STORMWATER REPORT

Meadowbank TaFE

See Street, Meadowbank

PREPARED FOR
Hansen Yuncken
Sydney Corporate Park
Building 1, Level 3
75-85 O-Riordan Street
Alexandria NSW 2015

Ref: SY193030-CR01
Rev: 1
Date: 26.04.20

Stormwater Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
24.04.20	1	For Information	E. Jacobs	J. Gilligan

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1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Hansen Yuncken to prepare the Civil Engineering design and documentation in support of a State Significant Development Application (SSDA) submission for the proposed Meadowbank TaFE development at See Street, Meadowbank.

This report covers the works shown as the Northrop Drawing Package required for the development of the site with a new Multi-storey carpark and includes:

- Erosion and Sediment control;
- Bulk Earthworks;
- Stormwater Drainage – Water Quantity;
- Stormwater Drainage – Water Quality

It should be noted that the Multi-Storey Carpark is in addition to the proposed Multi-Trades and Digital Technology Hub previously documented and submitted for approval.

1.2 Related Reports and Documents

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

1. State Significant Development Application (SSDA) Civil Documentation prepared by Northrop for the Multi Storey Carpark:
   - 193030-DAC01.01 Cover Sheet, Drawing Schedule and Locality Plan
   - 193030-DAC01.11 Specification Notes – Sheet 01
   - 193030-DAC01.12 Specification Notes – Sheet 02
   - 193030-DAC02.01 Sediment and Soil Erosion Control Plan
   - 193030-DAC02.11 Sediment and Soil Erosion Control Details
   - 193030-DAC04.01 Siteworks and Stormwater Management Plan
   - 193030-DAC09.01 Details – Sheet 01
   - 193030-DAC09.02 Details – Sheet 02
2. Managing Urban Stormwater: Soils and Construction prepared by prepared by Landcom 2004
3. City of Ryde Council's Development Control Plan Part 8;
4. NSW MUSIC Modelling Guidelines prepared by NSW Local Land Services August 2015;
5. Australian Rainfall and Runoff 2019
6. Architectural Plans for the proposed multi-storey carpark prepared by Gray Puksand
7. SSDA Design Report – Civil Meadowbank Tafe – Multi Trades and Digital Technology Hub.

1.3 The Development

1.3.1 Site Description and proposed works

The subject site is located within the suburb of Meadowbank in the City of Ryde Council (Council) Local Government Area (LGA). The proposed works are to take place on an existing carparking area within the Meadowbank TaFE site and is to consist of a new multi-storey car parking facility.

The development site for the multi-storey carpark is approximately 4,000m2 and is bound by See Street to the south and the existing TaFE development to the west, north and east.

Based on review of the survey undertaken across the site by CMS Surveyors Pty Ltd the general site levels fall from a maximum RL of approximately 27.09 m AHD at the south, to a minimum ground surface RL of approximately 23.61 m AHD at the north. There is limited information on the existing stormwater network which predominantly consists of 150mm and 225mm pipes

2. Erosion and Sediment Control

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

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

As part of the works, the erosion and sedimentation control will be constructed in accordance with Council requirements and "Managing Urban Stormwater Soil & Construction" 2004 (Blue Book) prepared by Landcom, prior to any earthworks commencing on site.

2.1 Sediment Basin

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

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

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

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

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

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

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

2.2 Sediment and Erosion Control Measures

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

- A temporary site security/safety fence is to be constructed around the site, the site office area and the proposed sediment basin;
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles;
- Dust control measures including covering stockpiles, installing fence hessian and watering exposed areas;
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basin as noted above in Section 2.1;
- Stabilised site access at the construction vehicle entry/exits.

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

3. Bulk Earthworks

The proposed works will generally consist of earthworks cut and fill operations to form design levels of the proposed carpark area. The levels have been designed to optimise and balance cut to fill material across the site (where possible). The levels for the site have been based on the current Architectural Plans with the majority of the site to be constructed in cut.

Preliminary bulk earthworks quantities are summarised in Table 1:

Table 1 - Concept Earthworks Volumes

Earthworks	Volume (m^3)
Cut	1,904
Fill	145
Balance	1,759 Excess Cut over Fill

The bulk earthworks cut/fill volumes provided are concept only and are subject to change pending final coordination and detailed design. It should be noted the above-mentioned cut/fill operations have been calculated based on the following assumptions:

- No allowance for earthworks bulking factors;
- No allowance for spoil generated from utility service and stormwater drainage trenching;
- No allowance for spoil generated from water quality media;
- 300mm pavement depth for roads and pavements

3.1 Construction Sequencing

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

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

4. Stormwater Management

4.1 Water Quantity

4.1.1 Major / Minor Drainage System

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

The minor system is comprised of the below ground pit and pipe network and is design to control nuisance flooding and enable effective stormwater management for the site. Council's DCP requires that the minor drainage system be designed for a minimum 20-year ARI for commercial development sites.

The major drainage system incorporates overland flow routes through proposed hardstand, carparking and landscaped areas and is assessed against the 100-year ARI design storm event. The major system also exists to cater for minor drainage system failures. In accordance with Council's requirements, the major drainage system is to be designed in a manner that ensures that personal safety is not compromised.

For the purposes of this report, 12d Drainage software is used to calculate flows exiting the site for the proposed scenario. Stormwater piped capacities have been designed to convey the minor (20-year ARI) storm event with safe overland flows for the 100-year ARI storm event. If the major system cannot meet the safety and flooding criteria, then the capacity of the minor drainage system has been increased.

4.1.2 Existing System

Detail site survey has very limited information on the existing stormwater pit and pipe network at the Meadowbank TaFE site. It is likely that additional survey information of the in-ground stormwater network will be required to finalise the civil design prior to construction. At present the design team has determined an appropriate point of discharge for the proposed development which will need further verification by the project surveyor.

4.1.3 Proposed system

The model for the proposed site was developed based upon the following methodology

- The site pit and pipe network is proposed to connect to existing stormwater infrastructure within the TaFE site
- An indicative pit and pipe network was developed for the proposed siteworks (refer civil drawing 193030-DAC04.01 Siteworks and Stormwater Management Plan for details)
- Tailwater conditions at the connection were considered 150mm below grate level for the 1 in 20-year ARI storm event and 150mm above grate level for the 1 in 100-year ARI storm event. These levels have been specified to simulate a charged system downstream and to verify the capacity of the designed pit and pipe network.
- The entire carpark building surface has been proposed to discharge to the in-ground stormwater pit and pipe network.

4.1.4 Results

Model simulations were undertaken in 12d Drainage software to determine the size of the proposed piped networks in order to satisfy major / minor requirements in accordance with City of Ryde Council's standards.

The proposed piped drainage system has been designed to cater for the 1 in 20-year ARI event leading to an existing pit within the TaFE site.

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

4.1.4.1 Discussion

The stormwater design of the Multi-Storey Carpark utilises the same philosophy with respect to On-Site Stormwater Detention (OSD) as the Multi-Trades and Digital Technology Hub. The following items have been considered.

- The proposed Multi Storey carpark is proposed in a location that currently occupies an at grade carpark. As the impervious percentage between the existing and proposed site is negligible, the provision of OSD has not been considered appropriate for this development.
- As the development site is within the same property as the Multi-Trades and Digital Technology Hub, it benefits from the analysis previously undertaken in the SSDA Design Report – Civil Meadowbank Tafe – Multi Trades and Digital Technology Hub. Findings in this report indicate that the downstream conditions are equal or worse off with an OSD installed. As such it is proposed to proceed with this component of the development without OSD.

4.2 Water Quality

The stormwater management systems for the site shall comply with City of Ryde Councils Water Sensitive Urban Design Guidelines. Council's policy requires improved water quality of the stormwater flow form the developed site prior to discharge into the authority's drainage system.

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

- Gross Pollutants;
- Coarse medium and fine sediments
- Oil and grease
- Heavy metals; and
- Nutrients.

4.2.1 Water Quality Objectives

In accordance with City of Ryde Council's Development Control Plan, we note that the following targets have neem set in relation to stormwater quality as shown in Table 2 below:

Table 2 - Water Quality Targets

Pollutant	% Reduction Post-Development Average Annual Load Reduction
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	60
Total Nitrogen (TN)	45
Gross Pollutants	90

To demonstrate compliance with City of Ryde, Council's Development Control Plan, treatment removal loads were analysed from pre-to post development scenarios using MUSIC (Model for Urban Stormwater Improvement Conceptualisation) Version 6 software. Model development and results are discussed in section 4.2.3.

4.2.2 Proposed Treatments

Possible stormwater quality treatment devices such as Ocean Protects Vortech and Jellyfish are discussed below. (refer to product specifications in Appendix C for further details).

4.2.2.1 Ocean Protect Vortech

The Ocean Protect Vortech is a Gross Pollutant Trap proposed as an end of line primary treatment device to treat stormwater runoff from the proposed development. The Ocean Protect Vortech system targets suspended solids, oil, floating and separable debris.

The expected removal rates that were utilised in the water quality modelling process to represent the pollutant filters were based on manufacturers specifications as follows:

Table 3 – Vortech MUSIC Input Parameters

Pollutant	Input	Output	Adopted Rate%
Total Suspended Solids (TSS)	1250	305	75.5
Total Phosphorous (TP)	2.12	1.53	27.9
Total Nitrogen (TN)	8.55	8.55	0
Gross Pollutants	83.8	1.05	98.7

4.2.2.2 Ocean Protect Jellyfish

The Ocean Protect Jellyfish is a proposed as an end of line secondary treatments device to treat stormwater runoff from the development. The Ocean Protect Jellyfish system targets particulate bound pollutants including phosphorus, nitrogen, metals and hydrocarbons.

