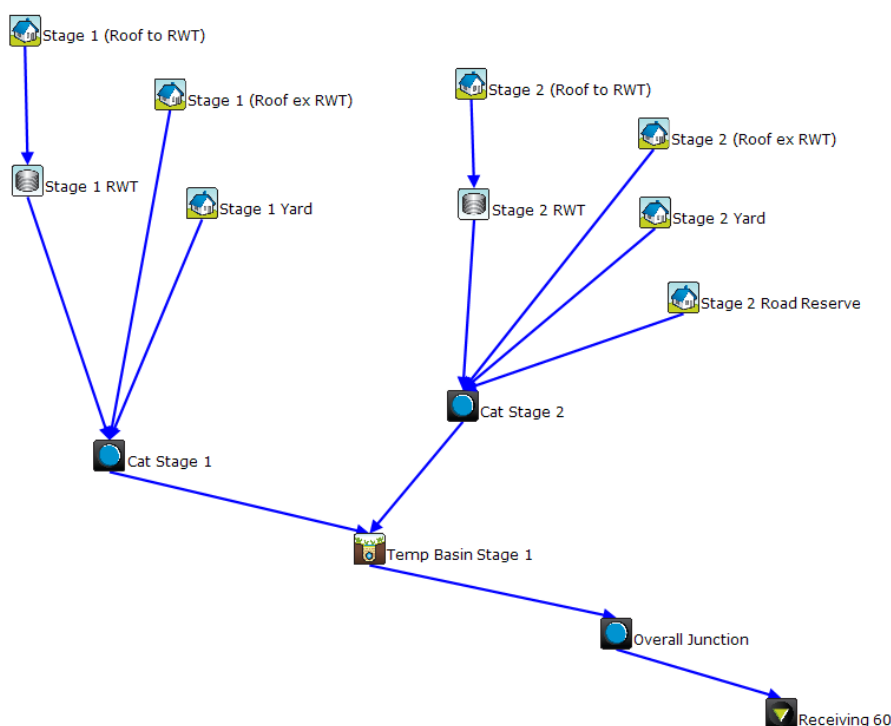


Figure 4: MUSIC treatment Train for Stage 1 and 2

Table 10: Stage 1 & 2 Treatment Train Effectiveness

PARAMETER	SOURCES (kg/yr)	RESIDUAL (kg/yr)	DIFFERENCE (kg/yr)	REDUCTION (%)	WCC TARGET (%)	COMPLIANT?
TSS	288.8	26.87	261.93	90.7	85	Yes
TP	1.203	0.1909	1.01	84.12	65	Yes
TN	16.03	4.079	11.95	74.55	45	Yes
GP	200.1	0	200.1	100	90	Yes

4.2.2. Soil and water management during construction

During construction, water quality is a major concern. As a result, sediment, and erosion controls such as sediment fencing, and straw bales must be used as minimum control and located entirely on the downstream side of the subject property.

The Stage 1 and 2 concept civil engineering plans show the location of the sediment fencing and a 1.8m high barrier fencing around the site. In addition, it is proposed that each pit in the Ashford Avenue will contain a kerb inlet sediment trap while sand filled hessian socks will be located in the kerb to help filter our sediment from stormwater being conveyed by the gutter. The common drainage surface inlet pits will also contain a geofabric filter. The existing sediment basin installed for the demolition will be maintained and be used during the Stage 1 and 2 works. Dirty water will be diverted via a 'V' Drain or mound and directed into the temporary sediment basin. This should be

flocculated after every rain event and once clean, the water should be pumped on to the large grassed area immediately east to evaporate or eventually drain into the M5 corridor.

It is reinforced that Sediment and Erosion Control will need to be implemented and maintained throughout the construction phase of the project. It is an evolving plan that needs to vary as site conditions dictate. It is noted that any site amendments should be done in conjunction with Council.

The sediment basin was sized according to the principles of Volume 1 of the Managing Urban Stormwater – Soils and Construction, otherwise referred to as the Bluebook. The total volume of this sediment basin was calculated to be 228 m³ using a spreadsheet that can be referred to in **Appendix F**.

5. FLOODPLAIN MANAGEMENT

5.1. Compensatory Storage

Noting that the JWP report identified that there are no adverse flood level impacts external to the site in the 1% AEP event, a further compensatory storage assessment of the site under both existing and developed conditions for Stage 1 and 2 was prepared to ensure that adequate compensatory flood storage was provided.

The compensatory storage assessment was undertaken in 12D and is documented in **Appendix C** – Plan of Compensatory Storage assessment. The 12D modelling assessed all surface levels and volume between RL 3.00 (lowest part of the site under existing conditions) and the 1%AEP flood level of RL 5.55 for both the pre-development and post-development conditions. A summary of the compensatory storage volumes is tabulated below in **Table 11**.

Table 11: Compensatory Storage Comparison

SCENARIO	VOLUME
Pre-development Flood Storage	6400m ³
Post-development Stage 1 & 2 Flood Storage	6872m ³ (Temp Sediment Basin for demolition)
Balance	472 m ³

In summary, the temporary sediment basin being constructed as part of the demolition DA and as modified to include the temporary raingarden at the completion of Stage 1 and 2 will provide approximate 472m³ of excess compensatory flood storage.

While this is temporary and will be modified as part of the overall masterplan development, this demonstrates that Stage 1 and 2 will not be required to provide any additional drainage.

6. CONCLUSIONS AND RECOMMENDATIONS

The water cycle management strategy outlined in this report has been prepared in support of the Stage 1 and 2 development which involves the creation of 27 residential lots along Ashford Avenue as well as the demolition of the existing buildings of the site.

This report provides the following conclusions and recommendations:

Stage 1 & 2

- The existing temporary sediment basin being used during the demolition of the structures and impervious surfaces on site as part of DA1512/2023 is to be utilised for temporary sediment control during the development of Stage 1 and 2. All 'dirty' water is to be directed to the basin.
- The Stage 1 and 2 development contains significantly less impervious surfaces than what the WSU campus had under existing conditions prior to the demolition of the buildings. This results in less peak flows than under existing conditions meaning that the Stage 1 and 2 development does not require any OSD control. A DRAINS model was prepared to demonstrate the reduction in peak flows.
- A MUSIC model was prepared to determine whether any WSUD measures are required for the Stage 1 and 2 development. The MUSIC model assessed stormwater from each of the lots only as the existing footpath in Ashford Road is existing and falls to the existing drainage system. It has been assumed that 75% of the roof water from each lot drains to a 2kL rainwater tank for reuse while the remaining 25% overflows to the common drainage system and flows downstream to a temporary raingarden containing a 68m² media area. The modelling found that this treatment train meets Council's water quality objectives to improve the stormwater runoff from the 27 lots in Stage 1 and 2.
- Stage 1 and 2 does not complete any filling within any portion of the site that has an existing ground level less than RL5.55 (Regional 1%AEP Flood Level). As a result, no portion of the flood plain is being filled and therefore no compensatory storage is required under Stage 1 and 2.

The proposed Water Cycle Management Strategy meets the following objectives:

- There are no detrimental offsite impacts as a result from the proposed development,
- There is no increase in flood levels, and flow rates as a result of this development,
- Compensatory Storage has been provided,
- OSD is not required and treatment design requirements have been met for Stage 1 and 2 as per CBC council requirements.

In summary, the proposed development achieves all stormwater objectives in Council's DCP and all impacts (temporary or permanent) can be mitigated as part of the detailed design process.

Prepared by

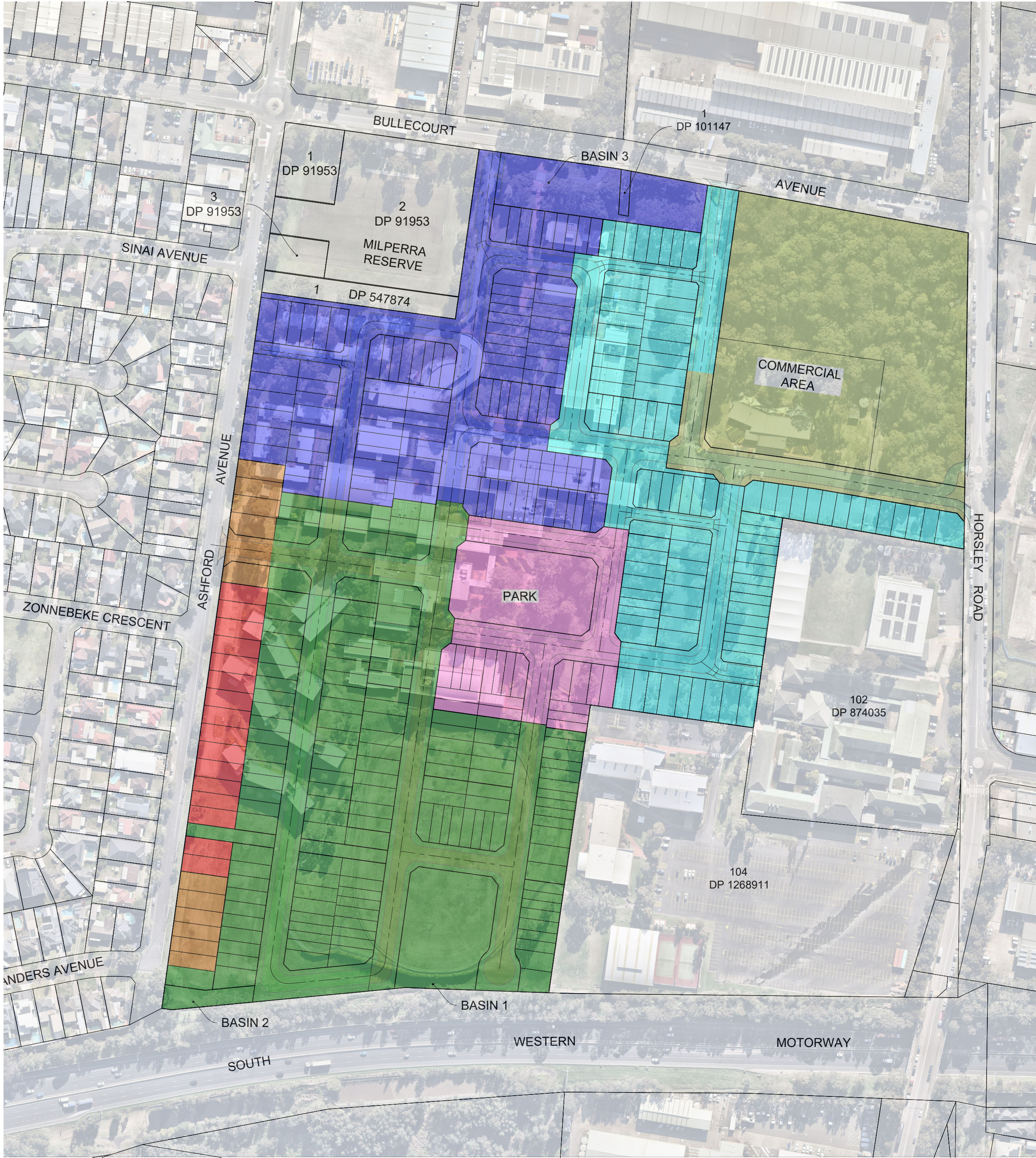


Gladys Hasan
Water Resources Engineer
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Frank Guo
Senior Water Resources Engineer
GuoF@bevwill.com.au

APPENDIX A: OVERALL STAGING PLAN



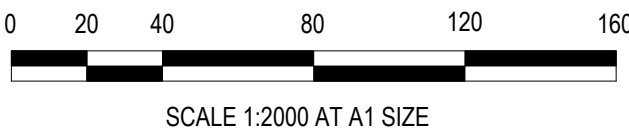
Stage No.	No. of Superlots Lots	No. of Residential Lots	No. of Public/Drainage Reserve Lots	Stage Area (m²)
Stage 1	0	16	0	6030
Stage 2	0	11	0	4690
Stage 3	10	135	2	61674
Stage 4	2	19	1	15108
Stage 5	9	96	0	35176
Stage 6	9	105	1	40385
Commercial	1	0	0	33340

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E	STAGE 4 & 5 BOUNDARY MODIFIED	13.06.24	S.G.	S.G.					
D	LAYOUT MODIFIED	23.05.24	S.G.	S.G.					
C	STAGE 1 BOUNDARIES	31.01.24	S.G.	S.G.					
B	STAGE 1 LIMITS UPDATED	22.01.24	S.G.	S.G.					
A	ISSUED FOR INFORMATION	15.12.23	D.H.	S.G.	F	REVISED STAGING ADDITION OF STAGE 6	09.08.24	AA	S.G.



Designed	S. GRAY
Date	15.01.2024
Drawn	D. HALL
Approved	N/A
Date	N/A
DA Number	N/A

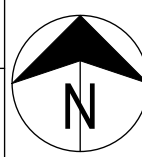
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32 Ianthe Street
Campbelltown, NSW 2560
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Project Details	WSU MILPERRA 2 BULLECOURT AVE, MILPERRA CANTERBURY-BANKSTOWN COUNCIL
Drawing Title	STAGING PLAN

Sheet 01 of 01

Scale
1:2000 @ A1

Project Number	Reference	Drawing No	Revision
2301879	302	010	G



APPENDIX B: 2301879-303-DA_REV C & 2301879-307-DA_REV A

WSU MILPERRA

CONCEPT CIVIL ENGINEERING PLANS TO SUPPORT THE STAGE 1 SUBDIVISION

LOT 2 IN DP1291984 - 2 BULLECOURT AVENUE, MILPERRA

CANTERBURY-BANKSTOWN COUNCIL

MIRVAC HOMES (NSW) PTY LTD



SITE PLAN
NOT TO SCALE

DRAWING INDEX

Sheet No.	DRAWING No.	TITLE	REVISION
1	2301879 - 303 - 001	COVER SHEET	C
2	2301879 - 303 - 002	DEMOLITION PLAN	C
3	2301879 - 303 - 011	LAYOUT PLAN	C
4	2301879 - 303 - 012	BULK EARTHWORKS AND LOT BENCHING PLAN	C
5	2301879 - 303 - 101	ASHFORD AVENUE BACK OF KERB - LONGITUDINAL SECTION - & TYPICAL CROSS SECTION	C
6	2301879 - 303 - 201	LOT CROSS SECTIONS - SHEET 1 OF 5	C
7	2301879 - 303 - 202	LOT CROSS SECTIONS - SHEET 2 OF 5	C
8	2301879 - 303 - 203	LOT CROSS SECTIONS - SHEET 3 OF 5	C
9	2301879 - 303 - 204	LOT CROSS SECTIONS - SHEET 4 OF 5	C
10	2301879 - 303 - 205	LOT CROSS SECTIONS - SHEET 5 OF 5	C
11	2301879 - 303 - 301	DETENTION BASIN LAYOUT PLAN	C
12	2301879 - 303 - 401	SOIL AND WATER MANAGEMENT PLAN - OVERALL PLAN	C
13	2301879 - 303 - 402	SOIL AND WATER MANAGEMENT PLAN - STAGE 1 PLAN	C
14	2301879 - 303 - 403	SOIL AND WATER MANAGEMENT PLAN - DETAILS & NOTES	C

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B	REVISED AS PER MIRVAC'S COMMENTS	23.05.24	S.F.	S.G.					
A	ISSUED TO CLIENT FOR REVIEW	08.03.24	J.B.	S.G.					
REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.



Designed	S. FERGUSON
Date	08.03.2024
Drawn	J. BIRD
Approved	S. GRAY
Date	08.03.2024
DA Number	-

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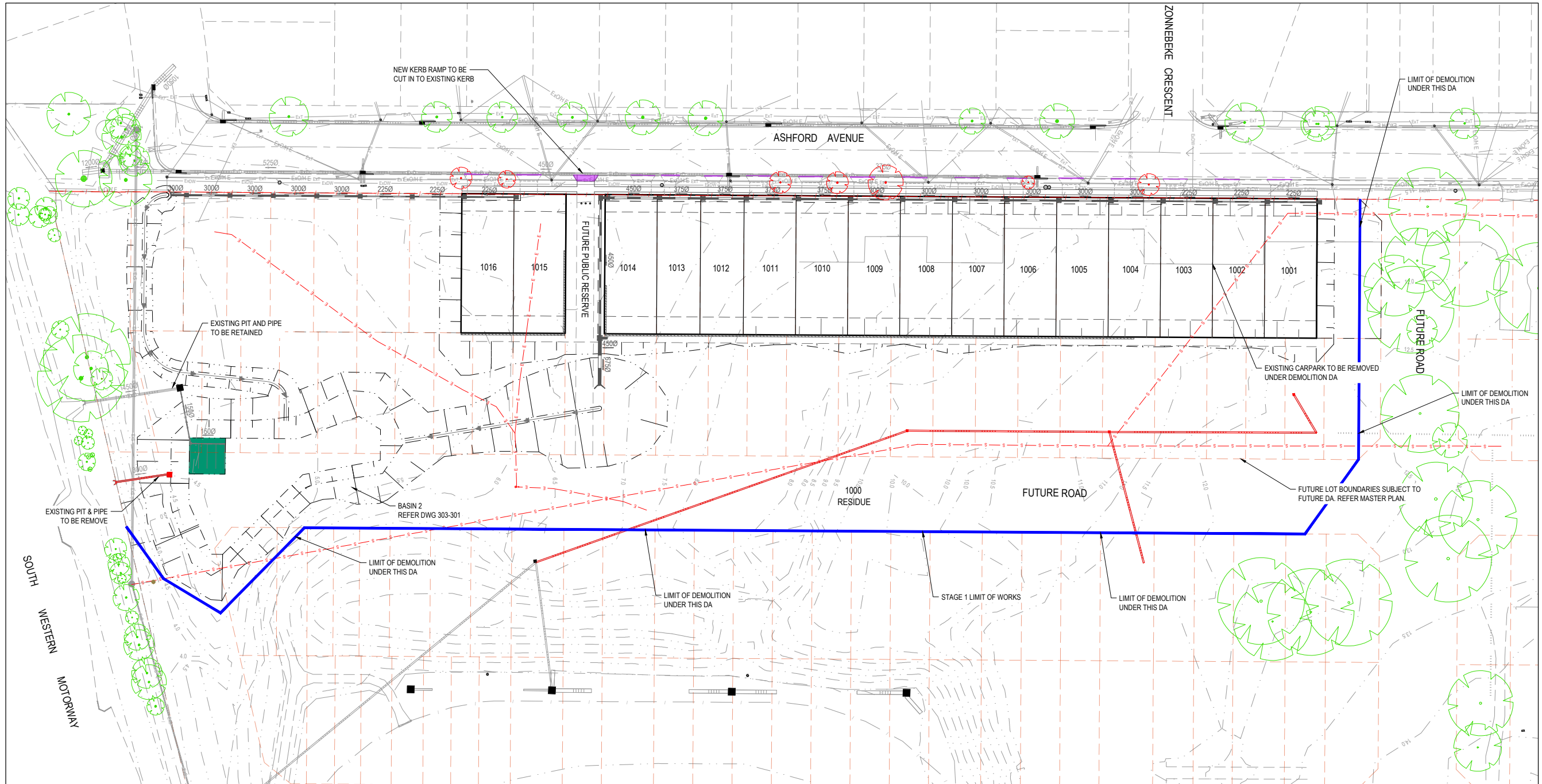
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Drawing Title	COVER SHEET

Sheet 01 of 14			
Scale			
Project Number	Reference	Drawing No	Revision
2301879	303	001	C



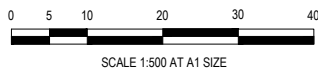
LEGEND - DEMOLITION PLAN PLAN

- EXISTING TREE TO BE RETAINED UNLESS IMPACTED BY UNDERGROUND ELECTRICAL WORKS
- EXISTING TREE TO BE RETAINED
- EXISTING STORMWATER PIT/PIPE TO BE REMOVED
- EXISTING ELECTRICITY TO BE REMOVED
- EXISTING SEWER TO BE REMOVED
- EXISTING FENCE TO BE REMOVED

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Drawn J. BIRD
Approved S. GRAY
Date 08.03.2024
DA Number

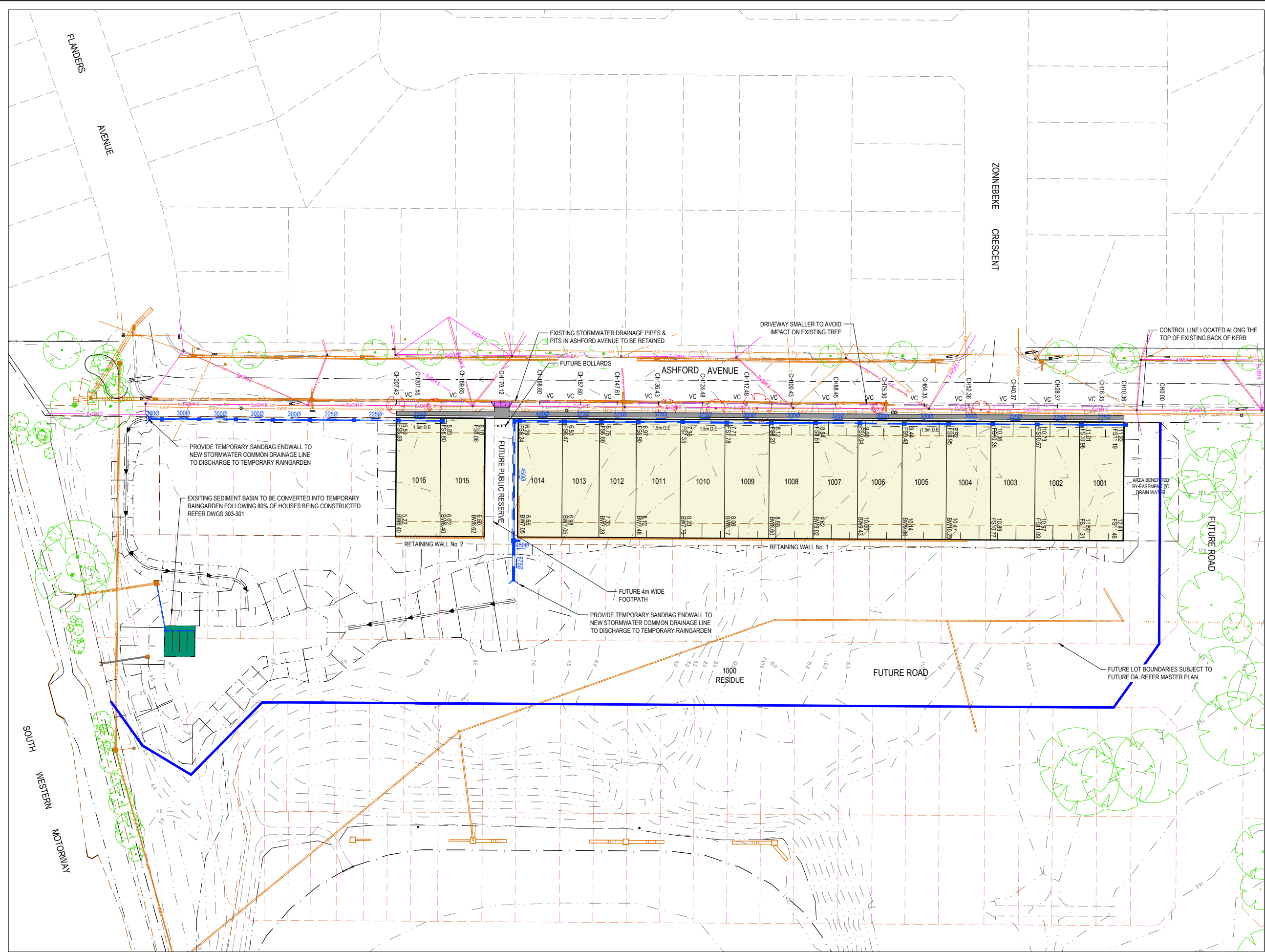
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WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 1 SUBDIVISION
Drawing Title
DEMOLITION PLAN

Sheet 02 of 14

Scale
1:500 @ A1

Project Number	Reference	Drawing No	Revision
2301879	303	002	C



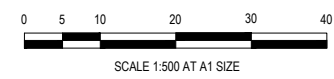
LEGEND - LAYOUT PLAN

- STORMWATER DRAIN, PIT & PROPERTY INLET
- SWALE DRAIN
- SEWER & MAINTENANCE STRUCTURES
- HOUSE DRAIN
- SERVICE CONDUITS
- TACTILE PAVERS (INDICATIVE ONLY)
- ELECTRICITY (UNDERGROUND)
- ELECTRICITY (OVERHEAD)
- OPTIC FIBRE
- TELECOMMUNICATIONS
- GAS
- WATER
- RECYCLED WATER
- EXISTING ELECTRICITY (UNDERGROUND)
- EXISTING ELECTRICITY (OVERHEAD)
- EXISTING GAS
- EXISTING OPTIC FIBRE
- EXISTING TELECOMMUNICATIONS
- EXISTING WATER
- EXISTING RECYCLED WATER
- EXISTING STORMWATER DRAIN
- EXISTING SEWER
- EXISTING HOUSE DRAIN
- EXISTING SWALE DRAIN
- EXISTING SURFACE LEVEL
- FINISHED BUILDING LINE LEVEL
- FINISHED RIDGE LINE LEVEL
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- RIDGE LINE
- RETAINING WALL
- ZERO LOT LINES
- PAVEMENT TREATMENT
- STRUCTURAL FILL > 200mm DEEP
- EX. STRUCTURAL FILL > 200mm DEEP
- DIRECTION OF FALL
- OVERLAND FLOW
- ALLOTMENT TO BE GRADED EVENLY IN
- DIRECTION OF FALL TO LEVELS INDICATED
- CONCRETE EDGE STRIP WITH SUBSOIL DRAIN, "NO ROAD" SIGN & BARRIER
- LIMIT OF WORKS
- EXISTING TREE TO BE RETAINED UNLESS IMPACTED BY UNDERGROUND ELECTRICAL WORKS
- EXISTING TREE TO BE RETAINED
- PERMANENT SURVEY MARK
- TEMPORARY BENCH MARK
- PROPOSED DRIVEWAY
- TREE PROTECTION ZONE (TPZ)
- NEW LAYBACK TO BE CUT IN TO EXISTING KERB FOR FUTURE DRIVEWAY.
- ALL NEW DRIVEWAYS TO BE 4m WIDE WITH EXCEPTION TO LOTS 1006, 1012 & 1013.
- LOTS 1006, 1012 & 1013 DRIVEWAYS TO BE 3m WIDE.
- RAINGARDEN

