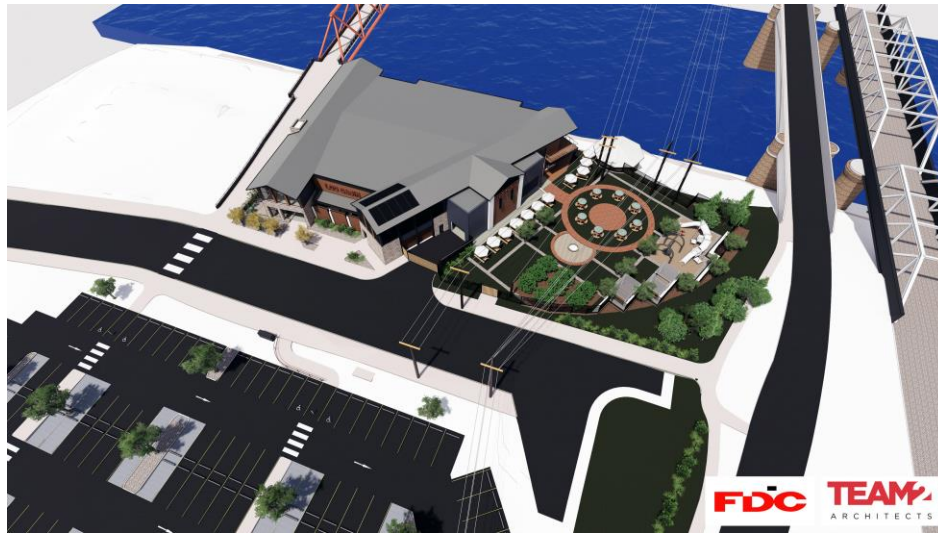


Concept Civil Engineering Design Report
Proposed Log Cabin Development
FDC Building

Lots 21 & 22 in DP 1236215 Memorial Ave Penrith NSW 2750



EWFW Pty Ltd
Century House
Level 4, 362 Kent St, Sydney NSW 2000
Phone: 1300 553 654
ABN: 48 130 395 827



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1 INTRODUCTION

1.1 PURPOSE

EWFw Consulting Engineers Pty Ltd (EWFw) has been engaged to prepare the concept civil engineering associated works for the proposed developments on Memorial Avenue. The primary objective of this report is to provide supplementary and supporting information to accompany the concept design drawings prepared for the development, in order to demonstrate compliance with Penrith City Council's Development Control Plan and Engineering Requirements.

1.2 SITE LOCATION

The proposed development site is located approximately 1km North-West of the Penrith Central Business District (CBD). The site is bordered by the Nepean River to the West, the Yandhai Nepean Crossing footbridge to the South, the Great Western Highway to the North and commercial development to the East.

The site is burdened by the presence of numerous overhead electrical lines, poles, and associated easements. Additionally, an existing heritage water pumphouse exists within the site, which is to be retained and incorporated into the design of the structure.

The proposed development site is highlight in Figure 1-1.



FIGURE 1-1 - SITE LOCATION PLAN - *GOOGLE MAPS*

1.3 REFERENCE DOCUMENTS

The following documents have been reviewed in order to develop this report and should be read in conjunction to this report:

TABLE 1-1 REFERENCE DOCUMENTS

Document	Reference
Penrith City Council Development Control Plan 2014	PCC DCP
Penrith City Council Stormwater Drainage Specification for Building Developments 2018	PCC SDS
Penrith City Council Water Sensitive Urban Design Policy 2017	PCC WSUD Policy
Penrith City Council Water Sensitive Urban Design Technical Guidelines 2015	PCC WSUD Guidelines
Building Code of Australia 2019	BCA 2019

2 BACKGROUND AND SCOPE

EWWF have been engaged by FDC Building to undertake the concept civil engineering design to accompany a Development Application for the proposed Log Cabin Hotel at Memorial Avenue, Penrith.

The proposed development site covers Lots 20, 21 and 22, D.P. 1236215, Memorial Avenue, Penrith. With reference to the Architectural Drawings, Lot 20 remains undeveloped, while a hotel is planned for Lot 21. Lot 22 is to be converted to a car-park, servicing the hotel patrons

The scope of EWWF's concept design covers the following aspects:

- Concept Design for the proposed road upgrade of Memorial Avenue, including:
 - Design of proposed kerb and gutter adjustments, replacement, or extensions;
 - Design of proposed pavement widening or reconstruction;
 - Typical road cross sections and details, as required;
- Concept Civil Design for the proposed Hotel development on Lot 21, including:
 - Bulk Earthworks levels to suit the proposed Finished Floor Levels;
 - Concept stormwater drainage design, including On-Site Stormwater Detention (OSD), to reduce post-development flows to pre-development flows (where required);
 - Water Sensitive Urban Design (WSUD) to incorporate appropriate water quality treatments into the proposed design;
- Concept Design for the proposed car-park on Lot 22, including:
 - Car park levels and gradings;
 - Bulk Earthworks to suit the proposed grading strategy;
 - Concept stormwater drainage design, including OSD, to reduce post-development flows to pre-development flows;
 - Water Sensitive Urban Design (WSUD) to incorporate appropriate water quality treatments into the proposed design;
- Concept Erosion and Sediment Control Drawings.

EWWF's concept engineering design work has been prepared in association with the following documents:

- Architectural Drawings completed by *Team2 Architects*;
- Landscape Architectural Drawings completed by *Site Image Landscape Architects*;
- Traffic and Car Parking Drawings completed by *PTC Consultants*.

3 CONCEPT ROAD AND CAR-PARK DESIGN

3.1 MEMORIAL AVENUE UPGRADE

To service the development, it is proposed to upgrade Memorial Avenue, to accommodate for the anticipated traffic and pedestrian movements associated with the new hotel and car-park. The upgrade of Memorial Avenue is detailed in the sub-sections below.

3.1.1 EXISTING INFRASTRUCTURE

Memorial Avenue currently consists of a sealed carriageway, with a nominal width of 11.0m. The carriageway is bound by upright kerb and gutter for the length of the Western carriageway. On the Eastern carriageway, upright kerb and gutter exists for approximately 25m from the Nepean Avenue intersection. The roadway is severed from High Street to the North, with no provision for turning movements at the termination. The existing Memorial Avenue pavement is shown in Figure 2 below.

With regard to stormwater drainage, the road is crowned, with the two-way crossfall directing stormwater runoff to kerb and gutter (where present), or to the vacant land on Lot 22 to the East. A sag point exists approximately 15m from the Nepean Avenue intersection, where Penrith City Council's (PCC) stormwater drainage network conveys runoff to the East towards Peach Tree Creek. There are no pipe extensions evident along Memorial Avenue.



FIGURE 3.1 – EXISTING MEMORIAL AVENUE, LOOKING NORTH FROM NEPEAN AVENUE

As shown in figure 3.1 above, a nominal 3.0m wide concrete shared user pathway connects Nepean Avenue to the Yandhai Nepean Crossing footbridge. As part of the recent shared pathway construction, new kerb and gutter, kerb ramps and minor pavement reconstruction works have been undertaken, as evident from EFWF's site visit. A 1.5m wide concrete footpath connects the footbridge to High Street to the North.

Note, services investigation, relocation or protection, was not assessed as part of EFWF's scope at this stage of the project.

3.1.2 PROPOSED KERB AND GUTTER

To formalise Memorial Avenue, it is proposed to extend the existing upright kerb and gutter on the Eastern carriageway to provide adequate servicing, delineation, and pedestrian protection for the development. The new kerb and gutter will connect into the proposed turning head at the termination of Memorial Avenue (discussed below).

It is proposed to replace the existing vehicular layback crossing into Lot 21 with the proposed loading dock (discussed below), and minor kerb replacements either side of the dock, to provide a smooth connection to existing kerb and gutter.

To facilitate adequate compaction of pavement materials during construction, it is proposed to reconstruct a minimum of 1.0m of pavement adjacent the new lip of kerb. Note, this width has been locally increased approximately 30 – 50m from the Nepean Avenue intersection, to locally grade out an existing low point at the edge of the existing pavement.

Subsurface drainage is proposed under the new kerb and gutter (where an outlet is possible) to facilitate drainage as recommended in the Geotechnical Investigation undertaken by Geotechnique.

3.1.3 PROPOSED TURNING HEAD

As discussed in Section 3.1.1 above, the existing Memorial Avenue pavement does not allow for large vehicles to turn around safely. Hence, it is proposed to construct a turning head suitable for a 12.5m rigid vehicle to complete a 3-point turn.

The horizontal geometry and associated turning head sweep paths were provided to EFWF by PTC Consultants. For further details, refer generally to the documentation completed by PTC Consultants.

3.1.4 PROPOSED LOADING DOCK INTO LOT 21

With reference to the Architectural Drawings, the hotel is to be serviced off Memorial Avenue for deliveries, stock etc. The horizontal geometry and associated sweep paths (8.8m medium rigid vehicle) were provided to EFWF by PTC Consultants.

Kerb only is proposed for the indented loading dock for pedestrian protection and delineation. A concrete dish drain or layback gutter crossing is proposed at the connection to Memorial Avenue, to ensure adequate provision of stormwater runoff from the up-gradient kerb and gutter.

To ensure safe and compliant pedestrian movements, kerb ramps or similar AS1428 compliant treatments (to be detailed at CC stage) are proposed at the footpath loading dock crossings, to accommodate level differences between the loading dock and footpath.

3.1.5 PAVEMENT DESIGN

A geotechnical investigation report was undertaken by Geotechnique Pty Ltd, as commissioned by FDC Building. Two pavement design options were provided, flexible and rigid. To match the existing pavement construction on Memorial Avenue, flexible pavement is proposed to mirror the existing road pavement profile..

The testing and investigation concluded that a design CBR of 3% was adopted for the site. The results of the pavement thickness design are summarised in Tables 1 and 2 below. For further details, refer generally to the Geotechnical Investigation Report undertaken by Geotechnique.

DESIGN TRAFFIC LOADING (ESA)	DESIGN CBR (%)	AC10 (MM) *	BASECOURSE (MM)	SUB-BASE (MM)	TOTAL (MM)
8 X 10 ⁴	3	40	135	200	378
NOTE: ASPHALT SEALS TO BE OVER A 7MM PRIMER SEAL (IN ADDITION TO THE THICKNESS NOTED)					

TABLE 3-1 – CARPARK PAVEMENT THICKNESS DESIGN – FLEXIBLE (GEOTECHNIQUE PTY LTD)

DESIGN TRAFFIC LOADING (ESA)	DESIGN CBR (%)	CONCRETE BASE(MM)	SUB-BASE (MM)	TOTAL (MM)
1.3 X 10 ⁵	3	180	100	280

TABLE 3-2 – LOADING DOCK PAVEMENT THICKNESS DESIGN – RIGID (GEOTECHNIQUE PTY LTD)

3.1.6 PEDESTRIAN CONNECTIVITY

Pedestrian connectivity measures have been implemented generally in accordance with the Architectural and Traffic Consultant's drawings, to improve pedestrian access, safety, and connectivity to the proposed development. The following measures have been included (but are not limited to) on the concept civil design drawings:

- New concrete footpaths (min. 2.5m wide) to connect to the existing shared user pathway on the Western side of Memorial Avenue, to the pathway on the Eastern side of Memorial Avenue adjacent the Nepean Avenue intersection, and to the existing footpath on the Southern side of High Street. Note, existing paths are to be retained where possible.
- Kerb ramps (or similar AS1428 treatment) at the proposed loading dock crossing (to be detailed at the CC stage), to comply with AS1428.1 and PCC's requirements.
- AS1428.1 compliant grades to connect the proposed car-park on Lot 22 to the existing and proposed Memorial Avenue footpaths.
- A raised pedestrian crossing to comply with AS1742.10-13, to provide safe access from the proposed car-park to the development site.

For further details regarding pedestrian connectivity, including within the proposed car-park, refer generally to the documentation completed by PTC Consultants.

3.2 LOT 22 CAR-PARK

3.2.1 CAR-PARK LAYOUT

The car-park layout, including parking modules, accessible parking, and pedestrian connectivity, was supplied to EFWF by PTC Consultants. For details, including compliance with relevant standards and requirements, refer generally to the documentation completed by PTC Consultants.

3.2.2 ACCESS DRIVEWAY

As provided in the documentation by PTC Consultants, the proposed car-park is to be accessed via a single access driveway, located off Memorial/ Nepean Avenue. The proposed access driveway is to be designed generally to AS2890.1 and PCC's Driveway Specifications.

A standard vehicular crossover is to be provided at the existing kerb and gutter generally in accordance with Penrith City Council Standard Drawing SD-1004.

3.2.3 PAVEMENT DESIGN

As detailed in Section 3.1.5 above, the pavement design for the proposed car-park has been undertaken by a suitably qualified geotechnical engineer. It is proposed to utilise flexible pavement for the proposed car-park. Refer to Table 3.2 for pavement details.

4 CONCEPT BULK EARTHWORKS

4.1 PROPOSED HOTEL (LOT 21)

Concept bulk earthworks drawings have been prepared based on the Architectural Drawings. The bulk earthworks level has been adopted based on the following:

- Building Pad:
 - Finished Floor Level = R.L. 27.30 m AHD
 - Assumed structural zone = 200mm
 - Bulk earthworks level = R.L. 27.10 m AHD
- Landscaped Beer Garden:
 - It is assumed that the beer garden is to be constructed utilising typical measures such as a set-down for waterproofing, with falls for drainage as indicated on the Concept Stormwater Plan. Hence, the bulk earthworks level of R.L. 27.10 m AHD was adopted for the landscaping area to match the building pad.

Conceptual earthworks volumes (excluding an adjustments for topsoil etc.) are as follows:

- $Cut = 230 m^3$
- $Fill = 300 m^3$
- $Balance = 70 m^3$ (excess of fill over cut)

Volumes do not account for any bulking or compaction factors of the soil.

4.2 PROPOSED CAR-PARK (LOT 22)

The bulk earthworks for the proposed car-park was developed in coordination with the stormwater drainage design for the site. The car-park is graded at a nominal grade of 2.0% towards the proposed OSD storage area, located at the North-East corner of the lot. The southern portion of the site will be graded as per status quo to Memorial Avenue.

The proposed bulk earthworks level was calculated using the proposed nominal flexible pavement depth of 370mm. Concept earthworks volumes, based on a 200mm strip of topsoil across the development extents, are as follows:

- $Cut = 340 m^3$
- $Fill = 900 m^3$
- $Balance = 560 m^3$ (excess of fill over cut)

Volumes do not account for any bulking or compaction factors of the soil.

5 CONCEPT STORMWATER DRAINAGE DESIGN

The development site does not require mandatory On-Site Stormwater Detention (OSD), as it does not reside in the specific catchments nominated in Appendix D of PCC's Stormwater Drainage Specification for Building Developments.

However, preliminary desktop and site investigations have concluded that the infrastructure at the development frontages are not suitably sized to accommodate the proposed increase in runoff as a result of the development. Hence, OSD is proposed to reduce post-development flows, accommodate water quality measures, and to utilise an existing under capacity drainage system.

The following criteria has been adopted for the stormwater drainage design of the development, in accordance with PCC's Stormwater Drainage Specification for Building Developments, Table 3:

- Surface, Piped Drainage and OSD – 5% AEP;
- Overland Flow – 1% AEP.

5.1 PROPOSED HOTEL (LOT 21)

5.1.1 EXISTING DRAINAGE CHARACTERISTICS

The current development site is cleared, with a mixture of grassed and impervious surfaces. The contours of the land are crowned approximately at the midpoint of the site (falls of nominal 3%), hence, the existing internal stormwater catchment from Lot 21 has two discharge points (figure 5.1):

- Memorial Avenue via overland flow;
- Nepean River via overland flow. Note, this includes the existing steep embankment to the West of the site.

Based on documentation received from PCC, the site is flood affected to an R.L. of 26.40 m AHD in the 1% AEP event.

5.1.2 HYDROLOGICAL ANALYSIS

The computer program DRAINS was selected to develop the hydrological model for this project. DRAINS, developed by Watercom, is a program for urban stormwater drainage system design and analysis, and is used extensively by professional engineers in Australia for both hydrological and hydraulic modelling. Additionally, DRAINS is Penrith City Council's preferred computer model (Section 3.2 of PCC's Stormwater Drainage Specification for Building Developments).

An ILSAX Model was developed in accordance with the DRAINS Manual (Watercom, 2017) and importantly, the ARR 2019 guidelines.

The parameters used for the hydrological model are summarised in Table 5.1 below.

Parameter	Value
Paved (impervious) area depression storage (mm)	1
Supplementary area depression storage (mm)	3
Grassed (pervious) area depression storage (mm)	5
Soil Type (1 to 4)	3
Overland Flow Equation	Kinematic Wave

TABLE 5-1 – DRAINS MODEL PARAMETERS

5.1.3 STORMWATER DRAINAGE STRATEGY

The proposed stormwater drainage strategy is to match existing stormwater flow characteristics, through discharge points into both Memorial Avenue and the Nepean River. However, the site is relatively sensitive with regard to stormwater drainage, due to the insufficient conveyance capacity of the existing Council drainage system on Memorial Avenue, and the steep embankment to the West of the site adjacent the Nepean River.

5.1.3.1 MEMORIAL AVENUE DISCHARGE

Therefore, it is proposed to collect the hotel roof stormwater (designed generally in accordance with AS3500.3 at CC stage) and distribute the runoff between Memorial Avenue and the Nepean River. As the Memorial Avenue stormwater drainage system is sized for the 5ARI storm event (Figure 43.1 – Stormwater Capacity, Peach Tree and Lower Surveyors Creek Flood Study), and there is no underground pipe network at the development frontage, the discharge quantity to Memorial Avenue is to be restricted in order to comply with PCC’s Stormwater discharge requirements. This is achieved by extending the stormwater network from the intersection between Nepean Avenue and Memorial Avenue and the provision of OSD to restrict flows to meet the capacity requirements of the existing network.

OSD will be provided to restrict the site flows to that of the existing for each storm event up until the 5% AEP. The DRAINS model was utilised to simulate the storm events and size up the site’s storage requirement – refer to Table 5-2 for summary of the results. Tailwater conditions have been set as per PCC SDS.

AEP Storm Event (%)	Total Pre-Development Discharge (m³/s)	Post-Development Discharge (OSD) (m³/s)	Post-Development Discharge bypassing OSD (m³/s)	Total Post Development Discharge (m³/s)
0.2EY (5 ARI)	0.060	0.026	0.033	0.059
10	0.079	0.030	0.039	0.069
5	0.099	0.040	0.046	0.086

TABLE 5-2 – SITE DISCHARGE SUMMARY – LOT 21

5.1.3.2 NEPEAN RIVER DISCHARGE

The Nepean River outlet is primarily the discharge of the undeveloped portion of the site in addition to overland flow from the remainder of the site in storm events greater than the 5% AEP.

Note, the existing steep embankment to the West of the site is to be retained. No work is proposed, except for landscaping / revegetation works. Therefore, stormwater flows will be consistent in this area for both pre/ post-development conditions.

Hence, the proposed stormwater runoff from the development site to the Nepean River will not significantly alter the existing flow characteristics of the Nepean River catchment.

For further details, including catchment plan, typical OSD sections and details, refer generally to the Concept Stormwater Drainage Drawings. A copy of the DRAINS model setup and results are affixed to this report in Appendix A.

5.2 PROPOSED CAR-PARK (LOT 22)

Similarly to Lot 21, the site does not require mandatory On-Site Stormwater Detention (OSD), as it does not reside in the specific catchments nominated by Penrith City Council in Appendix D of PCC's Stormwater Drainage Specification for Building Developments.

However, like Lot 21, the adjacent drainage infrastructure is not suitably sized to accommodate the proposed increase in runoff as a result of the development. Hence, OSD is proposed to reduce post-development flows, in order to utilise an existing under capacity drainage system.

5.2.1 EXISTING DRAINAGE CHARACTERISTICS

The current development site is generally cleared and consists predominantly of grassed, pervious surfaces. The contours of the land fall from West to East at approximately 2%. The existing internal stormwater catchment from Lot 22 has two discharge points:

- Nepean/Memorial Avenue via overland flow;
- High Street via the existing stormwater inlet pit.

Based on documentation received from PCC, the site is flood affected to an R.L. of 25.80 m AHD in the 1% AEP event.

5.2.2 STORMWATER DRAINAGE STRATEGY

The proposed stormwater drainage strategy is to match existing stormwater flow characteristics, through discharge points above.

Majority of the Lot 22 carpark will be collected by the proposed below ground stormwater system, designed to cater for the 5% AEP, and discharge runoff into the proposed OSD storage basin, located outside the carpark footprint in the landscaped zone. Overflows from the pipe network will be contained within the pavement aisles and will also be directed to the OSD storage basin.

The remainder of the carpark will be collected via a proposed below ground stormwater system, designed to cater for the 5% AEP, and discharge to the kerb inlet pit in Memorial Avenue. Overflows from the pipe network will be contained within the pavement aisles and will also be directed to this point.

The DRAINS model was utilised to simulate the storm events and size up the site's storage requirement – refer to Table 5-3 for summary of the results. Tailwater conditions have been modelled.