The expected removal rates that were utilised in the water quality modelling process to represent the pollutant filters were based on manufacturers specifications as follows:

Table 3 – Jellyfish MUSIC Input Parameters

Pollutant	Input	Output	Adopted Rate
Total Suspended Solids (TSS)	305	46.5	84.8
Total Phosphorous (TP)	1.53	0.556	63.6
Total Nitrogen (TN)	8.55	3.98	53.4
Gross Pollutants	1.05	0.0984	90.6

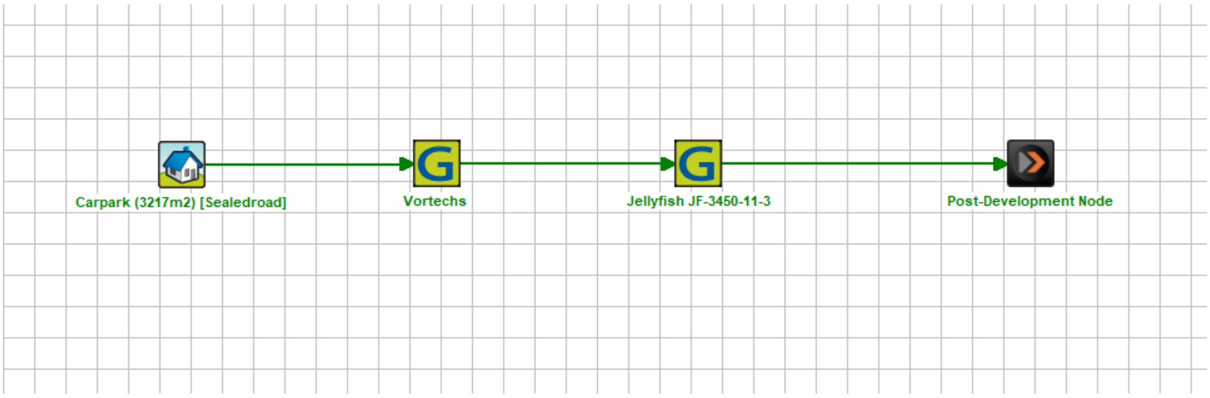
4.2.3 Water Quality Modelling – MUSIC Model, Parameters and Methodology

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

The following methodology and parameters were incorporated in the MUSIC modelling:

- The MUSIC model was created to assess the effectiveness of water quality nodes which are to be constructed as part of the proposed development;
- In accordance with Council's requirements, pluviograph data from Sydney was utilised within the model;
- A MUSIC model was setup to represent the post developed site. From architectural plans the site was categorized as hardstand / carpark / sealed road;
- Pollutant concentration parameters used with in the model were based on the recommended model defaults for hardstand / road area; and
- A treatment train was designed to incorporate a series of treatment nodes including Ocean Protect Vortech and Ocean Protect Jellyfish. The effectiveness of the proposed treatments is summarised in Section 4.2.4.

Figure 1 - Proposed MUSIC Model



4.2.4 Results

The following results were achieved in the model:

Table 5 – MUSIC Results

Pollutant	Post-Development with no WSUD measures (kg/yr.)	Post-Development with WSUD measures (kg/yr.)	Removal Rate (%)	Target Removal Rate (%)
Total Suspended Solids (TSS)	1280	49.8	96.1	85
Total Phosphorous (TP)	2.11	0.552	73.8	60
Total Nitrogen (TN)	8.87	4.14	53.4	45
Gross Pollutants	83.8	0.0984	99.9	90

Results of MUSIC analysis indicate that the proposed treatment train consisting of Ocean Protect Vortech and Ocean Protect Jellyfish satisfies City of Ryde Council's statutory requirements for target pollutant removal rates.

Appendix A. 12d Drainage Results

12d Model Dynamic Drainage Results 5AEP

Negative Flow Values Indicate Reverse Flows

DATA																						
Pit						Pipe											Catchment				Catchment Set 1	
Pit	Pit	Surface	Pit	Major Ever	Minor Ever	Pipe			Pipe	U/S	D/S		Pipe	Pipe	Pipe	Roughness	Catchment	Area	Impervious	Pervious	Impervious	Pervious
Name	Type	RL	Max Ku	Inlet Capac	Inlet Capac	Name	From	To	Length	IL	IL	Slope	Type	Diameter	Roughness	Type	Name		Percentage	Percentage	Tc	Tc
		(m)		%	%			(m)	(m)	(m)	(%)		(mm)				(Ha)	(%)	(%)	(min)	(min)	(min)
01\01	900x900 G	25.75	0	50	100	01\01 to 0	01\01	01\02	19.445	24.994	24.8	1	UPVC	150	0.013	Manning	01\01		0	0		
01\02	900x900 G	25.75	0	50	100	01\02 to 0	01\02	01\03	25.385	24.77	24.516	1	UPVC	150	0.013	Manning	01\02		0	0		
01\03	900x900 G	25.75	0	50	100	01\03 to 0	01\03	01\04	15.79	24.486	24.328	1	UPVC	150	0.013	Manning	01\03		0	0		
01\04	900x900 G	25.75	4	50	100	01\04 to 0	01\04	01\05	22.668	24.298	24.071	1	UPVC	150	0.013	Manning	01\04	0.024	90	10	5	27.3725
01\05	900x900 G	25.75	0.25	50	100	01\05 to 0	01\05	01\06	21.527	24.041	23.826	1	UPVC	150	0.013	Manning	01\05		0	0		
01\06	900x900 G	25.75	1.87	50	100	01\06 to 0	01\06	01\07	6.989	23.796	23.726	1	UPVC	150	0.013	Manning	01\06		0	0		
01\07	900x900 J.	25.75	5.95	80	100	01\07 to 0	01\07	01\08	2.854	22.887	22.602	10	UPVC	225	0.013	Manning	01\07	0.27	90	10	5	27.3725
01\08	900x900 G	23.381	1.89	80	100	01\08 to W	01\08	WQ01	2.368	22.527	22.278	10.517	UPVC	225	0.013	Manning	01\08		0	0		
WQ01	900x900 G	23.194	0.4	80	100	WQ01 to W	WQ01	WQ02	2.267	22.248	22.135	5	UPVC	225	0.013	Manning	WQ01		0	0		
WQ02	900x900 G	23.057	1.83	80	100	WQ02 to 0	WQ02	01\09	3.411	21.537	21.026	15	UPVC	225	0.013	Manning	WQ02		0	0		
01\09	G.G.P. 1.8n	21.962	1.81	80	100	01\09 to 0	01\09	01\10	12.236	20.996	19.598	11.424	UPVC	225	0.013	Manning	01\09	0.021	50	50	5	14.5799
01\10	G.G.P. 1.8n	20.466	1.38	80	100	01\10 to 0	01\10	01\11	19.139	19.568	17.621	10.171	UPVC	225	0.013	Manning	01\10	0.008	30	70	5	6.8757
01\11	G.G.P. 1.8n	18.414	0.63	80	100	01\11 to E	01\11	EX01	12.32	17.509	16.248	10.242	UPVC	225	0.013	Manning	01\11	0.012	20	80	5	13.2919
EX01	G.G.P. 1.8n	17.052															EX01					

RESULTS																	
Pit							Pipe					Overflow					
Pit	Approach	Captured	Bypass	Max	Ponding	Pit	Pipe	Max	Max	Max U/S	MAX D/S	From	To	Flow	Flow	Flow	VxD
Name	Flow	Flow	Flow	HGL	Depth	Freeboard	Name	Flow	Velocity	HGL	HGL			Width	Depth	Velocity	Ratio
(m3/s)	(m3/s)	(m3/s)	(m)	(m)	(m)		(m3/s)	(m/s)	(m)	(m)			(m)	(m)	(m/s)		
01\01	0	0		24.994	0	0.756	01\01 to 0	0	0	24.994	24.8	01\01			0		
01\02	0	0		24.77	0	0.98	01\02 to 0	0	0	24.77	24.516	01\02			0		
01\03	0	0		24.498	0	1.264	01\03 to 0	-0.001	0	24.507	24.455	01\03			0		
01\04	0.01	0.01		24.455	0	1.365	01\04 to 0	0.01	0.7	24.374	24.31	01\04			0		
01\05	0	0		24.31	0	1.644	01\05 to 0	0.014	0.86	24.308	24.244	01\05			0		
01\06	0	0		24.244	0	1.874	01\06 to 0	0.017	0.99	24.231	24.234	01\06			0		
01\07	0.113	0.113		24.234	0	2.22	01\07 to 0	0.111	2.78	24.052	23.327	01\07	LOST		0		
01\08	0	0		23.327	0	0.491	01\08 to W	0.109	2.75	23.148	22.661	01\08			0		
WQ01	0	0		22.661	0	0.635	WQ01 to W	0.109	2.75	22.553	22.381	WQ01			0		
WQ02	0	0		22.374	0	1.237	WQ02 to 0	0.107	2.7	22.206	21.623	WQ02			0		
01\09	0.007	0.007		21.623	0	0.806	01\09 to 0	0.113	3.23	21.527	19.759	01\09			0		
01\10	0.003	0.003		19.759	0	0.753	01\10 to 0	0.12	3.41	19.702	17.963	01\10			0		
01\11	0.003	0.003		17.963	0	0.781	01\11 to E	0.118	2.98	17.917	16.89	01\11			0		
EX01	0	0		16.89	0	-0.643						EX01			0		