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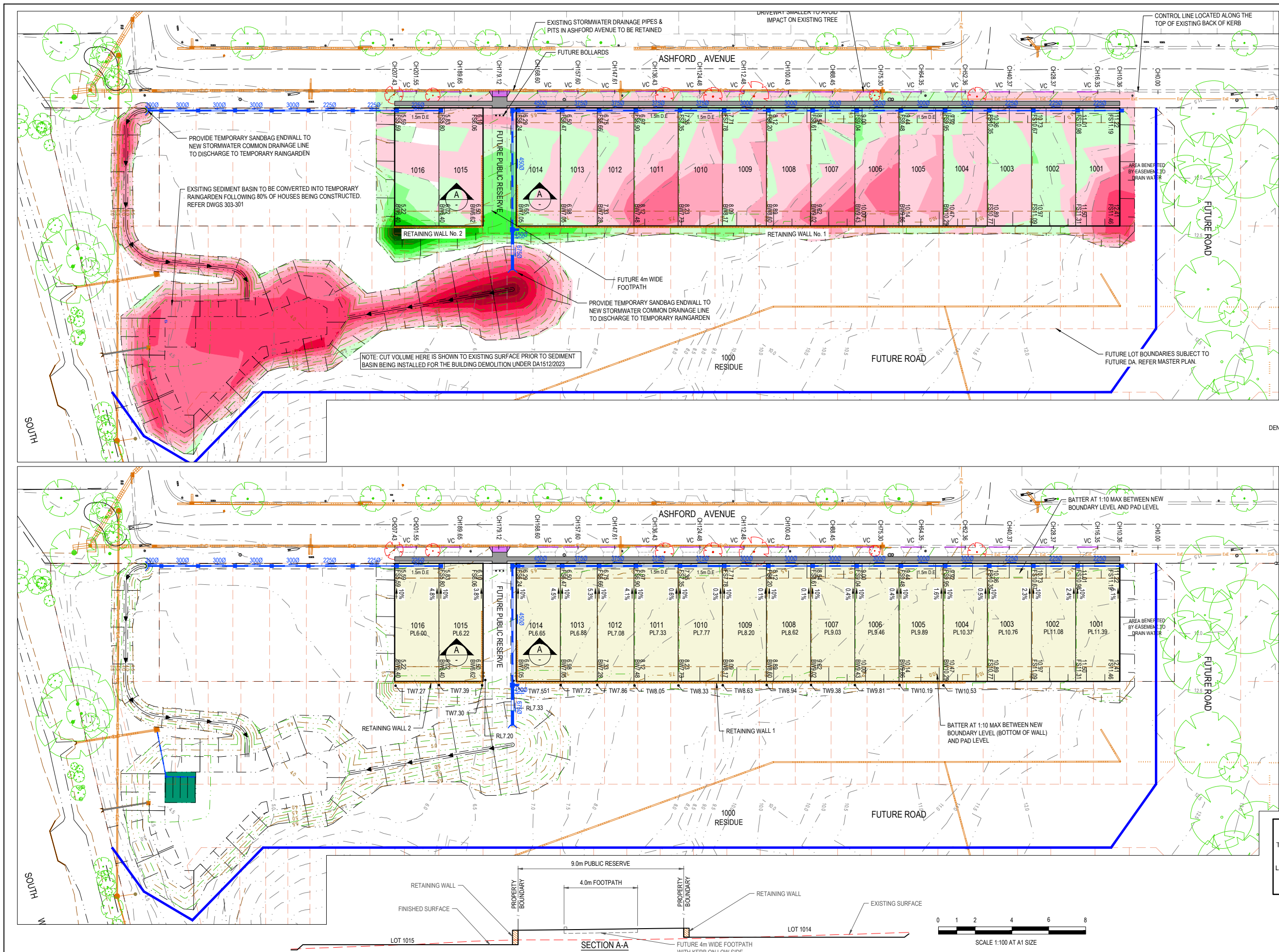


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Approved S. GRAY
Date 08.03.2024
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2 BULLECOURT AVE, MILPERRA
STAGE 1 SUBDIVISION
Drawing Title
LAYOUT PLAN

Sheet 03 of 14		Scale 1:500 @ A1	
Project Number 2301879	Reference 303	Drawing No 011	Revision C



CUT AND FILL LEGEND		
DEPTH RANGE (m)		COLOUR
>1.8m CUT	-1.8	-1.5
	-1.5	-1.2
	-1.2	-0.9
	-0.9	-0.6
	-0.6	-0.3
FILL	0.0	0.3
	0.3	0.6
	0.6	0.9
	0.9	1.2
	1.2	1.5
	1.5	1.8
	1.8	2.1
	2.1	2.4
	2.4	2.7
	>2.7m FILL	

APPROXIMATE EARTHWORKS VOLUMES:
CUT - 3,756m³
FILL - 640m³
BALANCE - 3,116m³ OF CUT

* THIS ESTIMATE IS BASED ON SURFACE TO SURFACE MODELLING ONLY AND IS SUBJECT TO FINAL DESIGNS

ASHFORD AVENUE

DENOTES EXISTING LEVEL AT FRONT BOUNDARY

DENOTES PROPOSED LEVEL AT FRONT BOUNDARY

DENOTES GRADE BETWEEN PAD LEVEL & PROPOSED BOUNDARY LEVEL

DENOTES FLAT PAD LEVEL AREA READY FOR HOUSE BUILDER

DENOTES EXISTING LEVEL AT REAR BOUNDARY

DENOTES PROPOSED (BOTTOM OF WALL) LEVEL AT REAR BOUNDARY

LOT LEVEL LEGEND

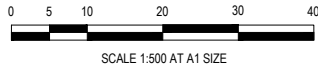
1014 PL6.65

1015 PL6.65

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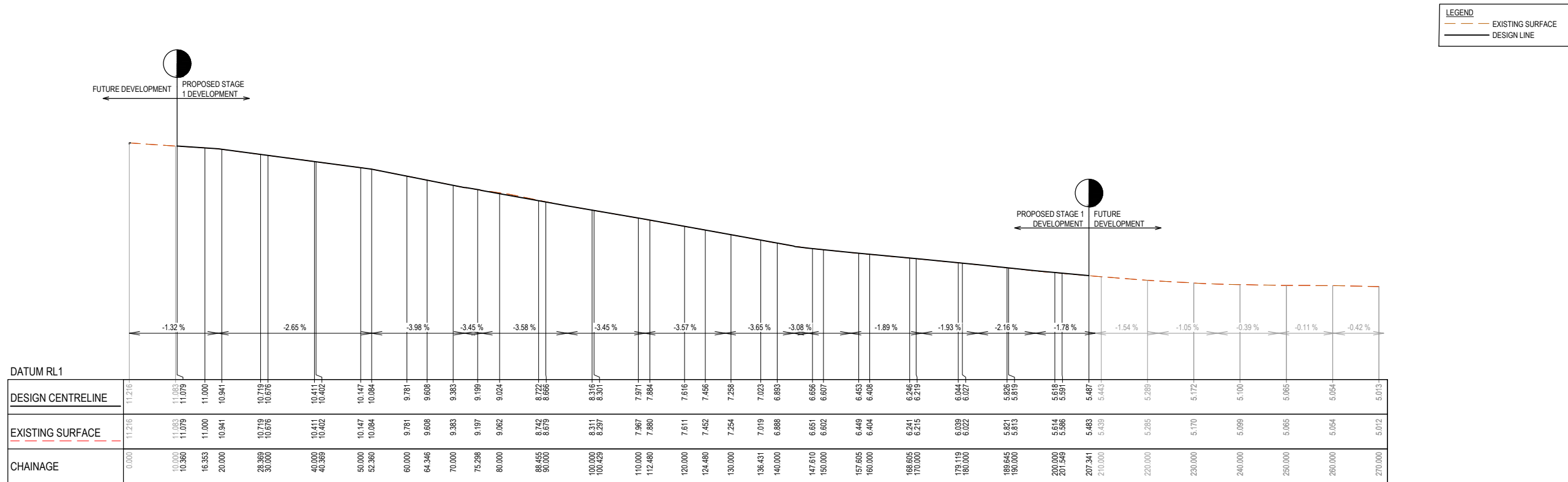
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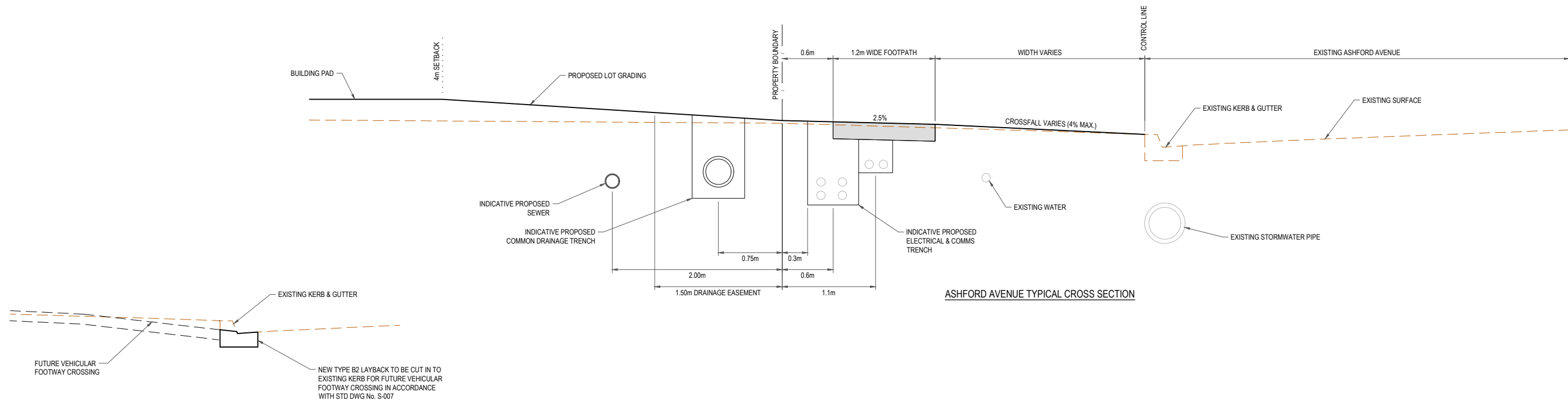
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Drawing Title	BULK EARTHWORKS AND LOT BENCHING PLAN

Sheet 04 of 14		Scale 1:500 @ A1	
Project Number	2301879	Reference	303
Drawing No	012	Revision	C



ASHFORD AVENUE EXISTING BACK OF KERB LONGITUDINAL SECTION
Scales: HORZ 1 : 500
VERT 1 : 100

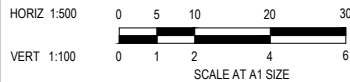


LAYBACK FOR VEHICULAR CROSSING TYPICAL SECTION

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WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 1 SUBDIVISION
Drawing Title
ASHFORD AVENUE BACK OF KERB
LONGITUDINAL SECTION
& TYPICAL CROSS SECTION

Sheet 05 of 14

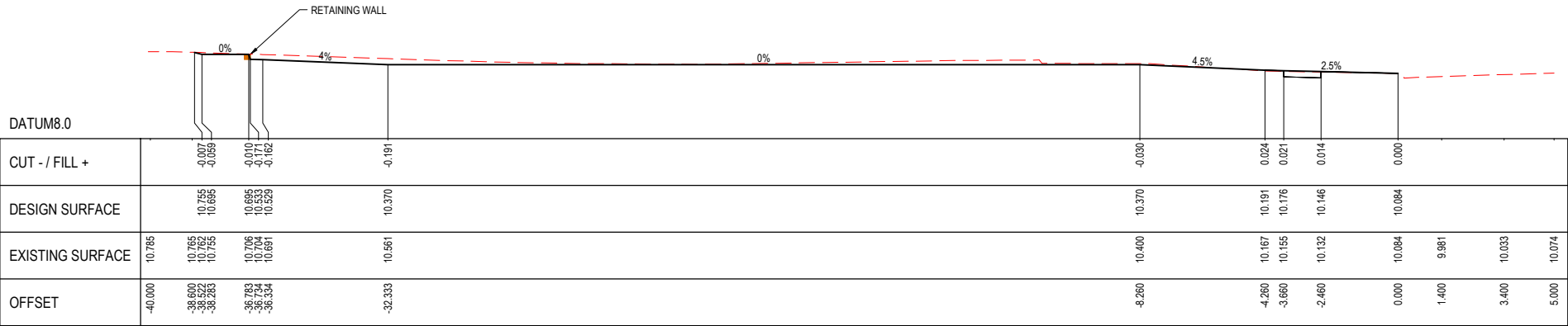
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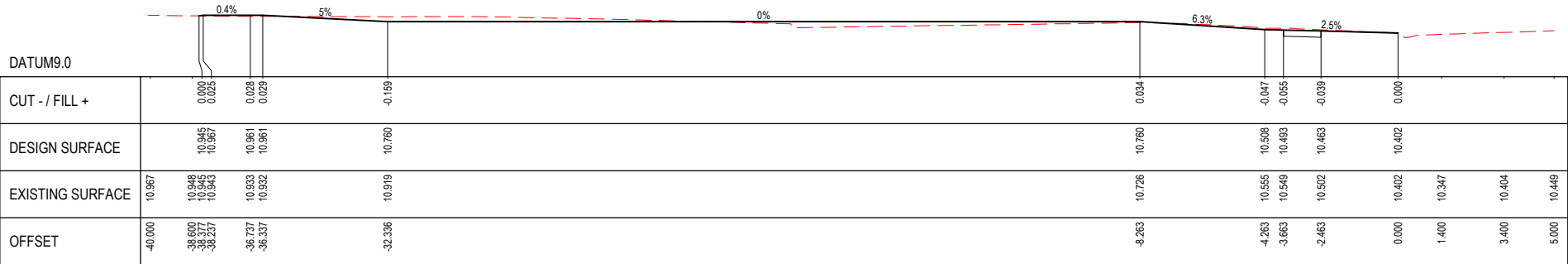
LEGEND

EXISTING SURFACE

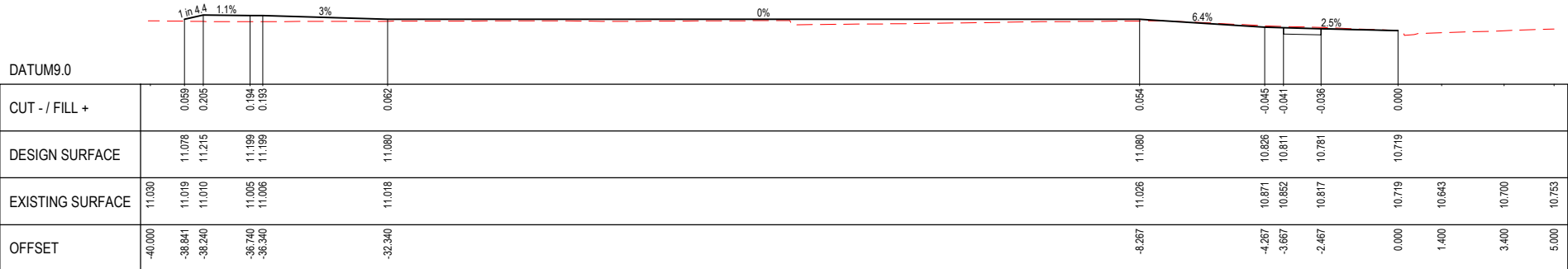
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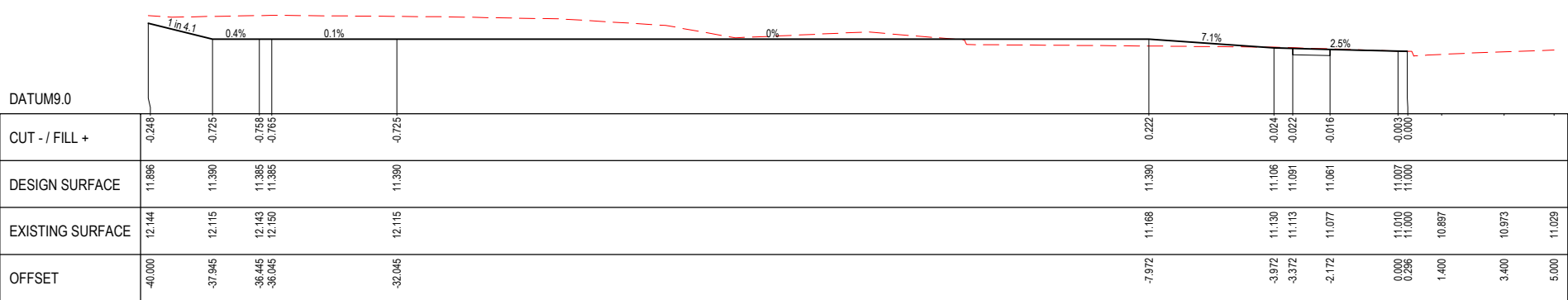
CH 52.360 - LOT 1004



CH 40.369 - LOT 1003



CH 28.369 - LOT 1002



CH 16.353 - LOT 1001

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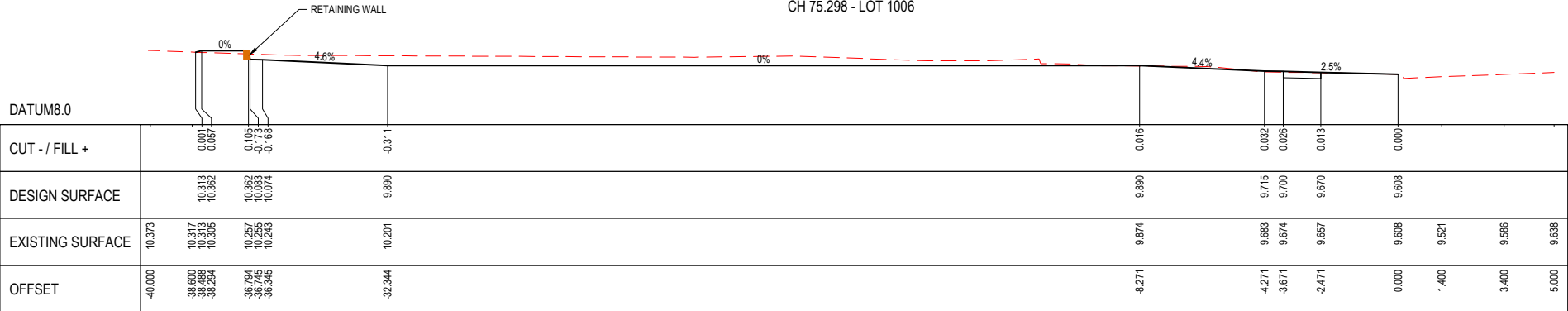
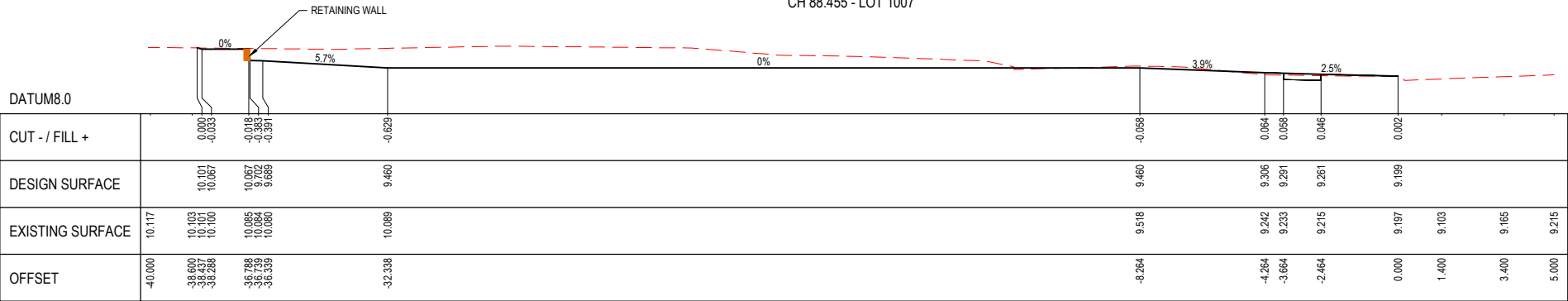
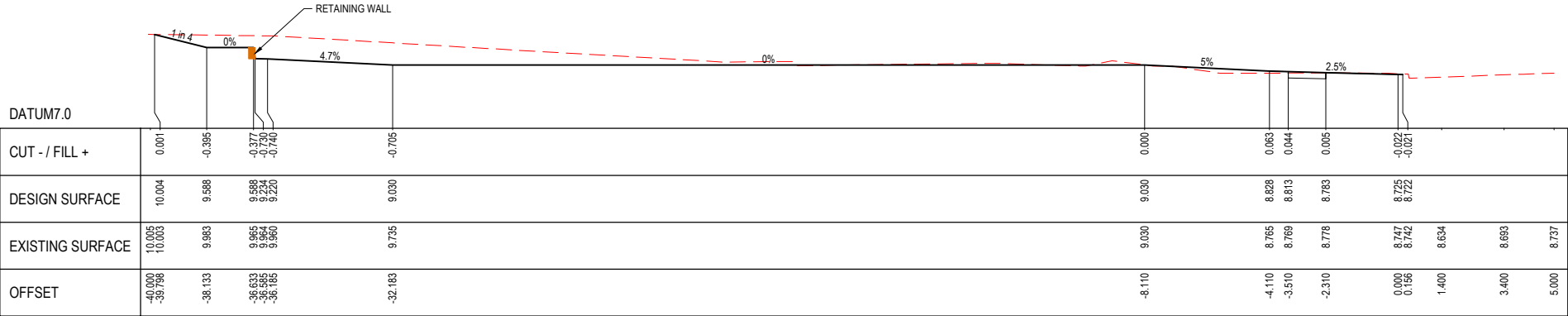
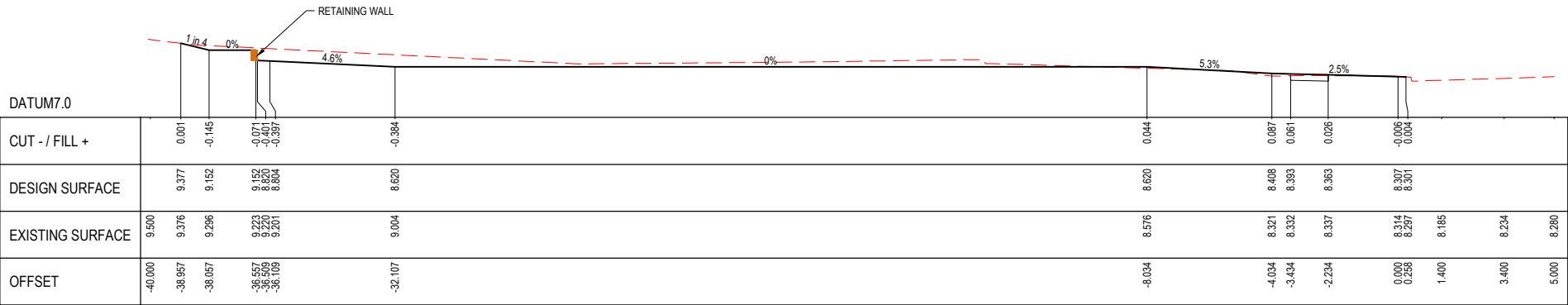
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Drawing Title	LOT CROSS SECTIONS SHEET 1 OF 5

Sheet	06 of 14
Scale	1:100 @ A1
Project Number	2301879
Reference	303
Drawing No	201
Revision	C

LEGEND

EXISTING SURFACE

DESIGN SURFACE

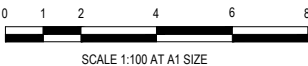


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Approved	S. GRAY
Date	08.03.2024
DA Number	-

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Drawing Title	LOT CROSS SECTIONS SHEET 2 OF 5

Sheet 07 of 14

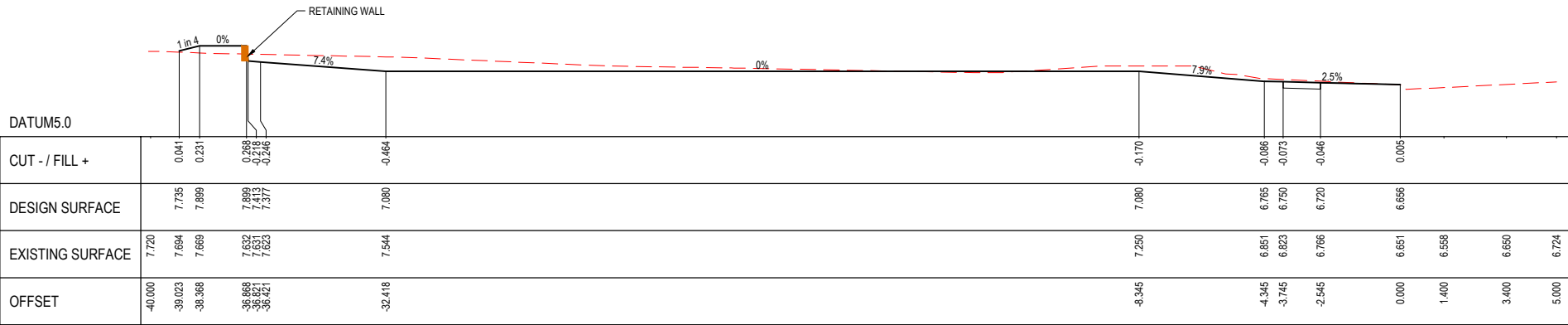
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Project Number	Reference	Drawing No	Revision
2301879	303	202	C

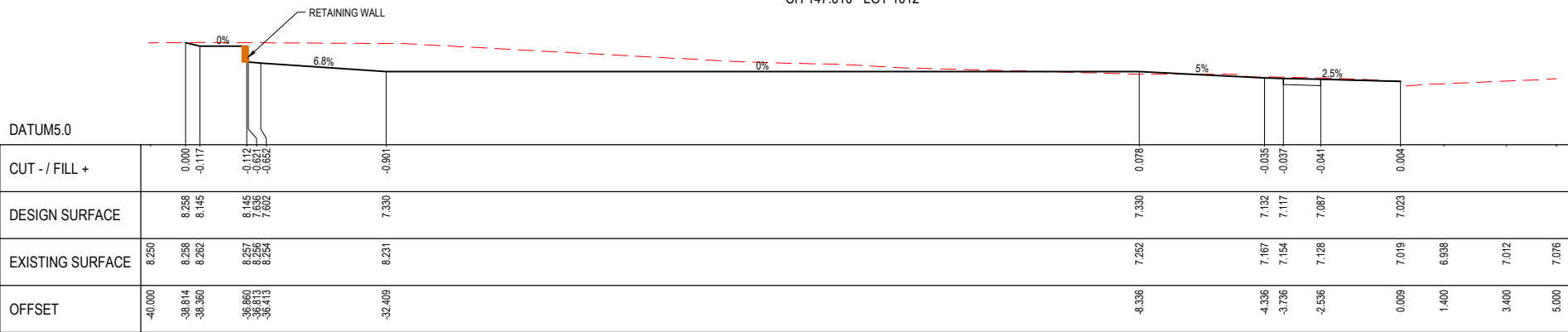
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LEGEND