AEP Storm Event (%)	Total Pre-Development Discharge (m ³ /s)	Post-Development Discharge (High Street) (m ³ /s)	Post-Development Discharge (Memorial Avenue) (m ³ /s)	Total Post Development Discharge (m ³ /s)
0.2EY (5 ARI)	0.067	0.042	0.025	0.067
10	0.103	0.044	0.030	0.074
5	0.147	0.046	0.035	0.081

TABLE 5-3 – DISCHARGE SUMMARY – LOT 22

Areas outside the car-park footprint will generally be similarly directed to these discharge points. These areas include proposed landscaped batters, and the existing open channel / buffer zone to the East of the site.

For further details, including catchment plan, typical OSD sections and details, refer generally to the Concept Stormwater Drainage Drawings.

6 CONCEPT WATER SENSITIVE URBAN DESIGN (WSUD) STRATEGY

The proposed development, summarised in Chapter 1 above, is required to meet the requirements outlined in Penrith City Council's WSUD Technical Guidelines, in order to Satisfy PCC's Development Control Plan 2014. The proposed WSUD strategy is detailed below.

6.1 WSUD OBJECTIVES

The key water management objectives for the development include:

- To protect and enhance natural water systems such as creeks and rivers in the Penrith LGA
- To treat urban stormwater to meet water quality objectives for reuse and/or discharge to receiving waters
- To match the natural water runoff regime as closely as possible (where appropriate)
- To reduce potable water demand through water efficient fittings and appliances, rainwater harvesting and water reuse
- To minimise wastewater generation and treatment of wastewater to a standard suitable for effluent reuse opportunities
- To integrate stormwater management into the landscape so as to maximise the visual and recreational amenity of urban development
- To provide objectives and controls for specific WSUD elements including water conservation, stormwater quality and waterway stability management

6.1.1 WATER CONSERVATION

Water usage reduction is to be achieved throughout the development through the use of a minimum of AAA rated water fixtures. For further details, including BASIX requirements, refer generally to the Architectural Drawings.

6.1.2 STORMWATER QUALITY

To ensure the quality of stormwater leaving the site meets Council's requirements, specific water quality treatment measures are to be employed. These treatment measures collect and treat stormwater runoff prior to discharge into Council's piped drainage infrastructure or receiving watercourses. The treatment measures comprise of a first-flush for roof water, proprietary Ocean Protect *Ocean Guard* Filter baskets for pits, and *Stormfilter Cartridges* located in the OSD tank for Lot 21 and a precast tank supplied by the manufacturer for Lot 22. The combination of these measures, provides a treatment train for stormwater runoff.

Modelling of the proposed treatment measures has been undertaken using the MUSIC software. The modelling inputs have been based on the pre-loaded Penrith City Council nodes using the MUSIC-link program. The modelling results of the proposed treatment train are detailed in Figure 6.1.

FIGURE 6.1 –MUSIC MODEL SETUP

Therefore, the proposed treatment train satisfies PCC's Water Quality Criteria, as demonstrated in Table 6.1:

Pollutant	Sources	Residual Load	% Reduction	Reduction Required to PCC DCP
Total Suspended Solids (kg/yr)	244	23.7	90.3	85
Total Phosphorus (kg/yr)	0.395	0.1388	65	60
Total Nitrogen (kg/yr)	2.96	1.6	46.1	45
Gross Pollutants (kg/yr)	38.9	0	100	90

TABLE 6-1 – WSUD CRITERIA SUMMARY – LOT 21

Pollutant	Sources	Residual Load	% Reduction	Reduction Required to PCC DCP
Total Suspended Solids (kg/yr)	1150	89.7	92.2	85
Total Phosphorus (kg/yr)	1.89	0.595	68.6	60
Total Nitrogen (kg/yr)	8.15	4.39	46.1	45
Gross Pollutants (kg/yr)	107	0	100	90

TABLE 6-2 – WSUD CRITERIA SUMMARY – LOT 22

6.1.3 STORMWATER QUANTITY

The proposed development does not require the implementation of on-site detention (OSD) as the site is not within an OSD zone as required by PCC Engineering Guide for Development. However, in order to minimise the impact on downstream drainage infrastructure, OSD has been provided to reduce the peak post-development flows to pre-development values.

Stormwater quantity objectives are summarised in Chapter 5 above.

6.1.4 MAINTENANCE

To ensure the continued efficient and correct operation of the proposed integrated water management infrastructure, a maintenance and monitoring schedule is required. The operation of the proposed system requires minimal maintenance. However regular inspections (i.e. every 3 months and following each rain event) should be undertaken to confirm that pits and pipes are not blocked and any debris contained within the pits is to be removed. The WSUD/OSD tank should also be checked after each rain event to confirm the filters are not blocked are working as intended.

Swales and outlets are to be kept vegetated and any debris within the swales removed to prevent the diversion of flows.

The maintenance schedule will be further developed in the detailed design phase and to be implemented upon commissioning of the water management infrastructure and remain in place for the

life of the development; with all records kept on site for inspection should the approval authority deem it necessary.

6.1.5 WSUD CHECKLIST

In accordance with PCC's WSUD Technical Guidelines, the following checklist has been completed.

Table 7 – WSUD Checklist

Water Sensitive Urban Design Development Application Checklist				
Project Name	Penrith Pub (Log Cabin), Memorial Ave Penrith			
Lot and DP	Lota 20, 21 & 22 DP 1236215	DA Number	TBA	
Information Required for DA Submission			Y	N
1	Has a Water Sensitive Urban Design Strategy been submitted as part of the development application?		Y	
2	Is a BASIX Certificate required? If so, Yes - Attach certificate with DA			N
3	<p>Has the digital version of MUSIC and report on the MUSIC model using data prescribed outlined in Council's Technical Guideline been attached?</p> <p>Have stormwater quality retention criteria (TSS 85%, TP 60%, and TN 45%) and water quantity / drainage requirements been met and documented in the WSUD Strategy?</p> <p>If relevant, have the Water Conservation, Quantity and quantity targets been achieved?</p>			
4	<p>Does WSUD Strategy contain the following information?</p> <ul style="list-style-type: none"> • Review of the WSUD principles and ensure that these are considered throughout development of the WSUD strategy. • Confirmation of the WSUD objectives that are relevant to the development application. • Confirmation of the WSUD targets for potable water conservation, stormwater quality management and stormwater quantity management that are relevant to the development application. • Complete a site analysis to evaluate the site characteristics that potentially will impact on the feasibility of WSUD for the site. • WSUD measures that would be appropriate for the development considering the development scale, site characteristics, stormwater quality management function and stormwater quantity management function. • A preliminary WSUD strategy that positions the selected WSUD measures in appropriate locations and arranges the measures in an appropriate series. • Numerical modelling utilising MUSIC software to evaluate appropriate sizes of the WSUD measures. • Concept designs of the WSUD measures. • WSUD strategy report that summarises the methodology and WSUD outcomes, and provide this with the development application for the site. 		Y	

5	Have the conceptual plans of the proposed stormwater treatment measures been included on the plans? (Detailed engineering plans will be required for the construction certificate)	Y	
6	<p>Has a Draft Operation and Maintenance Plan which includes details on the following been provided?</p> <ul style="list-style-type: none"> • Site description (area, imperviousness, land use, annual rainfall, topography etc) • Site access description • Likely pollutant types, sources and estimated loads • Locations, types and descriptions of measures proposed • Operation and maintenance responsibility (council, developer or owner) • Inspection methods • Maintenance methods (frequency, equipment and personnel requirements including Work Health and Safety requirements) • Landscape and weed control requirements • Operation and maintenance costs • Waste management and disposal options, and Reporting. 	Y	

7 CONCEPT EROSION AND SEDIMENTATION CONTROL

Concept erosion and sedimentation drawings have been prepared generally to the Blue Book (Landcom's Managing Urban Stormwater), and Penrith City Council's Development Control Plan and Engineering Requirements.

With reference to the Concept Erosion and Sediment Control Drawings, measures specified included, but are not limited to:

- Stabilised site access onto each proposed development site.
- Barrier fencing to restrict access into the sites to via the proposed stabilised site accesses.
- Sediment fence on downslopes from proposed disturbed areas.
- Diversion channels, where practical, to divert clean water around the development site.
- Indicative locations of topsoil stockpiles.
- Existing and proposed stormwater pit protection measures, such as sandbags.

A soil loss analysis was undertaken on each disturbed catchment. The analysis (RUSLE to Managing Urban Stormwater), concluded that the construction of sediment basins was not required for the development. Refer to the Concept Erosion and Sediment Control Drawings for details on the calculations.

8 CONCLUSION

This report provides supplementary and supporting information to accompany the concept civil design drawings prepared for the proposed Log Cabin development, in order to demonstrate compliance with Penrith City Council's Development Control Plan and Engineering Requirements.

The proposed development site is located on Memorial Avenue, approximately 1km North-West of the Penrith Central Business District (CBD) and primarily involves the construction of a Hotel and associated car-park.

The civil components of the project include;

- The extension of Memorial Avenue and construction of a vehicular turning area,
- Installation of kerb & gutter and pedestrian connectivity,
- Stormwater management strategy comprising of:
 - Stormwater drainage lines,
 - Construction of OSD tank/basin,
 - Water Sensitive Urban Design elements and,
 - Erosion and sediment control methodology,

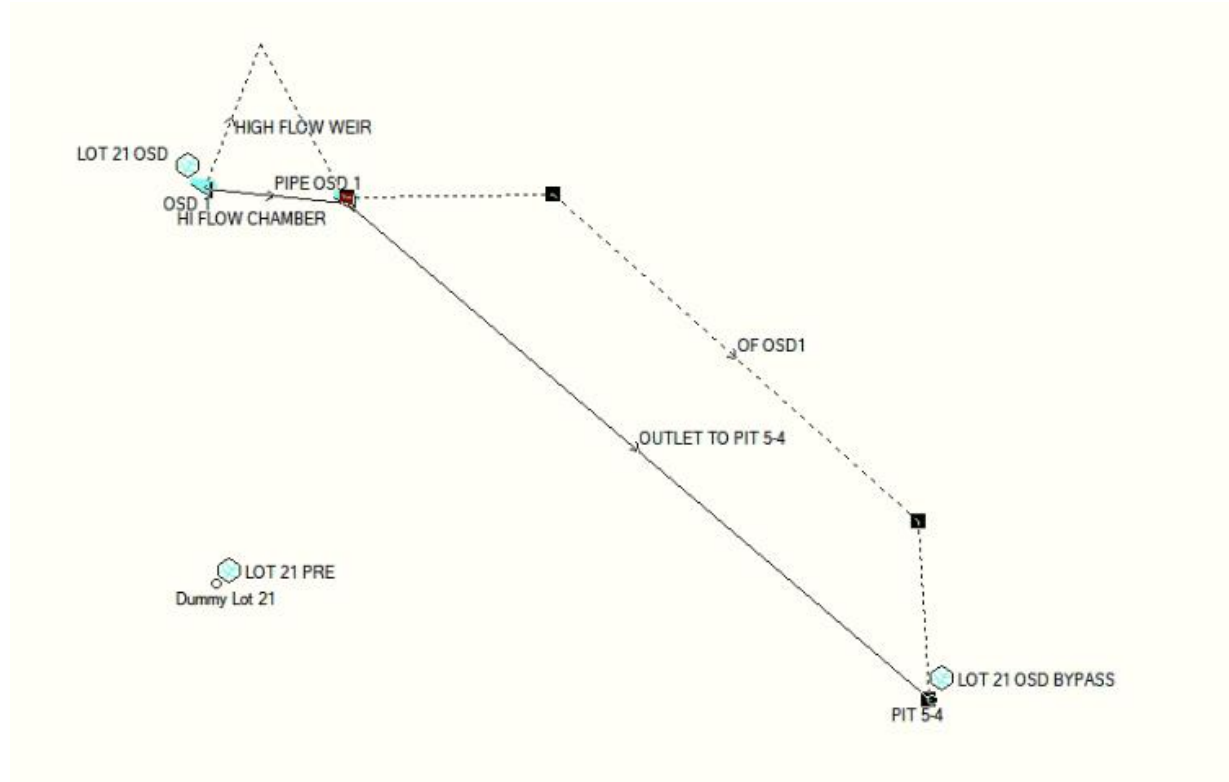
Based on this report and the associated civil design drawings, it is demonstrated that the civil engineering elements of the project achieves compliance with Penrith City Council's Development Control Plan and Engineering Requirements.

It is also demonstrated, via the MUSIC modelling results and WSUD elements, that the principles of WSUD management have been incorporated into the design and operation for the proposed development in accordance with PCC WSUD policy and guidelines.

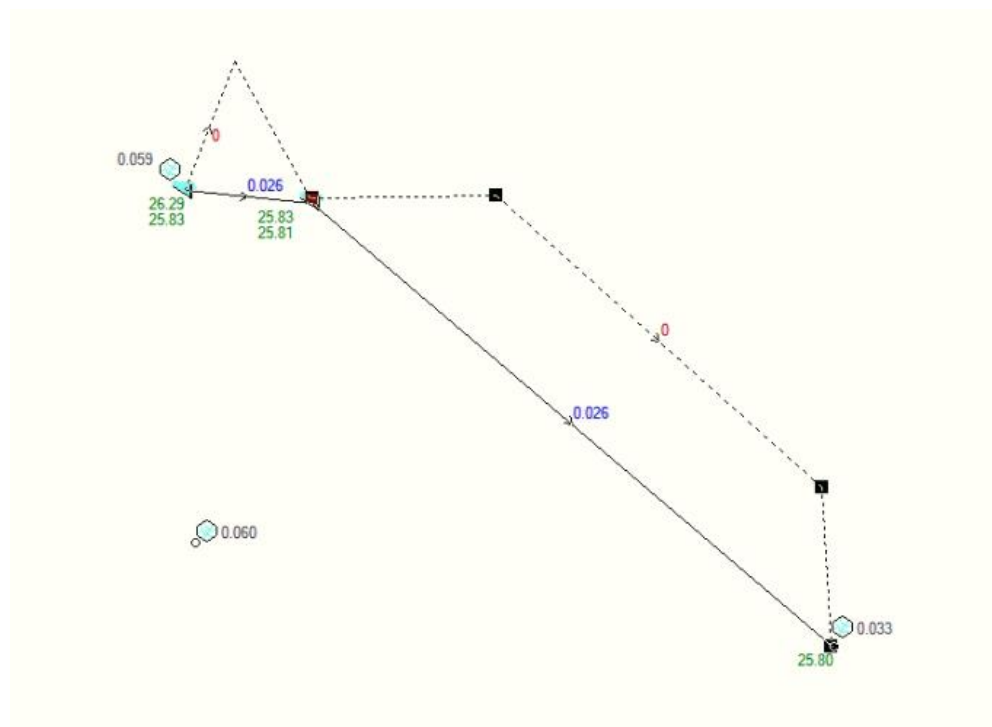
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APPENDIX A – DRAINS MODEL