12d Model Dynamic Drainage Results 1AEP

Negative Flow Values Indicate Reverse Flows

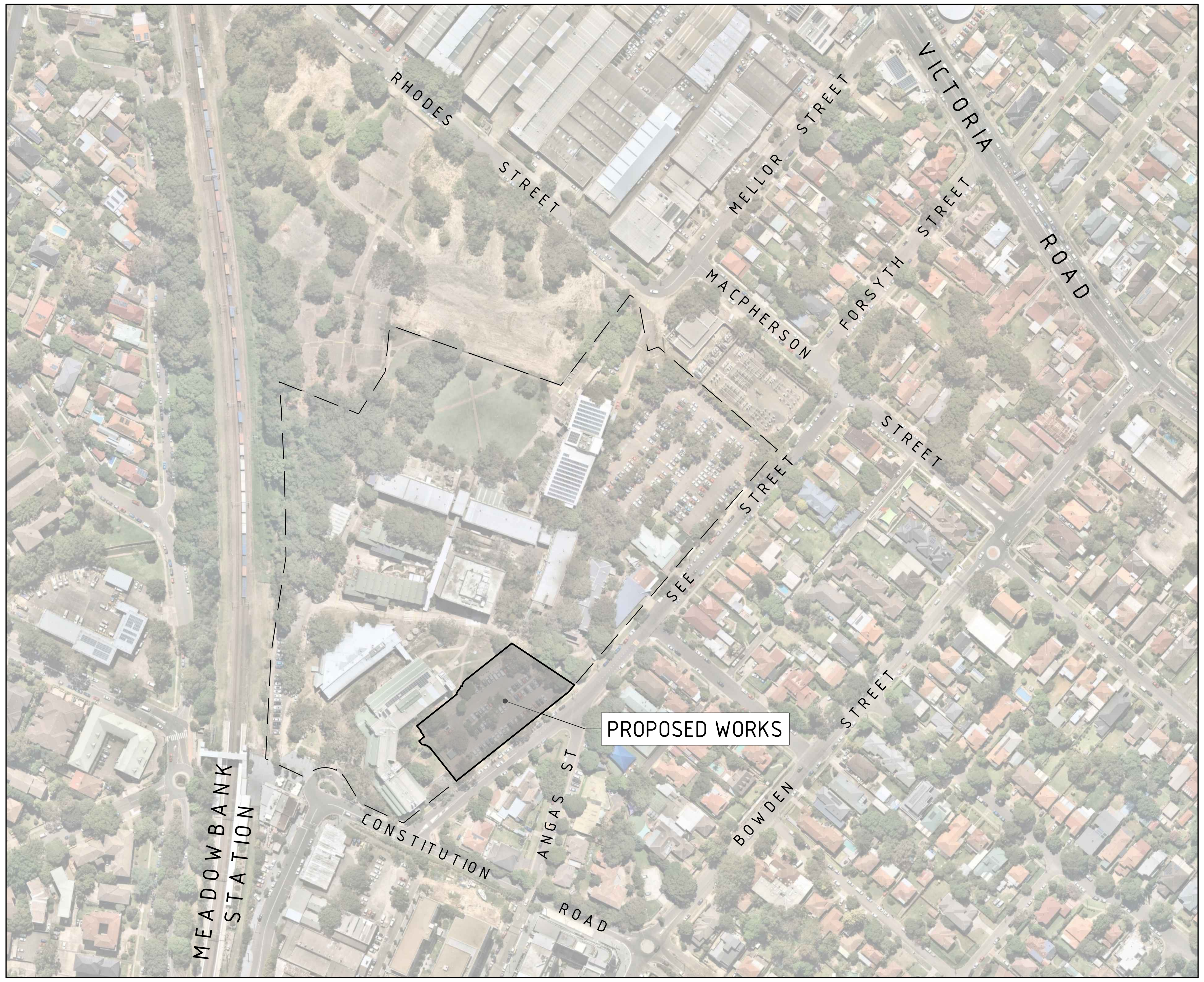
DATA																						
Pit						Pipe											Catchment				Catchment Set 1	
Pit	Pit	Surface	Pit	Major Event	Minor Event	Pipe			Pipe	U/S	D/S		Pipe	Pipe	Pipe	Roughness	Catchment	Area	Impervious	Pervious	Impervious	Pervious
Name	Type	RL	Max Ku	Inlet Capacity	Inlet Capacity	Name	From	To	Length	IL	IL	Slope	Type	Diameter	Roughness	Type	Name		Percentage	Percentage	Tc	Tc
		(m)		%	%			(m)	(m)	(m)	(%)		(mm)				(Ha)	(%)	(%)	(min)	(min)	(min)
01\01	900x900 G	25.75	0	50	100	01\01 to 01\02	01\01	01\02	19.445	24.994	24.8	1	UPVC	150	0.013	Manning	01\01		0	0		
01\02	900x900 G	25.75	0.2	50	100	01\02 to 01\03	01\02	01\03	25.385	24.77	24.516	1	UPVC	150	0.013	Manning	01\02		0	0		
01\03	900x900 G	25.75	2.13	50	100	01\03 to 01\04	01\03	01\04	15.79	24.486	24.328	1	UPVC	150	0.013	Manning	01\03		0	0		
01\04	900x900 G	25.75	8.02	50	100	01\04 to 01\05	01\04	01\05	22.668	24.298	24.071	1	UPVC	150	0.013	Manning	01\04	0.024	90	10	5	24.735
01\05	900x900 G	25.75	0.25	50	100	01\05 to 01\06	01\05	01\06	21.527	24.041	23.826	1	UPVC	150	0.013	Manning	01\05		0	0		
01\06	900x900 G	25.75	1.87	50	100	01\06 to 01\07	01\06	01\07	6.989	23.796	23.726	1	UPVC	150	0.013	Manning	01\06		0	0		
01\07	900x900 J.	25.75	5.95	80	100	01\07 to 01\08	01\07	01\08	2.854	22.887	22.602	10	UPVC	225	0.013	Manning	01\07	0.27	90	10	5	24.735
01\08	900x900 G	23.381	1.89	80	100	01\08 to WQ01	01\08	WQ01	2.368	22.527	22.278	10.517	UPVC	225	0.013	Manning	01\08		0	0		
WQ01	900x900 G	23.194	0.39	80	100	WQ01 to WQ02	WQ01	WQ02	2.267	22.248	22.135	5	UPVC	225	0.013	Manning	WQ01		0	0		
WQ02	900x900 G	23.057	1.81	80	100	WQ02 to 01\09	WQ02	01\09	3.411	21.537	21.026	15	UPVC	225	0.013	Manning	WQ02		0	0		
01\09	G.G.P. 1.8r	21.962	1.7	80	100	01\09 to 01\10	01\09	01\10	12.236	20.996	19.598	11.424	UPVC	225	0.013	Manning	01\09	0.021	50	50	5	13.175
01\10	G.G.P. 1.8r	20.466	1.19	80	100	01\10 to 01\11	01\10	01\11	19.139	19.568	17.621	10.171	UPVC	225	0.013	Manning	01\10	0.008	30	70	5	6.2131
01\11	G.G.P. 1.8r	18.414	0.63	80	100	01\11 to EX01	01\11	EX01	12.32	17.509	16.248	10.242	UPVC	225	0.013	Manning	01\11	0.012	20	80	5	12.0111
EX01	G.G.P. 1.8r	17.052															EX01					

RESULTS																	
Pit							Pipe					Overflow					
Pit	Approach	Captured	Bypass	Max	Ponding	Pit	Pipe	Max	Max	Max U/S	MAX D/S	From	To	Flow	Flow	Flow	VxD
Name	Flow	Flow	Flow	HGL	Depth	Freeboard	Name	Flow	Velocity	HGL	HGL			Width	Depth	Velocity	Ratio
(m3/s)	(m3/s)	(m3/s)	(m)	(m)	(m)		(m3/s)	(m/s)	(m)	(m)			(m)	(m)	(m/s)		
01\01	0	0		24.994	0	0.756	01\01 to 01\02	0	0	24.995	24.928	01\01			0		
01\02	0	0		24.928	0	0.98	01\02 to 01\03	-0.004	0.38	24.928	24.926	01\02			0		
01\03	0	0		24.926	0	1.264	01\03 to 01\04	-0.011	0.62	24.926	24.923	01\03			0		
01\04	0.013	0.013		24.923	0	1.35	01\04 to 01\05	0.015	0.85	24.896	24.861	01\04			0		
01\05	0	0		24.861	0	1.635	01\05 to 01\06	0.019	1.07	24.86	24.826	01\05			0		
01\06	0	0		24.826	0	1.861	01\06 to 01\07	0.025	1.44	24.82	24.807	01\06			0		
01\07	0.142	0.142		24.807	0	2.076	01\07 to 01\08	0.139	3.49	24.625	23.383	01\07	LOST		0		
01\08	0	0		23.383	0	0.309	01\08 to WQ01	0.113	2.84	23.203	22.714	01\08			0		
WQ01	0	0		22.714	0	0.589	WQ01 to WQ02	0.113	2.84	22.602	22.453	WQ01			0		
WQ02	0	0		22.453	0	1.181	WQ02 to 01\09	0.112	2.83	22.285	21.696	WQ02			0		
01\09	0.01	0.01		21.696	0	0.777	01\09 to 01\10	0.13	3.37	21.599	19.984	01\09			0		
01\10	0.004	0.004		19.984	0	0.73	01\10 to 01\11	0.128	3.41	19.927	18.04	01\10			0		
01\11	0.006	0.006		18.04	0	0.727	01\11 to EX01	0.129	3.52	17.996	16.414	01\11			0		
EX01	0	0		16.414	0	-0.138						EX01			0		

Appendix B. Engineering Drawings

MEADOWBANK TAFE

MEADOWBANK, NSW
CIVIL DOCUMENTATION - CARPARK



SOURCE : NEARMAP.COM.AU (©2020)

LOCALITY PLAN

CIVIL DRAWING SCHEDULE

DWG No.	DRAWING TITLE
DAC01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DAC01.11	SPECIFICATION NOTES - SHEET 01
DAC01.12	SPECIFICATION NOTES - SHEET 02
DAC02.01	SEDIMENT AND SOIL EROSION CONTROL PLAN
DAC02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS
DAC04.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN
DAC09.01	DETAILS - SHEET 01
DAC09.02	DETAILS - SHEET 02

DRAWN: JOHN O   DESIGNED: T. BUGAEV   JOB MANAGER: J. GILLIGAN   VERIFIER: .

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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

ARCHITECT: GRAY PUKSAND

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE

SCALE 1:2000@ A1   0 20 40 60 80 100m

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PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN

JOB NUMBER: 193030

DRAWING NUMBER: DAC01.01   REVISION: 1

DRAWING SHEET SIZE = A1

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

ACCESS AND SAFETY

1. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING TRAFFIC CONTROL.
2. THE CONTRACTOR SHALL PROVIDE TRAFFIC MANAGEMENT PLANS FOR THE PROPOSED WORKS COMPLETED BY A SUITABLY QUALIFIED PERSON AND APPROVED BY COUNCIL / REGULATORY AUTHORITY. WORK IS NOT TO COMMENCE ON SITE PRIOR TO APPROVAL OF TRAFFIC MANAGEMENT SCHEME.
3. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES ACCESS TO BUILDINGS ADJACENT THE WORKS IS NOT DISRUPTED.
4. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS THROUGH OR BY THE SITE.
5. THE CONTRACTOR SHALL ENSURE PUBLIC ACCESS EXTERNAL TO THE SITE IS IN ACCORDANCE WITH COUNCILS / AUTHORITY / SITE MANAGERS REQUIREMENTS.

TREE PROTECTION

1. REFER TO LANDSCAPE ARCHITECTS PLAN FOR TREES TO BE RETAINED AND PROTECTED.
2. ANY EXISTING/PROPOSED TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY;
   - 2.1. PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE.
   - 2.2. ENSURING THAT NOTHING IS NAILED TO ANY PART OF THE TREE.
   - 2.3. CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY. COUNCILS AND/OR INDEPENDENT ARBORISTS TO BE CONSULTED WHERE TREE ROOTS ARE TO BE REMOVED AND/OR CUT.