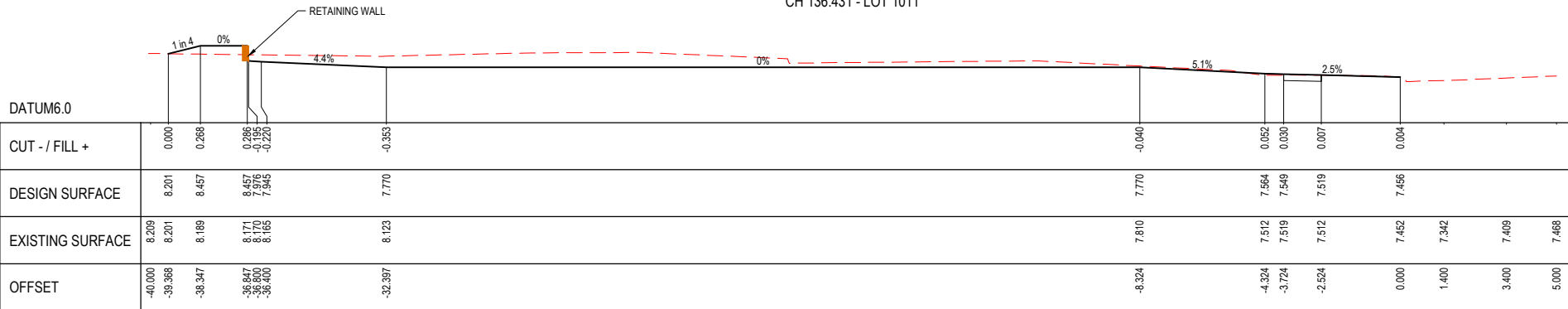
EXISTING SURFACE
DESIGN SURFACE



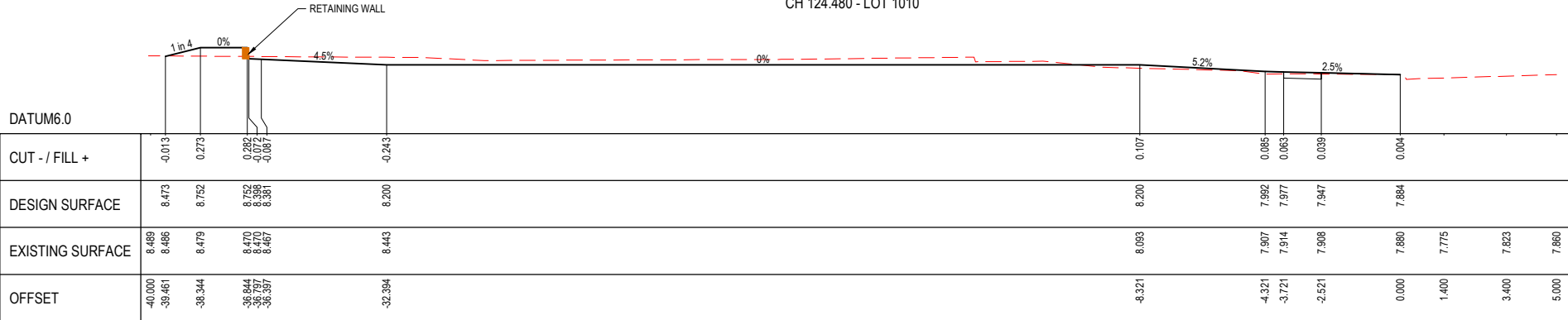
CH 147.610 - LOT 1012



CH 136.431 - LOT 1011



CH 124.480 - LOT 1010



CH 112.480 - LOT 1009

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B	REVISED AS PER MIRVAC'S COMMENTS	23.05.24	S.F	S.G
A	ISSUED TO CLIENT FOR REVIEW	08.03.24	JB	SG

REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.
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Designed	S. FERGUSON
Date	08.03.2024
Drawn	J. BIRD
Approved	S. GRAY
Date	08.03.2024
DA Number	-

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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 1 SUBDIVISION
Drawing Title	LOT CROSS SECTIONS SHEET 3 OF 5

Sheet 08 of 14

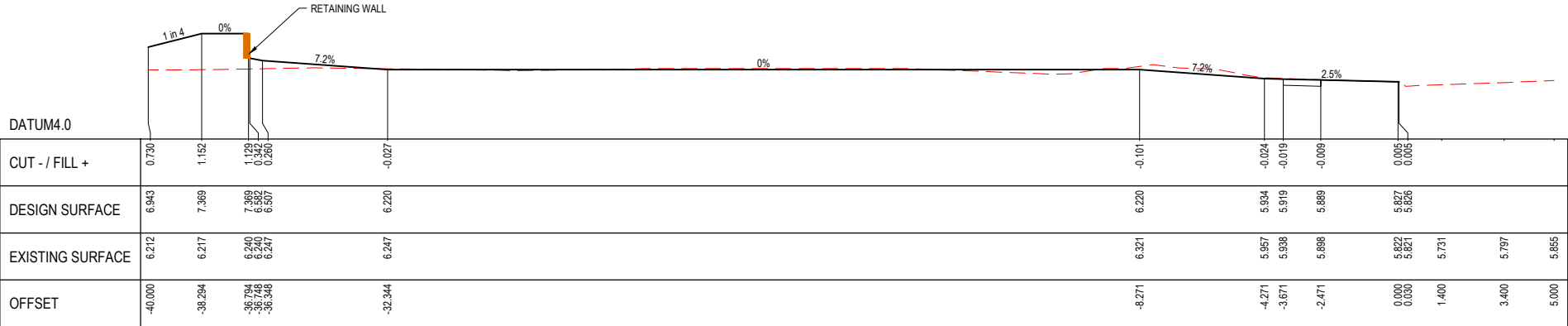
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Project Number	Reference	Drawing No	Revision
2301879	303	203	C

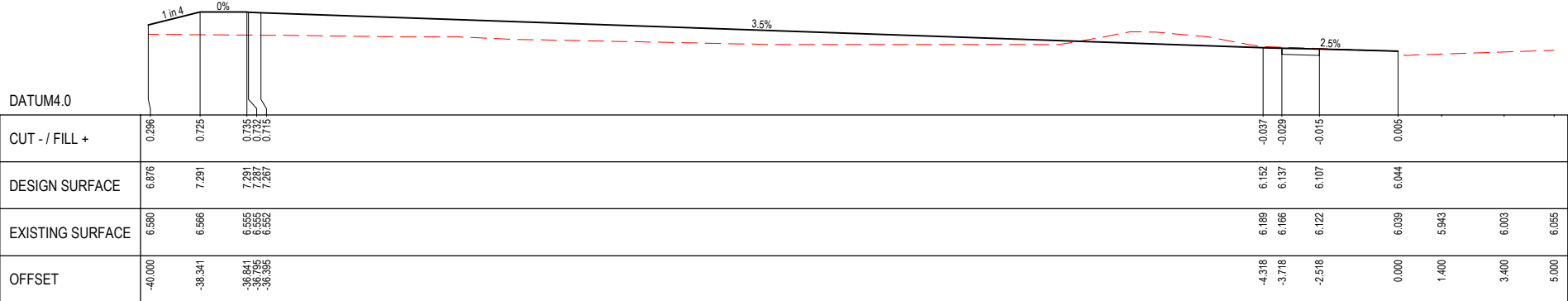
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EXISTING SURFACE

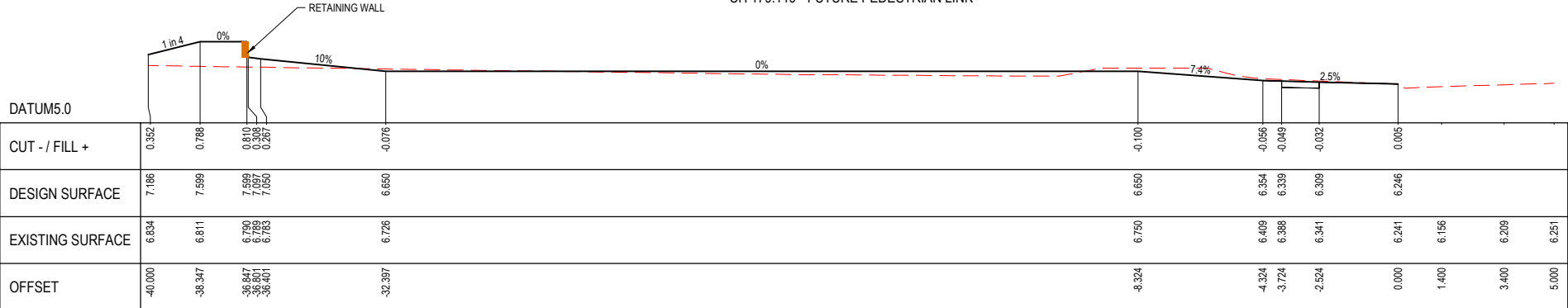
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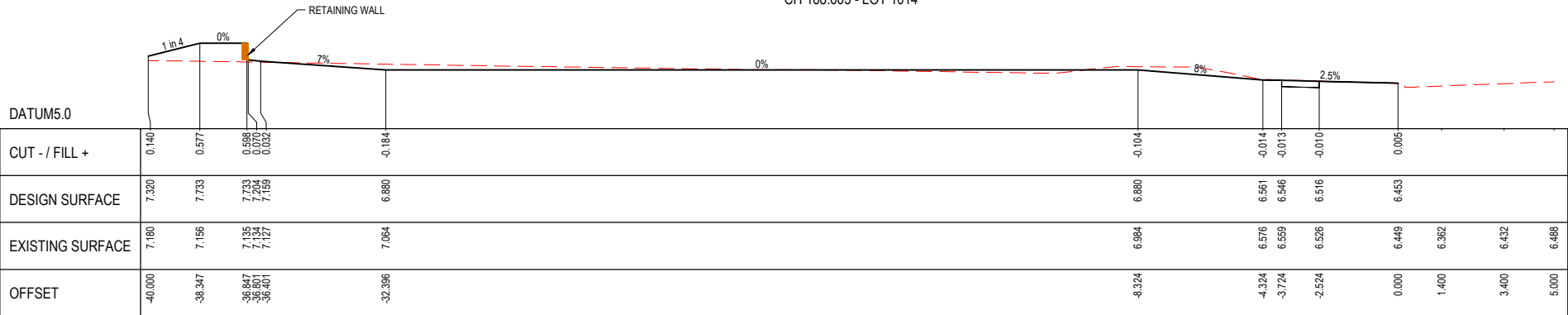
CH 189.645 - LOT 1015



CH 179.119 - FUTURE PEDESTRIAN LINK



CH 168.605 - LOT 1014



CH 157.605 - LOT 1013

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REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.



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Date	08.03.2024
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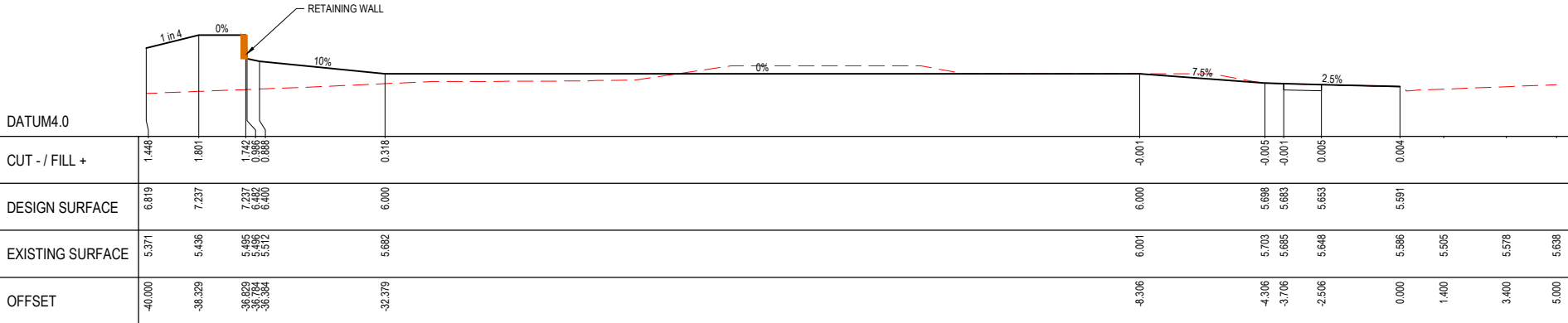
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 1 SUBDIVISION
Drawing Title	LOT CROSS SECTIONS SHEET 4 OF 5

Sheet	09 of 14
Scale	1:100 @ A1
Project Number	2301879
Reference	303
Drawing No	204
Revision	C

LEGEND

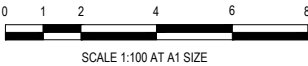
EXISTING SURFACE

DESIGN SURFACE

CH 201.549 - LOT 1016

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A	ISSUED TO CLIENT FOR REVIEW	08.03.24	JB	SG					
REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.



Designed	S. FERGUSON
Date	08.03.2024
Drawn	J. BIRD
Approved	S. GRAY
Date	08.03.2024
DA Number	-

BW

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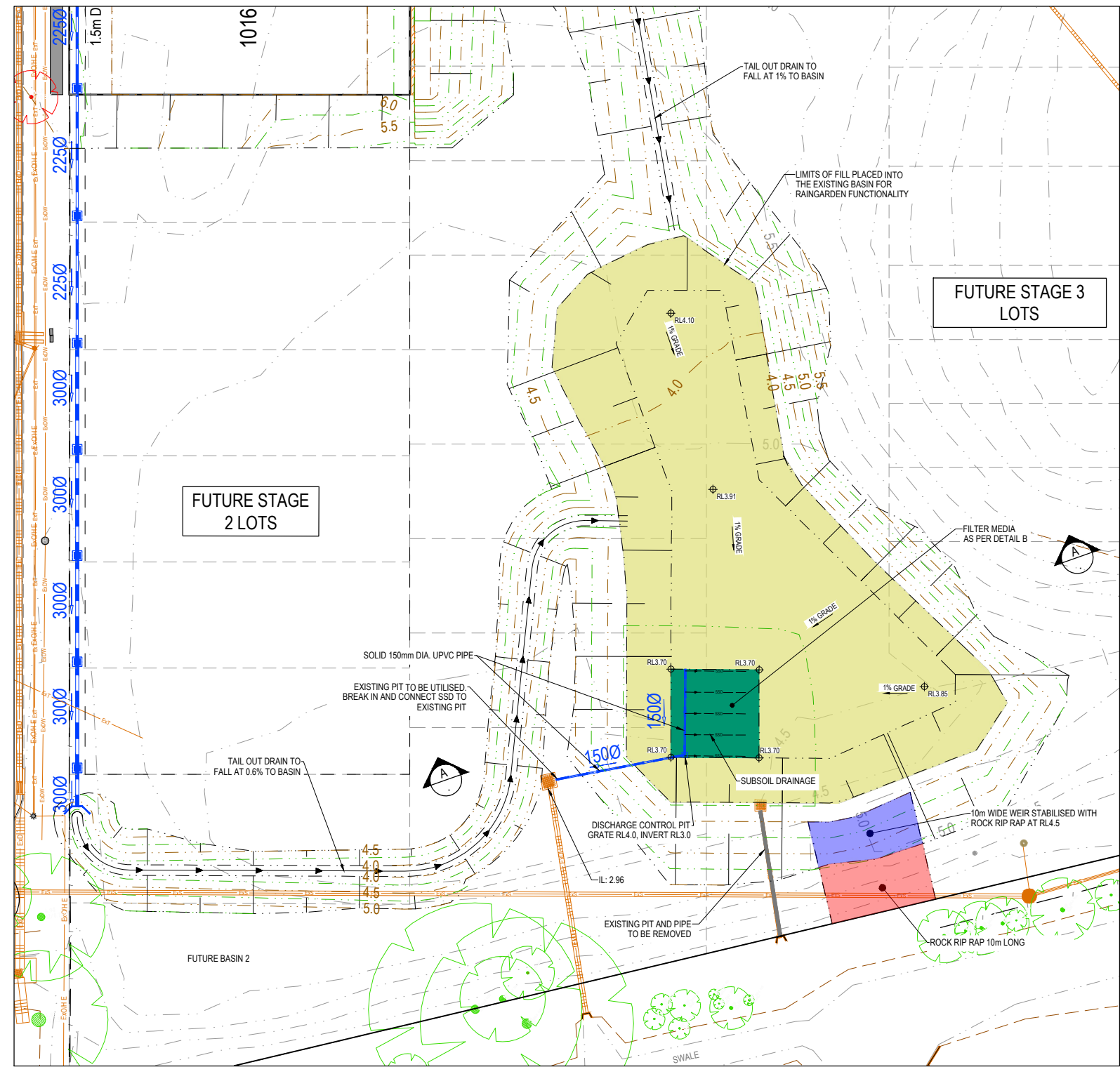
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Oran Park NSW 2570

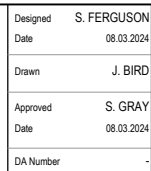
ph: 02 46255055
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 1 SUBDIVISION		
	LOT CROSS SECTIONS SHEET 5 OF 5		

Sheet 10 of 14			
Scale 1:100 @ A1			
Project Number	Reference	Drawing No	Revision
2301879	303	205	C

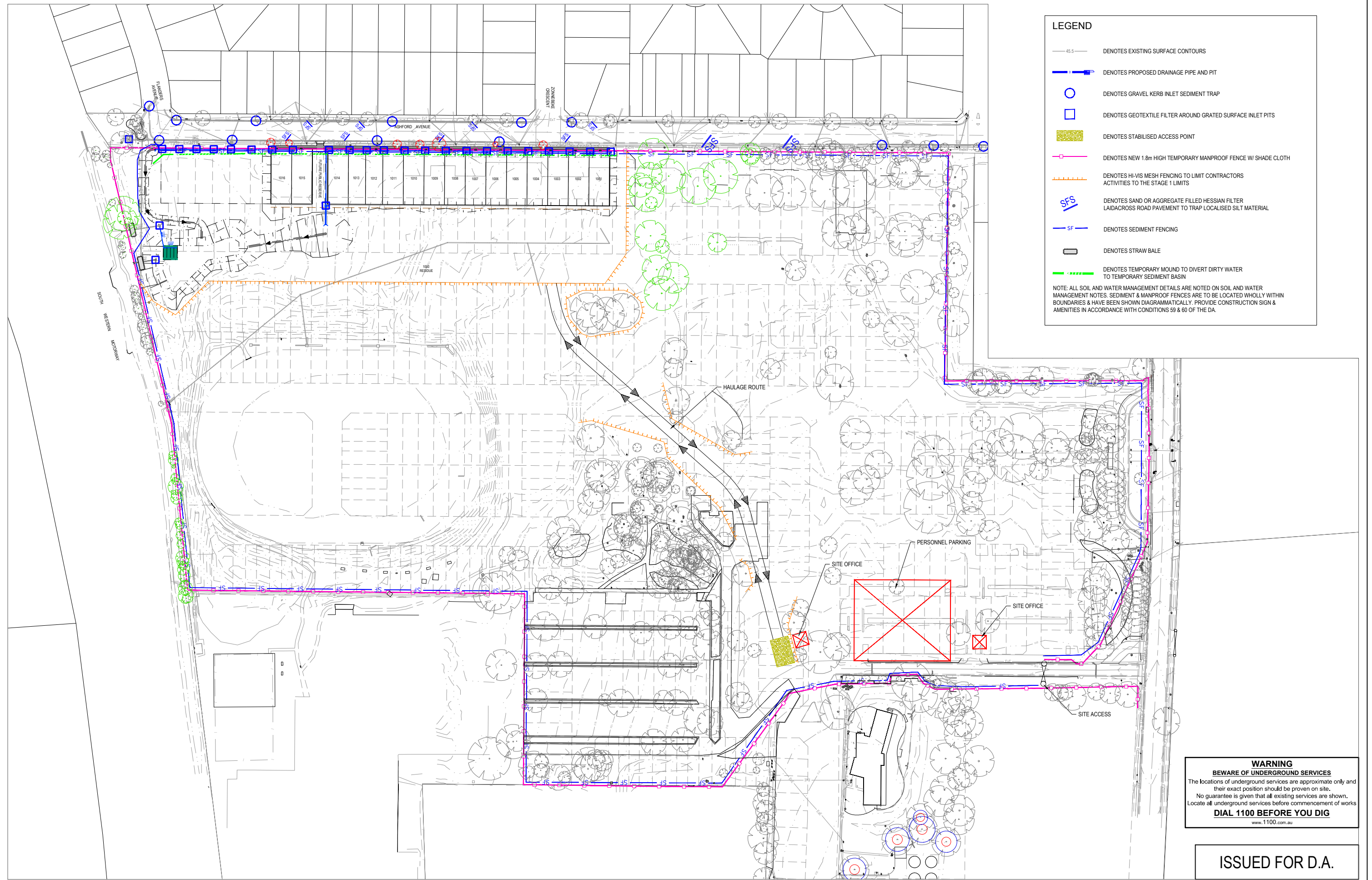


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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 1 SUBDIVISION
Drawing Title	DETENTION BASIN LAYOUT PLAN

Sheet 11 of 14			
Scale 1:250 @ A1			
Project Number	Reference	Drawing No	Revision
2301879	303	301	C



LEGEND

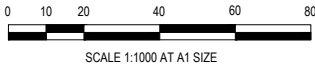
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- [Symbol] — DENOTES PROPOSED DRAINAGE PIPE AND PIT
- DENOTES GRAVEL KERB INLET SEDIMENT TRAP
- DENOTES GEOTEXTILE FILTER AROUND GRATED SURFACE INLET PITS
- [Symbol] DENOTES STABILISED ACCESS POINT
- [Symbol] — DENOTES NEW 1.8m HIGH TEMPORARY MANPROOF FENCE W/ SHADE CLOTH
- [Symbol] — DENOTES HI-VIS MESH FENCING TO LIMIT CONTRACTORS ACTIVITIES TO THE STAGE 1 LIMITS
- [Symbol] DENOTES SAND OR AGGREGATE FILLED HESSIAN FILTER LAID ACROSS ROAD PAVEMENT TO TRAP LOCALISED SILT MATERIAL
- [Symbol] — DENOTES SEDIMENT FENCING
- [Symbol] DENOTES STRAW BALE
- [Symbol] — DENOTES TEMPORARY MOUND TO DIVERT DIRTY WATER TO TEMPORARY SEDIMENT BASIN

NOTE: ALL SOIL AND WATER MANAGEMENT DETAILS ARE NOTED ON SOIL AND WATER MANAGEMENT NOTES. SEDIMENT & MANPROOF FENCES ARE TO BE LOCATED WHOLLY WITHIN BOUNDARIES & HAVE BEEN SHOWN DIAGRAMMATICALLY. PROVIDE CONSTRUCTION SIGN & AMENITIES IN ACCORDANCE WITH CONDITIONS 59 & 60 OF THE DA.

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown. Locate all underground services before commencement of works.
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C	DRAWINGS REVISED	13.09.24	R.G.	S.G.					
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A	ISSUED TO CLIENT FOR REVIEW	08.03.24	J.B.	S.G.					
REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.



Designed: S. FERGUSON
Date: 08.03.2024
Drawn: J. BIRD
Approved: S. GRAY
Date: 08.03.2024
DA Number: [Blank]

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Project Details: WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 1 SUBDIVISION

Drawing Title: SOIL AND WATER MANAGEMENT PLAN
OVERALL PLAN

Sheet 12 of 14

Scale: 1:1000 @ A1

Project Number	Reference	Drawing No	Revision
2301879	303	401	C

1. Erosion Hazard and Sediment Basins

Site Name: WSU Milperra
Site Location: 2 Bullecourt Ave, Milperra
Precinct/Stage: Stage 1 & 2 Subdivision
Other Details:

Site area	Sub-catchment or Name of Structure	Notes
Total catchment area (ha)	2.841	
Subtotal catchment area (ha)	2.841	

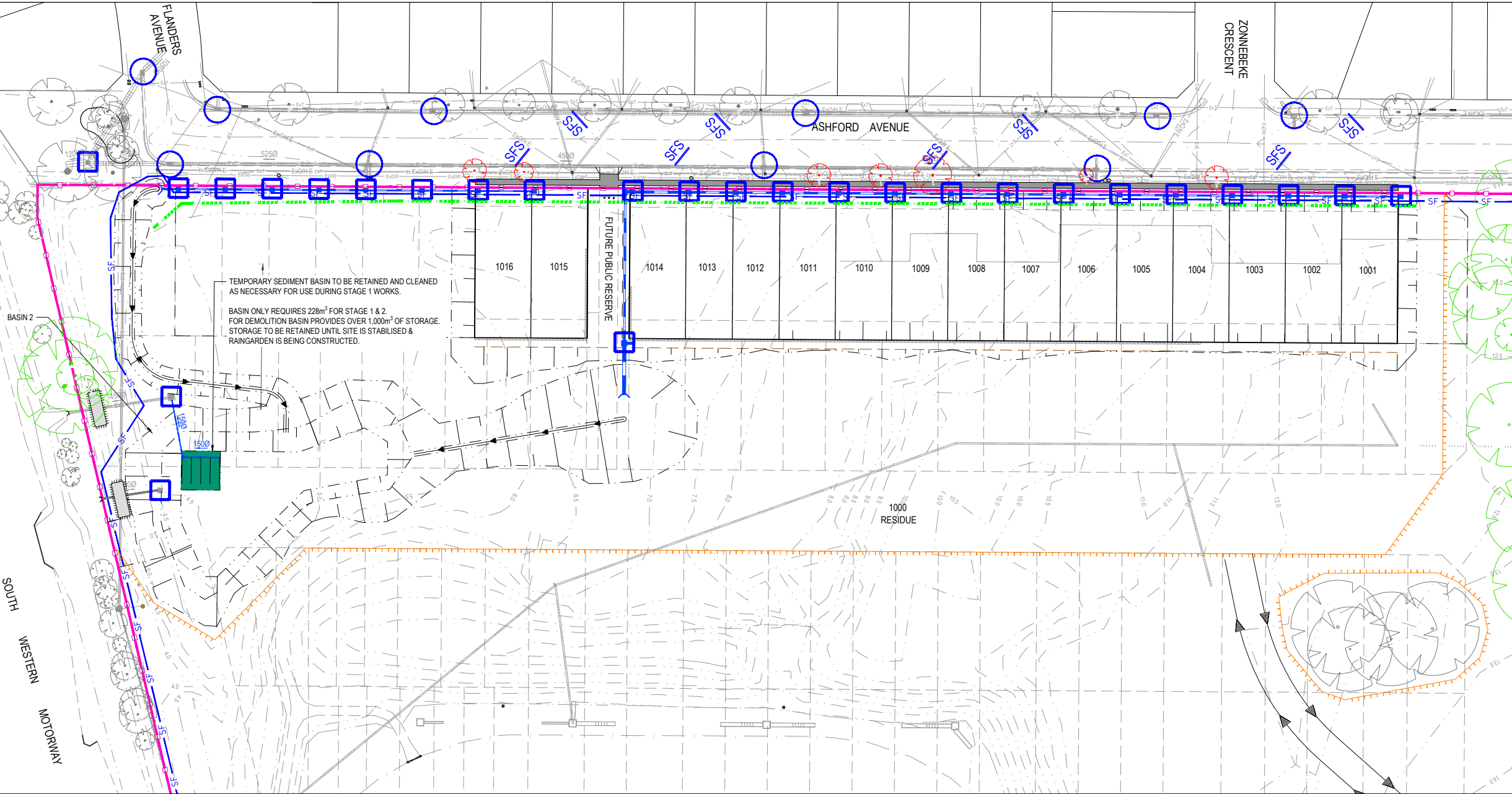
Soil analysis (enter sediment type if known, or laboratory particle size data)			
Catchment Type (C, F or D) (known)	F		From Appendix C (if known)
% sand fraction (0.075 to 2.00 mm)	30		Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt fraction (0.002 to 0.075 mm)	30		
% clay fraction (less than 0.002 mm)	100		E.g. enter 10 for deposition of 10%
Dispersal percentage	4.95		See Section 6.3.3 (d). Auto-calculated
% of whole soil dispersal	F		Auto-calculated from above

Rainfall data			
Design rainfall depth (no. of days)	5		See Section 6.3.4 and, particularly, Table 6.3 on pages 6.3.4 and 6.3.5
Design rainfall depth (percentage)	25		
Design rainfall depth (mm)	19.4		
Rainfall factor (if known)	2000		Only used to enter area or other data
IFD 2-year, 6-hour storm (if known)	8.3		

RUSLE Factors			
Rainfall erosivity (R-factor)	2000		Auto-filled from above
Soil erosivity (R-factor)	0.038		
Slope length (m)	200		
Slope gradient (S-factor)	2.4		RUSLE S factor calculated for a high relevant rate
Length gradient (LS-factor)	0.74		
Erosion control practice (P-factor)	1.3	1.3	1.3
Ground cover (C-factor)	1	1	1

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)			
Storage (m³) (one design (no. of months))	2	2	2
Cv (if dynamic runoff coefficient)	0.35		See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes			
Soil loss (t/ha/yr)	95		See Table 4.2, page 4.13
Soil loss Class	1		Conversion to cubic metres
Soil loss (m³/ha/yr)	73		See Section 6.3.4 (d) for calculations
Estimated basin storage (m³) (volume)	25		See Section 6.3.4 (d) for calculations
Sediment basin settling (bed) volume (m³)	193		See Section 6.3.4 (d) for calculations
Sediment basin total volume (m³)	228		



LEGEND

- 45.5 DENOTES EXISTING SURFACE CONTOURS
- DENOTES PROPOSED DRAINAGE PIPE AND PIT
- DENOTES GRAVEL KERB INLET SEDIMENT TRAP
- DENOTES GEOTEXTILE FILTER AROUND GRATED SURFACE INLET PITS
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- SFS DENOTES SAND OR AGGREGATE FILLED HESSIAN FILTER LAID ACROSS ROAD PAVEMENT TO TRAP LOCALISED SILT MATERIAL
- SF DENOTES SEDIMENT FENCING
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SEDIMENT BASIN

- THE CONTRACTOR IS TO ENSURE STORMWATER RUNOFF IS DIRECTED TO THE SEDIMENT BASIN WITH PLACEMENT OF TEMPORARY DIVERSION MOUNDS OR THE FORMATION OF OVERLAND FLOW PATHS.
- DIVERSION MOUNDS & FLOW PATHS ARE TO BE ADJUSTED AS FILLING LAYERS PROGRESS & SURFACE LEVELS RISE.
- SEDIMENT IS TO BE REMOVED SUCH THAT NOT LESS THAN 70% OF THE DESIGN CAPACITY IS AVAILABLE AT ALL TIMES MARKERS WITH DEPTH INDICATORS ARE TO BE PLACED IN EACH BASIN TO INDICATE WHEN SEDIMENT ACCUMULATION EXCEEDS 30% OF STORAGE REQUIREMENTS.
- BASINS ARE TO BE FLOCCULATED WITH GYPSUM WHEN SUSPENDED SOLID CONCENTRATION EXCEEDS 50 milligrams per litre. SPREADING RATE TO BE DETERMINED AFTER TESTING AND ANALYSIS OF THE INITIAL STORM EVENT. FIRST APPLICATION IS TO BE 30 kilograms GYPSUM PER 100 cum. OF STORED WATER & THEREAFTER AS DETERMINED BY TESTING. PUMP OUT TO GOLF COURSE DAM WITHIN 72 hrs OF TREATMENT. REFER LANDCOM SOIL & CONSTRUCTION - "MANAGING URBAN STORMWATER" MANUAL - APPENDIX E
- UPON ADEQUATE SITE REVEGETATION & COUNCIL APPROVAL SEDIMENT BASIN IS TO BE DECOMMISSIONED & CONVERTED INTO RAINGARDENS PER DESIGN.