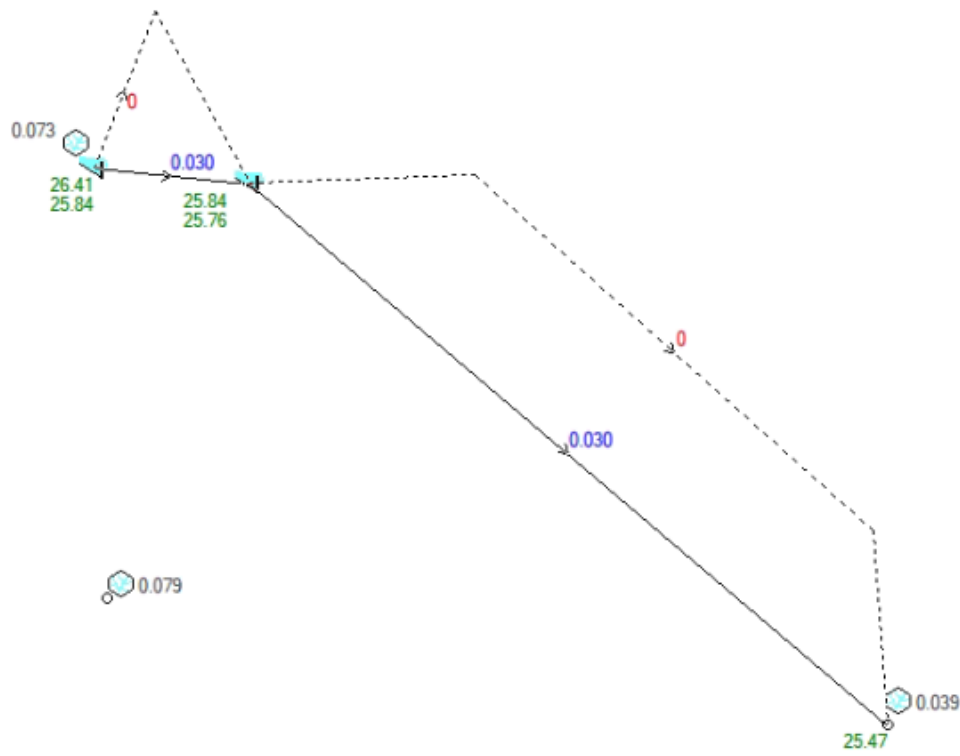
Lot 21 - Setup



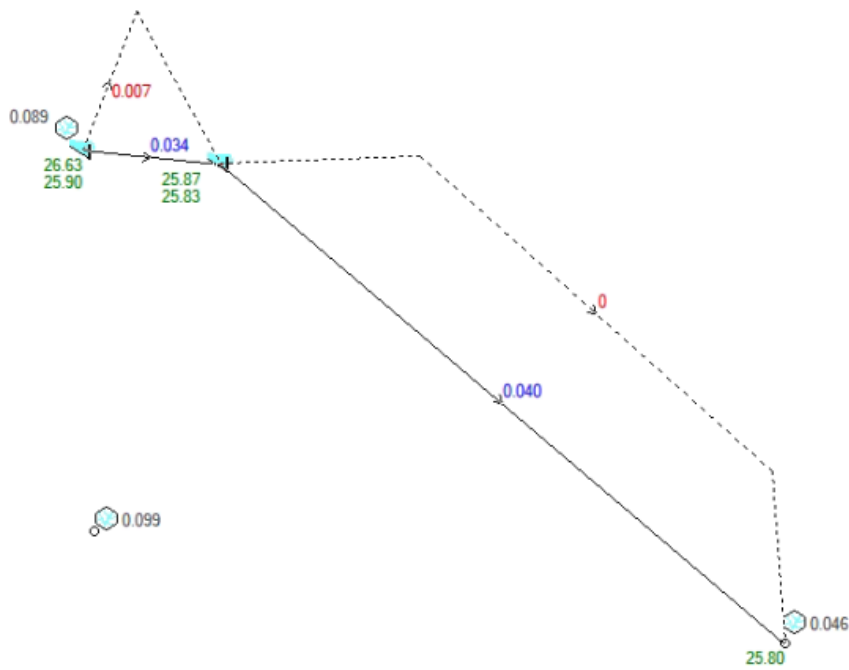
Lot 21 – 0.2EY% AEP



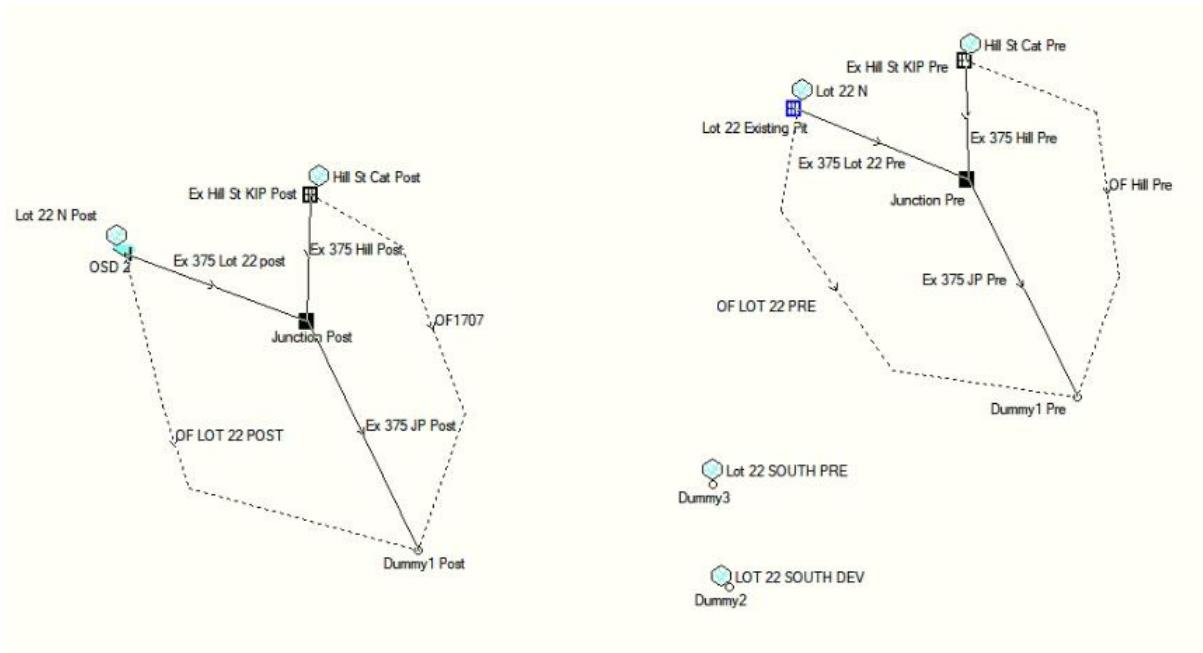
Lot 21 – 10% AEP



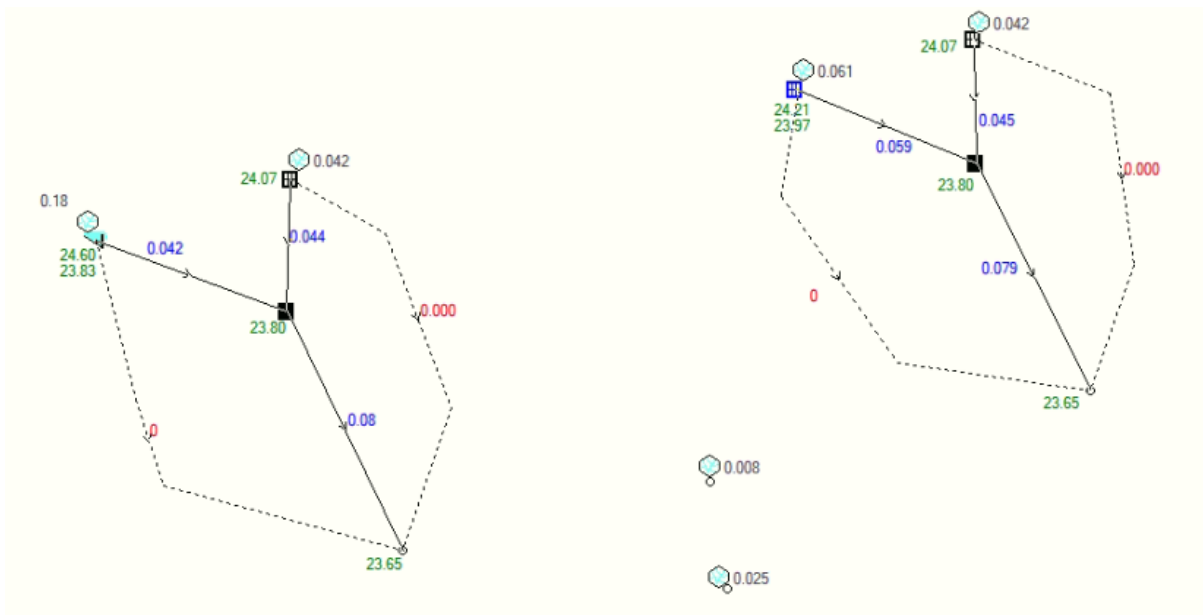
Lot 21 – 5% AEP



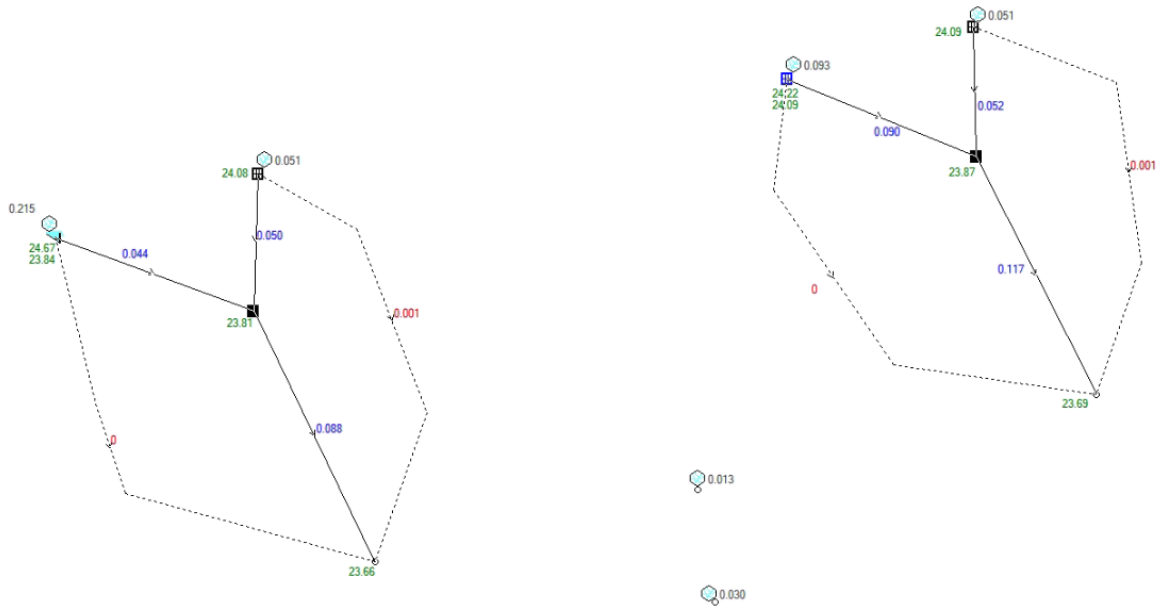
Lot 22 – Setup



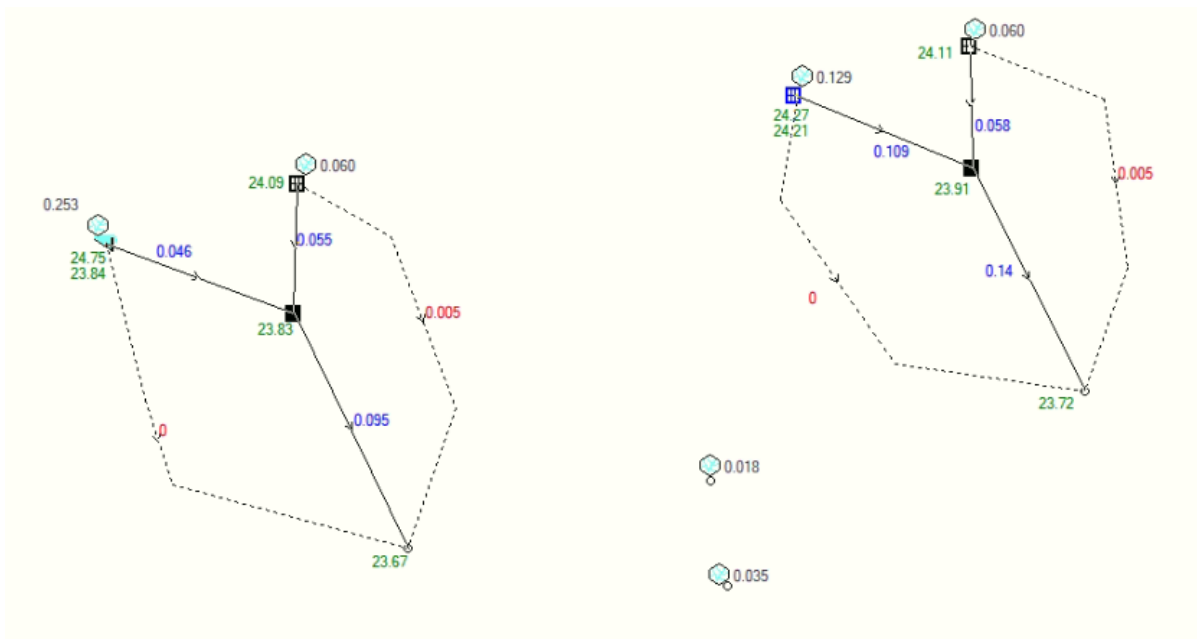
Lot 22 – 0.2EY% AEP



Lot 22- 10% AEP



Lot 22 – 5% AEP



PIT / NODE DETAILS

Version 15																		
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	
Dummy3	Node					24.4			0	1056.944	-260.417	2372		No				
Dummy2	Node								0	1063.194	-299.306	2381		No				
Junction Post	OnGrade	Junction Pit or Manhol			1.5	24.8			0	0	902.083	-197.917	Yes	3703174	1 x Ku	No	New	
Dummy1 Post	Node					24.4			0		944.444	-285.417		3703180		No		
Lot 22 Existing Pit	Sag	Surface Inlet		110	5.9	24.16	0.4		0	0	1088	-117	No	13105	1 x Ku	No	New	No
Junction Pre	OnGrade	Junction Pit or Manhol			1.5	24.8			0	0	1154	-144	Yes	13107	1 x Ku	No	New	
Dummy1 Pre	Node					24.4			0		1196	-227		11		No		
Ex Hill St KIP Pre	OnGrade	NSW RTA PSA2			5.9	24.3			0	0	1153	-99	No	13110	1 x Ku	No	New	No
Ex Hill St KIP Post	OnGrade	NSW RTA PSA2			5.9	24.3			0	0	903.472	-150	No	3703182	1 x Ku	No	New	No
Dummy Lot 21	Node								0		602.471	-261.982		6866216		No		
PIT 5-4	Node					25.8			0		656.944	-270.833		6866231		No		

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
OSD 2	23.7	1		Orifice		151	23.85			832.925	-172.238	No			2382
	24.15	1													
	24.25	56													
	24.35	196													
	24.5	280													
	24.75	493													
OSD 1	25.65	1		Orifice		136	25.85			601.521	-231.871	Yes	26.25	3	6866219
	25.85	1													
	25.95	36													
	26.8	36													
	26.801	5													
	27	5													
HI FLOW CHAMBER	27.5	100													
	25.65	2		Culvert	0.5					612.425	-232.962	No			10816417
	27	2													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area (%)	Grass Area (%)	Supp Area (%)	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope (%)	Supp Slope (%)	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	
Lot 22 SOUTH PRE	Dummy3	0.1036	0	100	0	0	0	0	0	-1	90	-1	-1	1.8	-1	-1	0.2	-1	0
LOT 22 SOUTH DEV	Dummy2	0.1036	63.5	36.5	0	0	0	0	0	90	91	-1	2	1.8	-1	0.015	0.2	-1	0
Lot 22 N Post	OSD 2	0.6457	75.5	24.5	0	0	0	0	0	76	88	-1	2	2	-1	0.015	0.18	-1	0
Lot 22 N	Lot 22 Existing	0.6457	0	100	0	0	0	0	0	-1	88	-1	-1	2.3	-1	-1	0.18	-1	0
Hill St Cat Pre	Ex Hill St KIP Pre	0.13	100	0	0	0	5	7	2										0
Hill St Cat Post	Ex Hill St KIP Post	0.13	100	0	0	0	5	7	2										0
LOT 21 PRE	Dummy Lot 2	0.3412	6	69	25	0	0	0	0	16	40	40	1.5	3	1.5	0.013	0.17	0.06	0
LOT 21 OSD	OSD 1	0.2302	40	47	13	6	5	5	5										0
LOT 21 OSD BYPASS	PIT 5-4	0.1111	87	13	0	6	7	2	2										0

PIPE DETAILS

Name	From	To	Length	U/S IL	D/S IL	Slope	Type	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg	RI	Chg	RL
------	------	----	--------	--------	--------	-------	------	-----	------	-------	---------	-----------	----------	--------	-----	----	-----	----

			(m)	(m)	(m)	(%)	(mm)	(mm)				(m)	(m)	(m)	(m)
Ex 375 Lot 22 post	OSD 2	Junction Pc	13.5	23.705	23.57		1 Concrete, r	375	375	0.013 NewFixed	1 OSD 2	0			
Ex 375 JP Post	Junction Post Dummy1 P		10	23.57	23.47		1 Concrete, r	375	375	0.013 New	1 Junction Pc	0			
Ex 375 Lot 22 Pre	Lot 22 Existin Junction Pr		13.5	23.705	23.57		1 Concrete, r	375	375	0.013 New	1 Lot 22 Exist	0			
Ex 375 JP Pre	Junction Pre Dummy1 P		10	23.57	23.47		1 Concrete, r	375	375	0.013 New	1 Junction Pr	0			
Ex 375 Hill Pre	Ex Hill St KIP Junction Pr		7	23.89	23.69	2.86	Concrete, r	375	375	0.013 New	1 Ex Hill St KI	0			
Ex 375 Hill Post	Ex Hill St KIP Junction Pc		7	23.89	23.69	2.86	Concrete, r	375	375	0.013 New	1 Ex Hill St KI	0			
PIPE OSD 1	OSD 1	HI FLOW CI	1	25.7	25.69		1 uPVC, unde	225	242	0.012 NewFixed	1 OSD 1	0			
OUTLET TO PIT 5-4	HI FLOW CHA PIT 5-4		30	25.65	25.365	0.95	Concrete, u	375	375	0.013 NewFixed	1 HI FLOW CI	0			

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg	Bottom	Height of S Chg	Bottom	Height of S Chg	Bottom	Height of S etc
	(m)	Elev (m)	(m) (m)	Elev (m)	(m) (m)	Elev (m)	(m) etc

CHANNEL DETAILS

Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Width	L.B. Slope	R.B. Slope	Manning	Depth	Roofed
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)	

OVERFLOW ROUTE DETAILS

Name	From	To	Travel	Spill	Crest	Weir	Cross	Safe Depth	SafeDepth	Safe	Bed	D/S Area	id	
			Time	Level	Length	Coeff. C	Section	Major Stori	Minor Stor	DxV	Slope	Contributing		
			(min)	(m)	(m)			(m)	(m)	(sq.m/sec)	(%)	%		
OF LOT 22 POST	OSD 2	Dummy1 P	0.1	24.75	15	1.84	Dummy1	0.3	0.3	0.4	2	0	1102941	10
OF LOT 22 PRE	Lot 22 Existin Dummy1 P		0.2				Dummy1	0.3	0.3	0.4	1	0	30032114	20
OF Hill Pre	Ex Hill St KIP Dummy1 P		0.1				10 m roadv	0.3	0.15	0.6	2	0	3703190	20
OF1707	Ex Hill St KIP Dummy1 P		0.1				10 m roadv	0.3	0.15	0.6	2	0	3703186	20
HIGH FLOW WEIR	OSD 1	HI FLOW CI	0.1	26.6	2	1.64	Dummy1	0.3	0.3	0.4	1	0	10816419	1
OF OSD1	HI FLOW CHA PIT 5-4		0.2	27.2	4	1.64	4 m wide p	0.3	0.15	0.4	1	0	31645338	30

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)
Ex 375 Lot 22 post	Concrete, noi	375	0.45	0.54
Ex 375 JP Post	Concrete, noi	375	0.45	0.52
Ex 375 Lot 22 Pre	Concrete, noi	375	0.45	0.05 Unsafe
Ex 375 JP Pre	Concrete, noi	375	0.45	0.52
Ex 375 Hill Pre	Concrete, noi	375	0.45	0 Unsafe
Ex 375 Hill Post	Concrete, noi	375	0.45	0 Unsafe
PIPE OSD 1	uPVC, under	242	0.5	-0.29 Unsafe
OUTLET TO PIT 5-4	Concrete, uni	375	0.6	-0.41 Unsafe

This model has no pipes with non-return valves

DRAINS results prepared from Version 2019.09

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surf Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Junction Pc	23.8		0		1		None
Dummy1 P	23.65		0.002				
Lot 22 Exist	23.97	24.21	0.064	5.8	0.19		0 Inlet Capacity
Junction Pr	23.8		0		1		None
Dummy1 P	23.65		0.002				
Ex Hill St Kl	24.07		0.053		0.23		0 Inlet Capacity
Ex Hill St Kl	24.07		0.053		0.23		0 Inlet Capacity
PIT 5-4	25.8		0.038				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Lot 22 SOU	0.008	0	0.008	0	24.59		0 0.2EY AEP, 25 min burst, Storm 1
LOT 22 SOL	0.025	0.024	0.001	3.84	18.87		0 0.2EY AEP, 5 min burst, Storm 1
Lot 22 N Pc	0.18	0.176	0.005	3.47	16.82		0 0.2EY AEP, 5 min burst, Storm 1
Lot 22 N	0.061	0	0.061	0	21.16		0 0.2EY AEP, 25 min burst, Storm 7
Hill St Cat F	0.042	0.042	0	5	7		2 0.2EY AEP, 5 min burst, Storm 1
Hill St Cat F	0.042	0.042	0	5	7		2 0.2EY AEP, 5 min burst, Storm 1
LOT 21 PRE	0.06	0.007	0.055	1.59	10.49	6.91	0.2EY AEP, 15 min burst, Storm 9
LOT 21 OSE	0.059	0.027	0.032	6	5		5 0.2EY AEP, 10 min burst, Storm 8
LOT 21 OSE	0.033	0.03	0.003	6	7		2 0.2EY AEP, 10 min burst, Storm 10

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex 375 Lot	0.042	0.6	24.338	23.798	0.2EY AEP, 30 min burst, Storm 1
Ex 375 JP P	0.08	1.55	23.776	23.648	0.2EY AEP, 10 min burst, Storm 10
Ex 375 Lot	0.059	1.16	23.881	23.795	0.2EY AEP, 30 min burst, Storm 9
Ex 375 JP P	0.079	1.55	23.775	23.646	0.2EY AEP, 25 min burst, Storm 5
Ex 375 Hill	0.045	1.77	24.075	23.795	0.2EY AEP, 5 min burst, Storm 1
Ex 375 Hill	0.044	1.69	24.072	23.798	0.2EY AEP, 5 min burst, Storm 1
PIPE OSD 1	0.026	1	25.914	25.825	0.2EY AEP, 10 min burst, Storm 8
OUTLET TO	0.026	0.52	25.825	25.8	0.2EY AEP, 10 min burst, Storm 8

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF LOT 22	0	0	2.975	0	0	0	0	0
OF LOT 22	0	0	2.953	0	0	0	0	0

OF Hill Pre	0	0	0.37	0	0	0	0
OF1707	0	0	0.37	0	0	0	0
HIGH FLOW	0	0	2.953	0	0	0	0
OF OSD1	0	0	0.908	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD 2	24.6	80.1	0.042	0.042	0
OSD 1	26.26	12.7	0.026	0.026	0
HI FLOW CI	25.83	0.4	0.026	0.026	0

Run Log for 21863_Log Cabin_DA_ Rev 2.drn run at 21:33:39 on 21/4/2020

No water upwelling from any pit. Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

These overflow routes carried water uphill (adding energy): OF Hill Pre, OF1707. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to refo

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DRAINS results prepared from Version 2019.09

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surf Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Junction Pc	23.81		0		0.99		None
Dummy1 P	23.66		0.007				
Lot 22 Exist	24.09	24.22	0.093	7.4	0.07		0 Inlet Capacity
Junction Pr	23.87		0		0.93		None
Dummy1 P	23.69		0.007				
Ex Hill St Kl	24.09		0.064		0.21	0.001	Inlet Capacity
Ex Hill St Kl	24.08		0.064		0.22	0.001	Inlet Capacity
PIT 5-4	25.47		0.047				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Lot 22 SOU	0.013	0	0.013	0	23		0 10% AEP, 25 min burst, Storm 5
LOT 22 SOL	0.03	0.028	0.002	3.6	17.69		0 10% AEP, 5 min burst, Storm 1
Lot 22 N Pc	0.215	0.206	0.008	3.25	15.77		0 10% AEP, 5 min burst, Storm 1
Lot 22 N	0.093	0	0.093	0	19.79		0 10% AEP, 25 min burst, Storm 10
Hill St Cat F	0.051	0.051	0	5	7		2 10% AEP, 5 min burst, Storm 1
Hill St Cat F	0.051	0.051	0	5	7		2 10% AEP, 5 min burst, Storm 1
LOT 21 PRE	0.079	0.007	0.075	1.49	9.81	6.46	10% AEP, 15 min burst, Storm 6
LOT 21 OSE	0.073	0.031	0.041	6	5	5	10% AEP, 15 min burst, Storm 5
LOT 21 OSE	0.039	0.035	0.004	6	7	2	10% AEP, 15 min burst, Storm 9

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex 375 Lot	0.044	0.58	24.395	23.813	10% AEP, 30 min burst, Storm 6
Ex 375 JP P	0.088	1.59	23.787	23.659	10% AEP, 15 min burst, Storm 5
Ex 375 Lot	0.09	1.35	23.924	23.866	10% AEP, 25 min burst, Storm 8
Ex 375 JP P	0.117	1.7	23.82	23.694	10% AEP, 20 min burst, Storm 10
Ex 375 Hill	0.052	1.11	24.056	23.866	10% AEP, 5 min burst, Storm 1
Ex 375 Hill	0.05	1.57	24.052	23.813	10% AEP, 5 min burst, Storm 1
PIPE OSD 1	0.03	1.02	25.946	25.836	10% AEP, 20 min burst, Storm 2
OUTLET TO	0.03	1.16	25.836	25.471	10% AEP, 20 min burst, Storm 2

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF LOT 22	0	0	2.975	0	0	0	0	0
OF LOT 22	0	0	2.953	0	0	0	0	0

OF Hill Pre	0.001	0.001	2.383	0.021	0.01	0.24	0.46	10% AEP, 5 min burst, Storm 1
OF1707	0.001	0.001	2.383	0.021	0.01	0.24	0.46	10% AEP, 5 min burst, Storm 1
HIGH FLOW	0	0	2.953	0	0	0	0	
OF OSD1	0	0	1.479	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q		
			Total	Low Level	High Level
OSD 2	24.67	110	0.044	0.044	0
OSD 1	26.41	18.2	0.03	0.03	0
HI FLOW CI	25.84	0.4	0.03	0.03	0

Run Log for 21863_Log Cabin_DA_ Rev 2.drn run at 11:23:25 on 23/4/2020

No water upwelling from any pit.