SEDIMENT AND SOIL EROSION

1. THE SEDIMENT & EROSION CONTROL PLAN PRESENTS CONCEPTS ONLY. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT & MANAGEMENT OF A DETAILED SCHEME MEETING COUNCILS AND OTHER REGULATORY AUTHORITY REQUIREMENTS AND MAKE PAYMENT OF ALL FEES.
2. THE CONTRACTOR SHALL INSTIGATE ALL SEDIMENT AND EROSION CONTROL MEASURES IN ACCORDANCE WITH STATUTORY REQUIREMENTS AND IN PARTICULAR THE 'BLUE BOOK' (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION), PRODUCED BY THE DEPARTMENT OF HOUSING AND COUNCILS POLICIES. THESE MEASURES ARE TO BE INSPECTED AND MAINTAINED ON A DAILY BASIS.
3. THE CONTRACTOR SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THE DRAWINGS AND ADHERE TO ALL REGULATORY AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL INFORM ALL SUB CONTRACTORS OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSTREAM LANDS AND WATERWAYS.
5. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE;
   - 5.1 CONSTRUCT TEMPORARY STABILISED SITE ACCESS INCLUSIVE OF SHAKE DOWN / WASH PAD.
   - 5.2 INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ADJACENT EACH OTHER, THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE.
   - 5.3 INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THE APPROVED PLANS.
6. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MINIMUM WORKABLE SIZE.
7. AT ALL TIMES AND IN PARTICULAR DURING WINDY AND DRY WEATHER, LARGE UNPROTECTED AREAS WILL BE STABILISED / KEPT MOIST (NOT WET) TO KEEP DUST UNDER CONTROL ENSURING CONFORMITY TO REGULATORY AUTHORITY REQUIREMENTS.
8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) SHALL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
9. WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN STABILISED AND/OR ANY LIKELY SEDIMENT BEEN FILTERED OUT.
10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES SHALL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE STABILISED / REHABILITATED.
11. ALLOW FOR GRASS STABILISATION OF EXPOSED AREAS, OPEN CHANNELS AND ROCK BATTERS DURING ALL PHASES OF CONSTRUCTION.
12. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN REGULARLY AND AS REQUIRED, PARTICULARLY FOLLOWING RAIN EVENTS.
13. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS. CONTRACTOR TO PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.
14. IF A TEMPORARY SEDIMENT BASIN IS REQUIRED, ENSURE SAFE BATTER SLOPES IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. MAINTAIN ADEQUATE STORAGE VOLUME IN ACCORDANCE WITH PLANS. TEMPORARY PUMP 'CLEAN FLOCCULATED' WATER TO AUTHORITIES STORMWATER SYSTEM. ENSURE WHOLE DISTURBED SITE RUN-OFF IS DIRECTED TO TEMPORARY SEDIMENT BASIN.

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIAL BEFORE YOU DIG SEARCHES, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY. NOTE SERVICE AUTHORITY REQUIREMENTS FOR LOCATING OF SERVICES PRIOR TO COMMENCEMENT OF WORKS.
2. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS ARE TO BE UNDERTAKEN OVER COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.
3. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AT THE CONTRACTORS EXPENSE.
4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE ADJUSTMENT (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.
5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS ARE NOT AFFECTED BY THE WORKS AND ARE MAINTAINED AND NOT DISRUPTED.
7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.
8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
9. THE CONTRACTOR IS TO ALLOW TO POTHOLE ANY SERVICES WITHIN A PUBLIC RESERVE WITHIN THE EXTENT OF WORKS (E.G. STORMWATER CROSSINGS).

EARTHWORKS

1. AT THE COMMENCEMENT OF FILLING OPERATIONS FOR BULK EARTHWORKS A GEOTECHNICAL ENGINEER IS TO VISIT THE SITE & CONFIRM THE SUITABILITY OF THE METHODOLOGY OF ACHIEVING THE REQUIRED COMPACTION EARTHWORKS REQUIREMENTS.
2. STRIP TOPSOIL, VEGETABLE MATTER AND RUBBLE TO EXPOSE NATURALLY OCCURRING MATERIAL AND STOCKPILE ON SITE AS DIRECTED BY THE SUPERINTENDENT.
3. WHERE FILLING IS REQUIRED TO ACHIEVE DESIGN SUBGRADE, PROOF ROLL EXPOSED NATURAL SURFACE WITH A MINIMUM OF TEN PASSES OF A VIBRATING ROLLER (MINIMUM STATIC WEIGHT OF 10 TONNES) IN THE PRESENCE OF THE SUPERINTENDENT OR CERTIFYING ENGINEER.
4. THE CONTRACTOR IS TO ALLOW FOR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO PROVIDE ADVICE AND CERTIFICATION OF ANY WORKS ASSOCIATED WITH TREATING OR MANAGING UNSUITABLE GROUND CONDITIONS THROUGHOUT THE CONTRACT (e.g. STABILITY OF EXCAVATIONS, POOR SUBGRADE, THE EXISTING QUARRY AREA etc).
5. ALL SOFT, WET OR UNSUITABLE MATERIAL IS TO BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND REPLACED WITH APPROVED MATERIAL SATISFYING THE REQUIREMENTS BELOW.
6. PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.
7. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS (LOOSE) AND COMPACTED AT OPTIMUM MOISTURE CONTENT (+ OR - 2%) TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289.2.1.1, AS1289.5.7.1 AND AS1289.5.8.8 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY;

LOCATION	COMPACTION REQUIREMENT
LANDSCAPED AREAS	98% SMDD
ROADS	100% SMDD (IN ACCORDANCE WITH COUNCIL SPECIFICATIONS)
PAVED AREAS	100% SMDD (IN ACCORDANCE WITH COUNCIL SPECIFICATIONS)

8. TESTING OF THE SUBGRADE SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. REGISTERED LABORATORY AT THE CONTRACTORS EXPENSE UNLESS AGREED DIFFERENTLY WITH THE PRINCIPAL.
9. ALLOW THE FOLLOWING COMPACTION TESTING BY N.A.T.A. REGISTERED LABORATORY FOR PLATFORMS AND FILL LAYERS IN ACCORDANCE WITH THE LATEST VERSION OF AS3798. (MINIMUM 3 TESTS PER LAYER) OR 1 TEST PER MATERIAL TYPE PER 2500sq.m OR 1 TEST.
10. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT (TYNING FIRST AS NECESSARY) AND RETEST UNTIL SPECIFIED COMPACTION STANDARDS ARE ACHIEVED, OTHERWISE SUBGRADE REPLACEMENT IS REQUIRED IF COMPACTION STANDARDS ARE NOT ACHIEVED.
11. ALLOW FOR EXCAVATION IN ALL MATERIALS AS FOUND U.N.O. NO ADDITIONAL PAYMENTS WILL BE MADE FOR EXCAVATION IN WET OR HARD GROUND.

EARTHWORKS (cont)

12. WHERE THERE IS INSUFFICIENT EXCAVATED MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING;
   - 1.1. BE OF VIRGIN EXCAVATED NATURAL MATERIAL OR
   - 1.2. CONTRACTOR TO PROVIDE EVIDENCE IMPORT IS SUITABLE FOR USE
   - 1.3. PLASTICITY INDEX BETWEEN 2-15% AND CBR > 8
   - 1.4. FREE FROM ORGANIC AND PERISHABLE MATTER
   - 1.5. MAXIMUM SIZE 50mm, PASSING 75 MICRON SIEVE (<25%)
2. THE CONTRACTOR SHALL PROGRAM THE EARTHWORKS OPERATION SO THAT THE WORKING AREAS ARE ADEQUATELY DRAINED DURING THE PERIOD OF CONSTRUCTION. THE SURFACE SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLERS MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED AT THEIR COST.
12. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND COMPACTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST.

DEEP EXCAVATIONS

13. PRIOR TO THE COMMENCEMENT OF EXCAVATION WORKS GREATER THAN 1.5m IN DEPTH, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO DETERMINE THE STABILITY OF MATERIAL BEING EXCAVATED AND BENCHING REQUIREMENTS / MINIMUM BATTER SLOPES.
14. THE CONTRACTOR MUST PROVIDE THE SUPERINTENDENT AND OR THE DESIGN ENGINEER WITH A COPY OF THE GEOTECHNICAL ENGINEERS REPORT PRIOR TO PRACTICAL COMPLETION.
15. THE CONTRACTOR IS TO PROVIDE SAFETY BARRIERS, FENCING AND THE LIKE IN ACCORDANCE WITH OH&S AND REGULATORY AUTHORITY REQUIREMENTS AND TO ENSURE THE WORK SITE IS SAFE AT ALL TIMES.

LANDSCAPING

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

STORMWATER DRAINAGE

1. ALL PIPES SHALL BE CLASS 2 RUBBER-RING JOINTED RCP U.N.O. WHERE uPVC PIPES HAVE BEEN SPECIFIED, THE FOLLOWING CLASS PIPEWORK IS TO BE ADOPTED U.N.O. Ø100mm OR LESS TO BE CLASS 'SN10' AND ABOVE Ø100mm TO BE CLASS 'SN8'. CLASS 4 PIPES ARE TO BE USED WHERE COVER OVER THE PIPE IS BELOW 600mm AND BENEATH A TRAFFICABLE PAVEMENT.
2. uPVC STORMWATER LINES PASSING UNDER FLOOR SLABS TO BE CONCRETE ENCASED.
3. FRC PIPES EQUAL TO THAT OF THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED SUBJECT TO APPROVAL FROM THE SUPERINTENDENT.
4. ALL PIPE ARE TO BE LAID AT 1.0% MIN GRADE U.N.O.
5. COVERS
   - 5.1. USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS.
   - 5.2. ALL COVERS AND GRATES TO BE POSITIONED IN A FRAME AND MANUFACTURED AS A UNIT.
   - 5.3. ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS
   - 5.4. OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES. CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.
   - 5.5. UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.
   - 5.6. ALL GRATED TRENCH DRAINS SHOULD BE 'CLASS D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.
6. ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.
7. ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH FINISH.
7. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT
8. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
9. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.
10. BEDDING SHALL BE U.N.O TYPE HS2 UNDER ROADS AND H2 UNDER GENERAL AREAS IN ACCORDANCE WITH CURRENT RELEVANT INDUSTRY STANDARDS AND GUIDELINES.
11. THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST TO THE CONTRACT.
12. NOTE THAT THE PIT COVER LEVEL NOMINATED IN GUTTERS ARE TO THE INVERT OF THE GUTTER WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER. REFER KERB DETAILS FOR CONFIRMATION.