CONSTRUCTION SEQUENCE

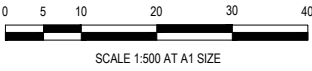
- FOLLOWING INSTALLATION OF THE SEDIMENT BASIN AND EROSION CONTROLS AND REMEDIATION OF THE AREA:
- ALL TOPSOIL CONTAINING VEGETATION TO BE STRIPPED FROM EXISTING SURFACE & STOCKPILED FOR RESPREADING
 - FOLLOWING COMPLETION OF EARTHWORKS, (APPROX. 75mm THICK) STRIPPED SURFACE TO BE INSPECTED & CERTIFIED READY FOR FILL PLACEMENT BY GEOTECHNICAL ENGINEER.
 - COMPLETE INITIAL EARTHWORKS IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S REPORT
 - IMPORTED FILL TO BE CERTIFIED AS V.E.N.M. & FREE OF SLAG, HAZARDOUS, CONTAMINATED, TOXIC, PUTRESCIBLE OR RADIO-ACTIVE MATTER & INDUSTRIAL WASTE & BUILDING DEBRIS. THE ORIGIN OF FILL PROPOSED TO BE IMPORTED & THE ABOVE CERTIFICATION TO BE REVIEWED & APPROVED BY COUNCIL PRIOR TO ANY IMPORTED FILL ARRIVING ON SITE.
 - ALL FILL IS TO BE PLACED & COMPACTED IN ACCORDANCE WITH COUNCIL'S CONSTRUCTION SPECIFICATION.
 - ALL FILL TO BE PLACED UNDER LEVEL 1 GEOTECHNICAL SUPERVISION.
 - COPIES OF ALL FILL COMPACTION TESTS TO BE PROVIDED TO PRINCIPLE.
 - COMPLETE ALL ROAD, DRAINAGE, RETAINING WALL & SERVICES WORKS
 - 300mm WIDE, 150mm THICK TOPSOIL TO BE PLACED BEHIND KERBS & TURFED WITH KIKUYU TURF
 - FINAL TOPSOIL TURF & PATHWAYS WITHIN ASHFORD AVENUE VERGES TO BE BONDED WITH COUNCIL & COMPLETED BY BUILDERS FOLLOWING HOUSE CONSTRUCTION

WARNING
BWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works
DIAL 1100 BEFORE YOU DIG
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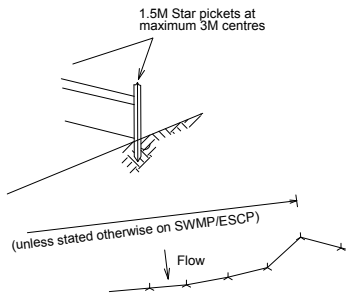
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Project Details
WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 1 SUBDIVISION
Drawing Title
SOIL AND WATER MANAGEMENT PLAN
STAGE 1 PLAN

Sheet 13 of 14

Scale
1:500 @ A1

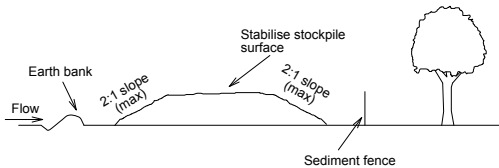
Project Number	Reference	Drawing No	Revision
2301879	303	402	C



Star pickets at maximum 3M spacings

1. Construct sediment fence as close as possible to parallel to the contours of the site
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150MM deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched
5. Fix self supporting geotextile to upslope side of posts with wire ties or as recommended by geotextile manufacturer
6. Join sections of fabric at a support post with a 150mm overlap

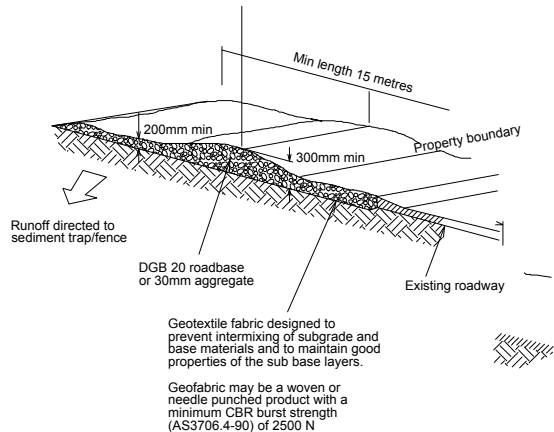
SEDIMENT FENCE



Construction Notes

1. Locate stockpile at least 5 metres from existing vegetation, concentrated water flows, roads and hazard areas.
2. Construct on the contour as a low, flat elongated mound.
3. All stockpiles shall be less than 2 metres in height
4. Rehabilitate in accordance with the SWMP/ESCP.
5. Construct earth bank (Standard Drawing 5-2) on the upslope side to divert run off around the stockpile and a sediment fence (standard Drawing 6-7) 1 to 2 metres downslope of stockpile.
6. Seeded areas to be watered twice weekly until established. Substantial growth required within 14 days or bitumen straw mulch to be placed.
7. Dust to be controlled by watering

STOCKPILES



Construction Notes

1. Strip topsoil and level site.
2. Compact subgrade
3. Cover area with needle punch geotextile.
4. Construct 200mm thick pad over geotextile using roadbase or 30mm aggregate. Minimum length 15 metres or to building alignment width 3 metres
5. Construct hump immediately within boundary to divert water to a sediment fence or other sediment trap.

STABILISED SITE ACCESS

NOTES

ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LANDCOM'S MANUAL "MANAGING URBAN STORMWATER" 4TH EDITION AUGUST 2004.

WORKS SHALL BE UNDERTAKEN AS OUTLINED ON PLANS EROSION AND SEDIMENT CONTROL MEASURES AFFECTED BY WORKS ARE TO BE RE-ESTABLISHED PRIOR TO THE COMPLETION OF EACH DAY'S WORK.

THE CONTRACTOR IS TO STABILISE ALL STOCKPILES AND DISTURBED AREAS AS SOON AS THEY ARE FORMED TO FINAL LEVELS. STABILISATION TO BE BY HYDROSEEDING / SPRAY GRASS, OR AS DIRECTED BY COUNCIL ENGINEER.

SEED MIXTURE FOR FOOTWAYS AND OTHER AREAS UNDER THE CONTROL OF COUNCIL ARE TO BE IN ACCORDANCE WITH COUNCIL'S SPECIFICATION. FOR OTHER AREAS, THE LIST OF PLANT SPECIES FOR TEMPORARY COVER IS:-

JAPANESE MILLET AND OATS(RYECORN) AT 25kg/ha EACH - SPRING/SUMMER
JAPANESE MILLET AT 10kg/ha AND OATS(RYECORN) AT 30kg/ha - AUTUMN/WINTER

ALL SEEDED AREAS ARE TO BE WATERED TWICE WEEKLY.

WHERE SURFACE SLOPES ARE MORE THAN 4H:1V BATTER THEY SHALL BE TURFED.

DUST CONTROL MEASURES SHALL BE IMPLEMENTED CONTINUOUSLY DURING CONSTRUCTION WORKS. SUCH MEASURES ARE TO BE TO THE SATISFACTION OF THE SUPERINTENDENT AND COUNCIL.

TOPSOIL SHALL BE RESPREAD ON CONSTRUCTION AREAS AND STABILISED AS SOON AS POSSIBLE WITHIN 60 DAYS OF DISTURBANCE. ALL DISTURBED AREAS ARE TO BE LEFT WITH A SCARIFIED SURFACE AT ALL TIMES TO ENCOURAGE WATER INFILTRATION AND ASSIST WITH KEYING OF TOPSOIL.

FOLLOWING COMPLETION OF WORKS AND STABILISATION OF ALL DISTURBED SURFACES, ALL MATERIALS AND CONTROL MEASURES ARE TO BE REMOVED FROM SITE AND TEMPORARY BASINS FILLED, COMPACTED AND STABILISED.

ALL SITE ACCESS TO BE ACHIEVED FROM DESIGNATED SITE ACCESS. SITE ACCESS TO BE PROTECTED BY THE INSTALLATION OF AN APPROVED SHAKER RAMP. SHAKER RAMP TO BE REGULARLY MAINTAINED TO ENSURE EFFECTIVENESS.

UPON COMPLETION OF FINAL EARTHWORKS OR AFTER WRITTEN DIRECTION OF COUNCIL, IMMEDIATE SILT CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.

ALL DISTURBED OVER ALL STORMWATER, POWER, TELEPHONE, GAS AND SEWER LINES NOT WITHIN STREETS IS TO BE SPRAY GRASSED AS SOON AS POSSIBLE BUT NO LATER THAN WITHIN 14 DAYS AFTER BACKFILL.

NO MORE THAN 150m OF TRENCH IS TO BE OPEN AT ANY ONE TIME. ALL TEMPORARY EARTH BERMS, DIVERSION AND SEDIMENT BASIN EMBANKMENTS ARE TO BE TRACK ROLLED, SEEDED OR MULCHED OR SPRAYED WITH BITUMEN AS SOON AS THEY HAVE BEEN FORMED.

ALL FILLS ARE TO BE LEFT WITH A WINDROW AT LEAST 20cm HIGH AT THE TOP OF THE SLOPE AT THE END OF EACH DAY'S EARTHWORKS AND ALL EARTHWORK AREAS SHALL BE ROLLED EACH EVENING TO "SEAL" THE EARTHWORKS.

STABILISATION OF ALL CUT AND FILL SLOPES SHALL BE COMMENCED WITHIN 14 DAYS OF COMPLETION OF FORMATION.

THE CONTRACTOR SHALL MAINTAIN AND PRODUCE ON REQUEST A LOGBOOK ON SITE DETAILING THE FOLLOWING:-

- RECORDS OF ALL RAINFALL
- DAILY CONDITION OF ALL EROSION AND SEDIMENT CONTROL MEASURES
- ANY APPLICATION OF FLOCCULATION AGENTS TO BASINS
- VOLUMES OF WATER DISCHARGED FROM BASINS
- METHOD OF DISPOSAL OF WATER FROM BASINS
- ANY ADDITIONAL REMEDIAL WORKS REQUIRED.

THE ORIGINAL LOGBOOK SHALL BE ISSUED TO THE PROJECT MANAGER ON COMPLETION OF THE WORKS. SEDIMENT CONTROL MEASURES TO BE MONITORED ONCE A WEEK AND AFTER EVERY STORM EVENT.

STOCKPILES TO BE MAX 2 METRE HIGH WITH SEDIMENT FENCING TO LOW SIDE LOCATED CLEAR OF WATERCOURSES

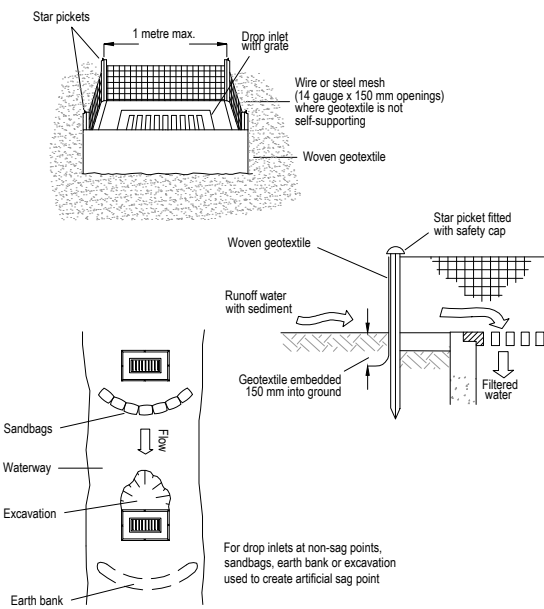
ALL STORMWATER PITS TO BE BLOCKED DURING CONSTRUCTION UNTIL SITE STABILISED.

DURING CONSTRUCTION WORKS ANY WORK AND STORAGE AREAS WHERE SPILLAGE MAY OCCUR MUST BE BUNDED. THE SIZE OF THE AREA TO BE BUNDED AND HEIGHT OF THE BUND WALLS MUST BE CALCULATED AS BEING EQUAL TO 110% OF THE TOTAL VOLUME STORED OR EQUAL TO THE LARGEST STORAGE CONTAINER, WHICHEVER IS GREATER. ALL PIPE WORK EXTENDING FROM THE BUNDED AREA MUST BE DIRECTED OVER THE BUND WALL AND HOSE COUPLINGS MUST BE PLACED SUCH THAT LEAKS AND SPILLAGE'S ARE CONTAINED. THE AREAS MUST BE GRADED TO A PIT/SUMP TO FACILITATE EMPTYING.

ANY IMPORTED FILL USED MUST BE VALIDATED & SUITABLE & FREE OF SALINE & CONTAMINATION

SEDIMENT & EROSION CONTROL

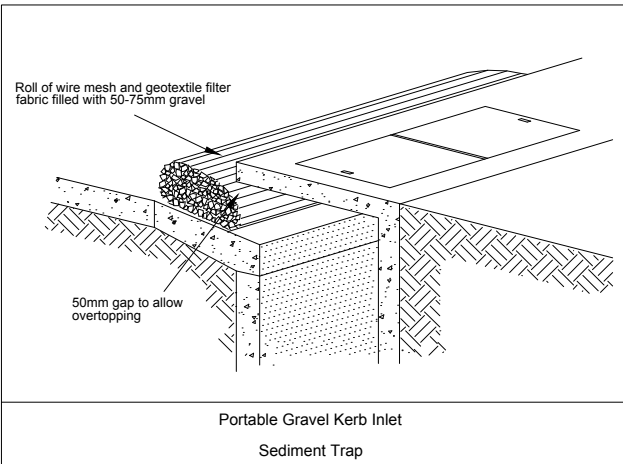
- SE1. THE CONTRACTOR SHALL IMPLEMENT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO DISTURBANCE OF THE WORK AREA & TO BE CARRIED OUT IN ACCORDANCE WITH LANDCOM'S "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION" VOLUME 1.
- SE2. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL SEDIMENT AND EROSION CONTROL DEVICES AND REMOVE ACCUMULATED SILT FROM SUCH DEVICES BEFORE MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL THE SILT REMOVED SHALL BE DISPOSED OF AS DIRECTED BY THE SUPERINTENDENT. NO SILT IS TO BE PLACED OUTSIDE THE LIMIT OF WORKS. THE PERIOD FOR MAINTAINING THESE DEVICES SHALL BE AT LEAST UNTIL ALL DISTURBED AREAS ARE REVEGETATED AND LONGER AS MAY BE DIRECTED BY THE SUPERINTENDENT OR COUNCIL.
- SE3. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING CONSTRUCTION CONFINING ACCESS WHERE POSSIBLE TO PROPOSED OR EXISTING ROAD ALIGNMENTS.
- SE4. WHEN ANY DEVICES ARE TO BE HANDED OVER TO COUNCIL, THEY SHALL BE IN A CLEAN & STABLE CONDITION.
- SE5. THE CONTRACTOR SHALL MAINTAIN ALL REVEGETATED AREAS INCLUDING WATERING UNTIL FINAL COMPLETION OF WORKS.
- SE6. THE CONTRACTOR SHALL MAINTAIN DUST CONTROL UNTIL FINAL COMPLETION OF WORKS.
- SE7. THE CONTRACTOR'S RESPONSIBILITY IS TO ENSURE ALL NECESSARY MEASURES SO AS TO PROTECT ALL DISTURBED AREAS AS PER NOTE SE1. ALL ADDITIONAL COSTS ARE TO BE REFLECTED IN TENDER PRICE EVEN IF SUCH MEASURES ARE NOT INDICATED ON THE SEDIMENT AND EROSION CONTROL PLAN.
- SE8. THE CONTRACTOR MUST COMMENCE REHABILITATION WITHIN 5 DAYS OF ANY SITE REGRADING & BATTER FORMATION.
- SE9. A 0.3m WIDE STRIP OF TURF TO BE PLACED BEHIND THE EXISTING KERB IN ASHFORD AVENUE.
- SE10. PROVIDE TURF AROUND ALL SURFACE INLET PITS IN ADDITION TO THE GEOTEXTILE INLET FILTER.
- SE11. STOCKPILES TO BE STABILISED WITHIN 14 DAYS OF COMPLETING THE STOCKPILE.



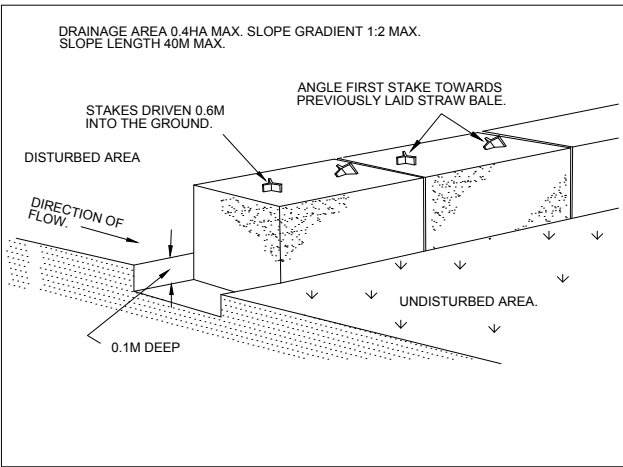
GEOTEXTILE INLET FILTER (SD 6-12)
NTS

Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.



Portable Gravel Kerb Inlet
Sediment Trap



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C	DRAWINGS REVISED	13.09.24	R.G	S.G					
B	SCALE AMENDED	23.05.24	S.F	S.G					
A	ISSUED TO CLIENT FOR REVIEW	08.03.24	J.B	SG					
REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.



Designed	S. FERGUSON
Date	08.03.2024
Drawn	J. BIRD
Approved	S. GRAY
Date	08.03.2024
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 1 SUBDIVISION
Drawing Title	SOIL AND WATER MANAGEMENT PLAN DETAILS & NOTES

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Sheet 14 of 14			
Scale NOT TO SCALE			
Project Number	Reference	Drawing No	Revision
2301879	303	403	C

WSU MILPERRA

CONCEPT CIVIL ENGINEERING PLANS TO SUPPORT THE STAGE 2 SUBDIVISION
OF PROPOSED LOT 1000 (UNREG.)(TO BE CREATED UNDER STAGE 1)
LOT 2 IN DP1291984 - 2 BULLECOURT AVENUE, MILPERRA
CANTERBURY-BANKSTOWN COUNCIL
MIRVAC HOMES (NSW) PTY LTD



SITE PLAN
NOT TO SCALE

DRAWING INDEX

SHEET No.	DRAWING No.	TITLE	REVISION
1	2301879-307-001	COVER SHEET	A
2	2301879-307-002	DETAILS & TYPICAL CROSS SECTION	A
3	2301879-307-005	DEMOLITION PLAN	A
4	2301879-307-010	LAYOUT PLAN	A
5	2301879-307-011	LOT BENCHING PLAN	A
6	2301879-307-012	BUILT EARTHWORKS	A
7	2301879-307-100	ROAD 1 LONGITUDINAL SECTION	A
8	2301879-307-101	ASHFORD AVENUE BACK OF KERB LONGITUDINAL SECTIONS (NORTH AND SOUTH OF ROAD 1)	A
9	2301879-307-200	ROAD 1 CROSS SECTIONS	A
10	2301879-307-201	ASHFORD AVENUE (NORTH OF ROAD 1) LOT CROSS SECTIONS	A
11	2301879-307-202	ASHFORD AVENUE (SOUTH OF ROAD 1) LOT CROSS SECTIONS (SHEET 1 OF 2)	A
12	2301879-307-203	ASHFORD AVENUE (SOUTH OF ROAD 1) LOT CROSS SECTIONS (SHEET 2 OF 2)	A
13	2301879-307-400	SOIL AND WATER MANAGEMENT PLAN OVERALL PLAN	A
14	2301879-307-401	SOIL AND WATER MANAGEMENT PLAN STAGE 2 PLAN	A
15	2301879-307-402	SOIL AND WATER MANAGEMENT PLAN DETAILS AND NOTES	A
16	2301879-307-800	TURNING MOVEMENTS CAR (SHEET 1 OF 2)	A
17	2301879-307-801	TURNING MOVEMENTS SERVICE VEHICLE (SHEET 2 OF 2)	A

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Designed	B.RAU
Date	17.09.24
Drawn	B.RAU
Approved	S.GRAY
Date	17.09.24
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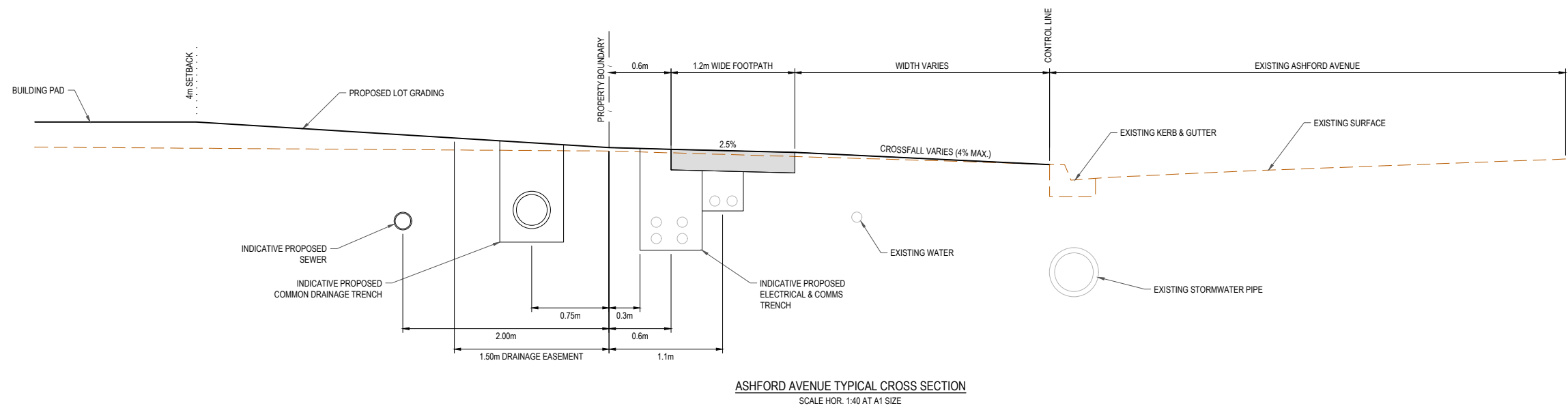
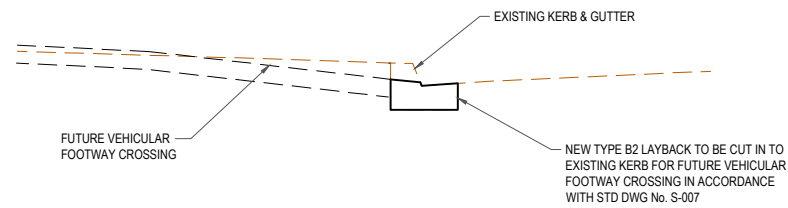
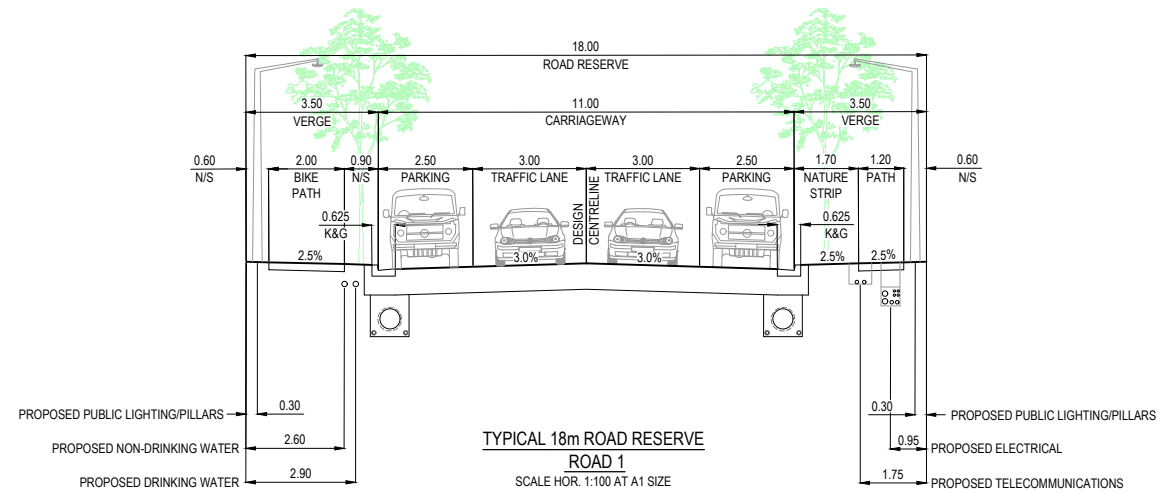
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	COVER SHEET