Freeboard was less than 0.15m at Lot 22 Existing Pit

Flows were safe in all overflow routes.

These overflow routes carried water uphill (adding energy): OF Hill Pre, OF1707. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to refo

IGNORE THESE WARNINGS AT YOUR OWN PERIL.\cf1

DRAINS results prepared from Version 2019.09

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surf Flow (cu.m/s)	Max Pond Volume (cu.m)			
Junction Post	23.83		0		0.97		None
Dummy1 Post	23.67		0.013				
Lot 22 Existing Pit	24.21	24.27	0.131	18.2	0		0 Outlet System
Junction Pre	23.91		0		0.89		None
Dummy1 Pre	23.72		0.013				
Ex Hill St KIP Pre	24.11		0.075		0.19	0.005	Inlet Capacity
Ex Hill St KIP Post	24.09		0.075		0.21	0.005	Inlet Capacity
PIT 5-4	25.8		0.055				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Lot 22 SOUTH PRE	0.018	0	0.018	0	21.6		0 5% AEP, 25 min burst, Storm 2
LOT 22 SOUTH DEV	0.035	0.032	0.003	3.38	16.64		0 5% AEP, 5 min burst, Storm 1
Lot 22 N Post	0.253	0.241	0.013	3.06	14.83		0 5% AEP, 5 min burst, Storm 1
Lot 22 N	0.129	0	0.129	0	18.58		0 5% AEP, 25 min burst, Storm 6
Hill St Cat Pre	0.06	0.06	0	5	7		2 5% AEP, 5 min burst, Storm 1
Hill St Cat Post	0.06	0.06	0	5	7		2 5% AEP, 5 min burst, Storm 1
LOT 21 PRE	0.099	0.009	0.094	1.4	9.21	6.07	5% AEP, 15 min burst, Storm 6
LOT 21 OSD	0.089	0.044	0.047	6	5		5 5% AEP, 15 min burst, Storm 3
LOT 21 OSD BYPASS	0.046	0.041	0.005	6	7		2 5% AEP, 15 min burst, Storm 9

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex 375 Lot 22 post	0.046	0.58	24.45	23.826	5% AEP, 30 min burst, Storm 3
Ex 375 JP Post	0.095	1.62	23.795	23.667	5% AEP, 15 min burst, Storm 5
Ex 375 Lot 22 Pre	0.109	1.37	23.959	23.915	5% AEP, 20 min burst, Storm 8
Ex 375 JP Pre	0.14	1.75	23.844	23.724	5% AEP, 20 min burst, Storm 10
Ex 375 Hill Pre	0.058	1.15	24.065	23.915	5% AEP, 5 min burst, Storm 1
Ex 375 Hill Post	0.055	1.52	24.06	23.826	5% AEP, 5 min burst, Storm 1
PIPE OSD 1	0.034	0.94	26.016	25.869	5% AEP, 20 min burst, Storm 8
OUTLET TO PIT 5-4	0.04	0.61	25.866	25.8	5% AEP, 20 min burst, Storm 8

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF LOT 22 POST	0	0	2.975	0	0	0	0	0
OF LOT 22 PRE	0	0	2.953	0	0	0	0	0

OF Hill Pre	0.005	0.005	2.383	0.036	0.02	0.42	0.65 5% AEP, 5 min burst, Storm 1
OF1707	0.005	0.005	2.383	0.036	0.02	0.42	0.65 5% AEP, 5 min burst, Storm 1
HIGH FLOW WEIR	0.007	0.007	2.953	0.005	0	7.4	0.19 5% AEP, 20 min burst, Storm 8
OF OSD1	0	0	1.479	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q		
			Total	Low Level	High Level
OSD 2	24.75	144.1	0.046	0.046	0
OSD 1	26.63	26.1	0.041	0.034	0.007
HI FLOW CHAMBER	25.87	0.4	0.04	0.04	0

Run Log for 21863_Log Cabin_DA_Rev 2.drn run at 21:35:59 on 21/4/2020

No water upwelling from any pit.

Freeboard was less than 0.15m at Lot 22 Existing Pit

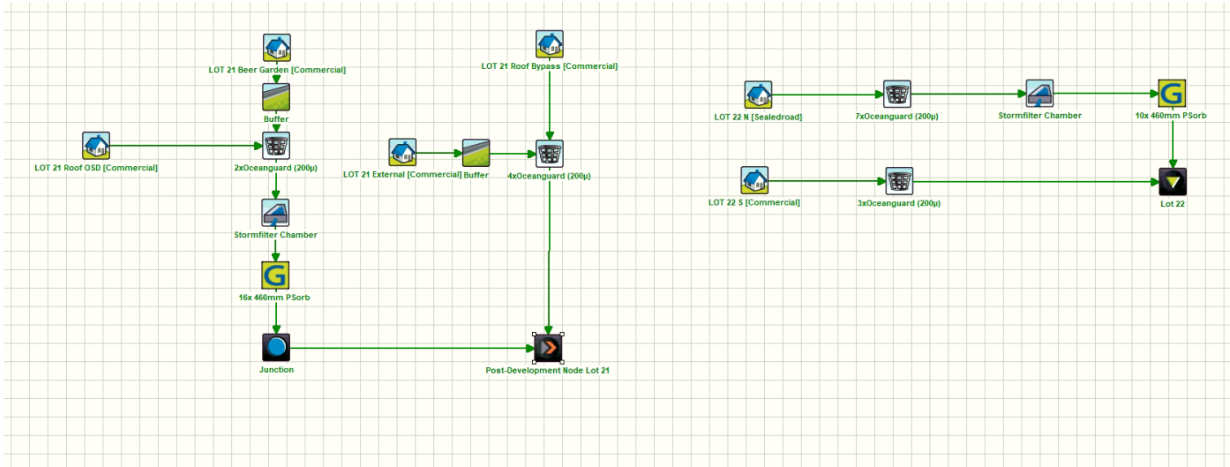
Flows were safe in all overflow routes.

These overflow routes carried water uphill (adding energy): OF Hill Pre, OF1707. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to

IGNORE THESE WARNINGS AT YOUR OWN PERIL.\cf1

APPENDIX B – MUSIC LINK REPORTS

MUSIC Setup



Lot 21 – Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.36	1.35	0.2
Total Suspended Solids (kg/yr)	244	23.7	90.3
Total Phosphorus (kg/yr)	0.395	0.138	65
Total Nitrogen (kg/yr)	2.96	1.6	46.1
Gross Pollutants (kg/yr)	38.9	0	100

Lot 22 – Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	3.45	3.44	0.1
Total Suspended Solids (kg/yr)	1150	89.7	92.2
Total Phosphorus (kg/yr)	1.89	0.595	68.6
Total Nitrogen (kg/yr)	8.15	4.39	46.1
Gross Pollutants (kg/yr)	107	0	100

MUSIC-*link* Report

Project Details		Company Details	
Project:	Proposed Log Cabin Development Lot 21	Company:	EWWF
Report Export Date:	22/04/2020	Contact:	C. Veleski
Catchment Name:	21863 Log Cabin Rev 1 ML	Address:	Level 4, 362 Kent St Sydney NSW 200
Catchment Area:	0.331ha	Phone:	1300 553 654
Impervious Area*:	63.34%	Email:	christopher.veleski@ewfw.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Penrith		
Scenario:	Penrith Development		

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

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node Lot 21	Reduction	Node Type	Number	Node Type	Number
Flow	0.238%	Buffer Node	2	Urban Source Node	6
TSS	90.3%	Detention Basin Node	2		
TP	65%	Generic Node	2		
TN	46.1%	GPT Node	4		
GP	100%				

Comments

NOTE: A successful self-validation check of your model does not constitute an approved model by Penrith City Council
MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	2xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.04
GPT	3xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.06
GPT	4xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.08
GPT	7xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.14
Post	Post-Development Node Lot 21	% Load Reduction	None	None	0.238
Post	Post-Development Node Lot 21	GP % Load Reduction	90	None	100
Post	Post-Development Node Lot 21	TN % Load Reduction	45	None	46.1
Post	Post-Development Node Lot 21	TP % Load Reduction	60	None	65
Post	Post-Development Node Lot 21	TSS % Load Reduction	85	None	90.3
Receiving	Lot 22	% Load Reduction	None	None	0.076
Receiving	Lot 22	GP % Load Reduction	90	None	100
Receiving	Lot 22	TN % Load Reduction	45	None	46.1
Receiving	Lot 22	TP % Load Reduction	60	None	68.6
Receiving	Lot 22	TSS % Load Reduction	85	None	92.2
Urban	LOT 21 Beer Garden	Area Impervious (ha)	None	None	0.022
Urban	LOT 21 Beer Garden	Area Pervious (ha)	None	None	0.108
Urban	LOT 21 Beer Garden	Total Area (ha)	None	None	0.131
Urban	LOT 21 External	Area Impervious (ha)	None	None	0.016
Urban	LOT 21 External	Area Pervious (ha)	None	None	0.012
Urban	LOT 21 External	Total Area (ha)	None	None	0.029
Urban	LOT 21 Roof Bypass	Area Impervious (ha)	None	None	0.081
Urban	LOT 21 Roof Bypass	Area Pervious (ha)	None	None	0
Urban	LOT 21 Roof Bypass	Total Area (ha)	None	None	0.081
Urban	LOT 21 Roof OSD	Area Impervious (ha)	None	None	0.09
Urban	LOT 21 Roof OSD	Area Pervious (ha)	None	None	0
Urban	LOT 21 Roof OSD	Total Area (ha)	None	None	0.09
Urban	LOT 22 N	Area Impervious (ha)	None	None	0.485
Urban	LOT 22 N	Area Pervious (ha)	None	None	0.160
Urban	LOT 22 N	Total Area (ha)	None	None	0.646
Urban	LOT 22 S	Area Impervious (ha)	None	None	0.066
Urban	LOT 22 S	Area Pervious (ha)	None	None	0.036
Urban	LOT 22 S	Total Area (ha)	None	None	0.103

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	Stormfilter Chamber	Evaporative Loss as % of PET	0	75	100
Detention	Stormfilter Chamber	Evaporative Loss as % of PET	0	75	100
Detention	Stormfilter Chamber	Hi-flow bypass rate (cum/sec)	None	99	100
Detention	Stormfilter Chamber	Hi-flow bypass rate (cum/sec)	None	99	100

Only certain parameters are reported when they pass validation

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MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

MUSIC-*link* Report

Project Details		Company Details	
Project:	Proposed Log Cabin Development Lot 22	Company:	EWFw
Report Export Date:	22/04/2020	Contact:	C Veleski
Catchment Name:	21863 Log Cabin Rev 1 ML	Address:	Level 4, 363 Kent St Sydney SNW 2000
Catchment Area:	0.749ha	Phone:	1300 553 654
Impervious Area*:	73.64%	Email:	christopher.veleski@ewfw.com.au
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Penrith		
Scenario:	Penrith Development		

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

Treatment Train Effectiveness	Treatment Nodes			Source Nodes	
Node: Lot 22	Reduction	Node Type	Number	Node Type	Number
Flow	0.076%	Buffer Node	2	Urban Source Node	6
TSS	92.2%	Detention Basin Node	2		
TP	68.6%	Generic Node	2		
TN	46.1%	GPT Node	4		
GP	100%				

Comments

NOTE: A successful self-validation check of your model does not constitute an approved model by Penrith City Council
MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	2xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.04
GPT	3xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.06
GPT	4xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.08
GPT	7xOceanguard (200◆)	Hi-flow bypass rate (cum/sec)	None	99	0.14
Post	Post-Development Node Lot 21	% Load Reduction	None	None	0.238
Post	Post-Development Node Lot 21	GP % Load Reduction	90	None	100
Post	Post-Development Node Lot 21	TN % Load Reduction	45	None	46.1
Post	Post-Development Node Lot 21	TP % Load Reduction	60	None	65
Post	Post-Development Node Lot 21	TSS % Load Reduction	85	None	90.3
Receiving	Lot 22	% Load Reduction	None	None	0.076
Receiving	Lot 22	GP % Load Reduction	90	None	100
Receiving	Lot 22	TN % Load Reduction	45	None	46.1
Receiving	Lot 22	TP % Load Reduction	60	None	68.6
Receiving	Lot 22	TSS % Load Reduction	85	None	92.2
Urban	LOT 21 Beer Garden	Area Impervious (ha)	None	None	0.022
Urban	LOT 21 Beer Garden	Area Pervious (ha)	None	None	0.108
Urban	LOT 21 Beer Garden	Total Area (ha)	None	None	0.131
Urban	LOT 21 External	Area Impervious (ha)	None	None	0.016
Urban	LOT 21 External	Area Pervious (ha)	None	None	0.012
Urban	LOT 21 External	Total Area (ha)	None	None	0.029
Urban	LOT 21 Roof Bypass	Area Impervious (ha)	None	None	0.081
Urban	LOT 21 Roof Bypass	Area Pervious (ha)	None	None	0
Urban	LOT 21 Roof Bypass	Total Area (ha)	None	None	0.081
Urban	LOT 21 Roof OSD	Area Impervious (ha)	None	None	0.09
Urban	LOT 21 Roof OSD	Area Pervious (ha)	None	None	0
Urban	LOT 21 Roof OSD	Total Area (ha)	None	None	0.09
Urban	LOT 22 N	Area Impervious (ha)	None	None	0.485
Urban	LOT 22 N	Area Pervious (ha)	None	None	0.160
Urban	LOT 22 N	Total Area (ha)	None	None	0.646
Urban	LOT 22 S	Area Impervious (ha)	None	None	0.066
Urban	LOT 22 S	Area Pervious (ha)	None	None	0.036
Urban	LOT 22 S	Total Area (ha)	None	None	0.103

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	Stormfilter Chamber	Evaporative Loss as % of PET	0	75	100
Detention	Stormfilter Chamber	Evaporative Loss as % of PET	0	75	100
Detention	Stormfilter Chamber	Hi-flow bypass rate (cum/sec)	None	99	100
Detention	Stormfilter Chamber	Hi-flow bypass rate (cum/sec)	None	99	100

Only certain parameters are reported when they pass validation

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APPENDIX C – CONCEPT CIVIL ENGINEERING DRAWINGS

PROPOSED PENRITH PUB RE-DEVELOPMENT

CONCEPT CIVIL DESIGN

LOTS 21 & 22 DP1236215
MEMORIAL AVE, PENRITH NSW 2750



LOCALITY PLAN
N.T.S.

DRAWING INDEX

- 21863 C001 COVER SHEET
- 21863 C002 NOTES SHEET
- 21863 C010 TYPICAL DETAILS SHEET
- 21863 C015 TYPICAL CROSS SECTIONS
- 21863 C050 BULK EARTHWORKS PLAN
- 21863 C060 BULK EARTHWORKS TYPICAL CROSS SECTIONS
- 21863 C100 GENERAL ARRANGEMENT PLAN
- 21863 C200 STORMWATER LAYOUT PLAN
- 21863 CE01 SOIL & WATER MANAGEMENT PLAN
- 21863 CE02 SOIL & WATER MANAGEMENT DETAILS SHEET

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CO-ORDINATED REFERENCE DRAWINGS			
SERVICE	DRAWING NUMBER	ISSUE	DATE
ARCH			
MECH			
STRUCT			
ELEC			
CIVIL			


NOTE: SYMBOLS ARE DRAWN IN THE CORRECT POSITION BUT ARE NOT SHOWN TO SCALE

Client / Architect:

Services Engineers:



LEVEL 4, 360-362 KENT STREET,
SYDNEY NSW 2000
t: 1300 553 654
e: ewfw@ewfw.com.au
w: www.ewfw.com.au



Project:

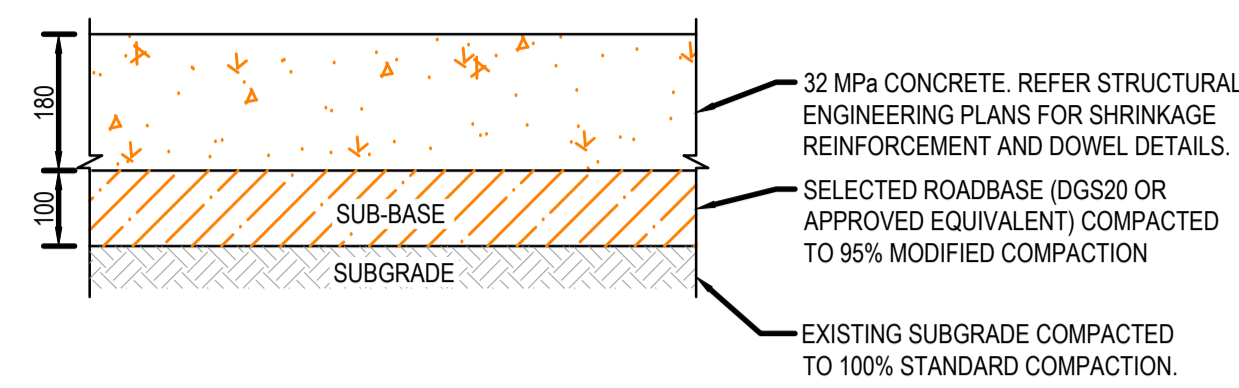
PENRITH PUB REDEVELOPMENT

MEMORIAL AVENUE PENRITH NSW 2750

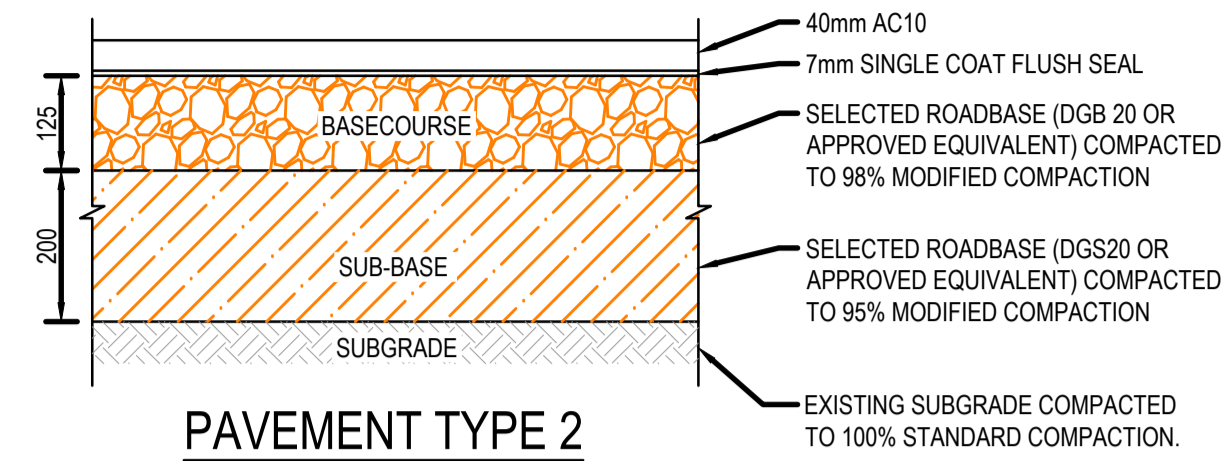
Drawing Title:

CIVIL SERVICES COVER SHEET

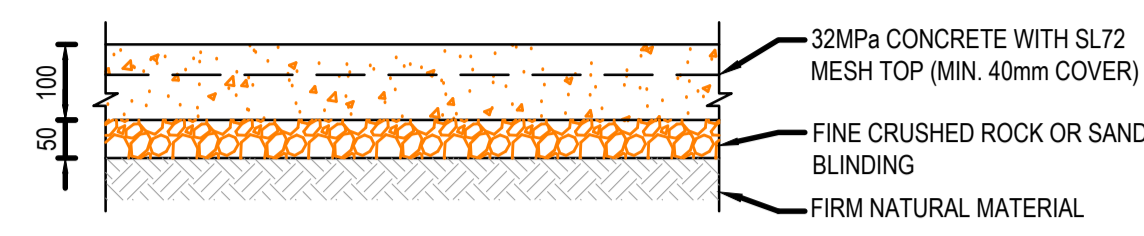
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Date:	JAN 2020	Design Validated:	CV
Job No.:	21863-001 - C - C001 - P - B	Amendment Approved:	LDG
Part No.:		Drawn:	CV
Disc:		Scale:	N/A
Stage:		Issue:	