SUBSOIL DRAINAGE

13. Ø100mm SUBSOIL DRAINAGE LINES WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;
   - 13.1. THE HIGH SIDE OF PROPOSED TRAFFICKED PAVEMENT AREAS.
   - 13.2. ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.
   - 13.3. BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).
   - 13.4. UPSTREAM OF STORMWATER PITS
   - 13.5. BENEATH FLEXIBLE PAVEMENT ALONG A SAG PROFILE
   - 13.6. ALL OTHER AREAS SHOWN ON DRAWINGS.
   - 13.7. CONTRACTOR IS TO MAKE ALLOWANCE IN BOTH TENDER AND CONSTRUCTION COSTING TO ALLOW FOR SUBSURFACE DRAINAGE BEHIND ALL RETAINING WALLS / ABOVE LOCATIONS AND TO MAKE CONNECTION TO STORMWATER SYSTEM.
14. WHERE SUBSOIL DRAINAGE PASSES BENEATH BUILDINGS / PAVED AREAS AND/OR PAVEMENTS. CONTRACTOR TO ENSURE Ø100mm CLASS 'SN10' uPVC DRAINAGE LINE IS USED AND THAT PROPRIETARY FITTINGS ARE USED TO RECONNECT SUBSOIL DRAINAGE LINE.
15. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS / CLEAROUTS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH COUNCIL SPECIFICATIONS. HOWEVER AS A MINIMUM THEY ARE TO BE PLACED AT MAXIMUM 30m CENTRES AND AT ALL UPSTREAM ENDPOINTS.
16. PROVIDE 3.0m LENGTH OF Ø100 SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.
17. IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE, LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC A34.
18. THE CONTRACTR IS TO ENSURE THAT A MINIMUM 150mm CLEARANCE IS PROVIDED BETWEEN THE INTERNAL FACE OF PIPE AND ADJACENT INTERNAL PIT WALLS
19. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK. (E.G. CLEAN 5-12mm AGGREGATE)

PRECAST STORMWATER PITS

1. THE USE OF PRE-CAST STORMWATER DRAINAGE PITS IS NOT ACCEPTED WITHOUT CONFIRMATION BETWEEN NORTHROP ENGINEERS AND THE CONTRACTOR REGARDING QUALITY CONTROL AND CERTIFICATION OF FINISHES.
2. REFER MANUFACTURERS SPECIFICATIONS FOR INSTALLATION GUIDELINES.
3. PRECAST PIT TO BE PLACED ON MINIMUM 150mm THICK CONCRETE PAD AND BED MINIMUM 50mm WHILST CONCRETE IS STILL PARTIALLY WET.
4. ENSURE PENETRATION IS CORED THROUGH PIT FACE TO ALLOW CONNECTION AND IS NOT OVERSIZED.
5. ENSURE A SEALED FINISH AT PIPE CONNECTIONS BY HAND-APPLYING MINIMUM 150mm THICK CONCRETE AROUND PIPE AT THE EXTERNAL FACE OF THE PIT. ENSURE CONCRETE DOES NOT AFFECT THE INTEGRITY OF THE SUBSOIL DRAINAGE CONNECTED TO THE PIT.
6. ENSURE A SMOOTH SEALED FINISH AT PIPE CONNECTIONS BY HAND APPLYING CONCRETE AROUND THE PIPE ON THE INTERNAL FACE OF THE PIT TO FILL IN ANY VOIDS CREATED WHEN PENETRATION FOR THE PIPE WAS CORED.
7. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT.
8. ENSURE THE OUTLET PIPE IS CONNECTED AT THE INVERT LEVEL OF THE PIT TO DRAIN. ALTERNATIVELY FILL THE BASE OF THE PIT WITH MASS CONCRETE (MIN 50mm THICK) OR APPROVED GROUTING COMPOUND (LESS THAN 50mm THICK) TO DRAIN.
9. PROVIDE CONCRETE BENCHING TO SIDES OF PIT TO SUIT PIPE DIAMETER. HEIGHT TO MATCH MINIMUM 1/3 PIPE DIAMETER.

SIGNAGE AND LINEMARKING

1. ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS 1742 / RMS STANDARDS AND SPECIFICATIONS.
2. LINE MARKING AND PAINT SHALL BE IN ACCORDANCE WITH AS1742.3 AND RMS STANDARDS.
3. PAINT SHALL BE TYPE 3 CLASS 'A' AND THE COLOUR SHALL BE WHITE AND NOT SUBJECT TO DISCOLOURATION BY BITUMEN FROM ROAD SURFACE. ALL PAINT TO BE APPLIED BY MECHANICAL SPRAYER. LINE MARKING SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm
4. PAINT SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm.
5. CARPARK LINEMARKING TO BE 80mm WIDE.
6. WHEEL STOPS TO BE PROVIDED FOR PARKING SPOTS ADJACENT TO A WALL WITHIN 1.1m OF THE FACE OF KERB IN ACCORDANCE WITH AS1428.1
7. REFER TO AUSTROADS FOR REMOVAL OF LINEMARKING.

SITEWORKS

1. ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL / REGULATORY AUTHORITIES REQUIREMENTS, ALL SPECIFICATIONS AND AUSTRALIAN STANDARDS. CONFLICTS BETWEEN SAID DOCUMENTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2. THE CONTRACTOR IS TO REVIEW THE DRAWINGS PRIOR TO PRICING AND COMMENCEMENT AND REPORT ANY DISCREPANCIES TO NORTHROP
3. ANY PRODUCTS SPECIFIED OR USED TO BE VERIFIED BY THE CONTRACTOR AS BEING SAFE AND APPROPRIATE FOR USE. NORTHROP DO NOT TAKE ANY RESPONSIBILITY FOR THE USE OF UNSAFE PRODUCTS
4. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCIL REGULATIONS AND REQUIREMENTS.
5. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.
6. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.
7. ON COMPLETION OF ANY TRENCHING WORKS, ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL, GRASSED AREAS AND ROAD PAVEMENTS.
8. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.THE CONTRACTOR IS TO ENSURE THAT SURVEY BOUNDARIES ARE DERIVED FROM A CADASTRAL SURVEY RATHER THAN A DETAIL SURVEY.
9. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMENT OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.
10. DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.
11. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
12. WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.
13. TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MIN 50mm IN BITUMINOUS PAVING.
14. ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.
15. NOTES ON DETAILS PROVIDED TAKE PRECEDENCE OVER SPECIFICATION NOTES UNLESS IN CONTRADICTION WITH COUNCIL/AUTHORITY SPECIFICATIONS/DETAILS. CONTRACTOR TO CONSULT WITH NORTHROP FOR ANY DISCREPANCIES.
16. IF THE CONTRACTOR DISCOVERS HAZARDOUS/CONTAMINATED MATERIAL THE CONTRACTOR SHALL CONSULT WITH AN ENVIRONMENTAL SPECIALIST.
17. THE CONTRACTOR IS RESPONSIBLE FOR DEALING WITH COMMUNITY COMPLAINTS ASSOCIATED WITH THE WORKS UNDER THE CONTRACT AND TO COMPENSATE FOR/RECTIFY ANY DAMAGE REASONABLY CAUSED BY THE CONTRACTOR.
18. THE TERM 'MAKE GOOD' OR 'MAKE NEAT' IS IN REFERENCE TO THE SATISFACTION OF NORTHROP OR CERTIFYING ENGINEER. THE CONTRACTOR IS TO SEEK CLARIFICATION FROM NORTHROP OR THE CERTIFYING ENGINEER IF NECESSARY
19. TOLERANCES TO BE IN ACCORDANCE WITH COUNCIL/AUTHORITY REQUIREMENTS.

SERVICE TRENCHES

20. SAWCUT EXISTING SURFACES PRIOR TO EXCAVATION. BACKFILL ALL TRENCHES UNDER EXISTING ROADS, PAVEMENTS AND PATHS WITH STABILISED SAND 5% CEMENT OR DGS40 MATERIAL (5% CEMENT) COMPACTED IN 200mm THICK LAYERS TO 98% MMDD TO UNDERSIDE OF PAVEMENT.
21. BACKFILL ALL TRENCHES NOT UNDER ROADS, PAVEMENTS, PATHS AND BUILDINGS WITH APPROVED EXCAVATED OR IMPORTED MATERIAL COMPACTED TO 95% SMDD.

NOT FOR CONSTRUCTION

DRAWN: JOHN O | DESIGNED: T. BUGAEV | JOB MANAGER: J. GILLIGAN | VERIFIER: .

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK SPECIFICATION NOTES - SHEET 01

JOB NUMBER: 193030

DRAWING NUMBER: DAC01.11 | REVISION: 1

DRAWING SHEET SIZE = A1

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

ENGINEERING CERTIFICATION

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

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

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

4. TO PROVIDE CERTIFICATION THE ENGINEER MUST VISIT THE SITE TO OBSERVE.
   - 4.1. PAVEMENTS
     - 4.1.1. POOR SUBGRADE CONDITIONS
     - 4.1.2. PROOF ROLLING OF SUB-GRADE
     - 4.1.3. PLACEMENT OF SUB-BASE COURSE, BASE COURSE AND WEARING COURSE.
     - 4.1.4. PLACEMENT OF STEEL REINFORCEMENT , DOWELS AND JOINT CRADLES PRIOR TO POURING OF CONCRETE
   - 4.2. EARTHWORKS
     - 4.2.1. TOPSOIL STRIP
     - 4.2.2. EARTHWORKS BATTER
     - 4.2.3. FILLING
   - 4.3. STORMWATER DRAINAGE
     - 4.3.1. DRAINAGE TRENCHES PRIOR TO BACKFILLING
     - 4.3.2. LEGAL POINT OF CONNECTION PRIOR TO BACKFILLING
     - 4.3.3. ANY OTHER DRAINAGE STRUCTURE THAT MAY BE CONCEALED DURING THE COURSE OF THE WORKS
   - 4.4. CONCRETE STRUCTURES
     - 4.4.1. PLACEMENT OF ANY STEEL REINFORCEMENT PRIOR TO CONSTRUCTION.

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

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

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

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

SIGNED.. DATE...

NAME...

POSITION.......................................

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

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

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

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

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

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

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

BITUMEN SEALING

1. PAVEMENT PREPARATION
   - 1.1. THE SURFACE TO BE SEALED SHALL BE DRY AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL, FOREIGN OR LOOSE MATTER.
   - 1.2. IF APPROVED BY THE MANAGING CONTRACTOR, ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT TO GENERAL LEVEL OF PAVEMENT WITH ASPHALT CONCRETE BEFORE SEALING COMMENCES.
2. MATERIALS
   - 2.1. BINDER SHALL BE CLASS 170 TO AS 2008 OR APPROVED PROPRIETARY MATERIAL FOR PRIMING AND PRIME SEALING.
   - 2.2. AGGREGATE SHAPE, DURABILITY AND WET TO DRY STRENGTH SHALL COMPLY TO AS2758 FOR CLASS 'N' AGGREGATES. A 20kg SAMPLE TO BE APPROVED BY THE MANAGING CONTRACTOR PRIOR TO USE.
   - 2.3. AGGREGATES SHALL BE DELIVERED UNIFORMLY PRECOATED, EXCESSIVE PRECOATING WILL RESULT IN AGGREGATES BEING REJECTED.
   - 2.4. FOR TWO COAT FLUSH SEALS, THE SIZE OF THE AGGREGATE FOR THE SECOND COAT, WHILE NORMALLY HALF THAT OF THE FIRST COAT, SHALL BE DIMENSIONALLY COMPATIBLE WITH THAT OF THE FIRST COAT.
   - 2.5. PRECOATING AGENTS SHALL BE COMPATIBLE WITH THE AGGREGATES AND BINDER TO BE USED.
3. DESIGN
   - 3.1. DESIGN OF SPRAYED BITUMINOUS SEALS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE AUSTROADS (NAASRA) PUBLICATION "PRINCIPLES AND PRACTICE OF BITUMINOUS SURFACING, VOLUME 1 - SPRAYED WORK".
   - 3.2. WHERE NOT INDICATED ON THE DRAWINGS, PRIMES AND PRIMER SEALS SHALL BE DESIGNED TO REMAIN INTACT UNTIL FINAL SEALING TAKES PLACE, HAVING REGARD FOR THE TRAFFIC AND CLIMATIC CONDITIONS.
   - 3.3. UNLESS OTHERWISE SPECIFIED, BINDER APPLICATION RATES SHALL BE SELECTED TO FILL 85% OF THE THEORETICAL VOIDS OF THE MAT.
4. BITUMEN FLUSH SEALING
   - 4.1. BITUMEN FLUSH SEALS SHALL BE EITHER SINGLE OR DOUBLE COAT AS SHOWN ON THE DRAWINGS. eg 14/7 INDICATES A DOUBLE COAT FLUSH SEAL USING TWO APPLICATIONS OF BITUMEN AND AGGREGATE. THE FIRST AGGREGATE LAYER BEING OF 14mm NOMINAL SIZE, THE SECOND 7mm.
   - 4.2. COVER AGGREGATE SHALL BE SPREAD IMMEDIATELY AFTER SPRAYING OF BINDER. IN NO CASE SHALL SPREADING BE DELAYED MORE THAN 8 MINUTES,
5. RECORDS
   - 5.1. ALL SPRAY RECORDS AND AGGREGATE SUPPLY TONNAGE RECEIPTS SHALL BE RETAINED AND PASSED ON TO THE CONSULTING ENGINEER AS PART OF QUALITY ASSURANCE PROCEDURES.
   - 5.2. GENERALLY FLUSH SEALING SHALL BE CARRIED OUT COMPLETE AND IN ACCORDANCE WITH THE RELEVANT RMS STANDARD.