Sheet 01 of 17			
Scale			
Project Number	Reference	Drawing No	Revision
2301879	307	001	A



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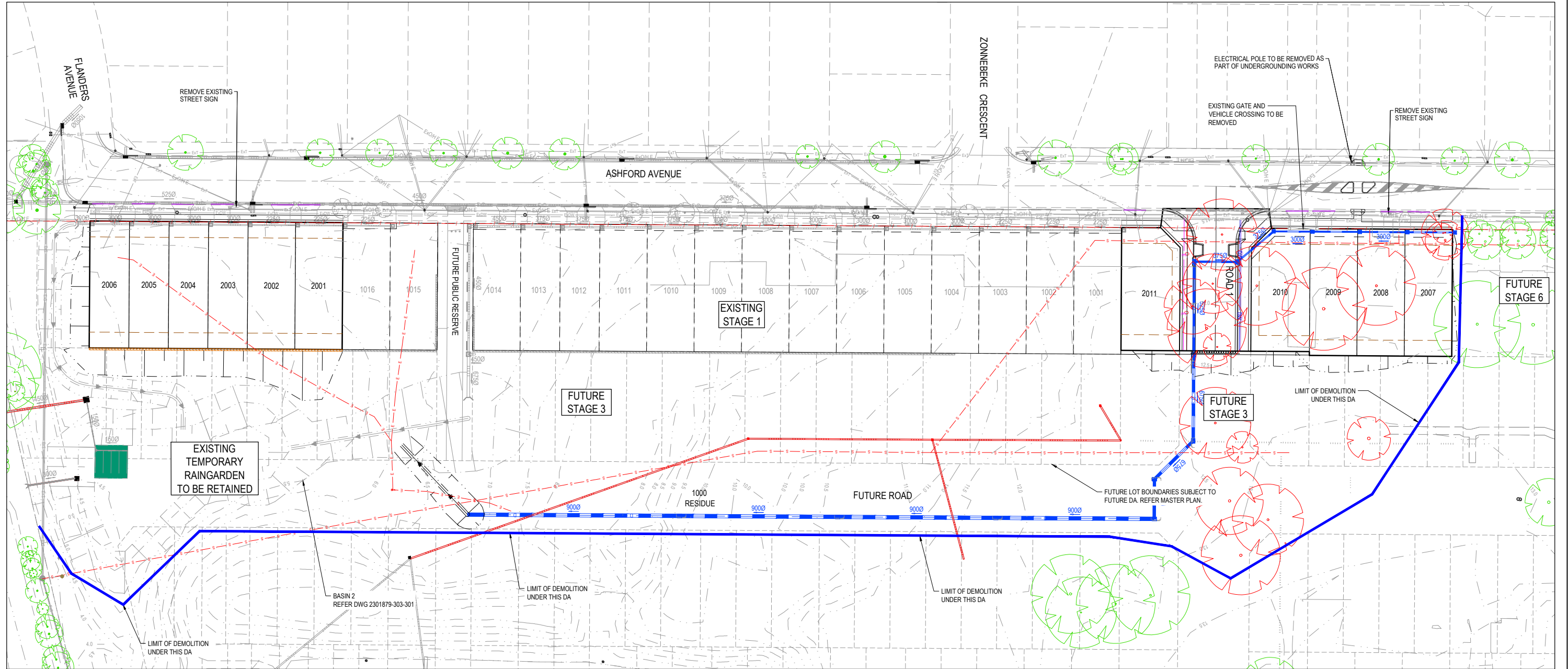


Designed	B.RAU
Date	17.09.24
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Date	17.09.24
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	DETAILS & TYPICAL CROSS SECTION

Sheet 02 of 17			
Scale AS SHOWN			
Project Number	Reference	Drawing No	Revision
2301879	307	002	A

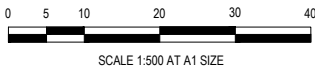


LEGEND - DEMOLITION PLAN PLAN	
	EXISTING TREE TO BE REMOVED
	EXISTING TREE TO BE RETAINED
	EXISTING STORMWATER PIT/PIPE TO BE REMOVED
	EXISTING ELECTRICITY TO BE REMOVED
	EXISTING SEWER TO BE REMOVED
	EXISTING FENCE TO BE REMOVED

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REV		DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN. APP.



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Date	17.09.24
Drawn	B.RAU
Approved	S.GRAY
Date	17.09.24
DA Number	

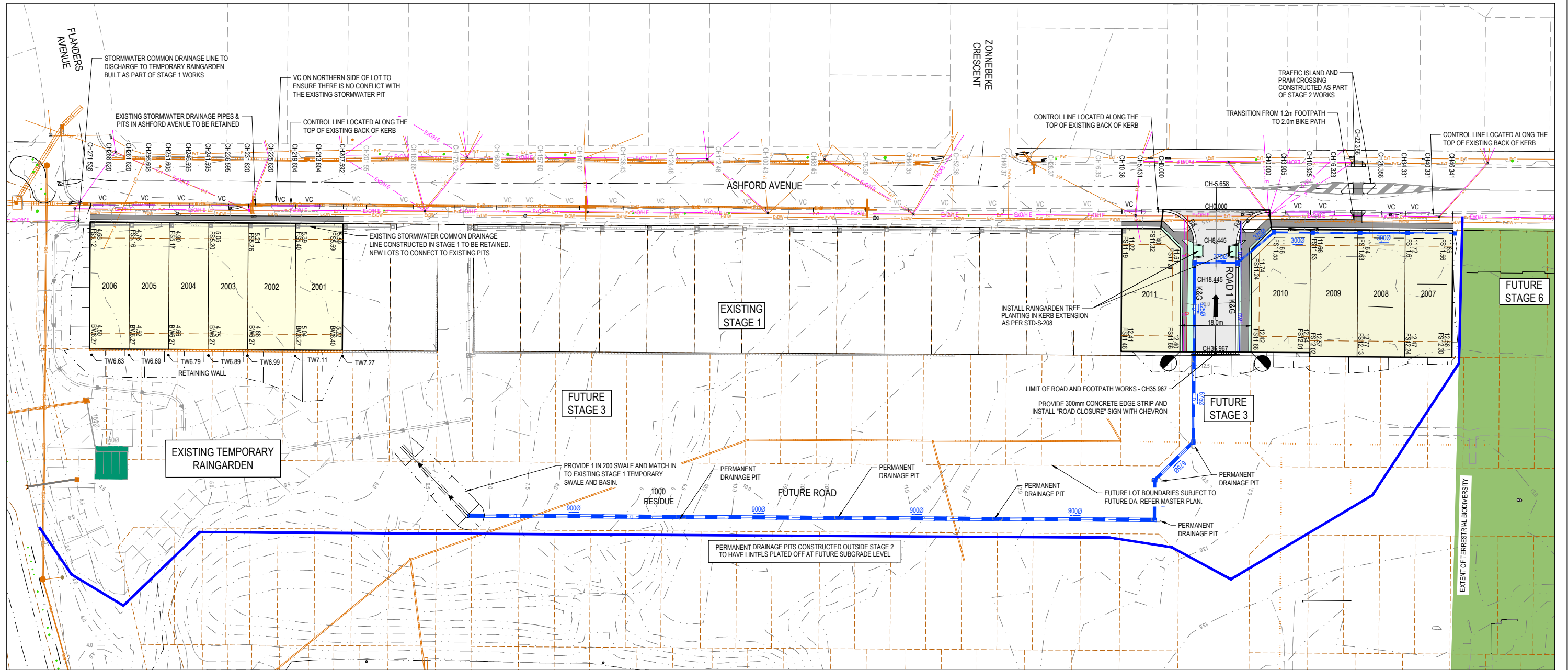
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	DEMOLITION PLAN

Sheet 03 of 17

Scale
1:500 @ A1

Project Number	Reference	Drawing No	Revision
2301879	307	003	A



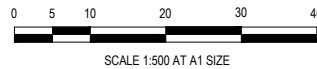
LEGEND - LAYOUT PLAN

STORMWATER DRAIN, PIT & PROPERTY INLET	— RIDGE LINE
SWALE DRAIN	— RETAINING WALL
SEWER & MAINTENANCE STRUCTURES	— ZERO LOT LINES
HOUSE DRAIN	— PAVEMENT TREATMENT
SERVICE CONDUITS	— STRUCTURAL FILL > 200mm DEEP
TACTILE PAVERS (INDICATIVE ONLY)	— EX. STRUCTURAL FILL > 200mm DEEP
ELECTRICITY (UNDERGROUND)	— DIRECTION OF FALL
ELECTRICITY (OVERHEAD)	— OVERLAND FLOW
OPTIC FIBRE	— ALLOTMENT TO BE GRADED EVENLY IN
TELECOMMUNICATIONS	— DIRECTION OF FALL TO LEVELS INDICATED
GAS	— CONCRETE EDGE STRIP WITH SUBSOIL DRAIN,
WATER	— "NO ROAD" SIGN & BARRIER
RECYCLED WATER	— LIMIT OF WORKS
EXISTING ELECTRICITY (UNDERGROUND)	— PERMANENT SURVEY MARK
EXISTING ELECTRICITY (OVERHEAD)	— TEMPORARY BENCH MARK
EXISTING GAS	— TREE PROTECTION ZONE (TPZ)
EXISTING OPTIC FIBRE	— NEW LAYBACK TO BE CUT IN TO EXISTING KERB
EXISTING TELECOMMUNICATIONS	— FOR FUTURE DRIVEWAY.
EXISTING WATER	— ALL NEW DRIVEWAYS TO BE 4m WIDE
EXISTING RECYCLED WATER	— AREA OF TERRESTRIAL BIODIVERSITY
EXISTING STORMWATER DRAIN	— RAINGARDEN
EXISTING SEWER	
EXISTING HOUSE DRAIN	
EXISTING SWALE DRAIN	
EXISTING SURFACE LEVEL	
FINISHED BUILDING LINE LEVEL	
FINISHED RIDGE LINE LEVEL	
TOP OF RETAINING WALL	
BOTTOM OF RETAINING WALL	

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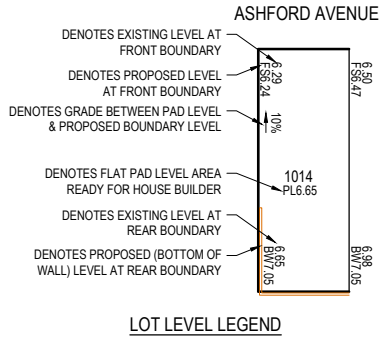
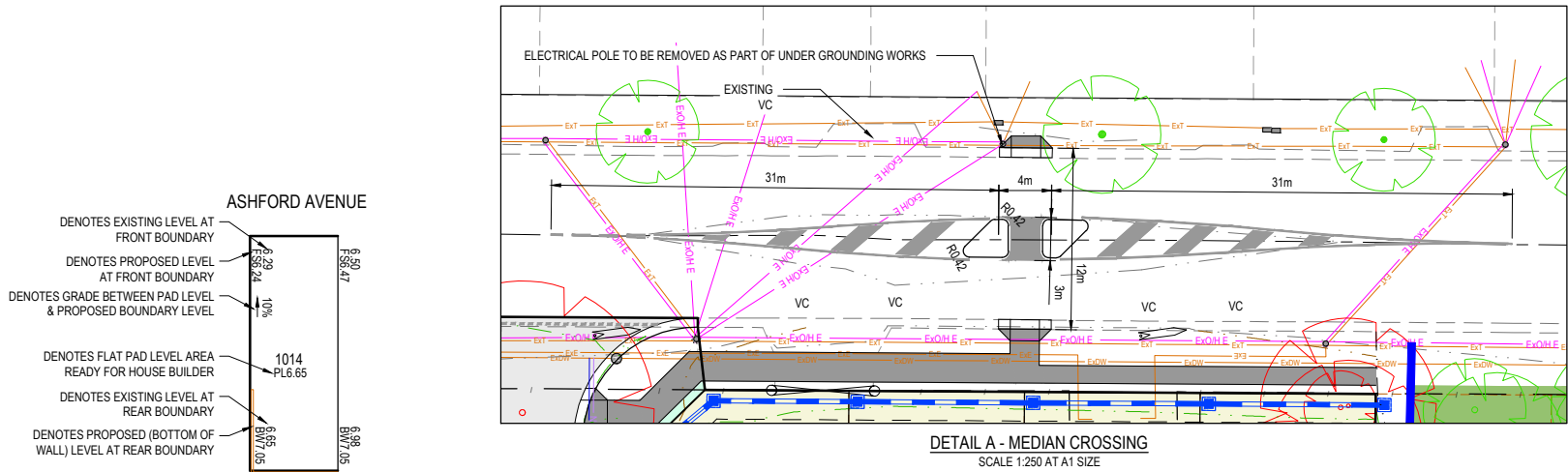
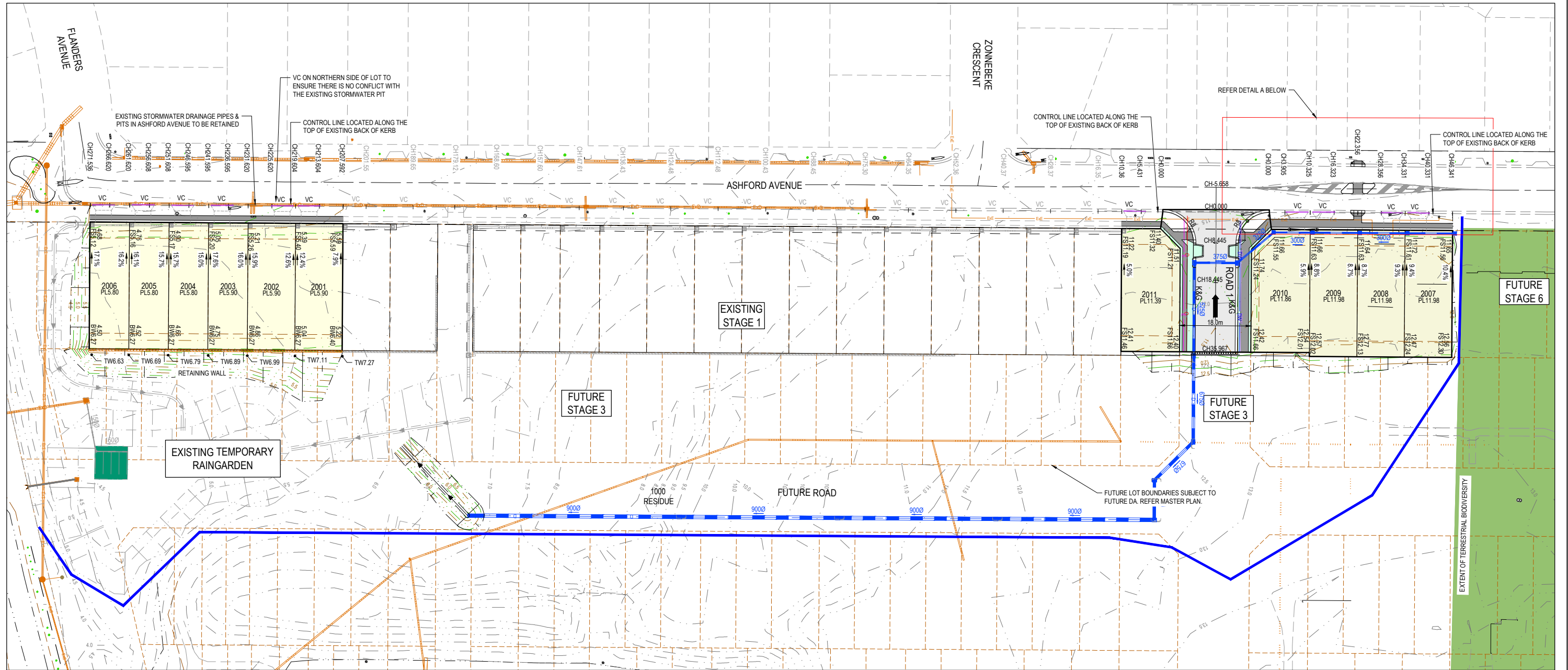


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Drawn	B.RAU
Approved	S.GRAY
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	LAYOUT PLAN

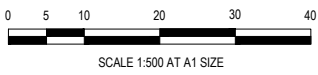
Sheet	04 of 17
Scale	1:500 @ A1
Project Number	2301879
Reference	307
Drawing No	010
Revision	A



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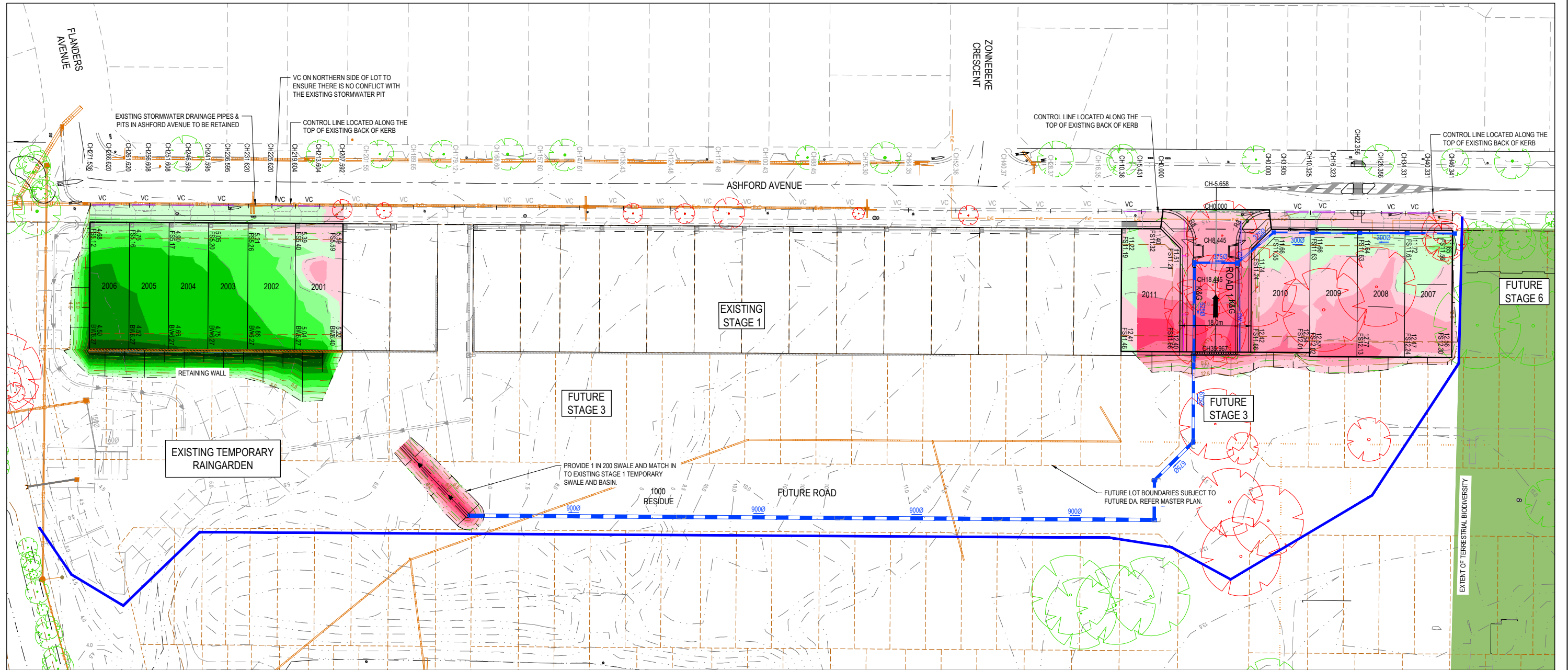


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Date 17.09.24
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Project Details
WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 2 SUBDIVISION
Drawing Title
LOT BENCHING PLAN

Sheet 05 of 17
Scale 1:500 @ A1
Project Number 2301879
Reference 307
Drawing No 011
Revision A



CUT AND FILL LEGEND		
DEPTH RANGE (m)		COLOUR
>1.8m CUT		
-1.8	-1.5	
-1.5	-1.2	
-1.2	-0.9	
-0.9	-0.6	
-0.6	-0.3	
-0.3	0.0	
0.0	0.3	
0.3	0.6	
0.6	0.9	
0.9	1.2	
1.2	1.5	
1.5	1.8	
1.8	2.1	
2.1	2.4	
2.4	2.7	
>2.7m FILL		

APPROXIMATE EARTHWORKS VOLUMES:
CUT - 1,201m³
FILL - 2,337m³
BALANCE - 1,170m³ OF FILL

* THIS ESTIMATE IS BASED ON SURFACE TO SURFACE MODELLING ONLY AND IS SUBJECT TO FINAL DESIGNS

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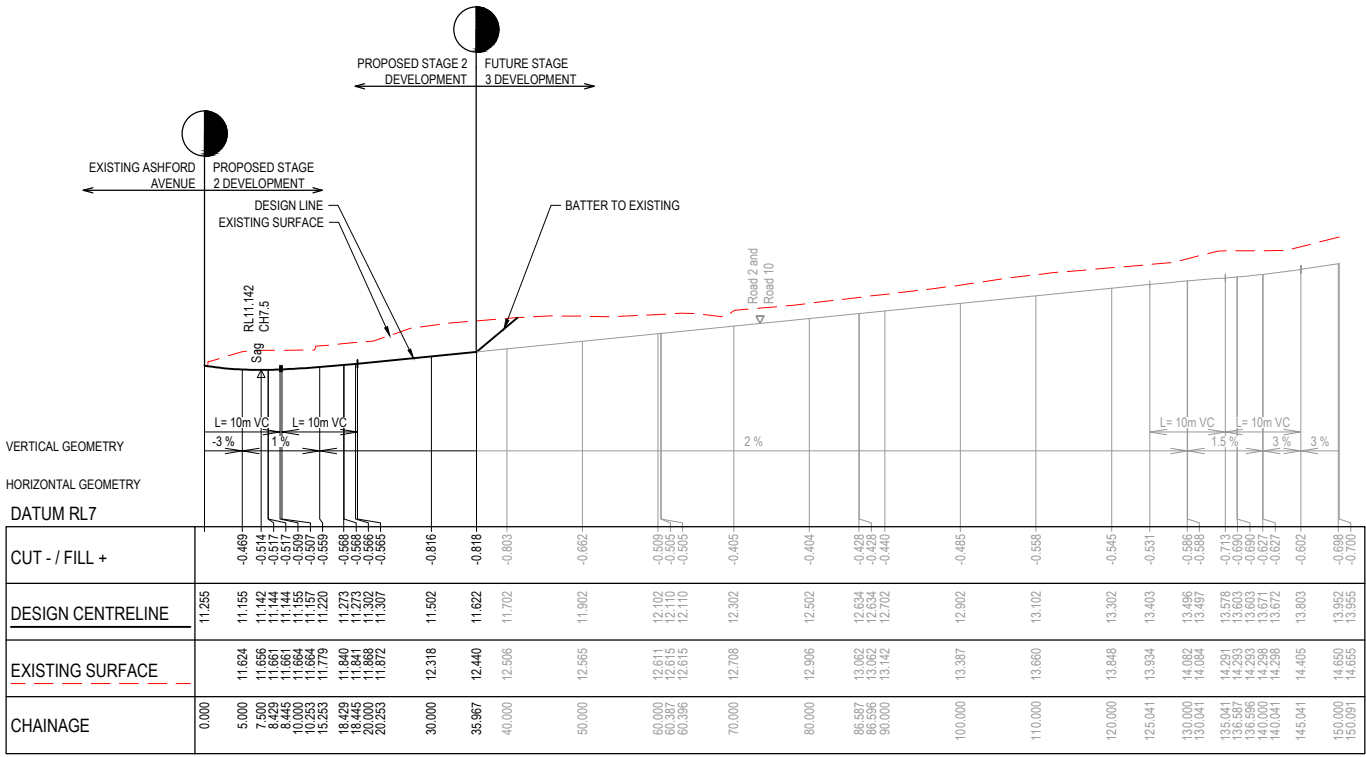


Designed	B.RAU
Date	17.09.24
Drawn	B.RAU
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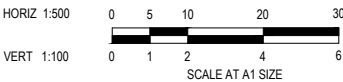
Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	BULT EARTHWORKS

Sheet	06 of 17
Scale	1:500 @ A1
Project Number	2301879
Reference	307
Drawing No	012
Revision	A



ROAD 1 - LONGITUDINAL SECTION
Scales: HORZ 1 : 500
VERT 1 : 100

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Designed	B.RAU
Date	17.09.24
Drawn	B.RAU
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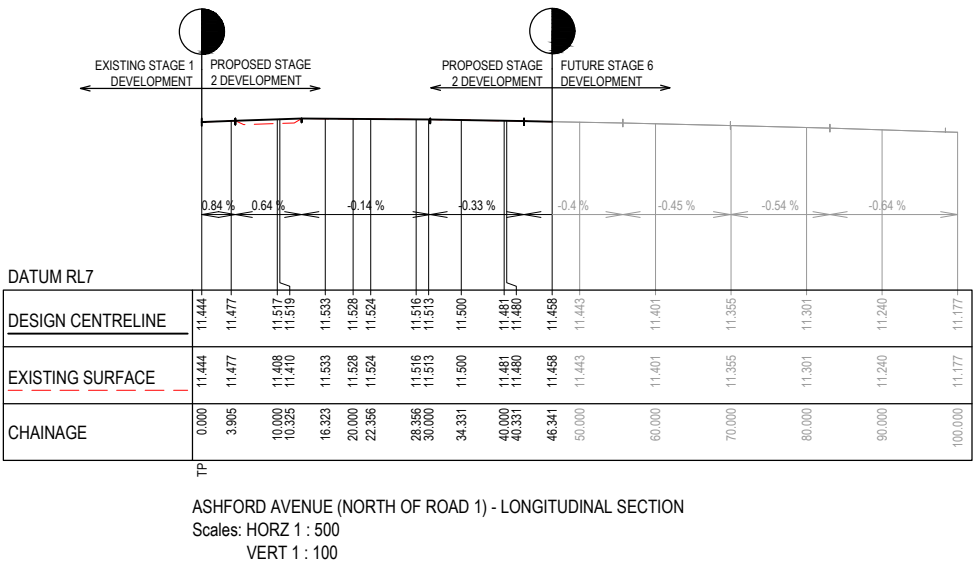
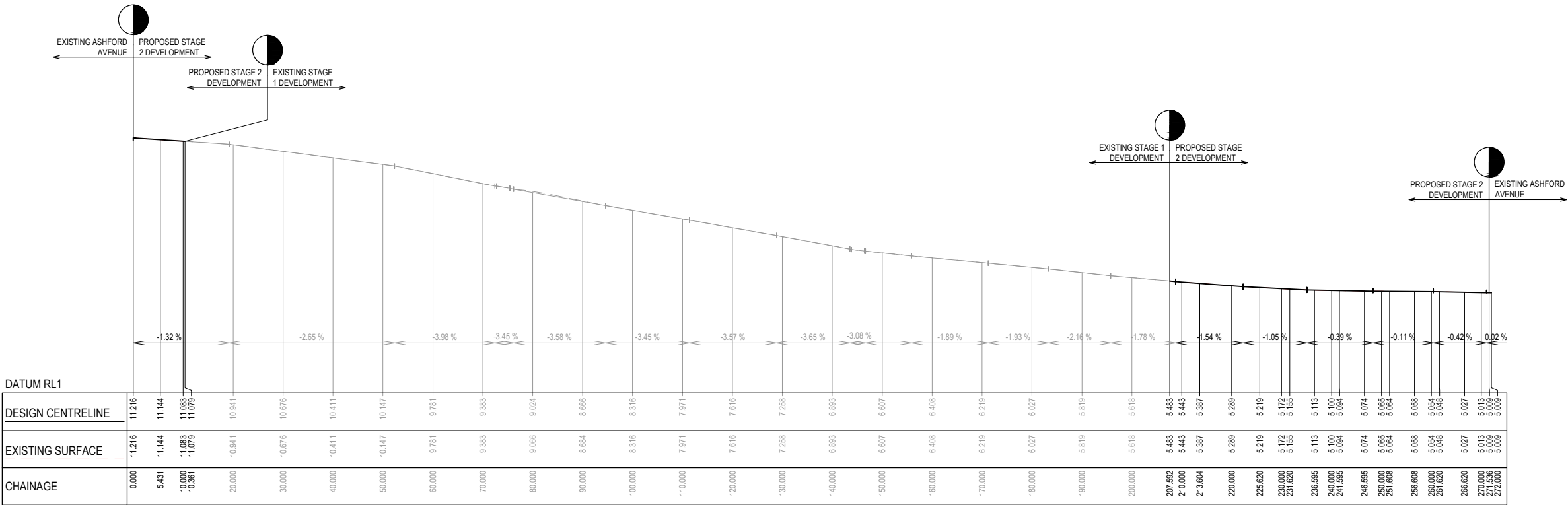
Tuggerah Business Park Unit 4, 5 Colony Ct
Tuggerah NSW 2259

Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	ROAD 1 LONGITUDINAL SECTION

Sheet 07 of 17

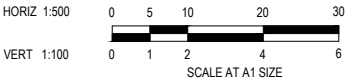
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1:500 H 1:100 V @ A1

Project Number	Reference	Drawing No	Revision
2301879	307	100	A



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Date	17.09.24
Drawn	B.RAU
Approved	S.GRAY
Date	17.09.24
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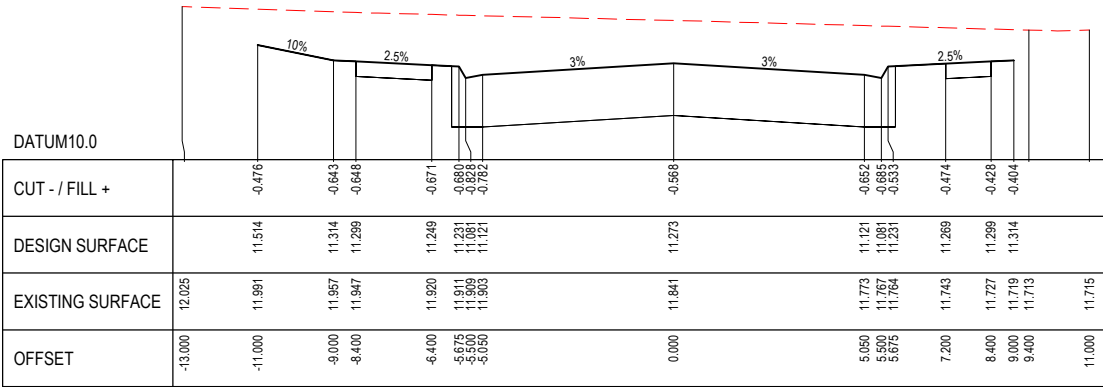
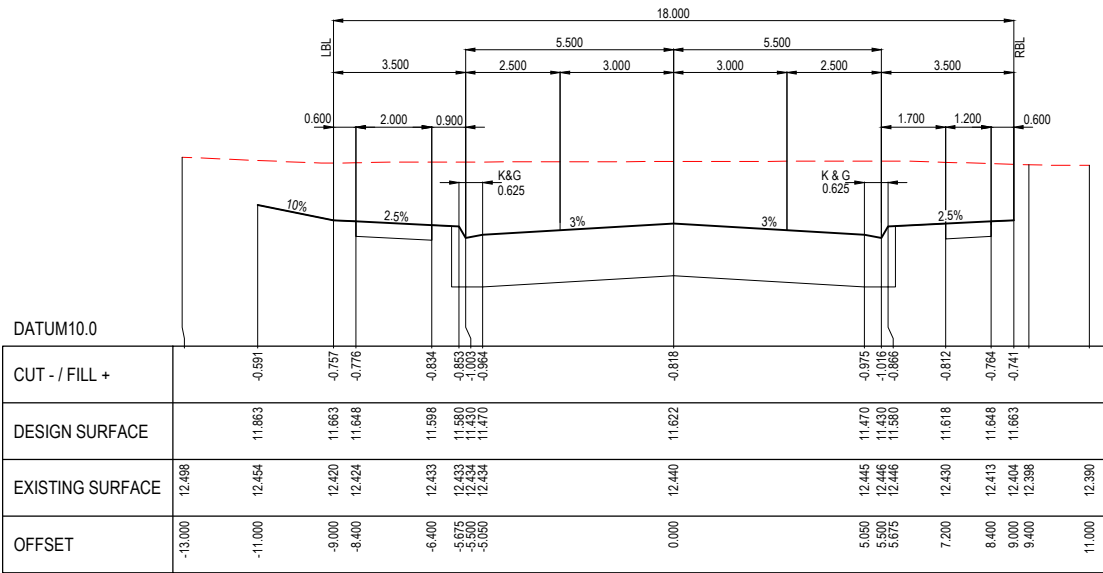
Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	ASHFORD AVENUE BACK OF KERB LONGITUDINAL SECTIONS (NORTH AND SOUTH OF ROAD 1)

Sheet 08 of 17			
Scale			
1:500 H 1:100 V @ A1			
Project Number	Reference	Drawing No	Revision
2301879	307	101	A

LEGEND

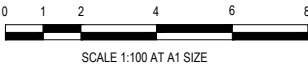
EXISTING SURFACE

DESIGN SURFACE



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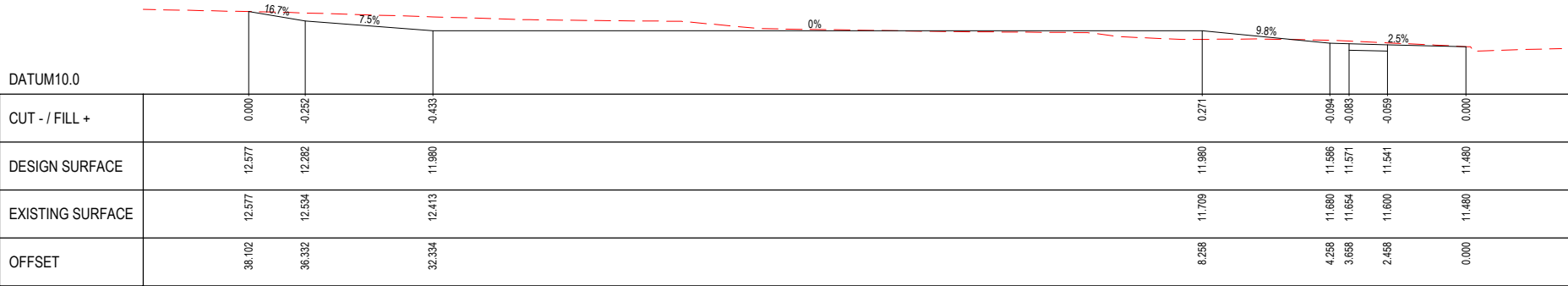
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Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION
Drawing Title	ROAD 1 CROSS SECTIONS

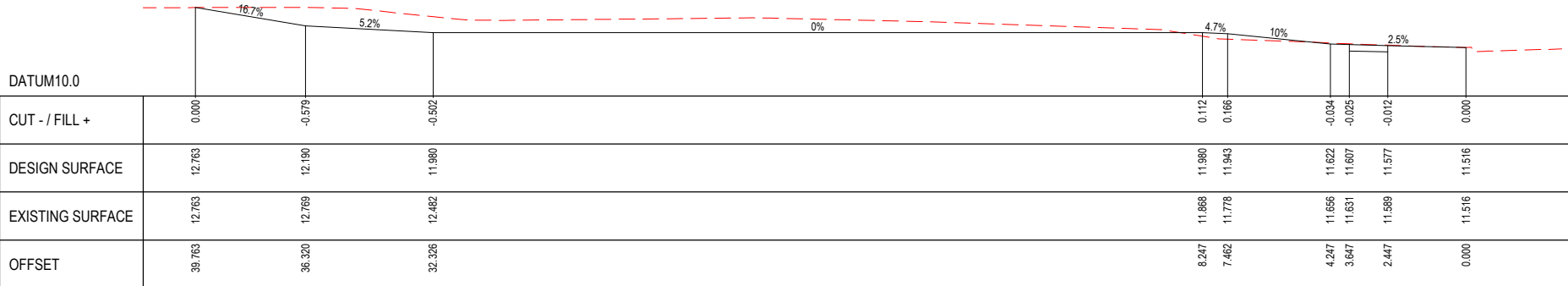
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2301879	307	200	A

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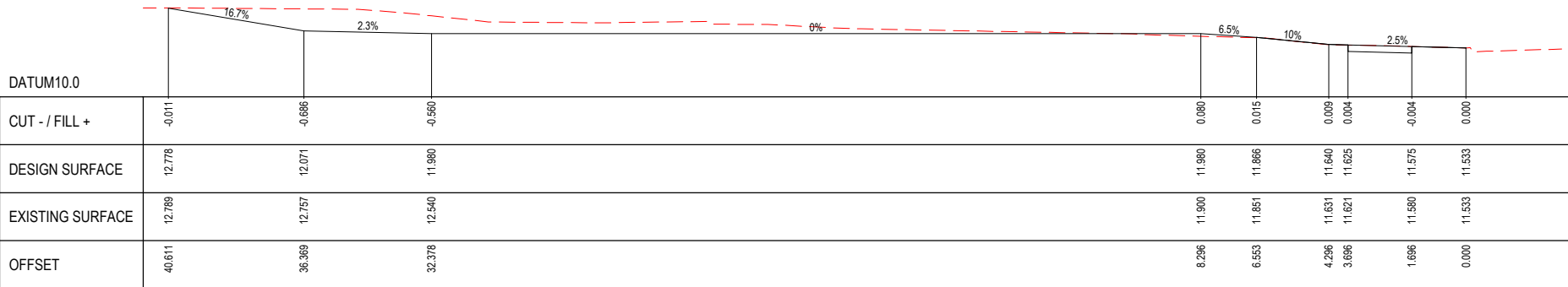
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DESIGN SURFACE

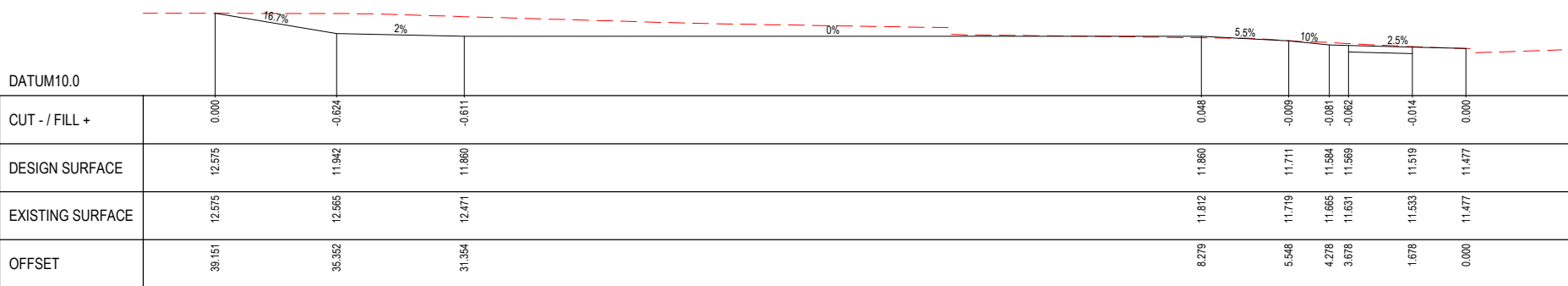
CH 40.331 - LOT 2007



CH 28.356 - LOT 2008



CH 16.323 - LOT 2009



CH 3.905 - LOT 2010

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Date	17.09.24
Drawn	B.RAU
Approved	S.GRAY
Date	17.09.24
DA Number	-

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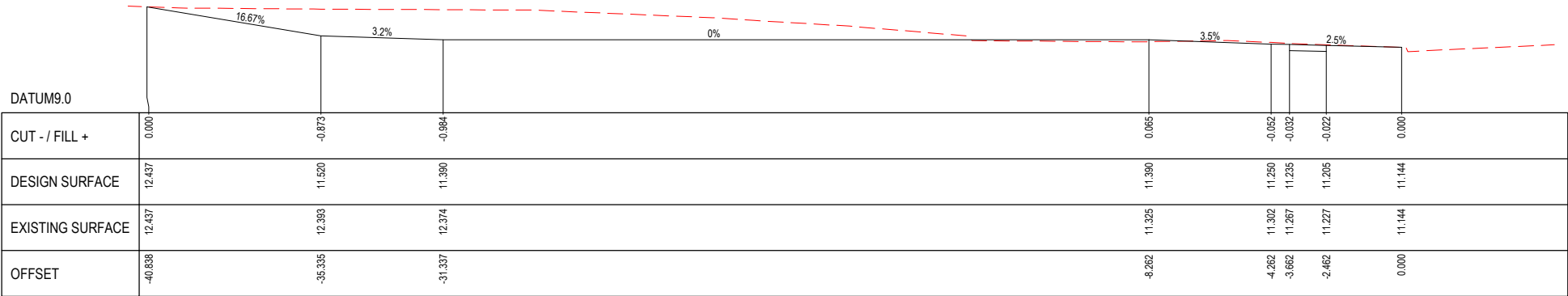
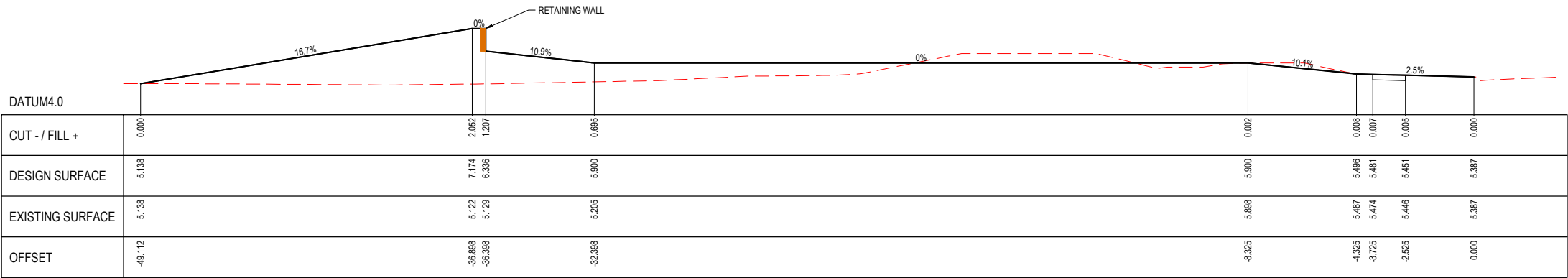
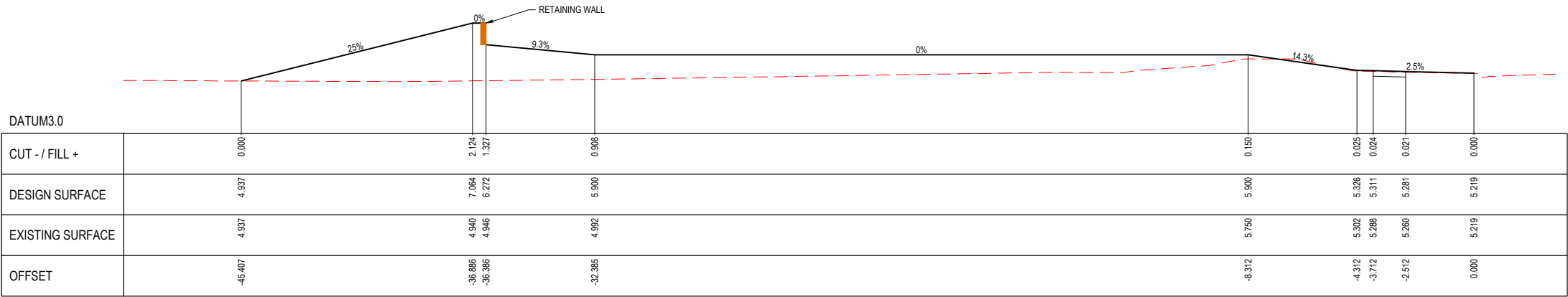
Project Details	WSU MILPERRA, LOT 2 IN DP1291984 2 BULLECOURT AVE, MILPERRA STAGE 2 SUBDIVISION		
	ASHFORD AVENUE (NORTH OF ROAD 1) LOT CROSS SECTIONS		

Sheet 10 of 17			
Scale 1:100 @ A1			
Project Number	Reference	Drawing No	Revision
2301879	307	201	A

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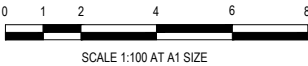
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DESIGN SURFACE



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Project
Details

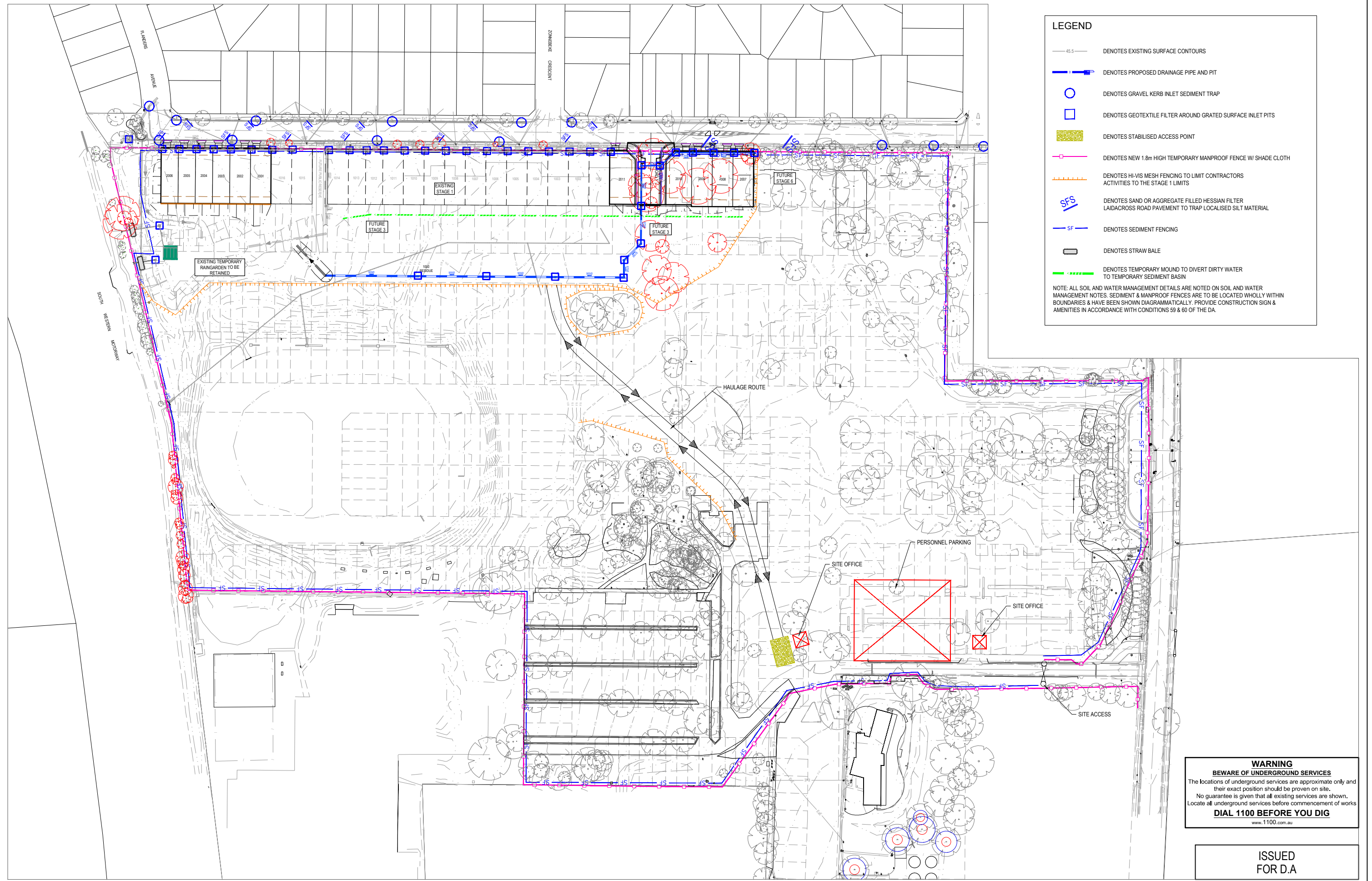
WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 2 SUBDIVISION

Drawing
Title

ASHFORD AVENUE (SOUTH OF ROAD 1)
LOT CROSS SECTIONS
(SHEET 1 OF 2)

Sheet 11 of 17			
Scale 1:100 @ A1			
Project Number 2301879	Reference 307	Drawing No 202	Revision A

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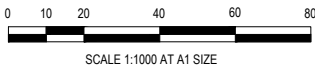
- 45.5 — DENOTES EXISTING SURFACE CONTOURS
- [Symbol] — DENOTES PROPOSED DRAINAGE PIPE AND PIT
- DENOTES GRAVEL KERB INLET SEDIMENT TRAP
- DENOTES GEOTEXTILE FILTER AROUND GRATED SURFACE INLET PITS
- [Symbol] DENOTES STABILISED ACCESS POINT
- [Symbol] DENOTES NEW 1.8m HIGH TEMPORARY MANPROOF FENCE W/ SHADE CLOTH
- [Symbol] DENOTES HI-VIS MESH FENCING TO LIMIT CONTRACTORS ACTIVITIES TO THE STAGE 1 LIMITS
- [Symbol] DENOTES SAND OR AGGREGATE FILLED HESSIAN FILTER LAID ACROSS ROAD PAVEMENT TO TRAP LOCALISED SILT MATERIAL
- [Symbol] DENOTES SEDIMENT FENCING
- [Symbol] DENOTES STRAW BALE
- [Symbol] DENOTES TEMPORARY MOUND TO DIVERT DIRTY WATER TO TEMPORARY SEDIMENT BASIN

NOTE: ALL SOIL AND WATER MANAGEMENT DETAILS ARE NOTED ON SOIL AND WATER MANAGEMENT NOTES. SEDIMENT & MANPROOF FENCES ARE TO BE LOCATED WHOLLY WITHIN BOUNDARIES & HAVE BEEN SHOWN DIAGRAMMATICALLY. PROVIDE CONSTRUCTION SIGN & AMENITIES IN ACCORDANCE WITH CONDITIONS 59 & 60 OF THE DA.

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown. Locate all underground services before commencement of works.
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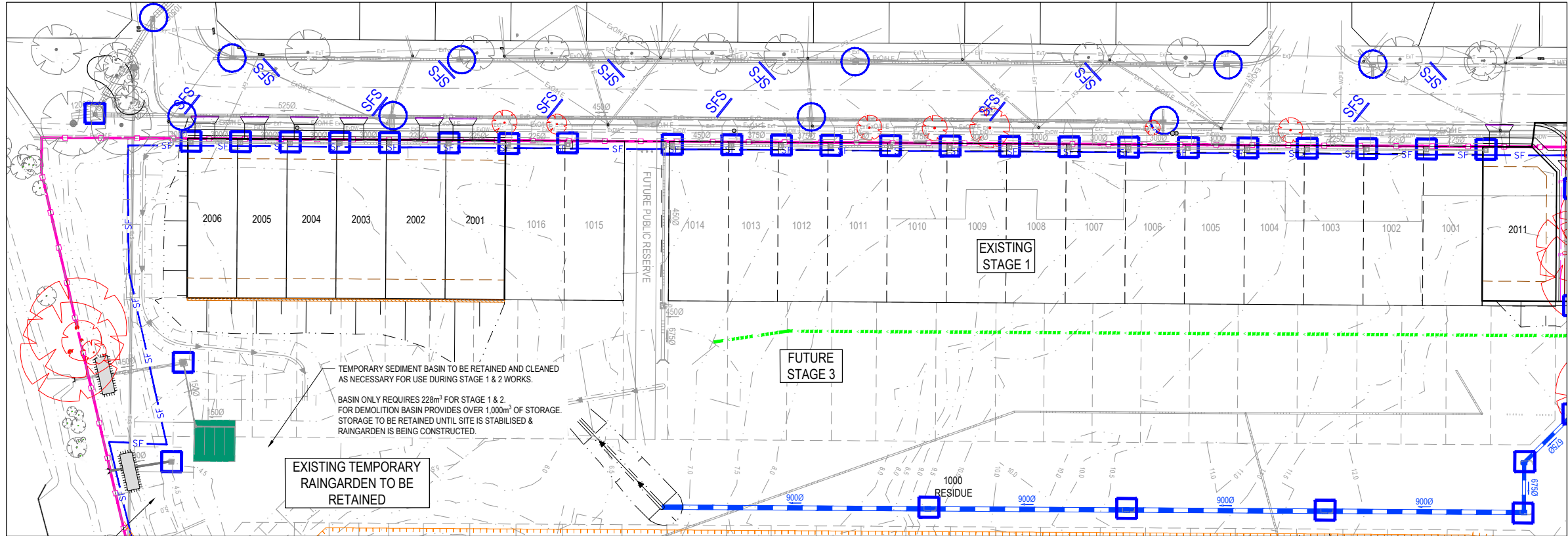
Project Details: WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 2 SUBDIVISION

Drawing Title: SOIL AND WATER MANAGEMENT PLAN
OVERALL PLAN

Sheet 13 of 17

Scale: 1:1000 @ A1

Project Number	Reference	Drawing No	Revision
2301879	307	400	A



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—45.5—

DENOTES EXISTING SURFACE CONTOURS

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DENOTES PROPOSED DRAINAGE PIPE AND PIT

○

DENOTES GRAVEL KERB INLET SEDIMENT TRAP

□

DENOTES GEOTEXTILE FILTER AROUND GRATED SURFACE INLET PITS

DENOTES STABILISED ACCESS POINT

DENOTES NEW 1.8m HIGH TEMPORARY MANPROOF FENCE W/ SHADE CLOTH

DENOTES HI-VIS MESH FENCING TO LIMIT CONTRACTORS ACTIVITIES TO THE STAGE 1 LIMITS

SFS

DENOTES SAND OR AGGREGATE FILLED HESSIAN FILTER LAIDACROSS ROAD PAVEMENT TO TRAP LOCALISED SILT MATERIAL

SF

DENOTES SEDIMENT FENCING

DENOTES STRAW BALE

DENOTES TEMPORARY MOUND TO DIVERT DIRTY WATER TO TEMPORARY SEDIMENT BASIN

NOTE: ALL SOIL AND WATER MANAGEMENT DETAILS ARE NOTED ON SOIL AND WATER MANAGEMENT NOTES. SEDIMENT & MANPROOF FENCES ARE TO BE LOCATED WHOLLY WITHIN BOUNDARIES & HAVE BEEN SHOWN DIAGRAMMATICALLY. PROVIDE CONSTRUCTION SIGN & AMENITIES IN ACCORDANCE WITH CONDITIONS 59 & 60 OF THE DA.