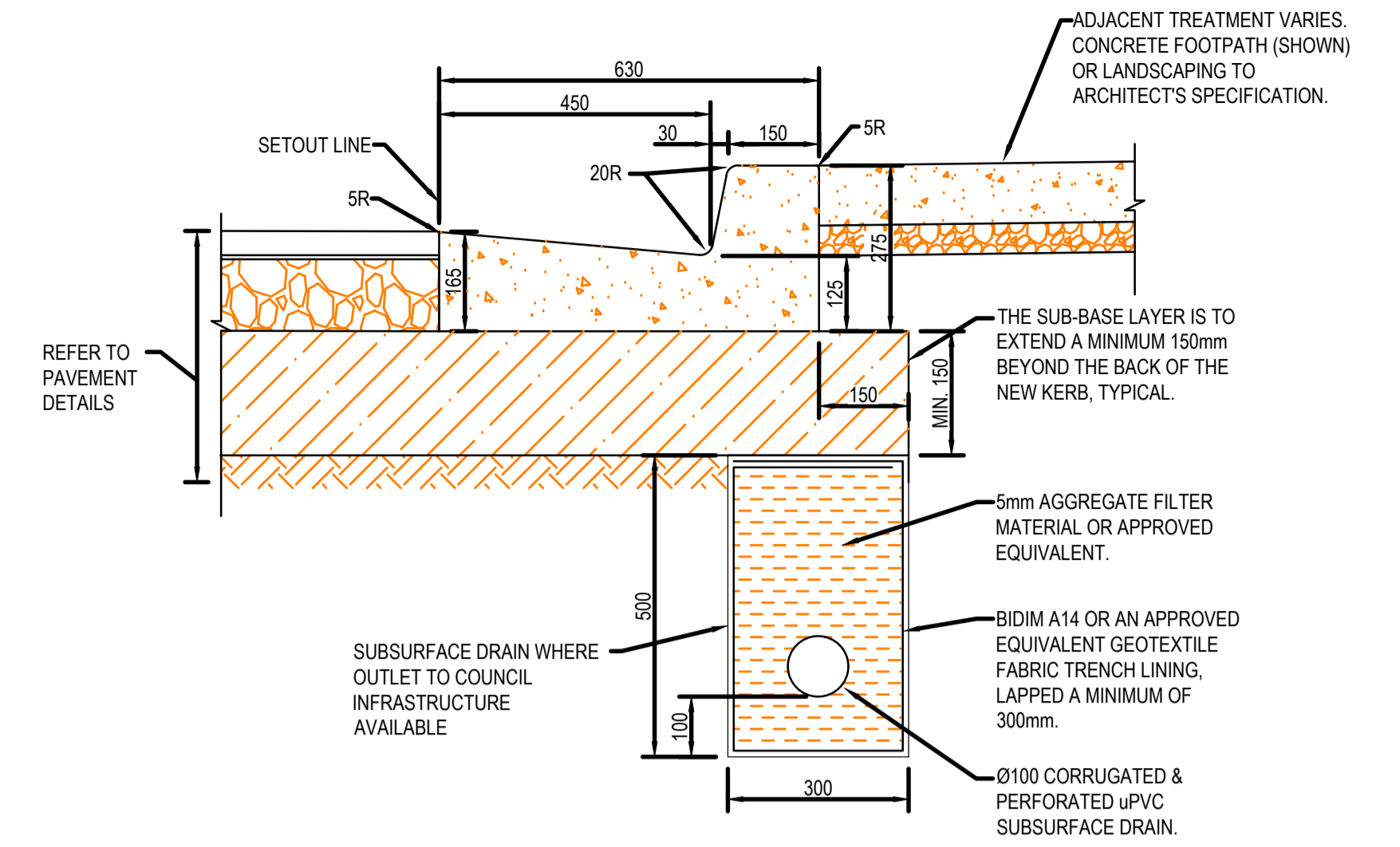
**PAVEMENT TYPE 1
TYPICAL RIGID
PAVEMENT DETAIL**



**PAVEMENT TYPE 2
TYPICAL FLEXIBLE
PAVEMENT DETAIL**



**PAVEMENT TYPE 3
TYPICAL CONCRETE
FOOTPATH DETAIL**
SCALE 1:10

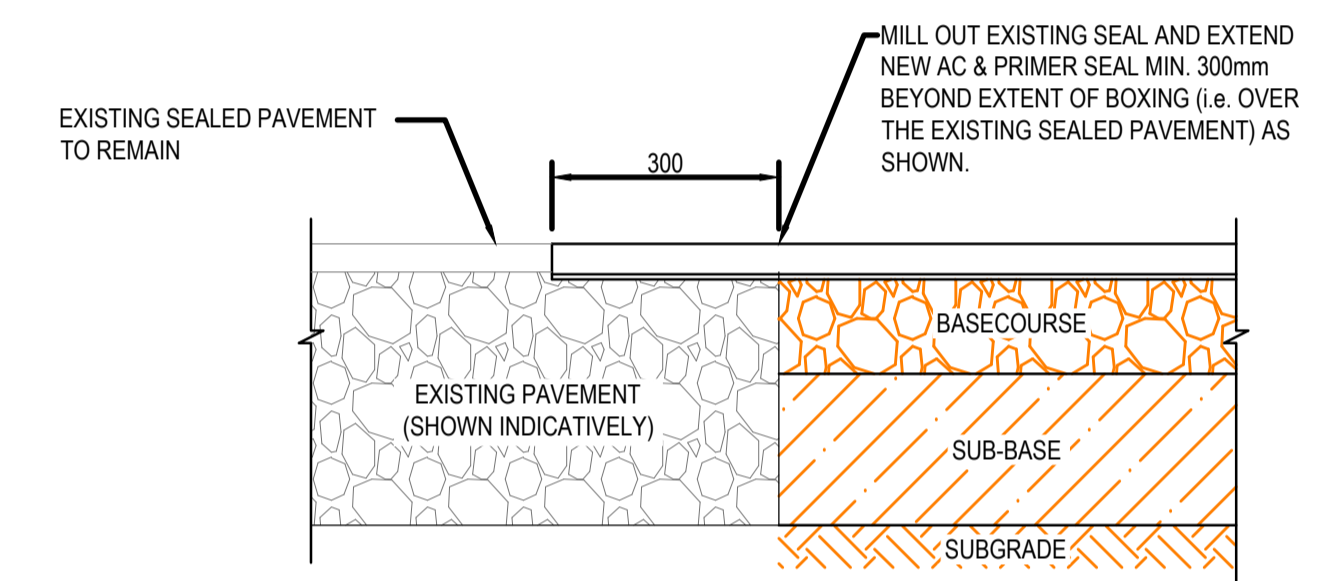


TYPICAL KERB AND GUTTER (KG) DETAIL
SCALE 1:10

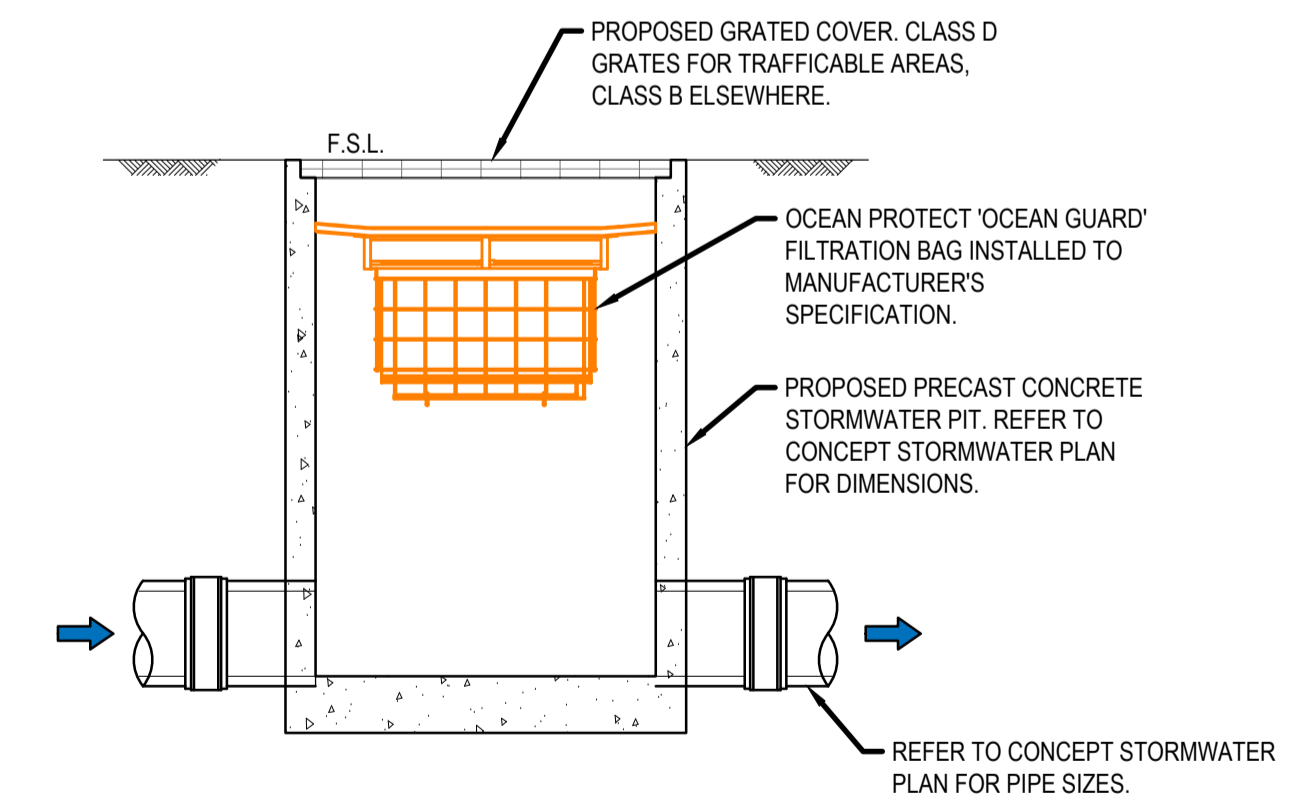
PAVEMENT DESIGN NOTES:

- FLEXIBLE PAVEMENT DESIGN HAS BEEN BASED ON A CBR OF 3.0% FOR A TRAFFIC LOADING OF 8X10⁶ ESAs
- RIGID PAVEMENT DESIGN HAS BEEN BASED ON A CBR OF 3% FOR A TRAFFIC LOADING OF 1.3X10⁶ HVAG
- FOR RIGID PAVEMENT SHRINKAGE REINFORCEMENT AND DOWEL SPECIFICATIONS, REFER STRUCTURAL ENGINEERS DETAILS.
- SUBGRADE PREPARATION AND PLACEMENT OF CONTROLLED FILL
THE FOLLOWING PROCEDURES ARE TO BE FOLLOWED FOR SUBGRADE PREPARATION AND PLACEMENT OF CONTROLLED FILL:
 - STRIP EXISTING TOPSOIL (IF PRESENT) AND STOCKPILE FOR POSSIBLE FUTURE USE IN LANDSCAPING.
 - IN AREAS WHERE GRADE RAISE FILL WILL BE PROVIDED THE EXPOSED MATERIAL AFTER REMOVAL OF TOPSOIL SHALL BE PROOF ROLLED (USING AN 8 TO 10 TONNES ROLLER) TO DETECT POTENTIALLY WEAK SPOTS (GROUND HEAVE). EXCAVATE AREAS OF LOCALISED HEAVING TO DEPTH OF ABOUT 300MM AND REPLACE WITH GRANULAR MATERIAL OR LOW PLASTICITY CLAY AND COMPACT AS RECOMMENDED BELOW.
 - REPEAT PROOF ROLLING OF SOFT SPOTS BACKFILLED WITH GRANULAR MATERIAL OR LOW PLASTICITY CLAY. IF THE BACKFILLED AREA SHOWS MOVEMENT DURING PROOF ROLLING, THIS OFFICE SHOULD BE CONTACTED FOR FURTHER RECOMMENDATIONS.
 - PLACE SUITABLE FILL MATERIALS ON PROOF ROLLED SURFACE IN HORIZONTAL LAYERS OF 250MM TO 300MM LOOSE THICKNESS (DEPENDENT ON THE SIZE OF EQUIPMENT) AND COMPACT TO ACHIEVE A MINIMUM DENSITY RATIO OF AT LEAST 98% STANDARD, AT MOISTURE CONTENT WITHIN 2% OF OPTIMUM MOISTURE CONTENT (OMC). SUITABLE FILL MATERIALS MAY COMPRISE GRANULAR OR LOW PLASTICITY CLAY. THE TOP 300MM OF THE FILL FORMING PAVEMENT SUBGRADE SHALL BE COMPACTED TO A MINIMUM DENSITY RATIO OF AT LEAST 100% STANDARD, AT MOISTURE CONTENT WITHIN 2% OF OPTIMUM MOISTURE CONTENT (OMC).
 - IN CUT AREAS THE TOP 300MM OF THE PAVEMENT SUBGRADE SHALL BE SCARIFIED AND COMPACTED TO A MINIMUM DENSITY RATIO OF AT LEAST 100% STANDARD, AT MOISTURE CONTENT WITHIN 2% OF OPTIMUM MOISTURE CONTENT (OMC).
 - FILL PLACEMENT SHOULD BE SUPERVISED TO ENSURE THAT MATERIAL QUALITY, LAYER THICKNESS, TESTING FREQUENCY AND COMPACTION CRITERIA CONFORM TO THE SPECIFICATIONS. WE RECOMMEND 'LEVEL 1' SUPERVISION, IN ACCORDANCE WITH AS3798-2007.

PENRITH PUB PAVEMENT DESIGN



**TYPICAL PAVEMENT
INTERFACE DETAIL**
SCALE 1:10



**TYPICAL GRATED
STORMWATER PIT DETAIL**
SCALE 1:20

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SERVICE	DRAWING NUMBER	ISSUE	DATE
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ARCH			
MECH			
STRUCT			
ELEC			
CIVIL			

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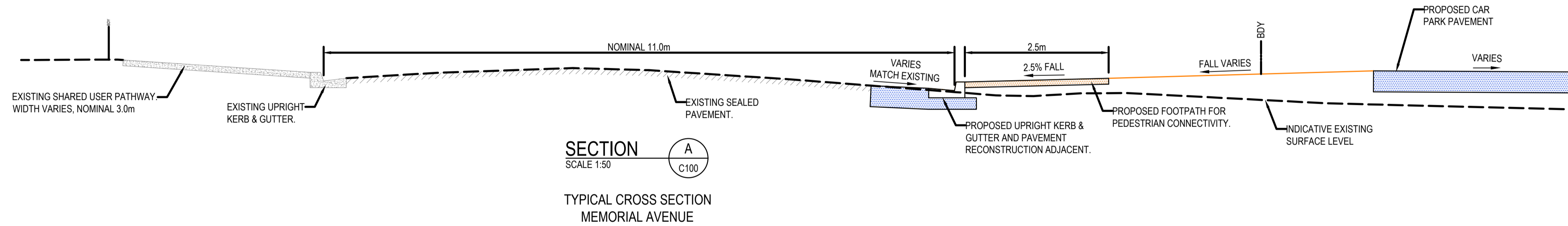
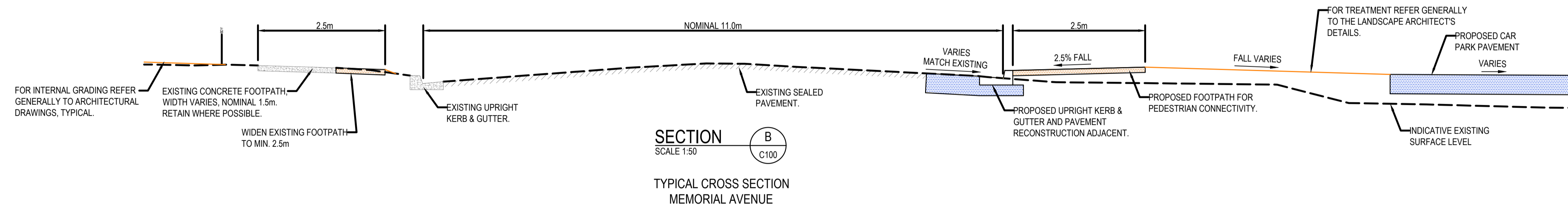
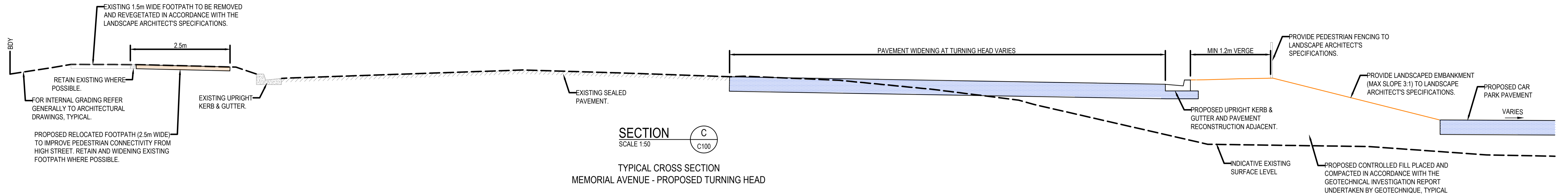
Services Engineers:
EWFw
CONSULTING ENGINEERS
LEVEL 4, 360-362 KENT STREET,
SYDNEY NSW 2000
t: 1300 553 654
e: ewfw@ewfw.com.au
w: www.ewfw.com.au

bsi ISO 9001 Quality Management

Project:
**PENRITH PUB
REDEVELOPMENT**
**MEMORIAL AVENUE PENRITH
NSW 2750**

Drawing Title:
**CIVIL SERVICES
TYPICAL DETAILS SHEET**

North Point:	Design:	CV
Date:	Design Validated:	-
MAR 2020	Amendment Approved:	LDG
Job No.:	Drawn:	CV
21863-001	Scale:	AS NOTED
Part No.:	Disc:	AS NOTED
C	Draw No.:	CV
- C	Stage:	CV
- C010	Issue:	CV
- P		
- B		



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B	23.04.2020	REISSUED FOR DA SUBMISSION	CV	LDG

CO-ORDINATED REFERENCE DRAWINGS			
SERVICE	DRAWING NUMBER	ISSUE	DATE
ARCH			
MECH			
STRUCT			
ELEC			
CIVIL			

NOTE: SYMBOLS ARE DRAWN IN THE CORRECT POSITION BUT ARE NOT SHOWN TO SCALE

Client / Architect:

Services Engineers:

LEVEL 4, 360-362 KENT STREET,
SYDNEY NSW 2000
t: 1300 553 654
e: ewfw@ewfw.com.au
w: www.ewfw.com.au

Project:

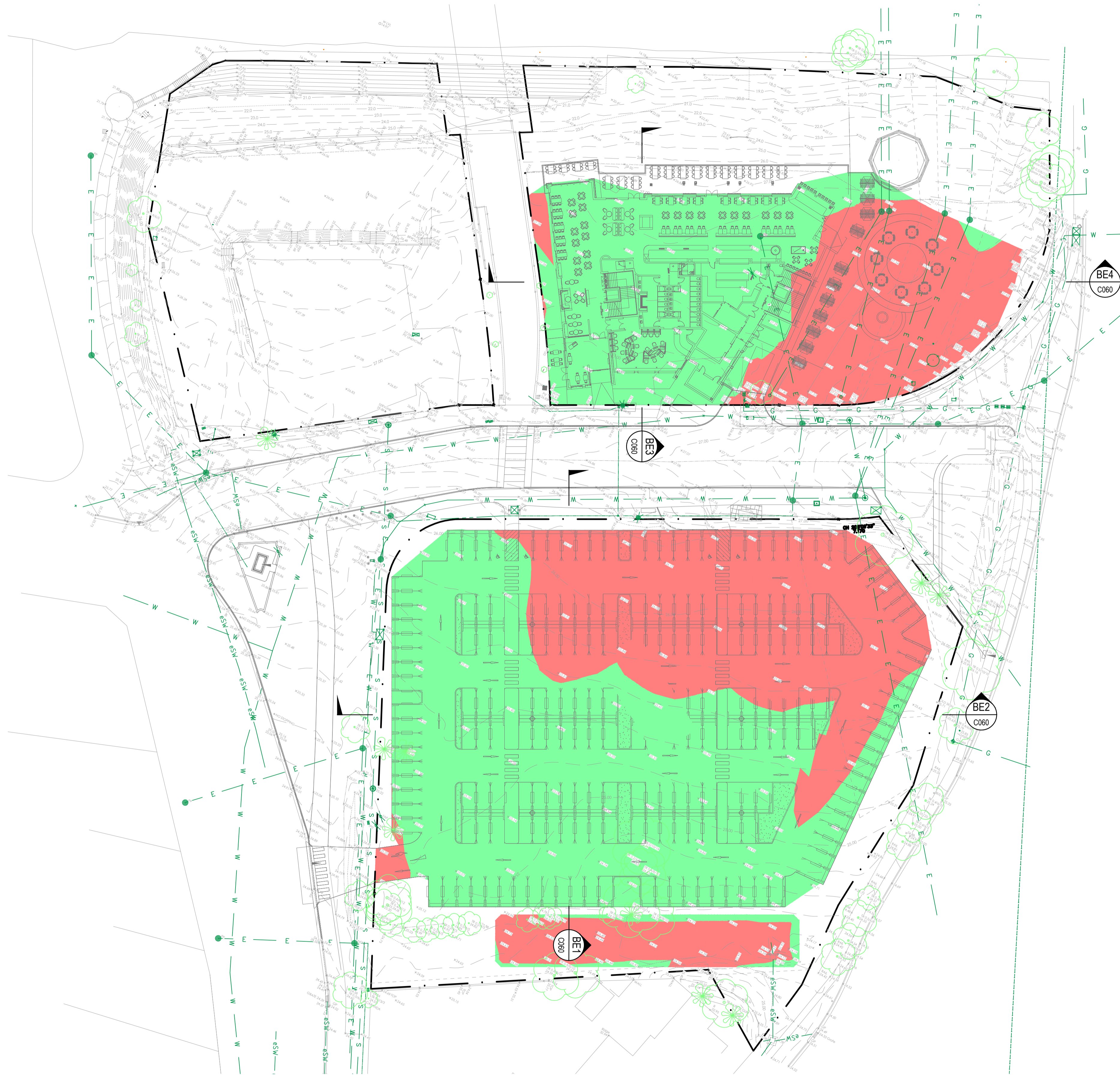
PENRITH PUB REDEVELOPMENT

MEMORIAL AVENUE PENRITH NSW 2750

Drawing Title:

CIVIL SERVICES TYPICAL CROSS SECTIONS

North Point:	Design:	CV
	Design Validated:	-
	Amendment Approved:	LDG
	Drawn:	CV
Date:	Scale:	1:50
MAR 2020	(A1)	
Job No.:	Part No.:	Disc:
21863-001	- C	-C015- P - B



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B	23.04.2020	REISSUED FOR DA SUBMISSION	CV	LDG

CO-ORDINATED REFERENCE DRAWINGS			
SERVICE	DRAWING NUMBER	ISSUE	DATE
ARCH			
MECH			
STRUCT			
ELEC			
CIVIL			

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Client / Architect

Services Engineers:

EWFV
CONSULTING ENGINEERS

LEVEL 4, 360-362 KENT STREET,
SYDNEY NSW 2000
t: 1300 553 654
e: ewfv@ewfv.com.au
w: www.ewfv.com.au

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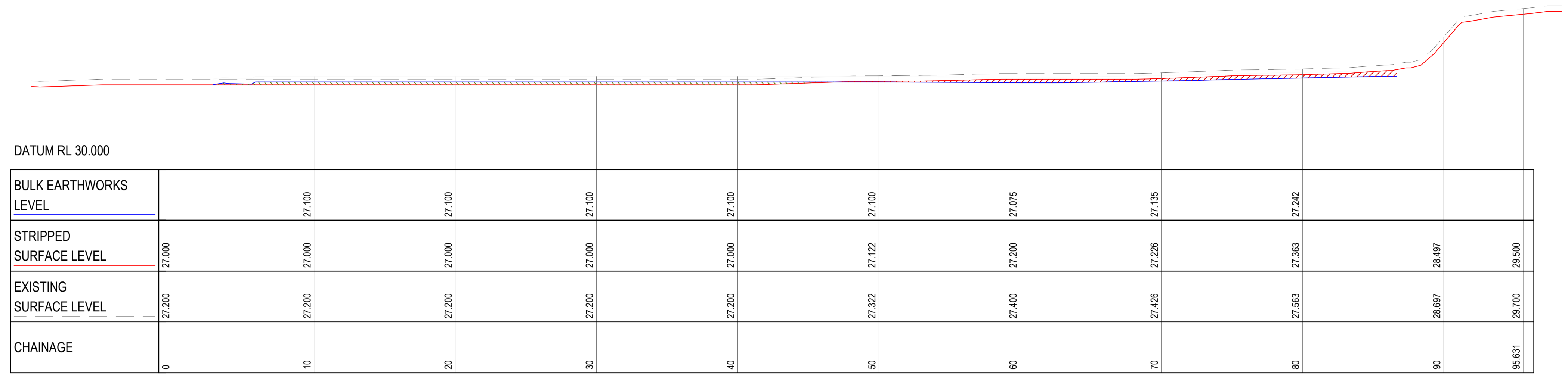
PENRITH PUB REDEVELOPMENT

MEMORIAL AVENUE PENRITH NSW 2750

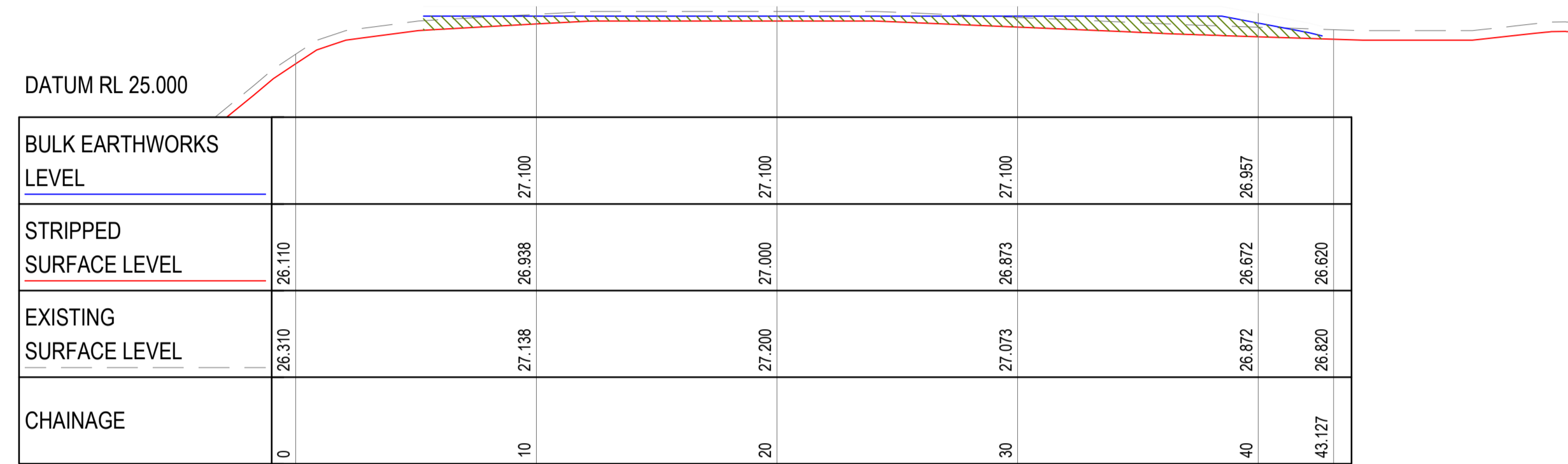
Drawing Title:

CIVIL SERVICES BULK EARTHWORKS PLAN

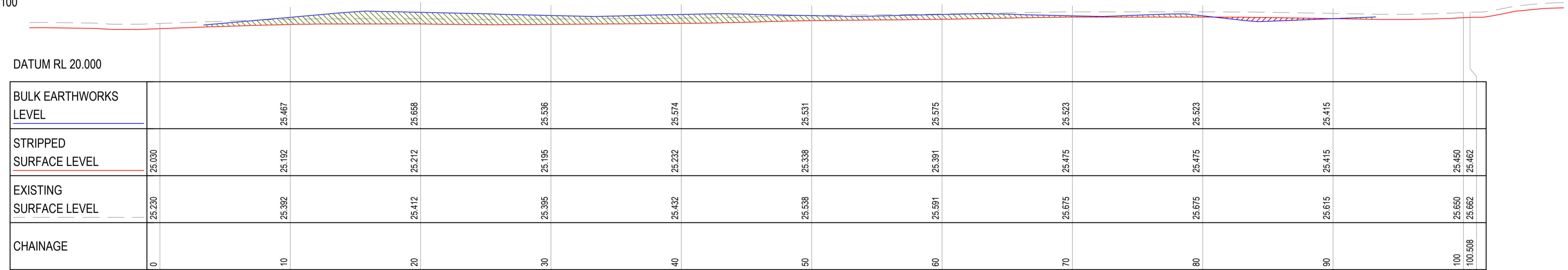
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	Amendment Approved:	LDG
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Date:	Scale:	1:400
MAR 2020	(A1)	
Job No.:	Part No.:	Disc.:
21863-001	- C	- C050 - P - B
Drawn No.:	Stage:	Issue:



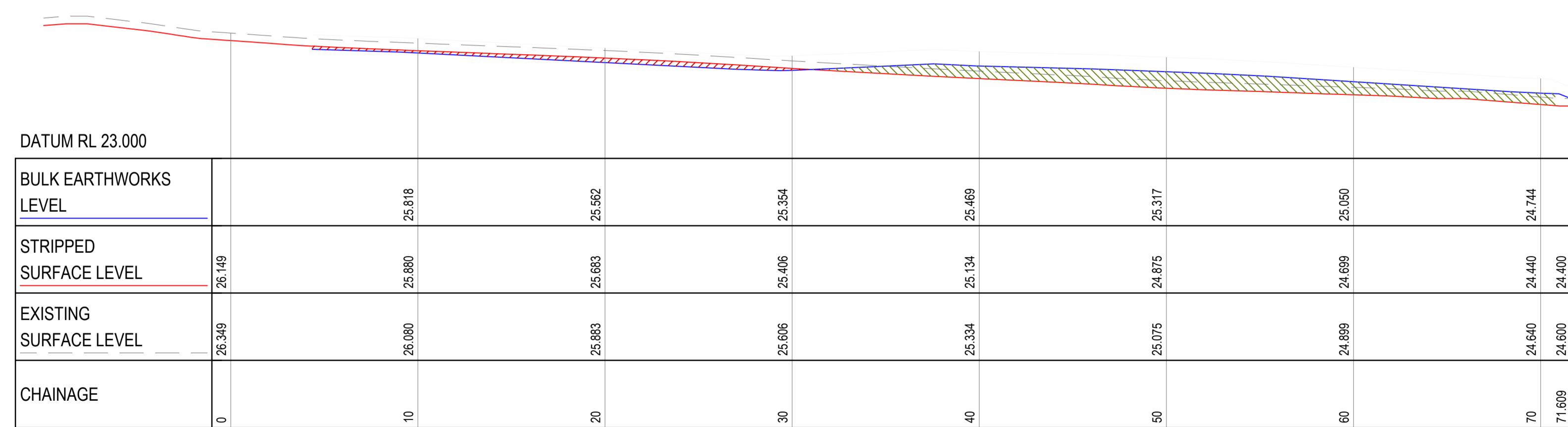
BE4 - LONGITUDINAL SECTION
 A1 HORZ SCALE 1:200
 A1 VERT SCALE 1:100



BE3 - LONGITUDINAL SECTION
 A1 HORZ SCALE 1:200
 A1 VERT SCALE 1:100



BE2 - LONGITUDINAL SECTION
 A1 HORZ SCALE 1:200
 A1 VERT SCALE 1:100



BE1 - LONGITUDINAL SECTION
 A1 HORZ SCALE 1:200
 A1 VERT SCALE 1:100

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A	31.03.20	ISSUED FOR DA SUBMISSION	RM	MW
B	23.04.2020	REISSUED FOR DA SUBMISSION	CV	LDG

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SERVICE		
ARCH		
MECH		
STRUCT		
ELEC		
CIVIL		

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LEVEL 4, 360-362 KENT STREET,
 SYDNEY NSW 2000
 t: 1300 553 654
 e: ewfv@ewfv.com.au
 w: www.ewfv.com.au

ISO 9001 Quality Management

Project:

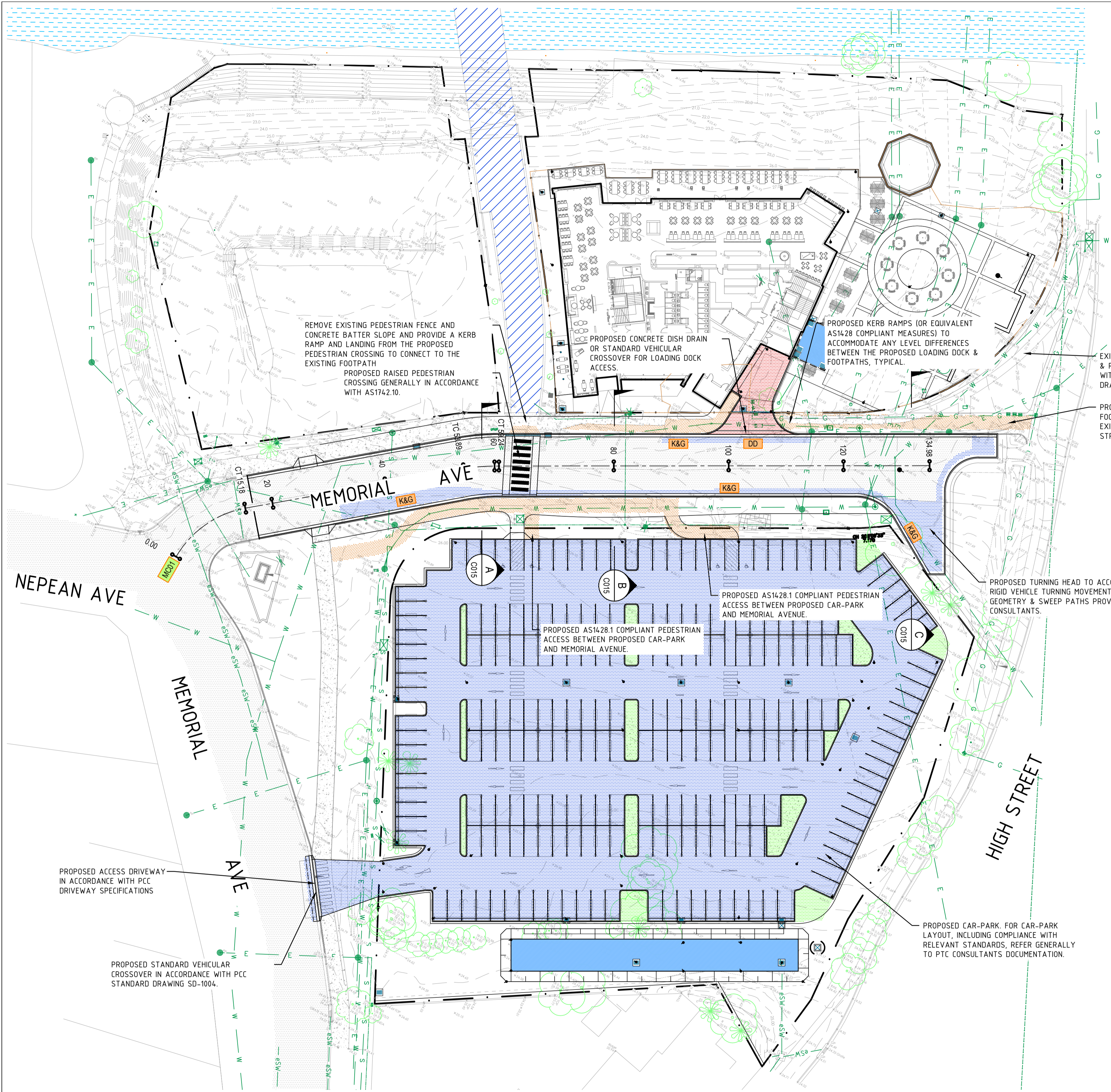
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Drawing Title:

CIVIL SERVICES BULK EARTHWORKS TYPICAL CROSS SECTIONS

North Point	Design:
	CV
	Design Validated: -
	Amendment Approved: LDG
	Drawn: CV
Date: MAR 2020	Scale: (A1) 1:200
Job No.: 21863-001	Part No.: - C - C060 - P - B
Disc:	Stage:
Issue:	



GENERAL LEGEND	
MO01	CONTROL LINE
K&G	PROPOSED KERB AND GUTTER
DD	PROPOSED DISH DRAIN
[Red Hatched]	PAVEMENT TYPE 1 - RIGID
[Blue Hatched]	PAVEMENT TYPE 2 - FLEXIBLE
[Orange Hatched]	PAVEMENT TYPE 3 - FOOTPATH
[Grey Hatched]	EXISTING SEALED ROAD
[White Hatched]	EXISTING CONCRETE
[Blue Hatched]	EXISTING FOOTBRIDGE
[Blue Wavy]	NEPEAN RIVER
[Dark Grey Hatched]	PROPOSED DEVELOPMENT
[Green Hatched]	PROPOSED LANDSCAPING (BY OTHERS)



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LEVEL 4, 360-362 KENT STREET, SYDNEY NSW 2000
t: 1300 553 654
e: ewfv@ewfv.com.au
w: www.ewfv.com.au

Project:

PENRITH PUB REDEVELOPMENT

MEMORIAL AVENUE PENRITH NSW 2750

Drawing Title:

CIVIL SERVICES GENERAL ARRANGEMENT PLAN

North Point:	Design:	RMMW
	Design Validated:	-
	Amendment Approved:	LDG
	Drawn:	CV
Date:	Scale:	1:400
MAR 2020	(A1)	
Job No.:	Part No.:	Disc.:
21863-001	- C	- C100 - P - B



STORMWATER LEGEND	
	PROPOSED STORMWATER LINE RCP AT MIN 1.0% U.N.O.
	PROPOSED STORMWATER PIT
	PROPOSED GRATED DRAIN
	OVERLAND FLOW DIRECTION
	CREST IN PAVEMENT
	PROPOSED FINISHED SURFACE LEVEL
	PIT NUMBER
	IMPERVIOUS CATCHMENT TO OSD
	PERVIOUS CATCHMENT TO OSD
	IMPERVIOUS CATCHMENT BYPASS OSD
	PERVIOUS CATCHMENT BYPASS OSD

OSD SCHEDULE					
OSD LABEL	CATCHMENT AREA (ha)	STORAGE (m³)	DETAILS	ORIFICE DETAILS	OVERFLOW WEIR
OSD1	0.2307	27	6.8m x 5.8m CAST-IN-SITU H.E.D WEIR 26.25	φ136mm CL25.85 ORIFICE ON φ300mm OUTLET PIPE	VIA INTERNAL OVERFLOW WEIR RL 26.65
OSD2	0.6457	144	50m x 5.6m BASIN TWL24.75	φ15mm CL23.85 ORIFICE ON φ225 OUTLET PIPE	VIA LANDSCAPE AREA ON HIGH STREET

CATCHMENT AREA SUMMARY			
CAT	TOTAL CATCHMENT AREA (ha)	IMPERVIOUS %	PERVIOUS %
LOT 21 TO OSD	0.2307	53	47
LOT 21 BYPASS	0.1102	88	12
LOT 22 TO OSD	0.6457	75	25
LOT 22 BYPASS	0.1036	65	35

PIT SCHEDULE				
PIT NO.	TYPE	SIZE	GRATE RL	PIT IL
1/1	EXISTING INLET PIT	-	e24.20	e23.70
1/2	DISCHARGE CONTROL PIT	900x900	24.15	23.70
1/3	GRATED INLET PIT	900x900	24.25	23.85
2/1	HEADWALL W/ SCOUR	TO SUIT 2x φ300	-	24.20
2/2	KERB INLET/DIVERSION PIT	1.8m LINTEL	25.00	23.95
2/3	KERB INLET PIT	1.8m LINTEL	25.05	24.10
2/4	KERB INLET PIT	1.8m LINTEL	25.10	24.30
3/1	GRATED INLET PIT	900x900	25.65	24.30
3/2	GRATED INLET PIT	900x900	25.70	24.45
3/3	GRATED INLET PIT	900x900	25.70	24.60
3/4	GRATED INLET PIT	900x900	25.70	24.80
4/1	EXISTING INLET PIT	-	e24.20	e23.50
4/2	GRATED INLET PIT	600x900	24.50	23.80
4/3	KERB INLET PIT	1.8m LINTEL	25.35	24.30
4/4	KERB INLET PIT	1.8m LINTEL	25.60	25.60
5/1	EXISTING KERB INLET PIT	-	25.69	24.48
5/2	KERB INLET PIT	1.8m LINTEL	26.35	24.80
5/3	KERB INLET PIT	1.8m LINTEL	26.55	25.05
5/4	GRATED INLET PIT	600x900	26.85	25.15
5/5	GRATED INLET PIT	900x900	27.00	25.50
6/1	GRATED INLET PIT	600x600	27.10	26.40
6/2	GRATED INLET PIT	600x900	27.10	26.10
7/1	JUNCTION PIT	600x900	27.25	26.05
7/2	GRATED INLET PIT	600x600	27.25	26.35
7/3	GRATED INLET PIT	600x600	27.10	26.45
8/1	GRATED INLET PIT	600x600	27.10	26.35

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A	31.03.20	ISSUED FOR REVIEW	JDC	LDG
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CO-ORDINATED REFERENCE DRAWINGS	
SERVICE	DRAWING NUMBER
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Services Engineers:

LEVEL 4, 360-362 KENT STREET, SYDNEY NSW 2000
t: 1300 553 654
e: ewfv@ewfv.com.au
w: www.ewfv.com.au

Project:

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MEMORIAL AVENUE PENRITH NSW 2750

Drawing Title:

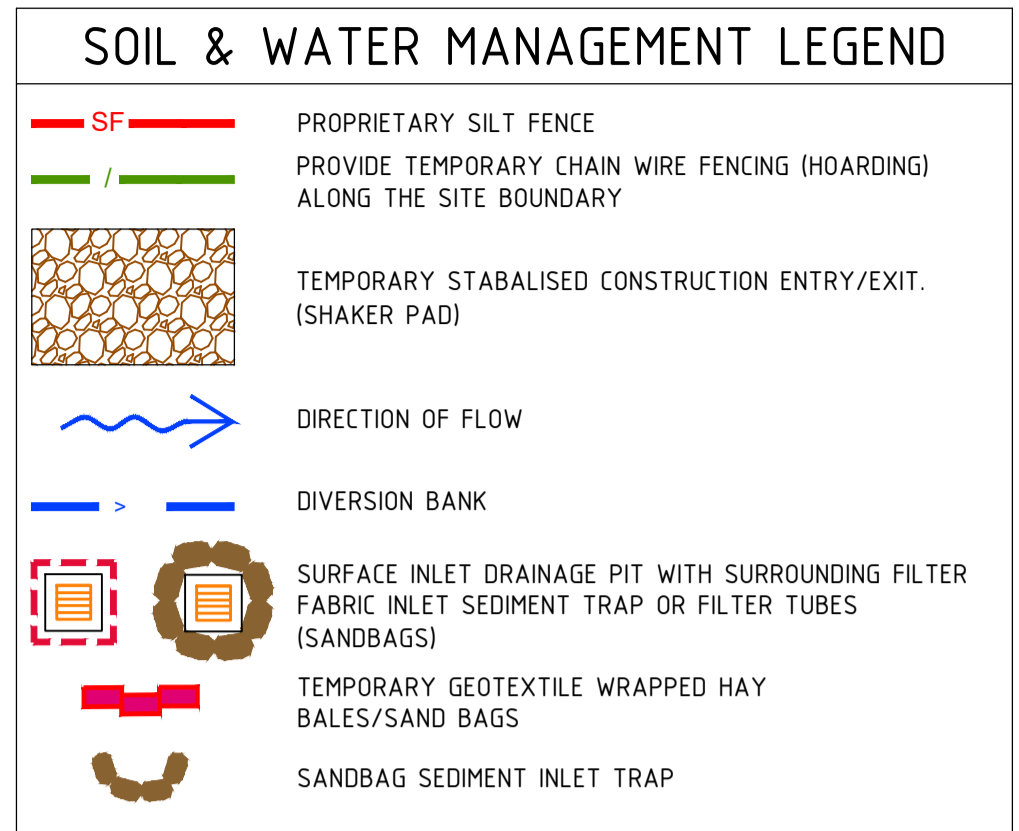
CIVIL SERVICES STORMWATER LAYOUT PLAN

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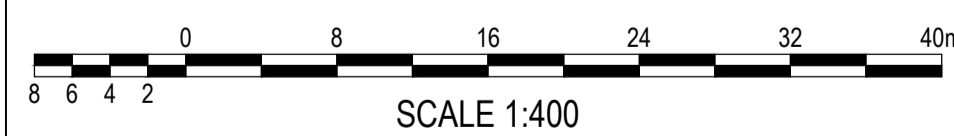
Design: CV
Design Validated: -
Amendment Approved: LDG
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Date: MAR 2020
Scale: (A1)
Date: 23 Apr 2020
Time: 2:30pm

Job No.: 21863-001 - C - C200 - P - B
Part No.:
Disc:
Dep No.:
Stage:
Issue:



- ### SOIL & WATER MANAGEMENT NOTES
- RUSLE: A = SOIL LOSS (tonne/ha/yr) = R.K.Ls.P.C
 - THE AVERAGE ANNUAL SOIL LOSS CALCULATIONS WERE UNDERTAKEN USING MUS - MANAGING URBAN STORMWATER VOL. 1 (LANDCOM, 2004).
 - MUS REQUIRES THE CONSTRUCTION OF A SEDIMENT BASIN IF THE ANNUAL SOIL LOSS IS GREATER THAN 150m³. AS THIS IS NOT THE CASE FOR EACH ASSUMED CATCHMENT, THE CONSTRUCTION OF A SEDIMENT BASIN IS CONSIDERED UNNECESSARY.
 - THE DISTURBED AREA SHALL BE REHABILITATED & STABILISED PRIOR TO DISTURBING THE NEXT SUB-CATCHMENT AREA. THE CONTRACTOR SHALL SUBMIT THE PROPOSED EARTHWORKS CONSTRUCTION METHODOLOGY TO THE PRINCIPAL FOR REVIEW AND APPROVAL PRIOR TO COMMENCING WORK.



RUSLE CALCULATIONS

CATCHMENT	R-FACTOR	K-FACTOR	SLOPE (%)	SLOPE DISTANCE (m)	Ls FACTOR	P-FACTOR	C-FACTOR	CATCHMENT AREA (ha)	SOIL LOSS, A (tonne/ha/yr)	SOIL LOSS, A (m ³ /ha/yr)	SOIL LOSS PER CATCHMENT (m ³ /yr)
LOT 21	2400.00	0.06	3.00	40.00	0.47	1.30	1.00	0.35	30.28	23.29	8.15
LOT 22	2400.00	0.06	3.00	80.00	0.66	1.30	1.00	0.65	78.97	60.75	39.49
REFERENCE	MUS APP B, MAP 10	MUS APP C, T19 RICHMOND SOIL	SURVEY	SURVEY	MUS, APP A4	MUS, APP A5	MUS, APP A6	SURVEY	RUSLE EQUATION	CONVERSION 1.3t/m ³	

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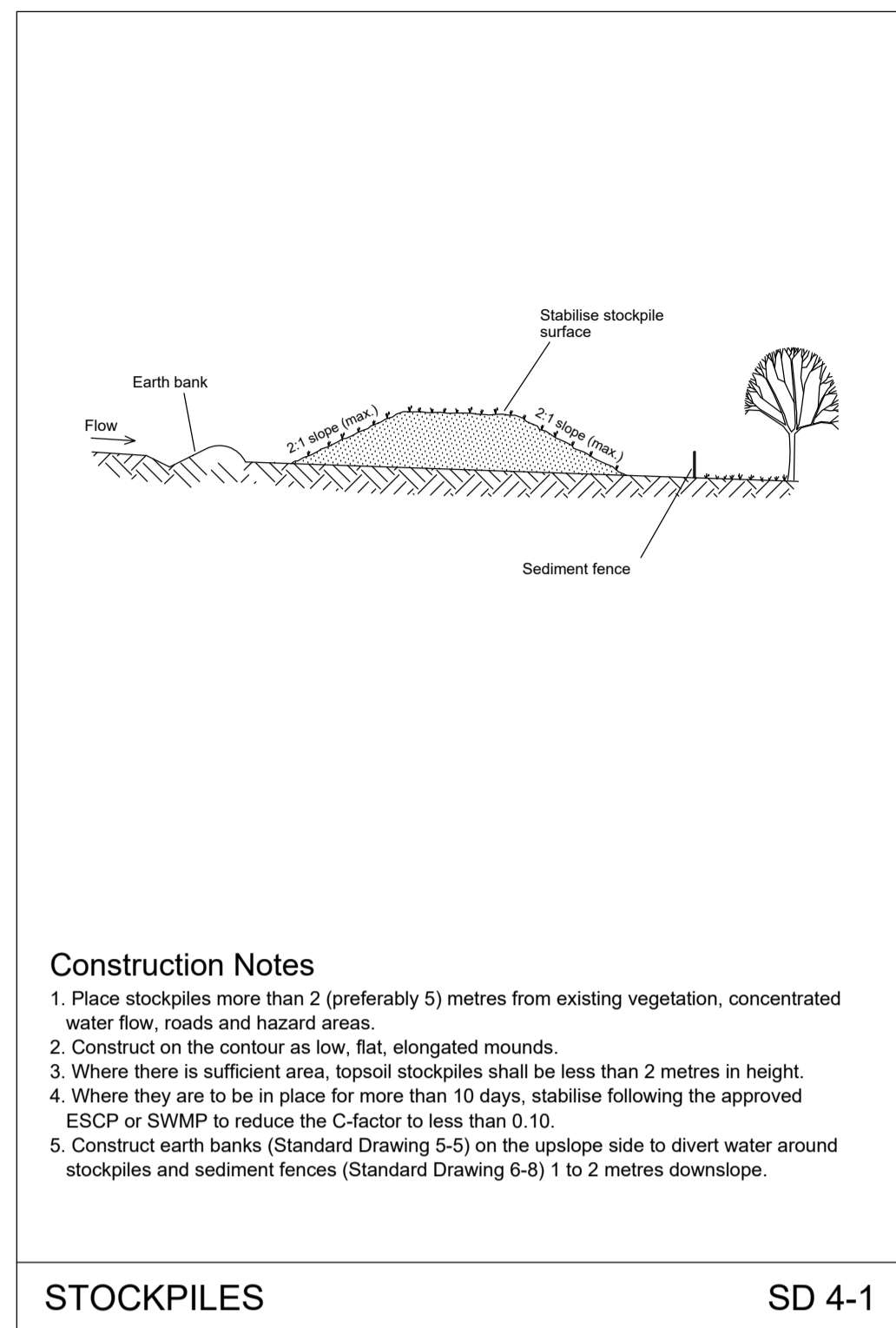
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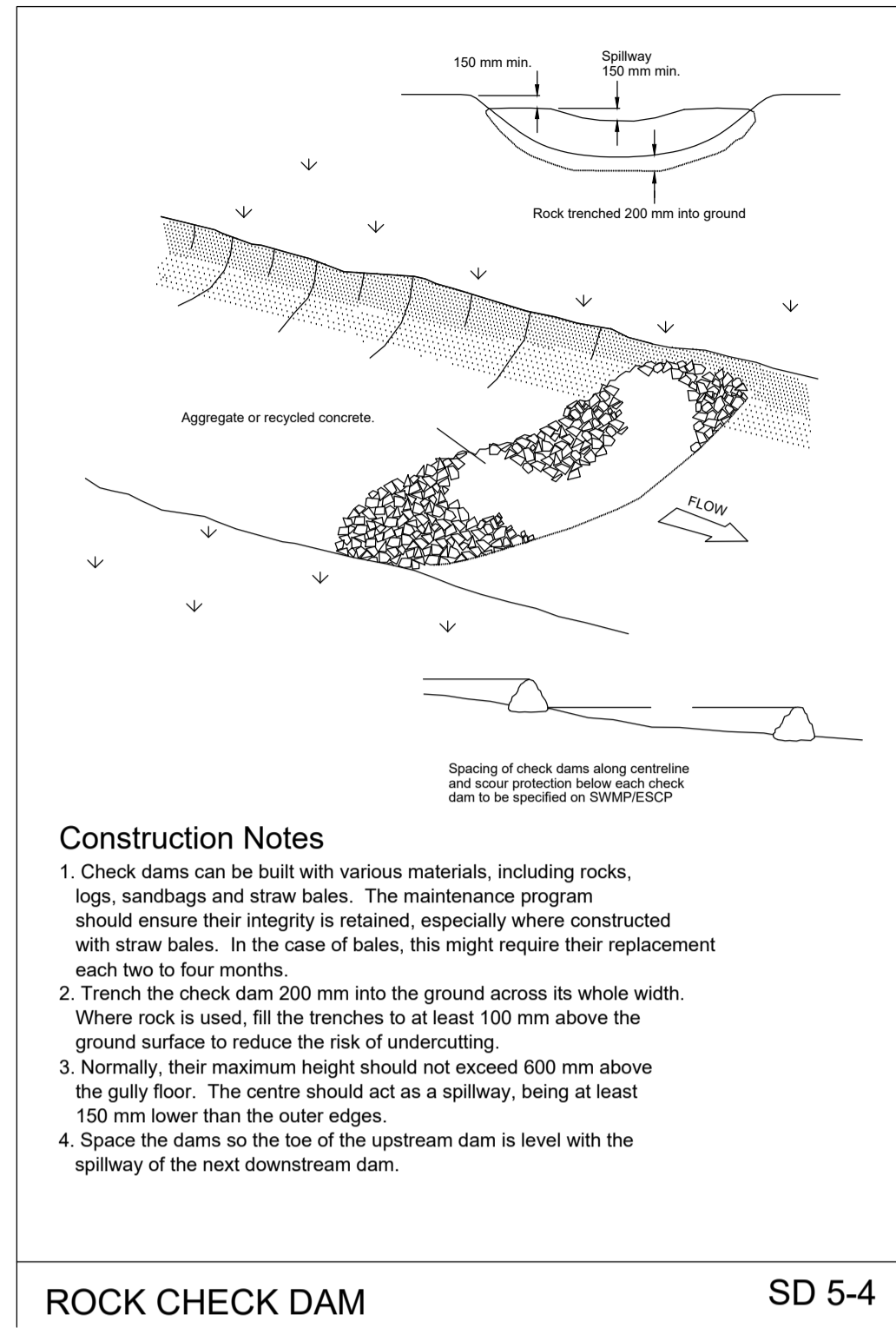
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North Point

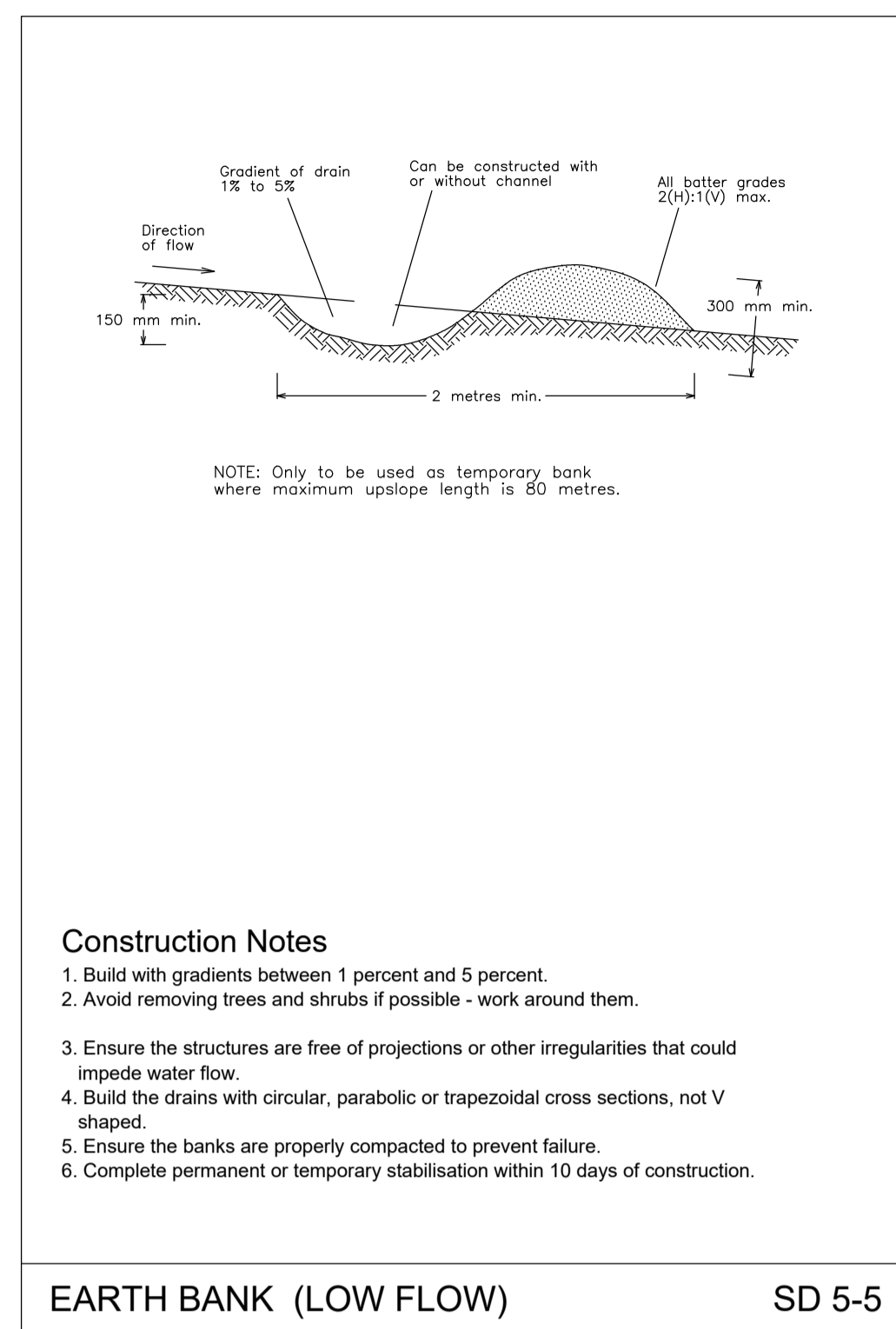
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Amendment Approved: LDG
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Date: MAR 2020
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1:400
Job No.: 21863-001 - C - CE01 - P - B
Part No.:
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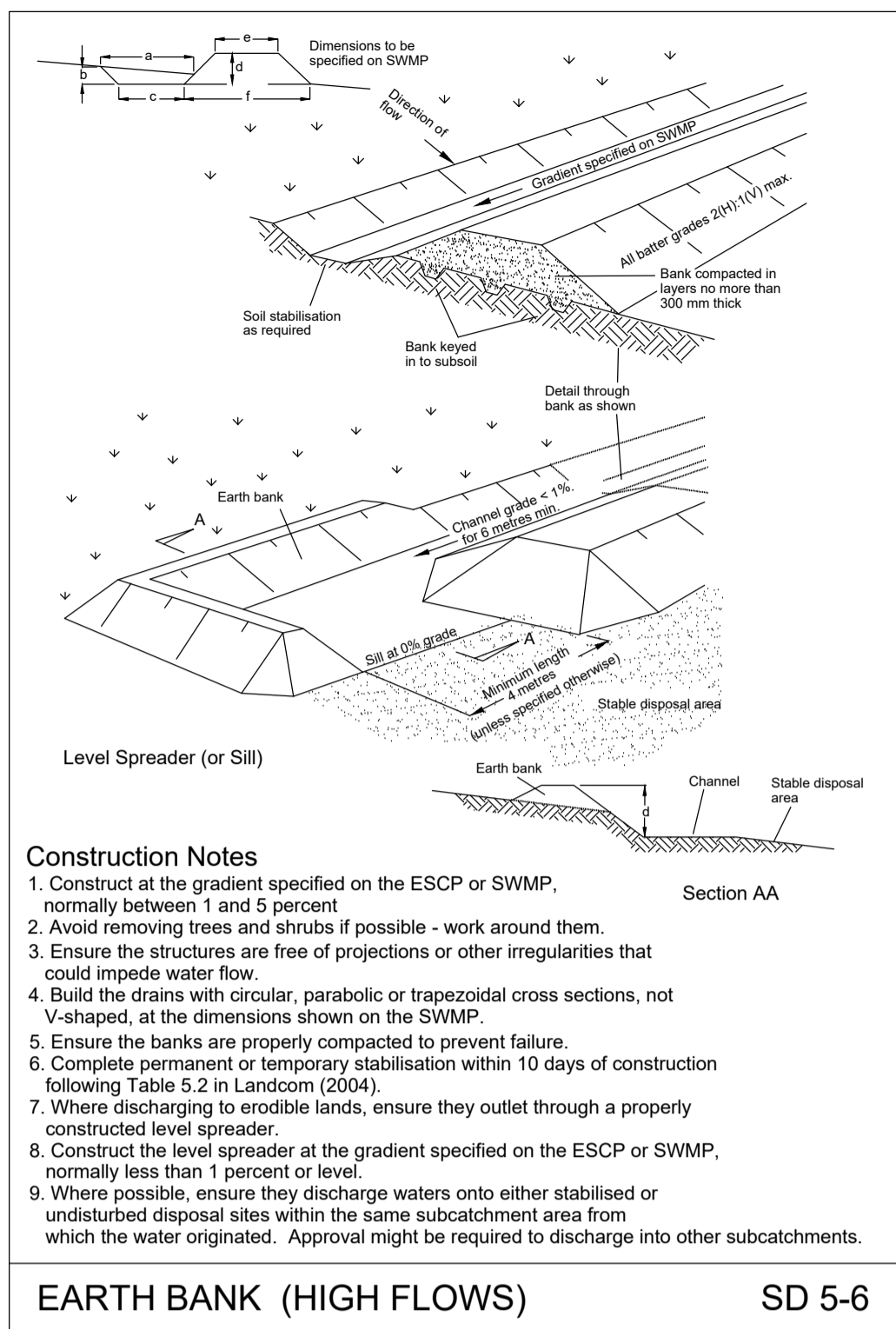
STOCKPILES SD 4-1