ASPHALTIC CONCRETE

1. GENERAL
   - 1.1. ALL ASPHALTIC CONCRETE (AC) WORK TO BE PREPARED AND CARRIED OUT IN ACCORDANCE WITH GOOD ASPHALTIC PAVING PRACTICE AS DESCRIBED IN AS2150-2005 "ASPHALT (HOT-MIXED) PAVING - GUIDE TO GOOD PRACTICE" AND CURRENT RMS SPECIFICATIONS.
2. PAVEMENT PREPARATION
   - 2.1. THE FINISHED PAVEMENT SURFACE TO BE SEALED SHALL BE WITHIN +/- 2% OF THE OPTIMUM AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL FOREIGN MATTER.
   - 2.2. PRIME ALL SURFACES TO BE SEALED. ALLOW PRIME TO SETTLE FOR A MINIMUM OF 3 DAYS BEFORE APPLYING TACK COAT AND ASPHALT.
   - 2.3. SWEEP PRIMED SURFACES BEFORE APPLYING TACK COAT.
   - 2.4. ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT UP TO GENERAL LEVEL OF PAVEMENT WITH ASPHALTIC CONCRETE BEFORE LAYING OF MAIN COURSE.
   - 2.5. ALL DEFECTS IN THE BASE COURSE INCLUDING CRACKS, SURFACE DEFORMATION AND THE LIKE SHALL BE REPAIRED AS DIRECTED BY THE SUPERINTENDENT PRIOR TO PLACEMENT OF TACK COAT AND/OR AC COURSES.
3. PLACEMENTS
   - 3.1. ALL ASPHALT SHALL BE PLACED UTILISING APPROVED MECHANICAL PAVING MACHINES. DO NOT HAND PLACE ASPHALT WITHOUT PRIOR APPROVAL FROM ENGINEER.
4. JOINTS
   - 4.1. THE DENSITY AND SURFACE FINISH AT JOINTS SHALL BE SIMILAR TO THOSE OF THE REMAINDER OF THE LAYER.
5. COMPACTION
   - 5.1. ALL COMPACTION SHALL BE UNDERTAKEN USING SELF PROPELLED ROLLERS.
   - 5.2. INITIAL ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 105°C USING A STEEL DRUM ROLLER HAVING A MINIMUM WEIGHT OF 8 TONNES AND A MAXIMUM UNIT LOAD ON THE REAR DRUM EQUIVALENT TO 55kN/m WIDTH OF DRUM.
   - 5.3. SECONDARY ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 80°C USING A PNEUMATIC TYRED ROLLER OF AT LEAST 10 TONNES MASS. A MINIMUM TYRE PRESSURE OF 550kPA AND A MINIMUM TOTAL LOAD OF 1 TONNE ON EACH TYRE.
   - 5.4. ROLLED SURFACES SHALL BE SMOOTH AND FREE OF UNDULATIONS. BONY AND/OR UNEVEN SURFACES WILL BE REJECTED.
   - 5.5. PROVIDE 2 No. MINIMUM COMPACTION TESTS.
6. FINISHED SURFACE PROPERTIES
   - 6.1. FINISHED SURFACES SHALL BE SMOOTH, DENSE AND TRUE OF SHAPE AND SHALL NOT VARY MORE THAN;
     - 6.1.1. 3mm FROM THE SPECIFIED PLAN LEVEL AT ANY POINT.
     - 6.1.2. 3mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID TRANSVERSELY.
     - 6.1.3. 5mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID LONGITUDINALLY.
     - 6.1.4. MINUS 0 TO PLUS 2mm ADJACENT TO OTHER ELEMENTS SUCH AS KERBS AND THE LIKE TO AVOID POOLING OF SURFACE WATER.
     - 6.1.5. MINUS 0 FROM THE SPECIFIED THICKNESS.
7. DO NOT STORE PLANT EQUIPMENT OR TRAFFIC NEWLY LAID ASPHALTIC CONCRETE PAVEMENTS WITHOUT PRIOR APPROVAL FROM THE ENGINEER.
8. DO NOT APPLY MARKING PAINTS UNTIL ASPHALT HAS CURED IN ACCORDANCE WITH PAINT MANUFACTURERS SPECIFICATIONS.

PAVEMENTS

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

1. COMPACTION STANDARDS

BASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBBASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBGRADE	100% STANDARD MAXIMUM DRY DENSITY

2. THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGN ENGINEER.
3. ALLOW FOR COMPACTION TESTING BY A N.A.T.A. REGISTERED LABORATORY FOR BASE LAYER, SUBBASE LAYER AND SUBGRADE LAYER IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS (MINIMUM 2 TESTS PER LAYER). ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER.
4. MATCH NEW PAVEMENTS NEATLY AND FLUSH WITH EXISTING
5. AFTER BASE IS APPROVED, SWEEP CLEAN AND PRIME AT NOMINAL RATE OF 1.0L PER 1.0 sq.m.
6. PAVEMENT HOLD POINTS
   - 6.1. SUB-GRADE PROOF ROLL PRIOR TO SET-UP AND FORM FOR CONCRETE POUR.
   - 6.2. INSPECTION OF FORMWORK / STEEL PRIOR TO CONCRETE POUR.

3D INFORMATION DISCLAIMER

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

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

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

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

SAFETY IN DESIGN

THE FOLLOWING ITEMS HAVE BEEN IDENTIFIED AS SAFETY RISKS

- S01 INTERCEPTION OF EXISTING SERVICES
- S02 FALL DURING CONSTRUCTION
- S03 VEHICULAR TRAFFIC
- S04 DEEP TRENCHES

CONCEPT SOIL & WATER MANAGEMENT NOTES

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

BASIN MANAGEMENT NOTES

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

DRAWN: JOHN O DESIGNED: T. BUGAEV JOB MANAGER: J. GILLIGAN VERIFIER: .

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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

ARCHITECT: GRAY PUKSAND

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
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PROJECT: MEADOWBANK TAFE

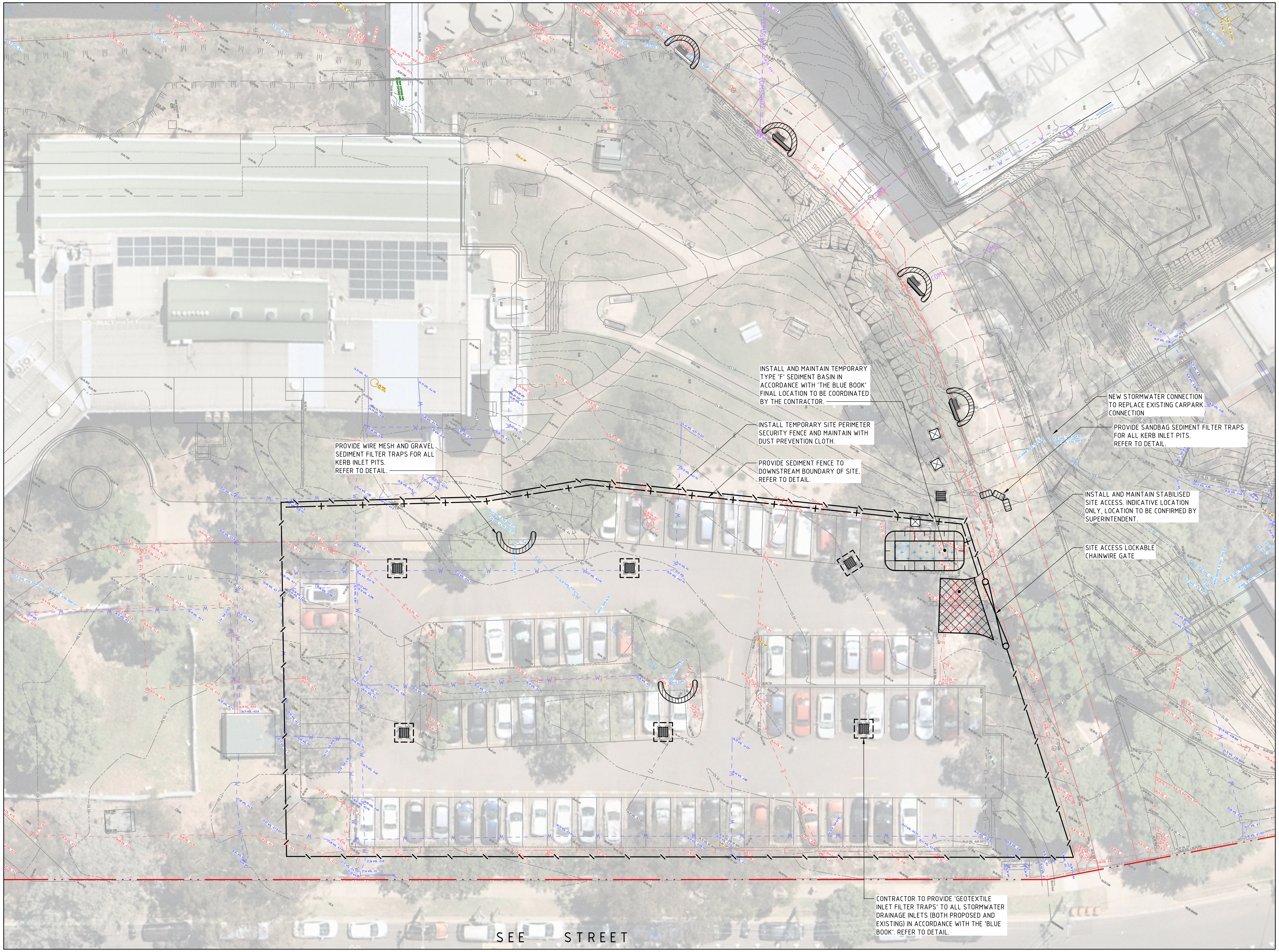
DRAWING TITLE: CIVIL DOCUMENTATION CARPARK SPECIFICATION NOTES - SHEET 02

JOB NUMBER: 193030

DRAWING NUMBER: DAC01.12 REVISION: 1

DRAWING SHEET SIZE = A1

Date :19.11.2019 1:35 PM Plotted By : JOHN O Found : t:\2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC01.12.dwg