SEDIMENT BASIN

1. THE CONTRACTOR IS TO ENSURE STORMWATER RUNOFF IS DIRECTED TO THE SEDIMENT BASIN WITH PLACEMENT OF TEMPORARY DIVERSION MOUNDS OR THE FORMATION OF OVERLAND FLOW PATHS.

2. DIVERSION MOUNDS & FLOW PATHS ARE TO BE ADJUSTED AS FILLING LAYERS PROGRESS & SURFACE LEVELS RISE.

3. SEDIMENT IS TO BE REMOVED SUCH THAT NOT LESS THAN 70% OF THE DESIGN CAPACITY IS AVAILABLE AT ALL TIMES MARKERS WITH DEPTH INDICATORS ARE TO BE PLACED IN EACH BASIN TO INDICATE WHEN SEDIMENT ACCUMULATION EXCEEDS 30% OF STORAGE REQUIREMENTS.

4. BASINS ARE TO BE FLOCCULATED WITH GYPSUM WHEN SUSPENDED SOLID CONCENTRATION EXCEEDS 50 milligrams per litre. SPREADING RATE TO BE DETERMINED AFTER TESTING AND ANALYSIS OF THE INITIAL STORM EVENT. FIRST APPLICATION IS TO BE 30 kilograms GYPSUM PER 100 cum. OF STORED WATER & THEREAFTER AS DETERMINED BY TESTING. PUMP OUT TO GOLF COURSE DAM WITHIN 72 hrs OF TREATMENT. REFER LANDCOM SOIL & CONSTRUCTION - "MANAGING URBAN STORMWATER" MANUAL - APPENDIX E

6. UPON ADEQUATE SITE REVEGETATION & COUNCIL APPROVAL SEDIMENT BASIN IS TO BE DECOMMISSIONED & CONVERTED INTO RAINGARDENS PER DESIGN.

CONSTRUCTION SEQUENCE

1. ALL TOPSOIL CONTAINING VEGETATION TO BE STRIPPED FROM EXISTING SURFACE & STOCKPILED FOR RESPREADING FOLLOWING COMPLETION OF EARTHWORKS. (APPROX. 75mm THICK)

2. STRIPPED SURFACE TO BE INSPECTED & CERTIFIED READY FOR FILL PLACEMENT BY GEOTECHNICAL ENGINEER.

3. COMPLETE INITIAL EARTHWORKS IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S REPORT

4. IMPORTED FILL TO BE CERTIFIED AS V.E.N.M. & FREE OF SLAG, HAZARDOUS, CONTAMINATED, TOXIC, PUTRESCIBLE OR RADIO-ACTIVE MATTER & INDUSTRIAL WASTE & BUILDING DEBRIS. THE ORIGIN OF FILL PROPOSED TO BE IMPORTED & THE ABOVE CERTIFICATION TO BE REVIEWED & APPROVED BY COUNCIL PRIOR TO ANY IMPORTED FILL ARRIVING ON SITE.

5. ALL FILL IS TO BE PLACED & COMPACTED IN ACCORDANCE WITH COUNCIL'S CONSTRUCTION SPECIFICATION.

6. ALL FILL TO BE PLACED UNDER LEVEL 1 GEOTECHNICAL SUPERVISION.

7. COPIES OF ALL FILL COMPACTION TESTS TO BE PROVIDED TO PRINCIPLE.

8. COMPLETE ALL ROAD, DRAINAGE, RETAINING WALL & SERVICES WORKS

9. 300mm WIDE, 150mm THICK TOPSOIL TO BE PLACED BEHIND KERBS & TURFED WITH KIKUYU TURF

10. FINAL TOPSOIL/ TURF & PATHWAYS WITHIN ASHFORD AVENUE VERGES TO BE BONDED WITH COUNCIL & COMPLETED BY BUILDERS FOLLOWING HOUSE CONSTRUCTION

1. Erosion Hazard and Sediment Basins

Site Name: WSU Milperra

Site Location: 2 Bullecourt Ave, Milperra

Precinct/Stage: Stage 1 & 2 Subdivision

Other Details:

Site area	Sub-catchment or Name of Structure	Notes
Total catchment area (ha)	2.841	
Disturbed catchment area (ha)	2.841	

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F	From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	33	
% silt (fraction 0.002 to 0.02 mm)	33	Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% clay (fraction finer than 0.002 mm)	33	
Dispersion percentage	10.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	4.95	See Section 6.3.3(e) Auto-calculated
Soil Texture Group	F	Automatic calculation from above

Rainfall data

Design rainfall depth (no of day s)	5								
Design rainfall depth (percentile)	75								See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
x-day, y-percentile rainfall event (mm)	19.4								
Rainfall R-factor (if known)	2600								Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	8.3								

RUSLE Factors

Rainfall erosivity (R-factor)	2600								Auto-filled from above
Soil erodibility (K-factor)	0.038								
Slope length (m)	200								
Slope gradient (%)	2.4								RUSLE LS factor calculated for a high hill/interill ratio.
Length/gradient (LS-factor)	0.74								
Erosion control practice (P-factor)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C-factor)	1	1	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.35						See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/y)	96								
Soil Loss Class	1								See Table 4.2, page 4-13
Soil loss (m³/ha/y)	73								Conversion to cubic metres
Sediment basin storage (soil) volume (m³)	35								See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m³)	193								See Sections 6.3.4(i) for calculations
Sediment basin total volume (m³)	228								

WARNING

Beware of underground services

The locations of underground services are approximate only and their exact position should be proven on site.

No guarantee is given that all existing services are shown. Locate all underground services before commencement of works

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Project Details

WSU MILPERRA, LOT 2 IN DP1291984
2 BULLECOURT AVE, MILPERRA
STAGE 2 SUBDIVISION

Drawing Title

SOIL AND WATER MANAGEMENT PLAN
STAGE 2 PLAN

Sheet 14 of 17

Scale

1:500 @ A1

Project Number

2301879

Reference

307

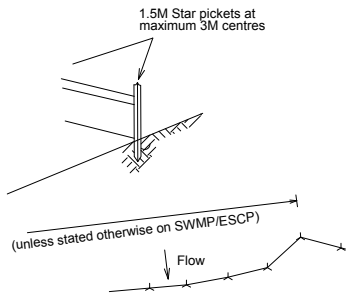
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Revision

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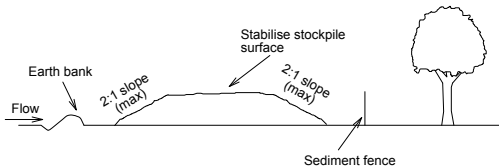
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Star pickets at maximum 3M spacings

1. Construct sediment fence as close as possible to parallel to the contours of the site
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150MM deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched
5. Fix self supporting geotextile to upslope side of posts with wire ties or as recommended by geotextile manufacturer
6. Join sections of fabric at a support post with a 150mm overlap

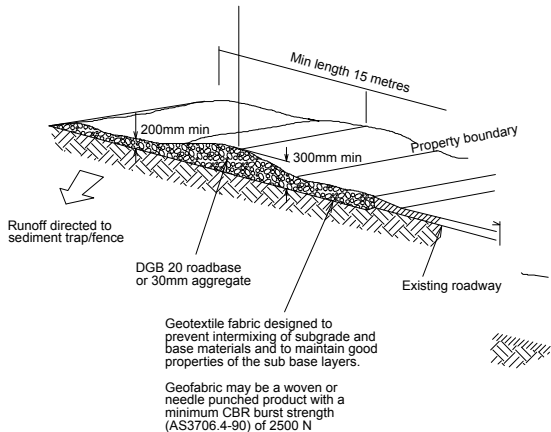
SEDIMENT FENCE



Construction Notes

1. Locate stockpile at least 5 metres from existing vegetation, concentrated water flows, roads and hazard areas.
2. Construct on the contour as a low, flat elongated mound.
3. All stockpiles shall be less than 2 metres in height
4. Rehabilitate in accordance with the SWMP/ESCP.
5. Construct earth bank (Standard Drawing 5-2) on the upslope side to divert run off around the stockpile and a sediment fence (standard Drawing 6-7) 1 to 2 metres downslope of stockpile.
6. Seeded areas to be watered twice weekly until established. Substantial growth required within 14 days or bitumen straw mulch to be placed.
7. Dust to be controlled by watering

STOCKPILES



Construction Notes

1. Strip topsoil and level site.
2. Compact subgrade
3. Cover area with needle punch geotextile.
4. Construct 200mm thick pad over geotextile using roadbase or 30mm aggregate. Minimum length 15 metres or to building alignment width 3 metres
5. Construct hump immediately within boundary to divert water to a sediment fence or other sediment trap.

STABILISED SITE ACCESS

NOTES

ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LANDCOM'S MANUAL "MANAGING URBAN STORMWATER" 4TH EDITION AUGUST 2004.

WORKS SHALL BE UNDERTAKEN AS OUTLINED ON PLANS EROSION AND SEDIMENT CONTROL MEASURES AFFECTED BY WORKS ARE TO BE RE-ESTABLISHED PRIOR TO THE COMPLETION OF EACH DAY'S WORK.

THE CONTRACTOR IS TO STABILISE ALL STOCKPILES AND DISTURBED AREAS AS SOON AS THEY ARE FORMED TO FINAL LEVELS. STABILISATION TO BE BY HYDROSEEDING / SPRAY GRASS, OR AS DIRECTED BY COUNCIL ENGINEER.

SEED MIXTURE FOR FOOTWAYS AND OTHER AREAS UNDER THE CONTROL OF COUNCIL ARE TO BE IN ACCORDANCE WITH COUNCIL'S SPECIFICATION. FOR OTHER AREAS, THE LIST OF PLANT SPECIES FOR TEMPORARY COVER IS:-

JAPANESE MILLET AND OATS(RYECORN) AT 25kg/ha EACH - SPRING/SUMMER
JAPANESE MILLET AT 10kg/ha AND OATS(RYECORN) AT 30kg/ha - AUTUMN/WINTER

ALL SEEDED AREAS ARE TO BE WATERED TWICE WEEKLY.

WHERE SURFACE SLOPES ARE MORE THAN 4H:1V BATTER THEY SHALL BE TURFED.

DUST CONTROL MEASURES SHALL BE IMPLEMENTED CONTINUOUSLY DURING CONSTRUCTION WORKS. SUCH MEASURES ARE TO BE TO THE SATISFACTION OF THE SUPERINTENDENT AND COUNCIL.

TOPSOIL SHALL BE RESPREAD ON CONSTRUCTION AREAS AND STABILISED AS SOON AS POSSIBLE WITHIN 60 DAYS OF DISTURBANCE. ALL DISTURBED AREAS ARE TO BE LEFT WITH A SCARIFIED SURFACE AT ALL TIMES TO ENCOURAGE WATER INFILTRATION AND ASSIST WITH KEYING OF TOPSOIL.

FOLLOWING COMPLETION OF WORKS AND STABILISATION OF ALL DISTURBED SURFACES, ALL MATERIALS AND CONTROL MEASURES ARE TO BE REMOVED FROM SITE AND TEMPORARY BASINS FILLED, COMPACTED AND STABILISED.

ALL SITE ACCESS TO BE ACHIEVED FROM DESIGNATED SITE ACCESS. SITE ACCESS TO BE PROTECTED BY THE INSTALLATION OF AN APPROVED SHAKER RAMP. SHAKER RAMP TO BE REGULARLY MAINTAINED TO ENSURE EFFECTIVENESS.

UPON COMPLETION OF FINAL EARTHWORKS OR AFTER WRITTEN DIRECTION OF COUNCIL, IMMEDIATE SILT CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.

ALL DISTURBED OVER ALL STORMWATER, POWER, TELEPHONE, GAS AND SEWER LINES NOT WITHIN STREETS IS TO BE SPRAY GRASSED AS SOON AS POSSIBLE BUT NO LATER THAN WITHIN 14 DAYS AFTER BACKFILL.

NO MORE THAN 150m OF TRENCH IS TO BE OPEN AT ANY ONE TIME. ALL TEMPORARY EARTH BERMS, DIVERSION AND SEDIMENT BASIN EMBANKMENTS ARE TO BE TRACK ROLLED, SEEDED OR MULCHED OR SPRAYED WITH BITUMEN AS SOON AS THEY HAVE BEEN FORMED.

ALL FILLS ARE TO BE LEFT WITH A WINDROW AT LEAST 20cm HIGH AT THE TOP OF THE SLOPE AT THE END OF EACH DAY'S EARTHWORKS AND ALL EARTHWORK AREAS SHALL BE ROLLED EACH EVENING TO "SEAL" THE EARTHWORKS.

STABILISATION OF ALL CUT AND FILL SLOPES SHALL BE COMMENCED WITHIN 14 DAYS OF COMPLETION OF FORMATION.

THE CONTRACTOR SHALL MAINTAIN AND PRODUCE ON REQUEST A LOGBOOK ON SITE DETAILING THE FOLLOWING:-

- RECORDS OF ALL RAINFALL
- DAILY CONDITION OF ALL EROSION AND SEDIMENT CONTROL MEASURES
- ANY APPLICATION OF FLOCCULATION AGENTS TO BASINS
- VOLUMES OF WATER DISCHARGED FROM BASINS
- METHOD OF DISPOSAL OF WATER FROM BASINS
- ANY ADDITIONAL REMEDIAL WORKS REQUIRED.

THE ORIGINAL LOGBOOK SHALL BE ISSUED TO THE PROJECT MANAGER ON COMPLETION OF THE WORKS. SEDIMENT CONTROL MEASURES TO BE MONITORED ONCE A WEEK AND AFTER EVERY STORM EVENT.

STOCKPILES TO BE MAX 2 METRE HIGH WITH SEDIMENT FENCING TO LOW SIDE LOCATED CLEAR OF WATERCOURSES

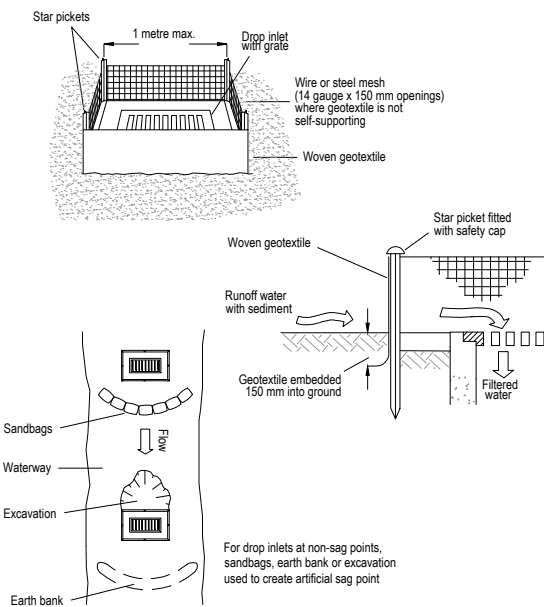
ALL STORMWATER PITS TO BE BLOCKED DURING CONSTRUCTION UNTIL SITE STABILISED.

DURING CONSTRUCTION WORKS ANY WORK AND STORAGE AREAS WHERE SPILLAGE MAY OCCUR MUST BE BUNDED. THE SIZE OF THE AREA TO BE BUNDED AND HEIGHT OF THE BUND WALLS MUST BE CALCULATED AS BEING EQUAL TO 110% OF THE TOTAL VOLUME STORED OR EQUAL TO THE LARGEST STORAGE CONTAINER, WHICHEVER IS GREATER. ALL PIPE WORK EXTENDING FROM THE BUNDED AREA MUST BE DIRECTED OVER THE BUND WALL AND HOSE COUPLINGS MUST BE PLACED SUCH THAT LEAKS AND SPILLAGE'S ARE CONTAINED. THE AREAS MUST BE GRADED TO A PIT/SUMP TO FACILITATE EMPTYING.

ANY IMPORTED FILL USED MUST BE VALIDATED & SUITABLE & FREE OF SALINE & CONTAMINATION

SEDIMENT & EROSION CONTROL

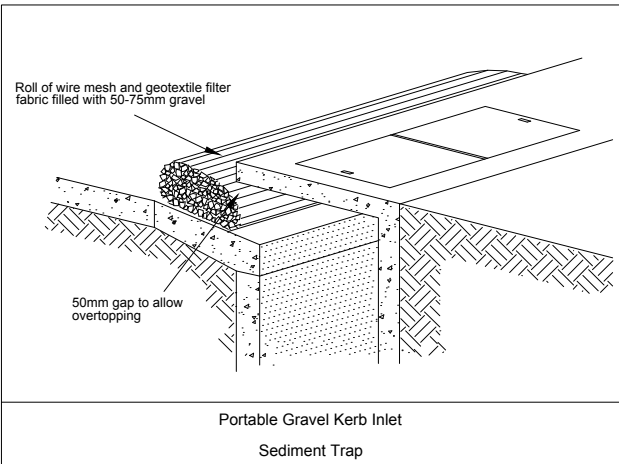
- SE1. THE CONTRACTOR SHALL IMPLEMENT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO DISTURBANCE OF THE WORK AREA & TO BE CARRIED OUT IN ACCORDANCE WITH LANDCOM'S "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION" VOLUME 1.
- SE2. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL SEDIMENT AND EROSION CONTROL DEVICES AND REMOVE ACCUMULATED SILT FROM SUCH DEVICES BEFORE MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL THE SILT REMOVED SHALL BE DISPOSED OF AS DIRECTED BY THE SUPERINTENDENT. NO SILT IS TO BE PLACED OUTSIDE THE LIMIT OF WORKS. THE PERIOD FOR MAINTAINING THESE DEVICES SHALL BE AT LEAST UNTIL ALL DISTURBED AREAS ARE REVEGETATED AND LONGER AS MAY BE DIRECTED BY THE SUPERINTENDENT OR COUNCIL.
- SE3. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING CONSTRUCTION CONFINING ACCESS WHERE POSSIBLE TO PROPOSED OR EXISTING ROAD ALIGNMENTS.
- SE4. WHEN ANY DEVICES ARE TO BE HANDED OVER TO COUNCIL, THEY SHALL BE IN A CLEAN & STABLE CONDITION.
- SE5. THE CONTRACTOR SHALL MAINTAIN ALL REVEGETATED AREAS INCLUDING WATERING UNTIL FINAL COMPLETION OF WORKS.
- SE6. THE CONTRACTOR SHALL MAINTAIN DUST CONTROL UNTIL FINAL COMPLETION OF WORKS.
- SE7. THE CONTRACTOR'S RESPONSIBILITY IS TO ENSURE ALL NECESSARY MEASURES SO AS TO PROTECT ALL DISTURBED AREAS AS PER NOTE SE1. ALL ADDITIONAL COSTS ARE TO BE REFLECTED IN TENDER PRICE EVEN IF SUCH MEASURES ARE NOT INDICATED ON THE SEDIMENT AND EROSION CONTROL PLAN.
- SE8. THE CONTRACTOR MUST COMMENCE REHABILITATION WITHIN 5 DAYS OF ANY SITE REGRADING & BATTER FORMATION.
- SE9. A 0.3m WIDE STRIP OF TURF TO BE PLACED BEHIND THE EXISTING KERB IN ASHFORD AVENUE.
- SE10. PROVIDE TURF AROUND ALL SURFACE INLET PITS IN ADDITION TO THE GEOTEXTILE INLET FILTER.
- SE11. STOCKPILES TO BE STABILISED WITHIN 14 DAYS OF COMPLETING THE STOCKPILE.



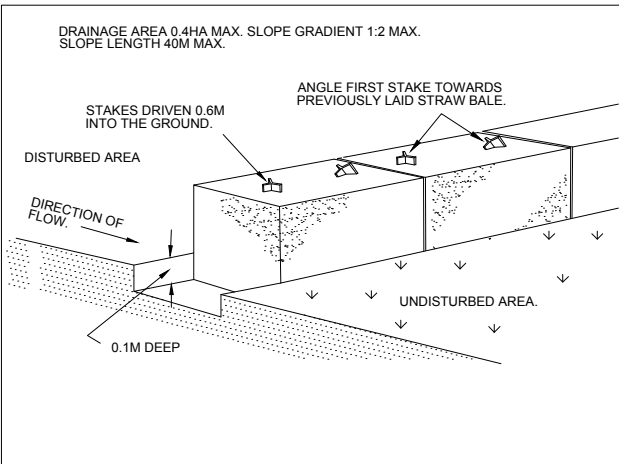
GEOTEXTILE INLET FILTER (SD 6-12)
NTS

Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geotextile. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.



Portable Gravel Kerb Inlet
Sediment Trap



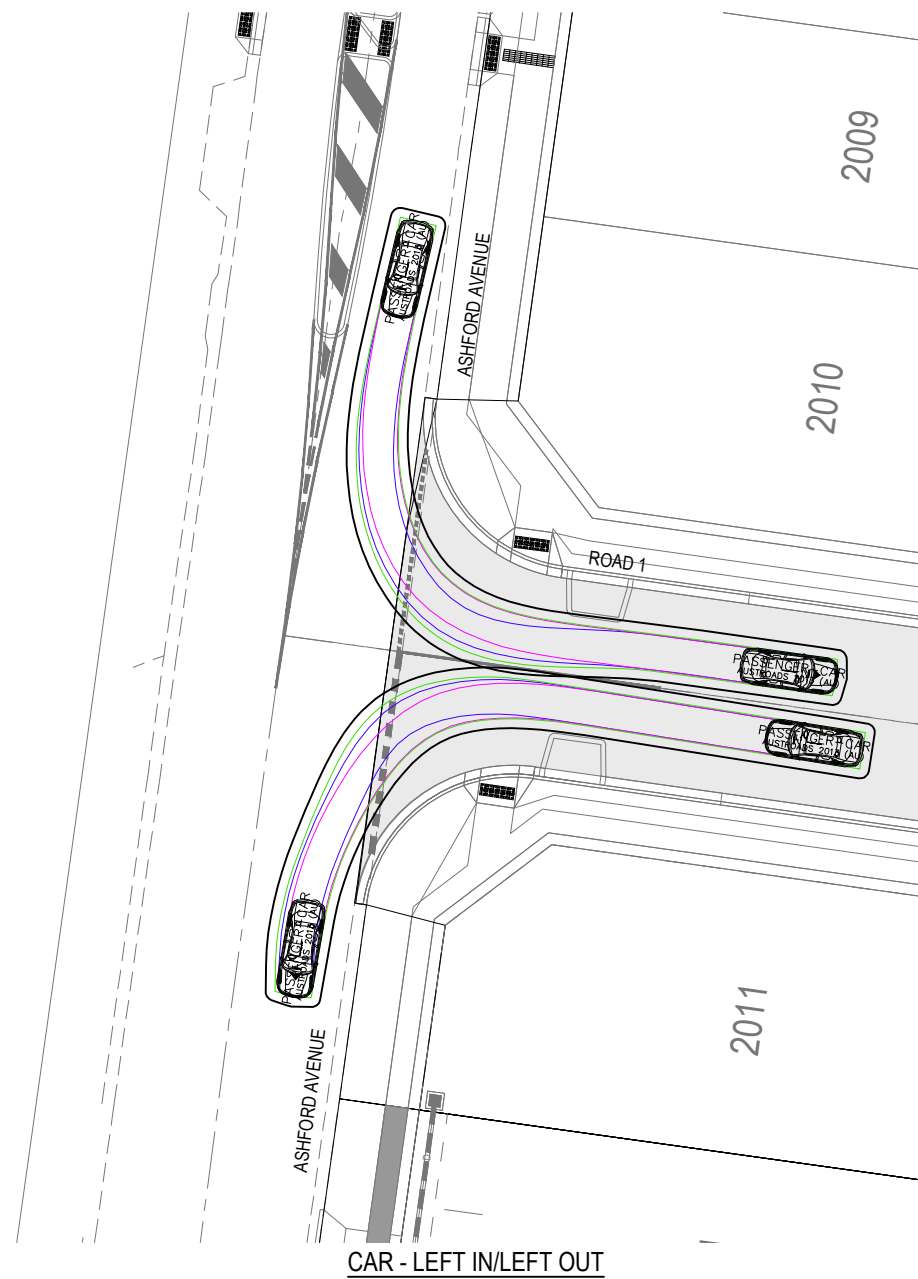
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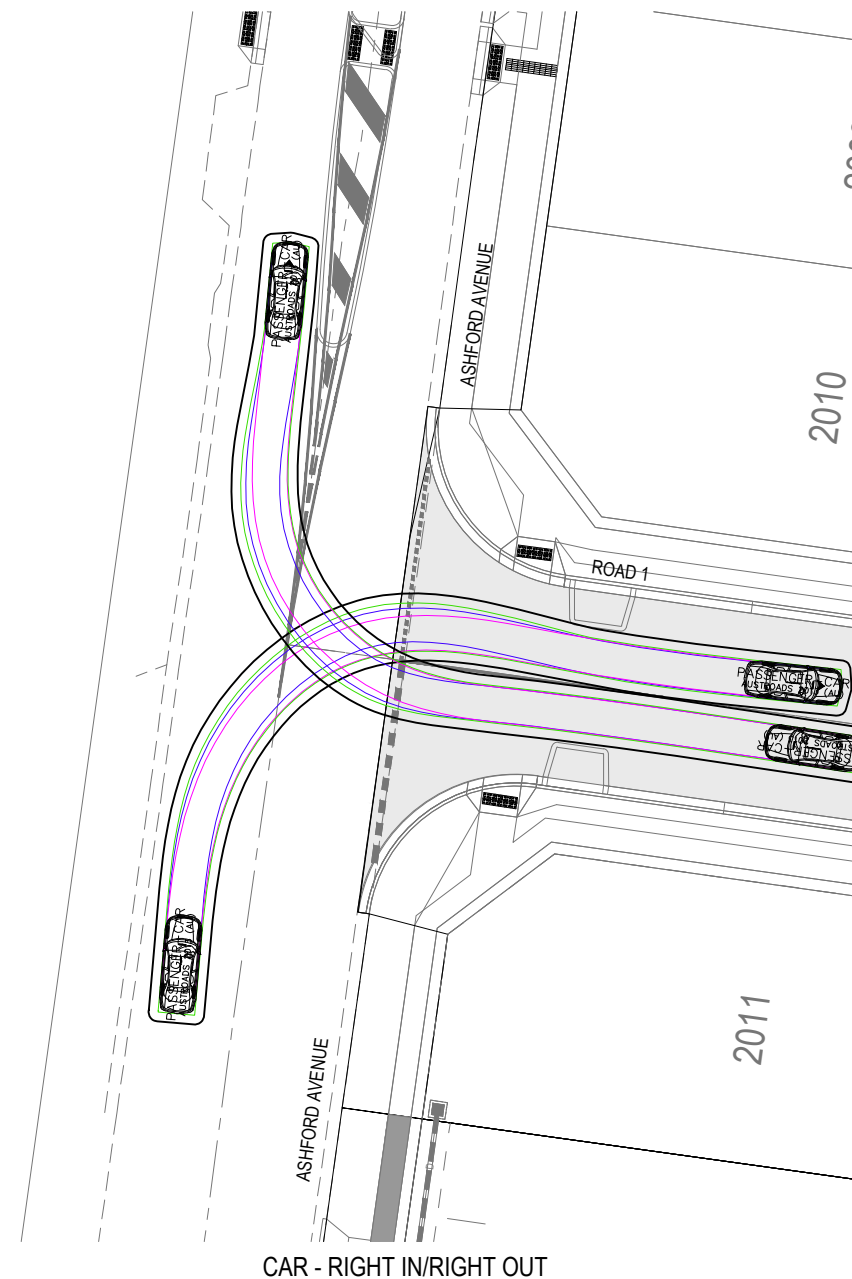
Designed	B.RAU
Date	17.09.24
Drawn	B.RAU
Approved	S.GRAY
Date	17.09.24
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Tuggerah Business Park Unit 4, 5 Colony Ct
Tuggerah NSW 2259
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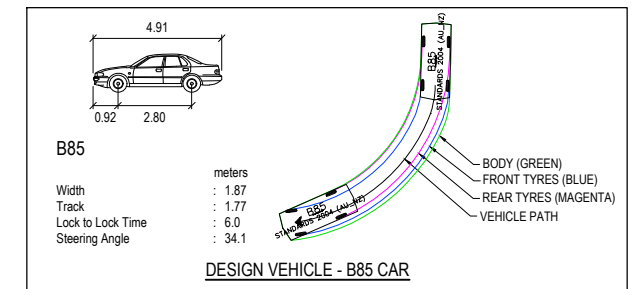
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Drawing Title	SOIL AND WATER MANAGEMENT PLAN DETAILS AND NOTES	Scale NOT TO SCALE
Project Number	Reference	Drawing No
2301879	307	402
		Revision
		A