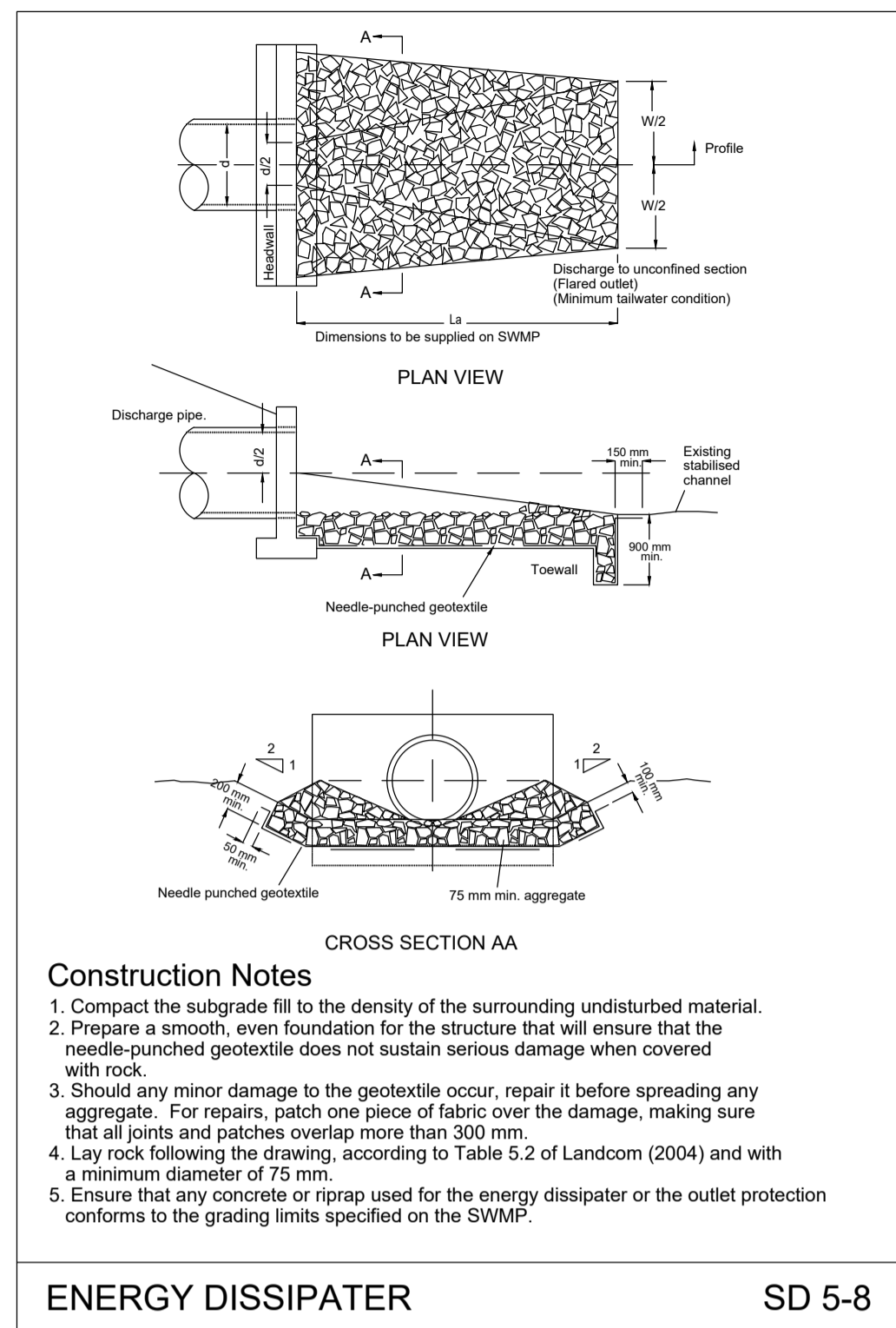
ROCK CHECK DAM SD 5-4



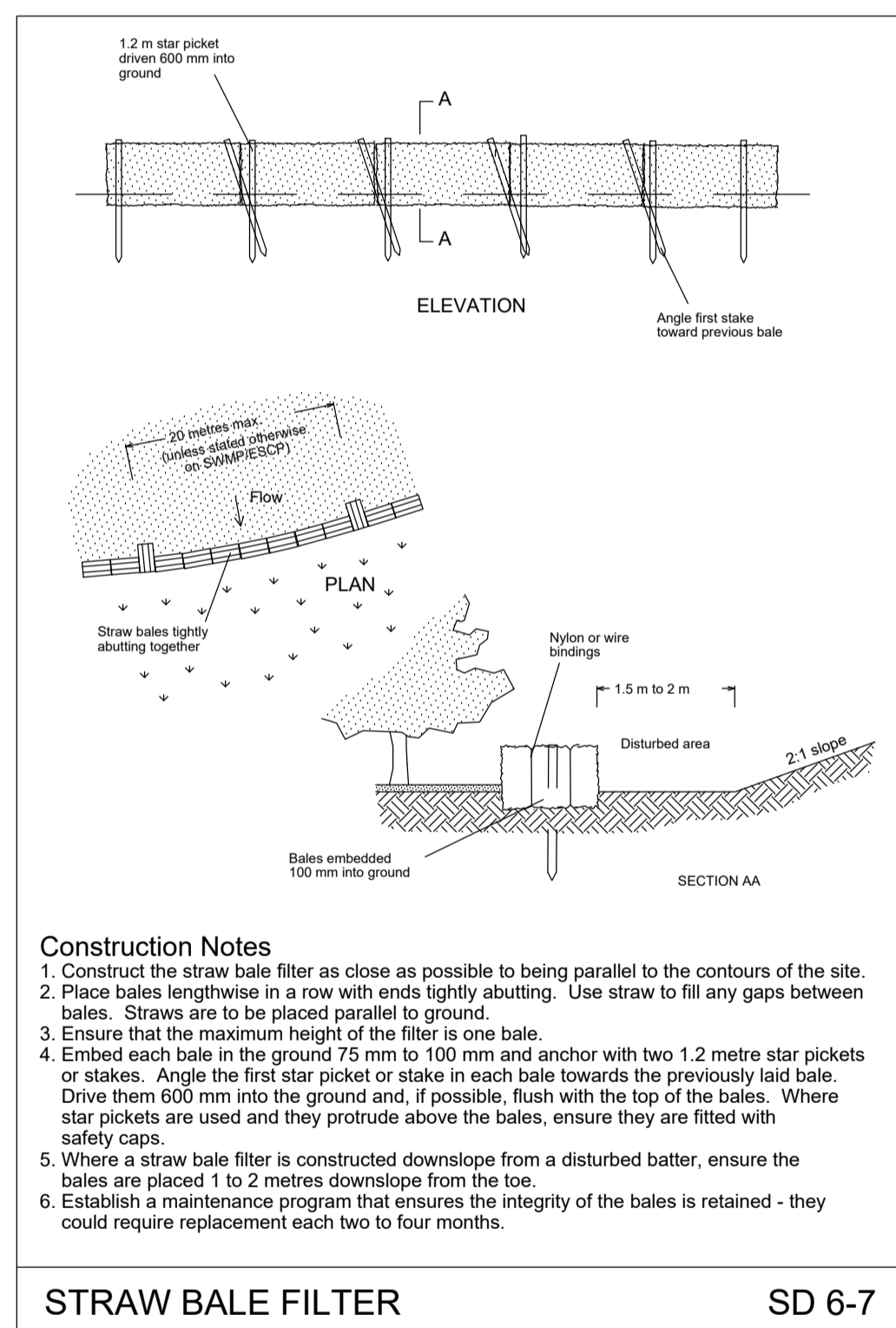
EARTH BANK (LOW FLOW) SD 5-5



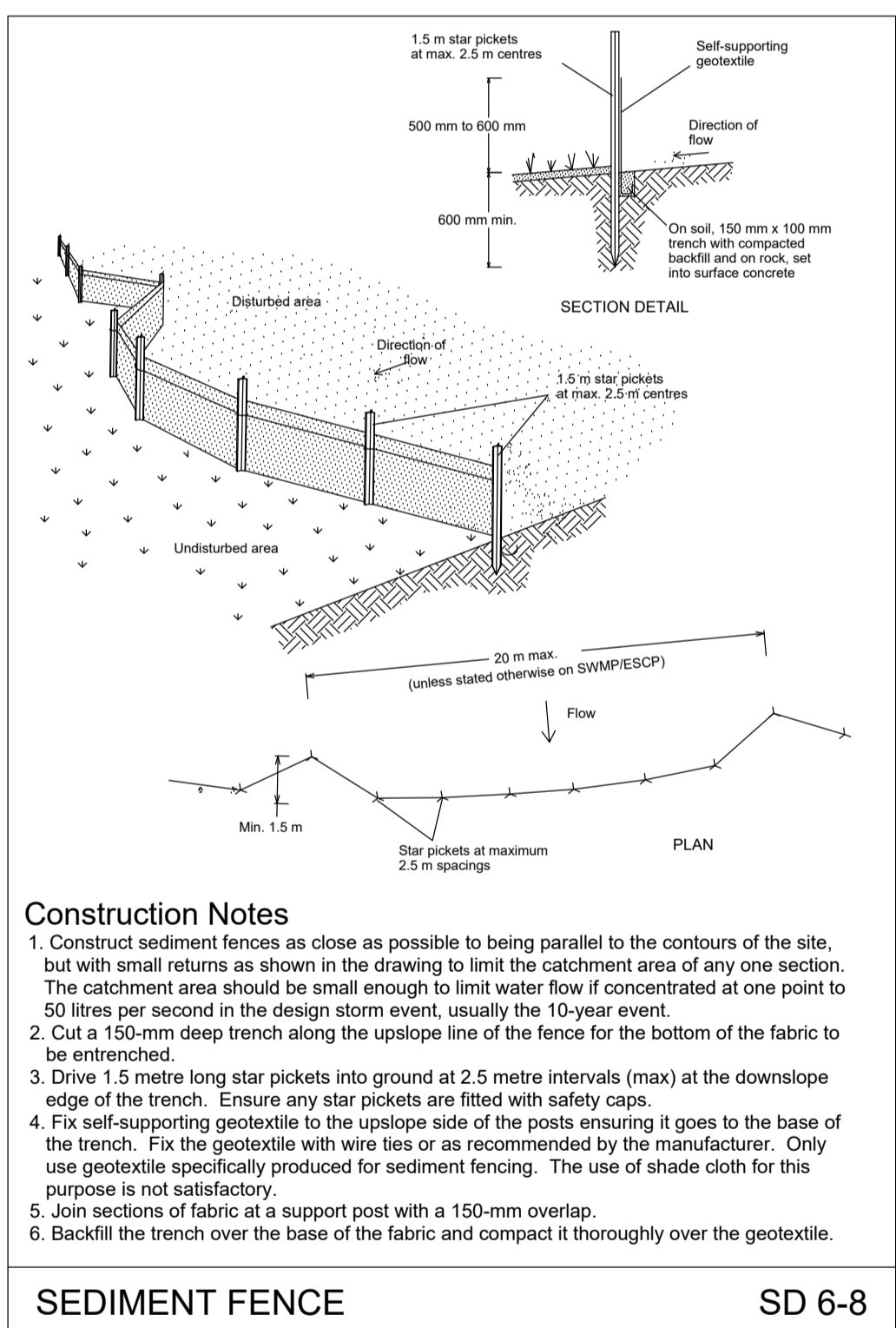
EARTH BANK (HIGH FLOWS) SD 5-6



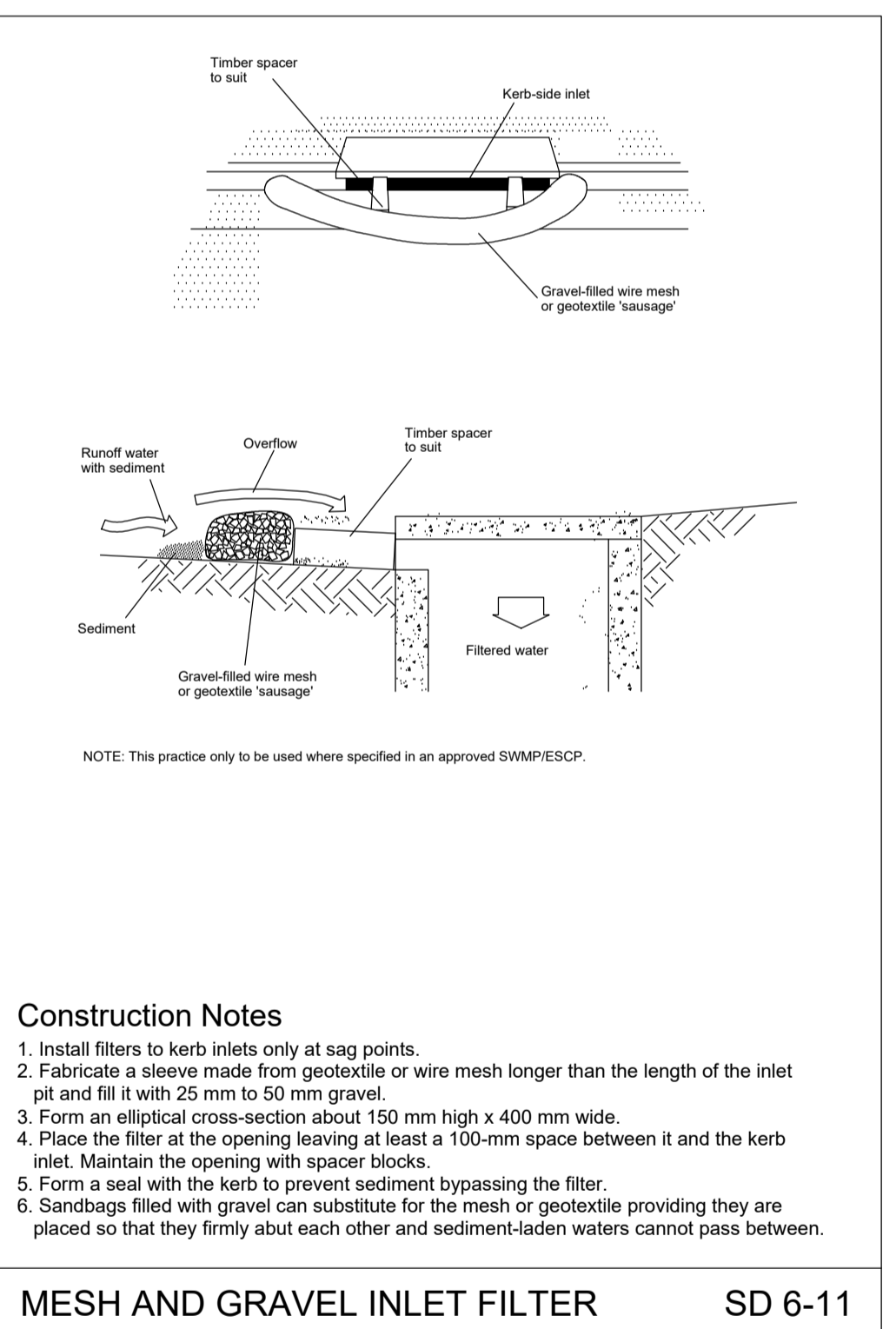
ENERGY DISSIPATER SD 5-8



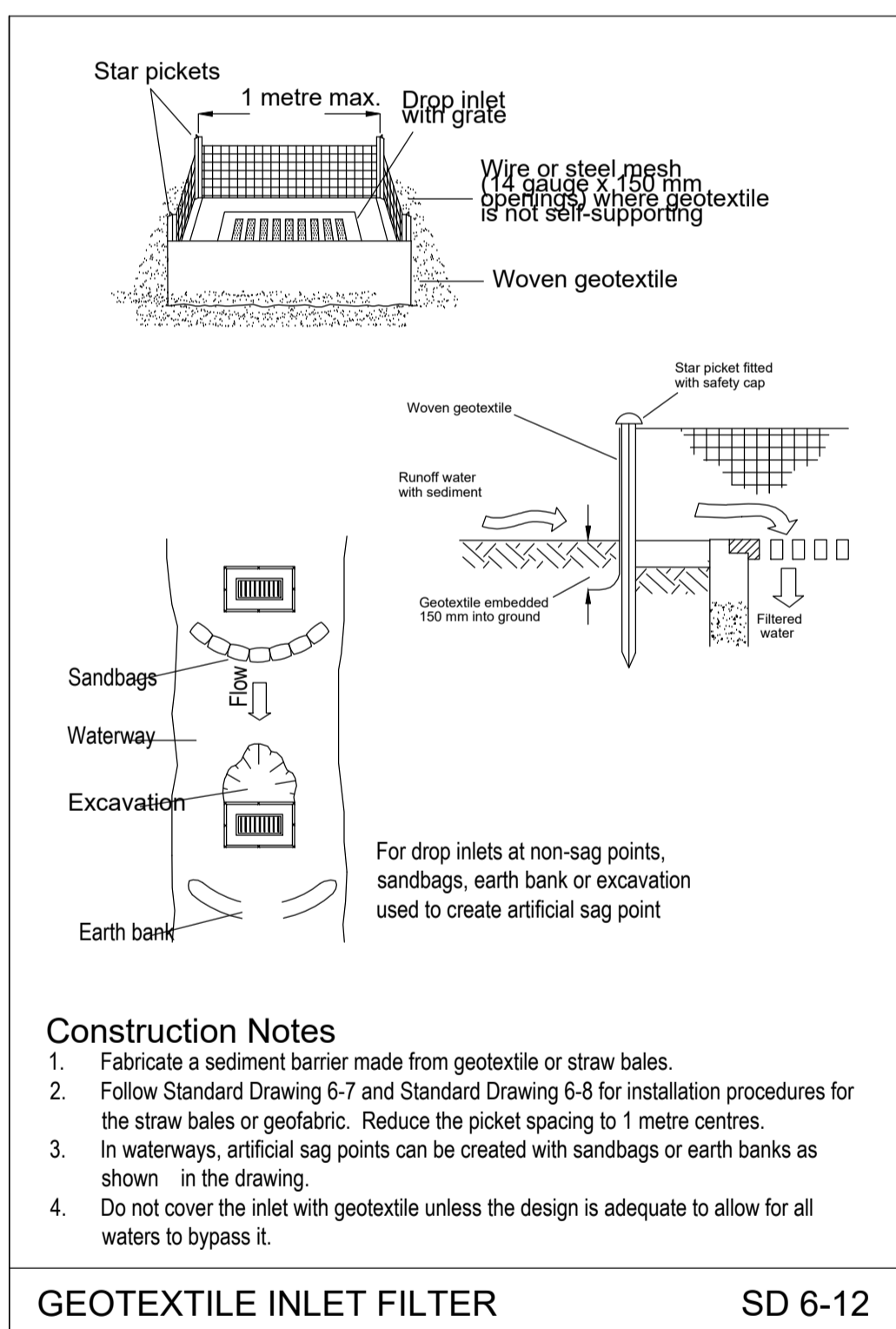
STRAW BALE FILTER SD 6-7



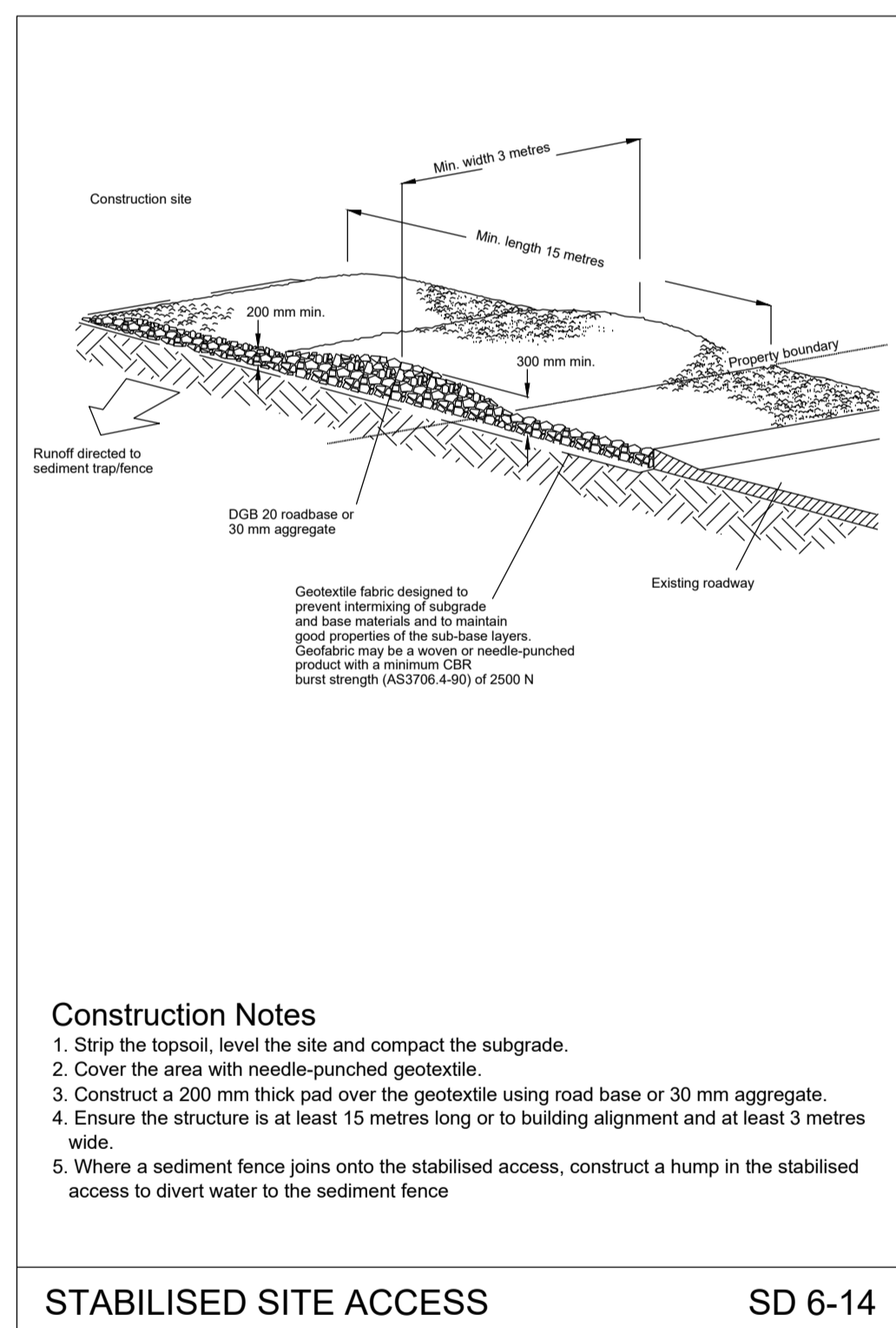
SEDIMENT FENCE SD 6-8



MESH AND GRAVEL INLET FILTER SD 6-11



GEOTEXTILE INLET FILTER SD 6-12



STABILISED SITE ACCESS SD 6-14

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Project:

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Drawing Title:

CIVIL SERVICES SOIL & WATER MANAGEMENT DETAILS SHEET

North Point:	Design:	CV
	Design Validated:	-
	Amendment Approved:	LDG
	Drawn:	CV
Date:	Scale:	NTS
MAR 2020	(A1)	
Job No.:	Part No.:	Disc.:
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