LEGEND

- SITE BOUNDARY LINE
- EASEMENT LINE
- EXISTING CONTOURS
- SEDIMENT FENCE
- SECURITY FENCE
- WIRE MESH AND GRAVEL SEDIMENT FILTER
- SANDBAG SEDIMENT FILTER
- DROP INLET SEDIMENT TRAP
- STABILISED SITE ACCESS
- SEDIMENT BASIN

GENERAL NOTES:

1. REFER SPECIFICATIONS NOTES FOR SEDIMENT AND SOIL EROSION CONTROL GENERAL REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
3. ALL SEDIMENT AND SOIL EROSION CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH THE 'BLUE BOOK'. CONTRACTOR TO ENSURE THESE MEASURES ARE IN PLACE AND MAINTAINED AT ALL TIMES DURING CONSTRUCTION WORKS.
4. CONTRACTOR TO PROVIDE 'WIRE MESH AND GRAVEL SEDIMENT FILTER' TO ALL PAVED / ROAD AREAS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.
5. CONTRACTOR TO PROVIDE 'GEOTEXTILE INLET FILTER TRAPS' TO ALL STORMWATER DRAINAGE INLETS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'

DRAWN: JOHN O DESIGNED: T. BUGAEV JOB MANAGER: J. GILLIGAN VERIFIER: .

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSEN YUNCKEN

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

ARCHITECT: GRAY PUKSAND

SCALE 1:200@ A1 — 0 2 4 6 8 10m

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

PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
SEDIMENT AND SOIL EROSION CONTROL PLAN

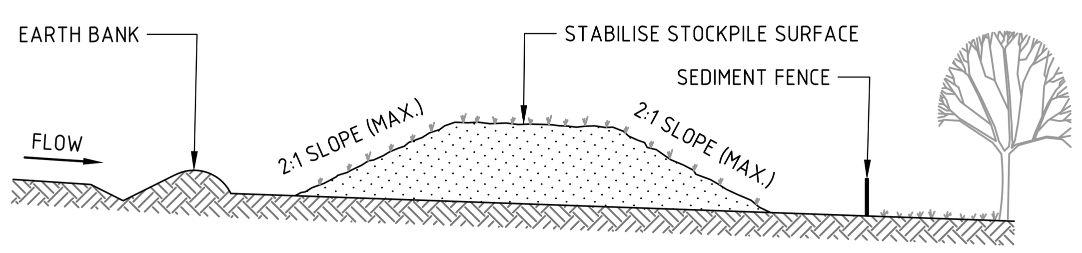
JOB NUMBER: 193030

DRAWING NUMBER: DAC02.01

REVISION: 1

DRAWING SHEET SIZE = A1

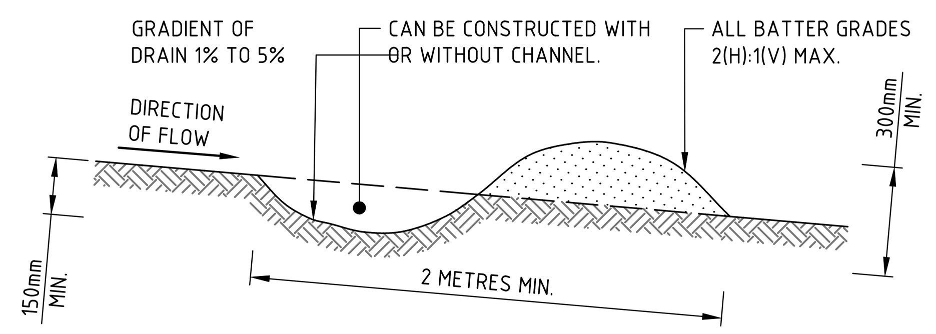
Found : \\1:2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC02.01.dwg
Plotted By : JOHN O
Date : 19.11.2019 1:35 PM