CAR - LEFT IN/LEFT OUT

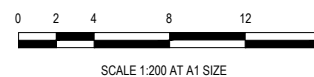


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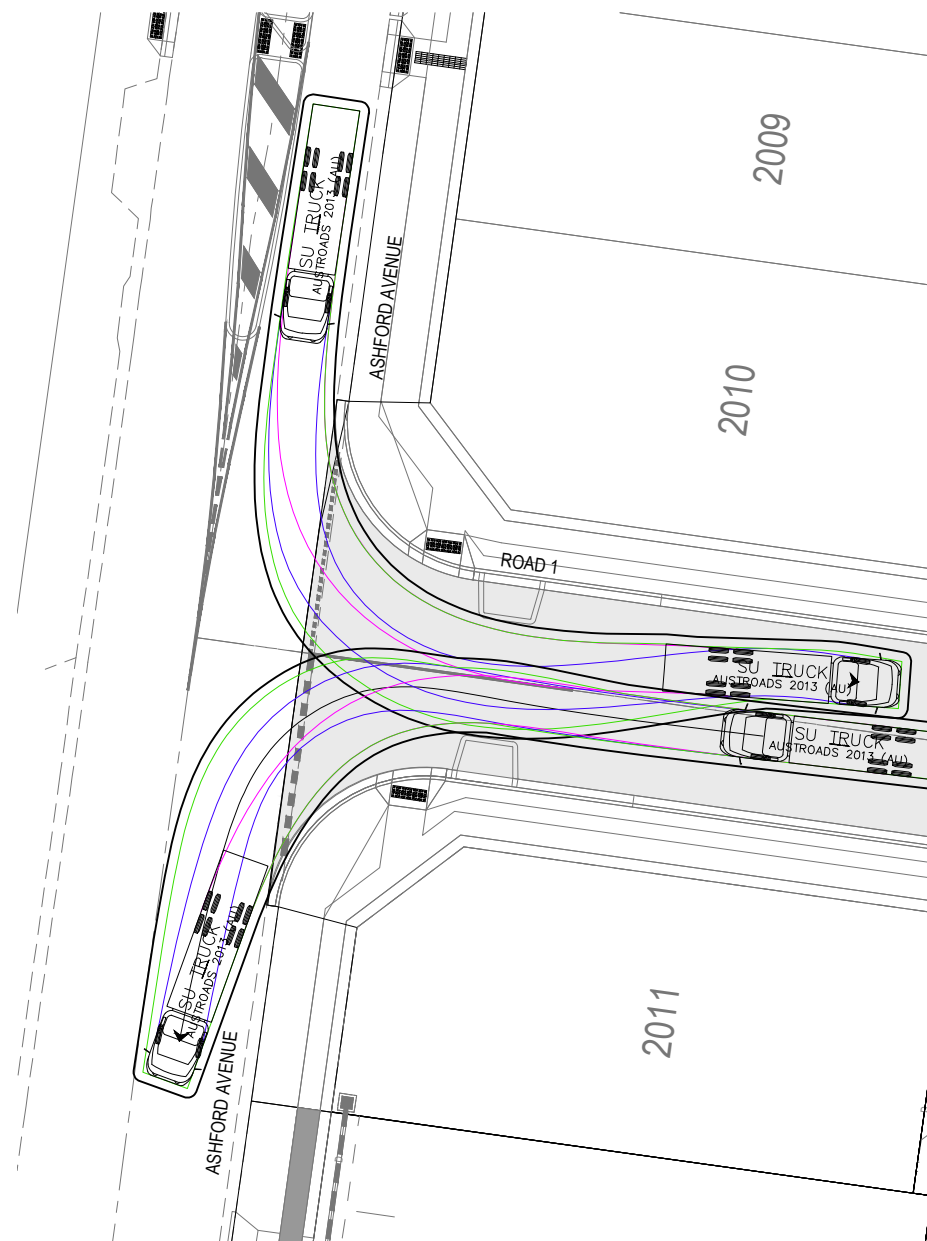
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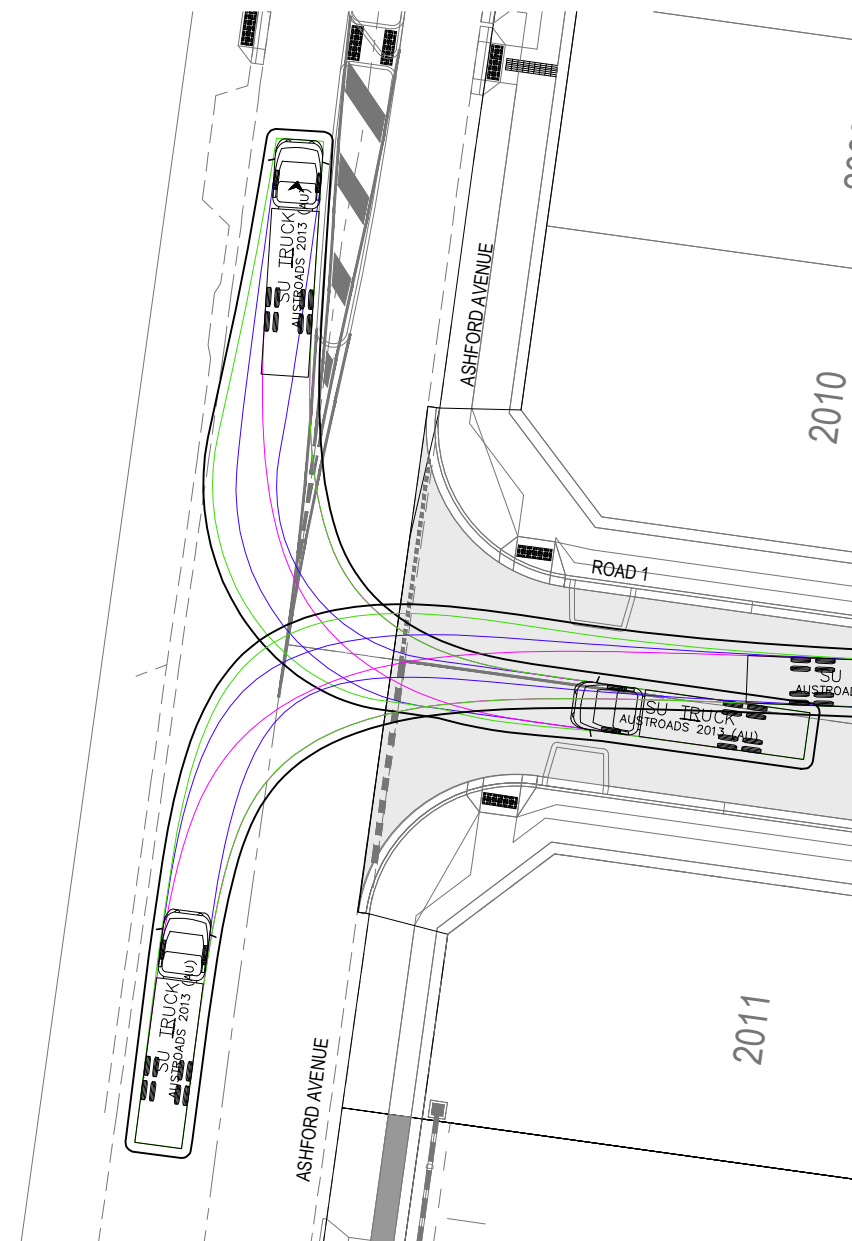
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Drawing Title	TURNING MOVEMENTS CAR (SHEET 1 OF 2)

Sheet	16 of 17
Scale	1:200 @ A1
Project Number	2301879
Reference	307
Drawing No	800
Revision	A

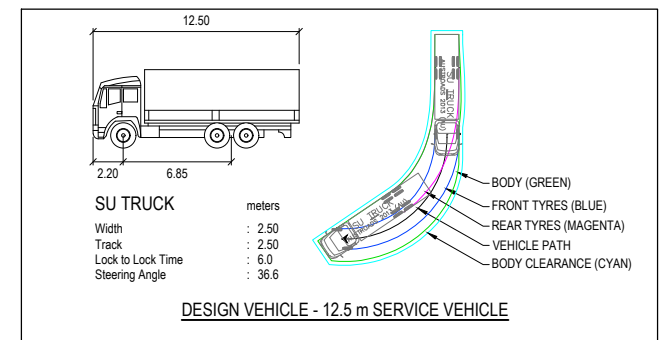




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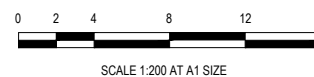


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Approved	S.GRAY
Date	17.09.24
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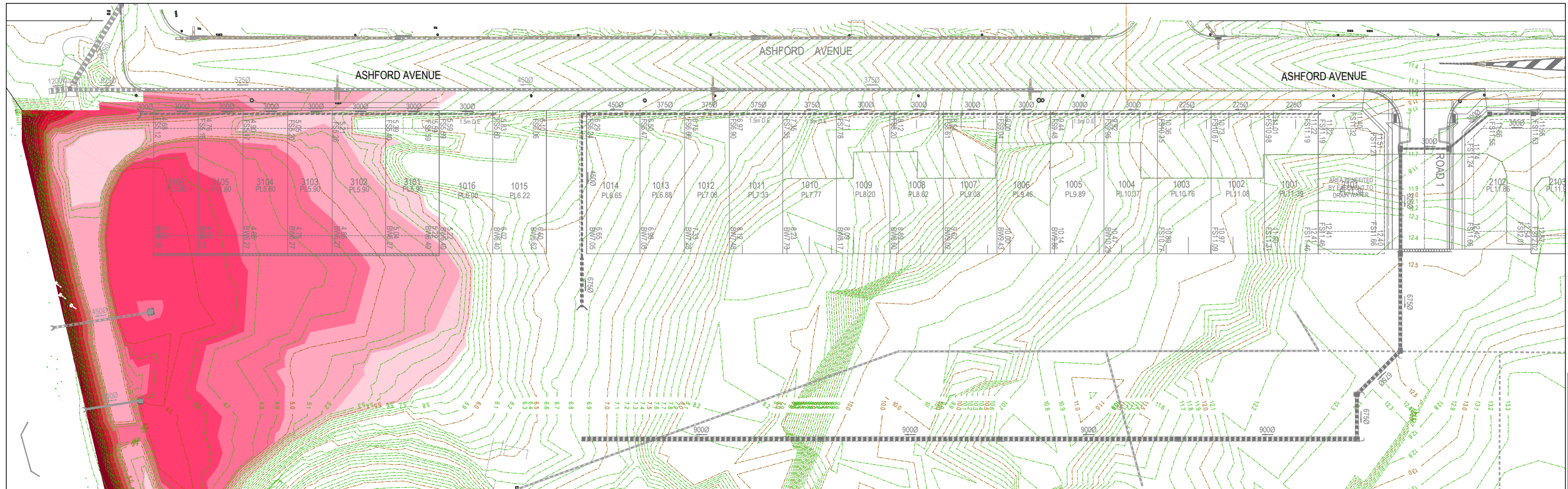
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Drawing Title	TURNING MOVEMENTS SERVICE VEHICLE (SHEET 2 OF 2)

Sheet	17 of 17
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Project Number	2301879
Reference	307
Drawing No	801
Revision	A

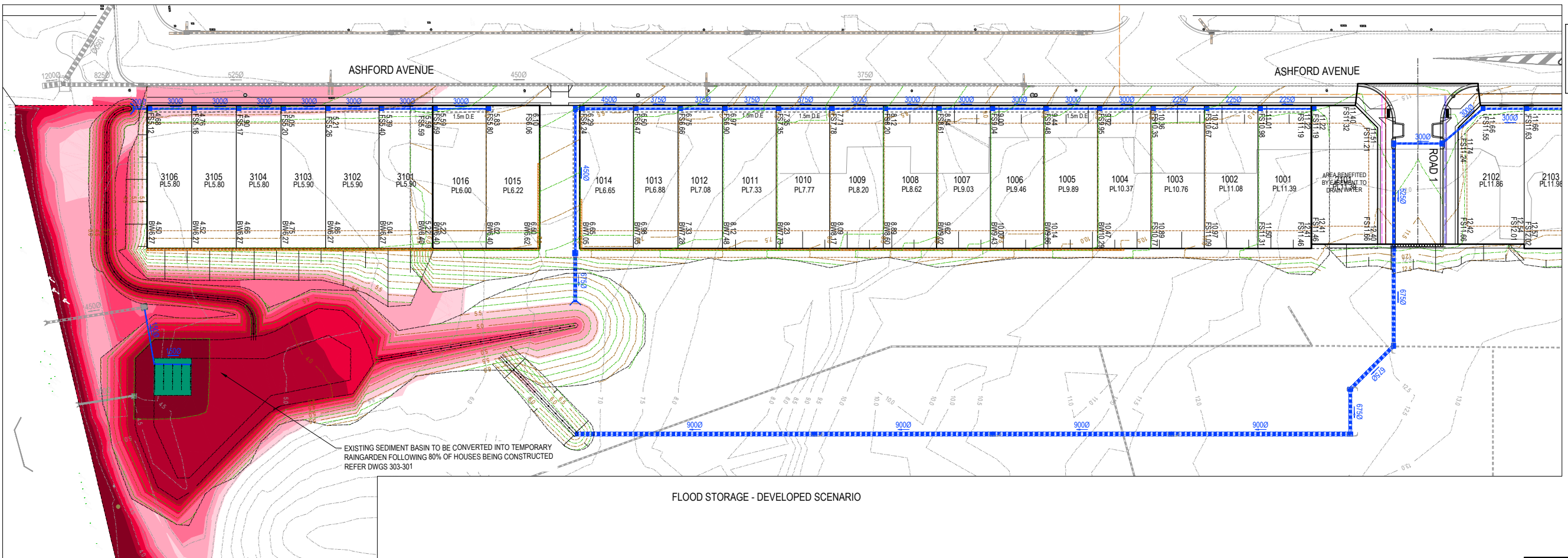


APPENDIX C: COMPENSATORY STORAGE PLANS – STAGE 1 & 2



FLOOD STORAGE - EXISTING SCENARIO

STORAGE LEGEND		
DEPTH RANGE (m)		COLOUR
>1.8m STORAGE		
1.8	1.5	
1.5	1.2	
1.2	0.9	
0.9	0.6	
0.6	0.3	
0.3	0.0	



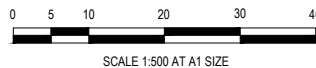
FLOOD STORAGE - DEVELOPED SCENARIO

STORAGE VOLUMES:	
EXISTING SCENARIO :	6400 m ³
DEVELOPED SCENARIO :	6855 m ³

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B	ISSUED FOR INFORMATION	19.09.24	R.G.	S.G.					
A	ISSUED FOR INFORMATION	23.05.24	S.F.	S.G.					



Designed Date	S. FERGUSON 20.05.2024
Drawn	C.YAP
Approved Date	S. GRAY 20.05.2024
PS Number	-



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Project Details	WSU MILPERRA, LOT 2 IN DP1291884 2 BULLECOURT AVE, MILPERRA STAGE 1 & 2 SUBDIVISION
Drawing Title	COMPENSATORY STORAGE PLAN

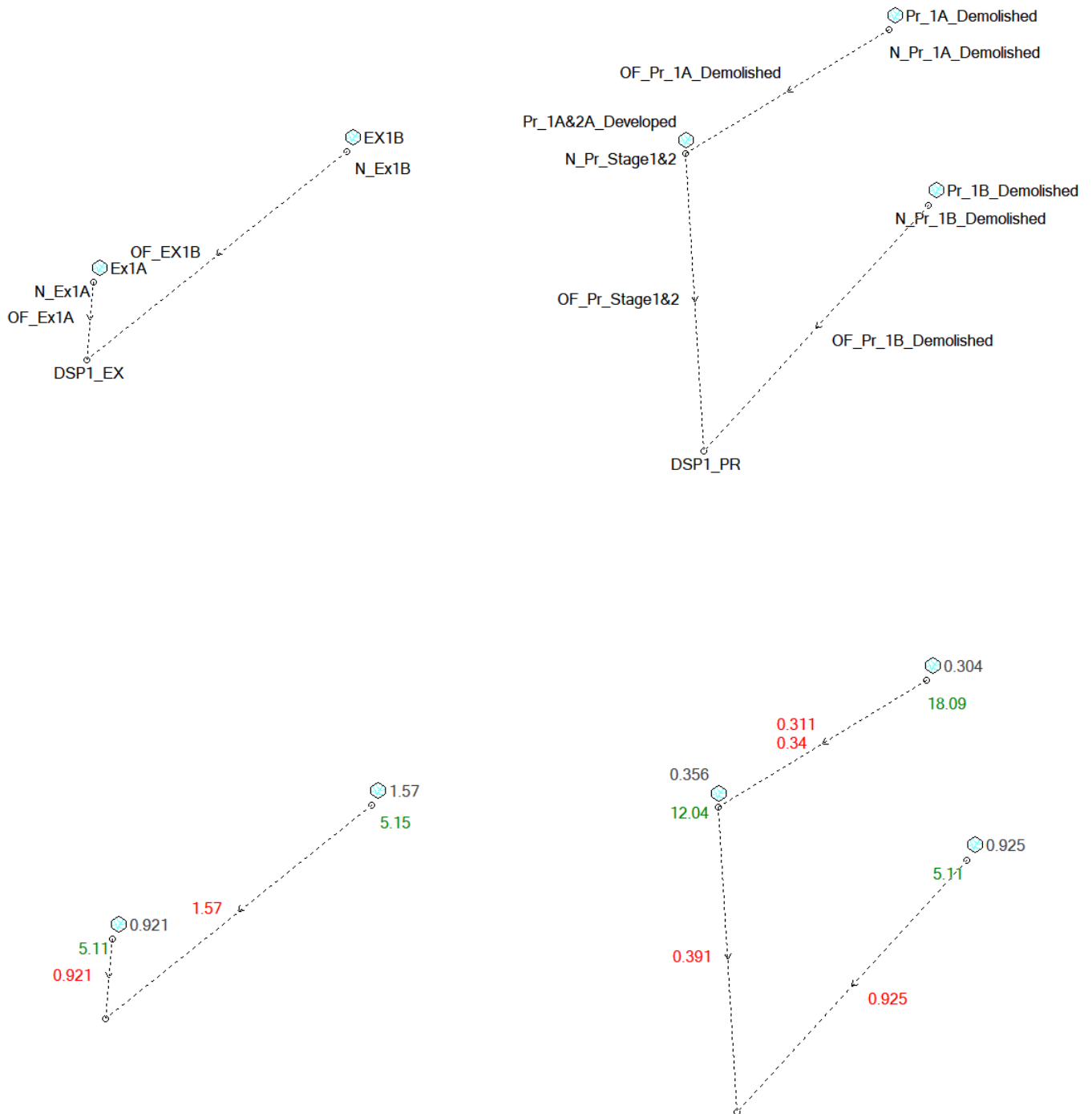
Sheet 01 of 01

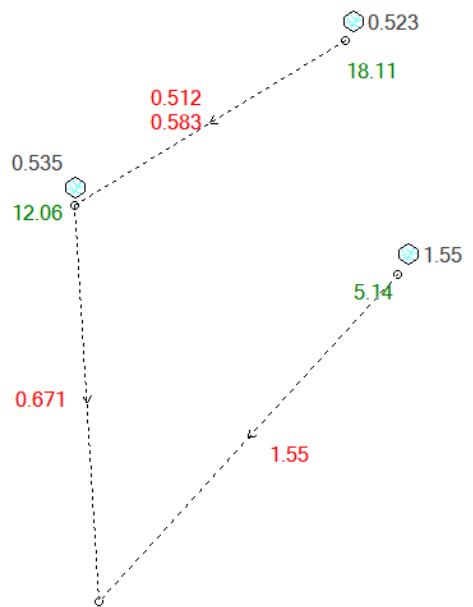
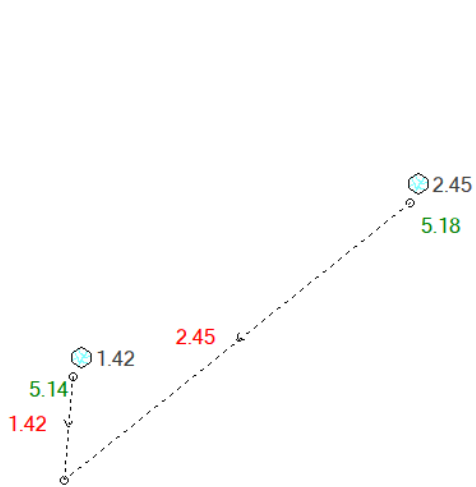
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Project Ref	Stage No	Drawing No	Rev
2301879	306	850	B

APPENDIX D: OSD DRAINS IL CL MODEL SETUP & DATA – STAGE 1 & 2





APPENDIX E: MUSIC LINK FOR LIVERPOOL

MUSIC-*link* Report

Project Details		Company Details	
Project:		Company:	
Report Export Date:	2/09/2024	Contact:	
Catchment Name:	Receiving 60	Address:	
Catchment Area:	1.01ha	Phone:	
Impervious Area*:	85.0871287128713%	Email:	
Rainfall Station:	67035 LIVERPOOL(WHITLAM		
Modelling Time-step:	Six minutes		
Modelling Period:	01/01/67 - 31/12/1976 11:54:00 PM		
Mean Annual Rainfall:	856.622mm		
Evapotranspiration:	1171.074mm		
MUSICX Version:	1.30.0.13025 (5.30.0.13025)		
MUSIC-link data Version:	5.0		
Study Area:	Liverpool City Council		
Scenario:	Liverpool 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:	Reduction	Node Type	Number	Node Type	Number
Flow	27.567%	Rainwater Tank Nodes	2	Urban_Roof Nodes	4
TSS	90.788%	Bioretention Nodes	1	Urban_Residential Nodes	2
TP	84.044%				
TN	74.44%				
GP	100%				

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bioretention	Temp Basin Stage 1	Exfiltration Rate	0	None	0 mm/h
Bioretention	Temp Basin Stage 1	High Flow Bypass	0	None	100 m³/s
Bioretention	Temp Basin Stage 1	Orthophosphate Content of Filter Media	0	55	30
Bioretention	Temp Basin Stage 1	PET Scaling Factor	2.1	2.1	2.1 proportion
Bioretention	Temp Basin Stage 1	TN Content of Filter Media	1	800	600
Rainwater	Stage 1 RWT	% Reuse Demand Met	None	None	40.46 %
Rainwater	Stage 2 RWT	% Reuse Demand Met	None	None	40.579 %
Receiving	Receiving 60	Flow Reduction	None	None	27.567 %
Receiving	Receiving 60	GP Reduction	90	None	100 %
Receiving	Receiving 60	TN Reduction	45	None	74.44 %
Receiving	Receiving 60	TP Reduction	65	None	84.044 %
Receiving	Receiving 60	TSS Reduction	85	None	90.788 %
Urban_Residential	Stage 1 Yard	Impervious Area	None	None	0.033 ha
Urban_Residential	Stage 1 Yard	Pervious Area	None	None	0.09 ha
Urban_Residential	Stage 1 Yard	Total Area	None	None	0.123 ha
Urban_Residential	Stage 2 Yard	Impervious Area	None	None	0.016 ha
Urban_Residential	Stage 2 Yard	Pervious Area	None	None	0.061 ha
Urban_Residential	Stage 2 Yard	Total Area	None	None	0.077 ha
Urban_Roof	Stage 1 (Roof ex RWT)	Impervious Area	None	None	0.12 ha
Urban_Roof	Stage 1 (Roof ex RWT)	Pervious Area	None	None	0 ha
Urban_Roof	Stage 1 (Roof ex RWT)	Total Area	None	None	0.12 ha
Urban_Roof	Stage 1 (Roof to RWT)	Impervious Area	None	None	0.36 ha
Urban_Roof	Stage 1 (Roof to RWT)	Pervious Area	None	None	0 ha
Urban_Roof	Stage 1 (Roof to RWT)	Total Area	None	None	0.36 ha
Urban_Roof	Stage 2 (Roof ex RWT)	Impervious Area	None	None	0.08 ha
Urban_Roof	Stage 2 (Roof ex RWT)	Pervious Area	None	None	0 ha
Urban_Roof	Stage 2 (Roof ex RWT)	Total Area	None	None	0.08 ha
Urban_Roof	Stage 2 (Roof to RWT)	Impervious Area	None	None	0.25 ha
Urban_Roof	Stage 2 (Roof to RWT)	Pervious Area	None	None	0 ha
Urban_Roof	Stage 2 (Roof to RWT)	Total Area	None	None	0.25 ha

Only certain parameters are reported when they pass validation

APPENDIX F: BLUEBOOK DESIGN SPREADSHEET TO SIZE TEMP SEDIMENT

1. Erosion Hazard and Sediment Basins

Site Name: WSU Milperra

Site Location: 2 Bullecourt Ave, Milperra

Precinct/Stage: Stage 1 & 2 Subdivision

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	Temp Basin						
Total catchment area (ha)	2.841						
Disturbed catchment area (ha)	2.841						

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F						From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)	33						Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)	33						
% clay (fraction finer than 0.002 mm)	33						
Dispersion percentage	10.0						E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	4.95						See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F						Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5						See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	75						
x-day, y-percentile rainfall event (mm)	19.4						
Rainfall R-factor (if known)	2600						Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	8.3						

RUSLE Factors

Rainfall erosivity (R -factor)	2600						Auto-filled from above
Soil erodibility (K -factor)	0.038						RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	200						
Slope gradient (%)	2.4						
Length/gradient (LS -factor)	0.74						
Erosion control practice (P -factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C -factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.35						See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	96						
Soil Loss Class	1						See Table 4.2, page 4-13
Soil loss (m ³ /ha/yr)	73						Conversion to cubic metres
Sediment basin storage (soil) volume (m ³)	35						See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m ³)	193						See Sections 6.3.4(i) for calculations
Sediment basin total volume (m ³)	228						

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).