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILE

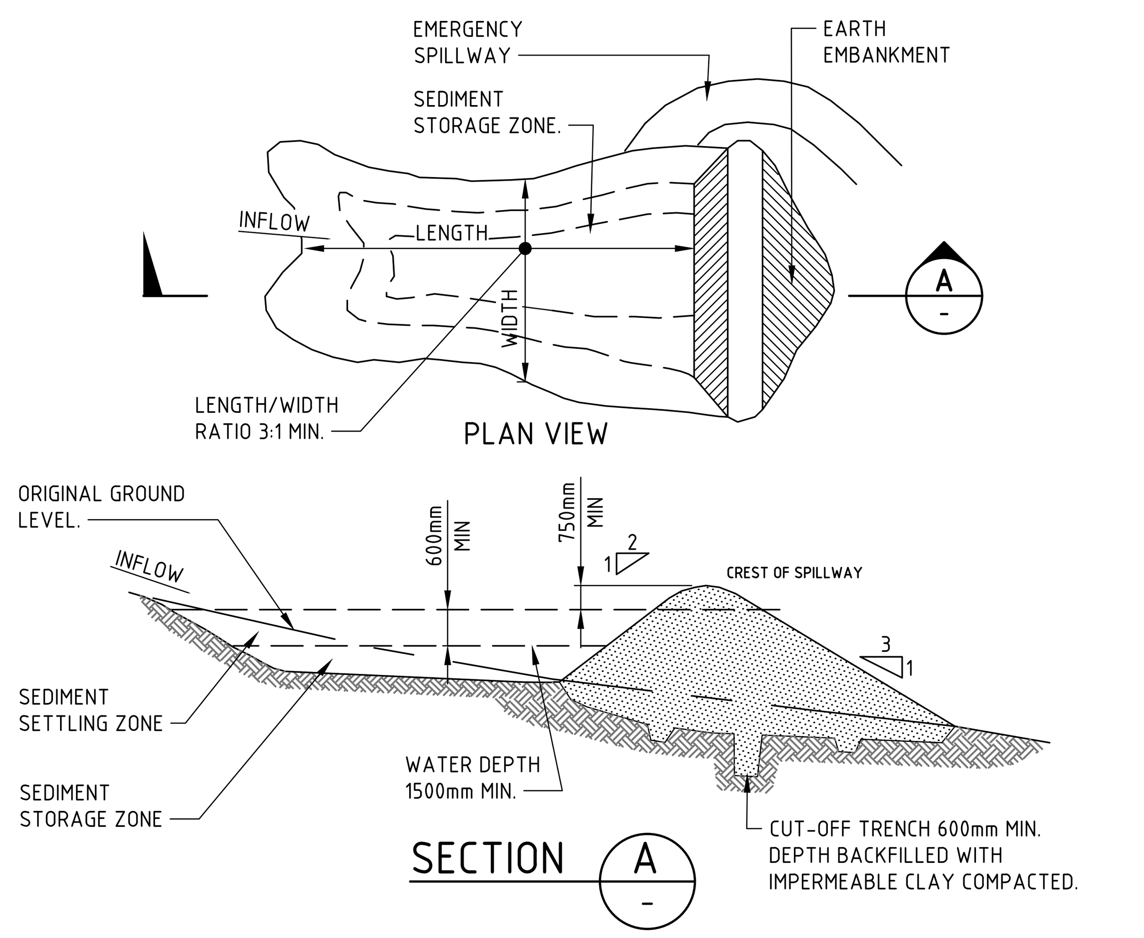


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

DRAINAGE SWALE - LOW FLOW

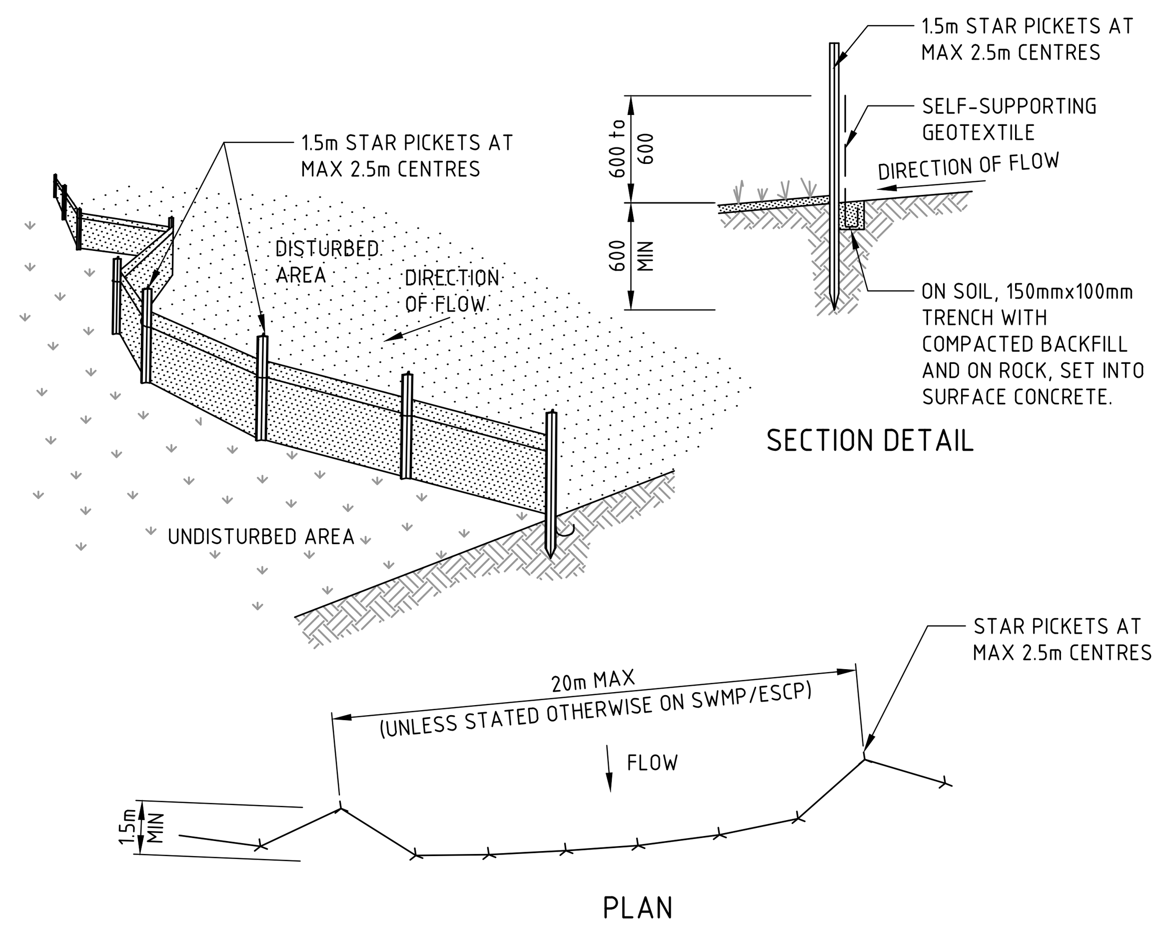


CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

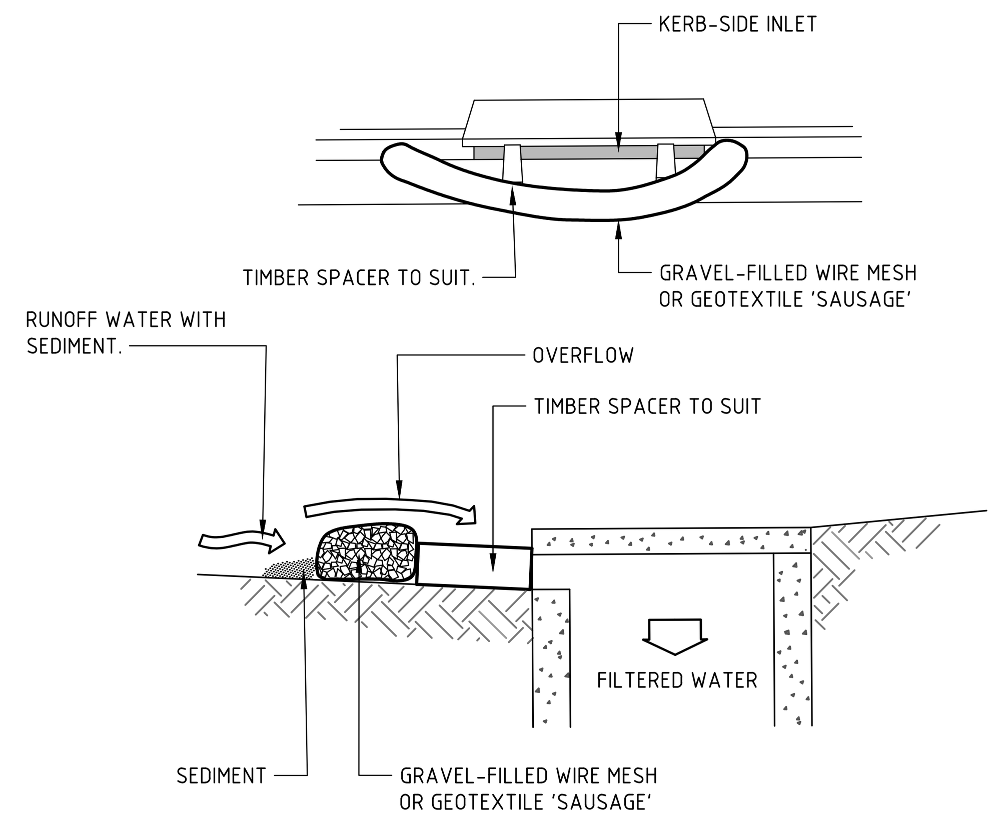
EARTH BASIN - WET



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE

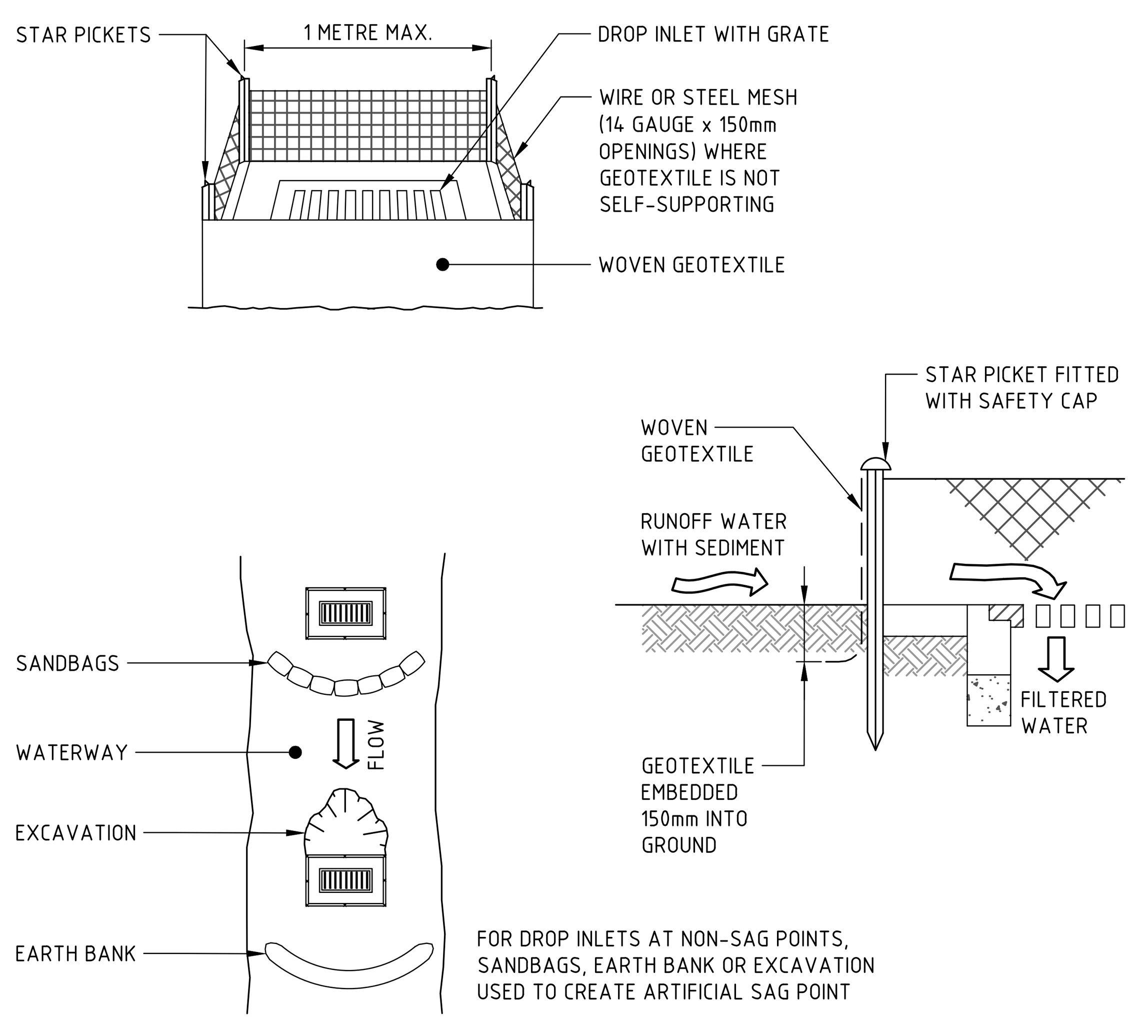


NOTE:THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

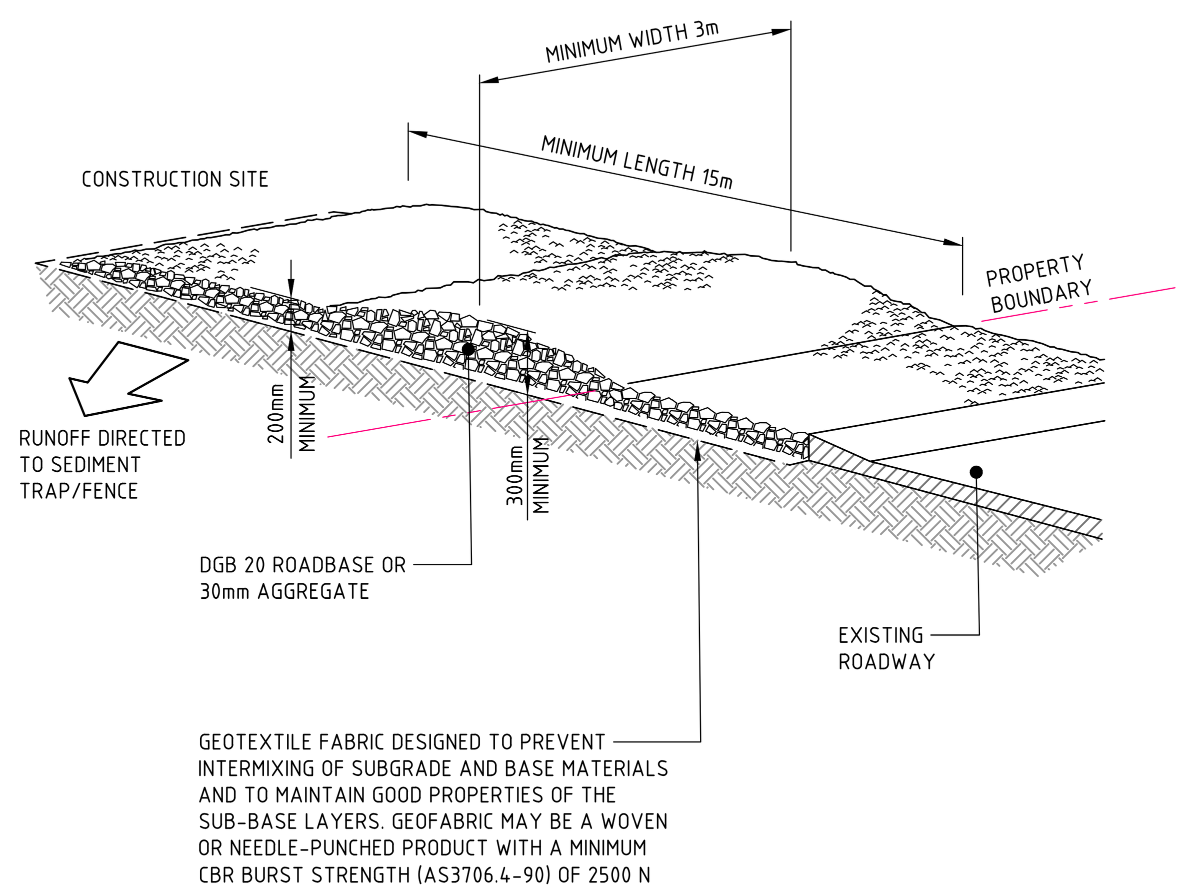
WIRE MESH AND GRAVEL SEDIMENT FILTER



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.

GEOTEXTILE INLET FILTER TRAPS



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS

VERIFIER: .
JOB MANAGER: J. GILLIGAN
DESIGNED: T. BUGAEV
DRAWN: JOHN O

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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ARCHITECT: GRAY PUKSAND

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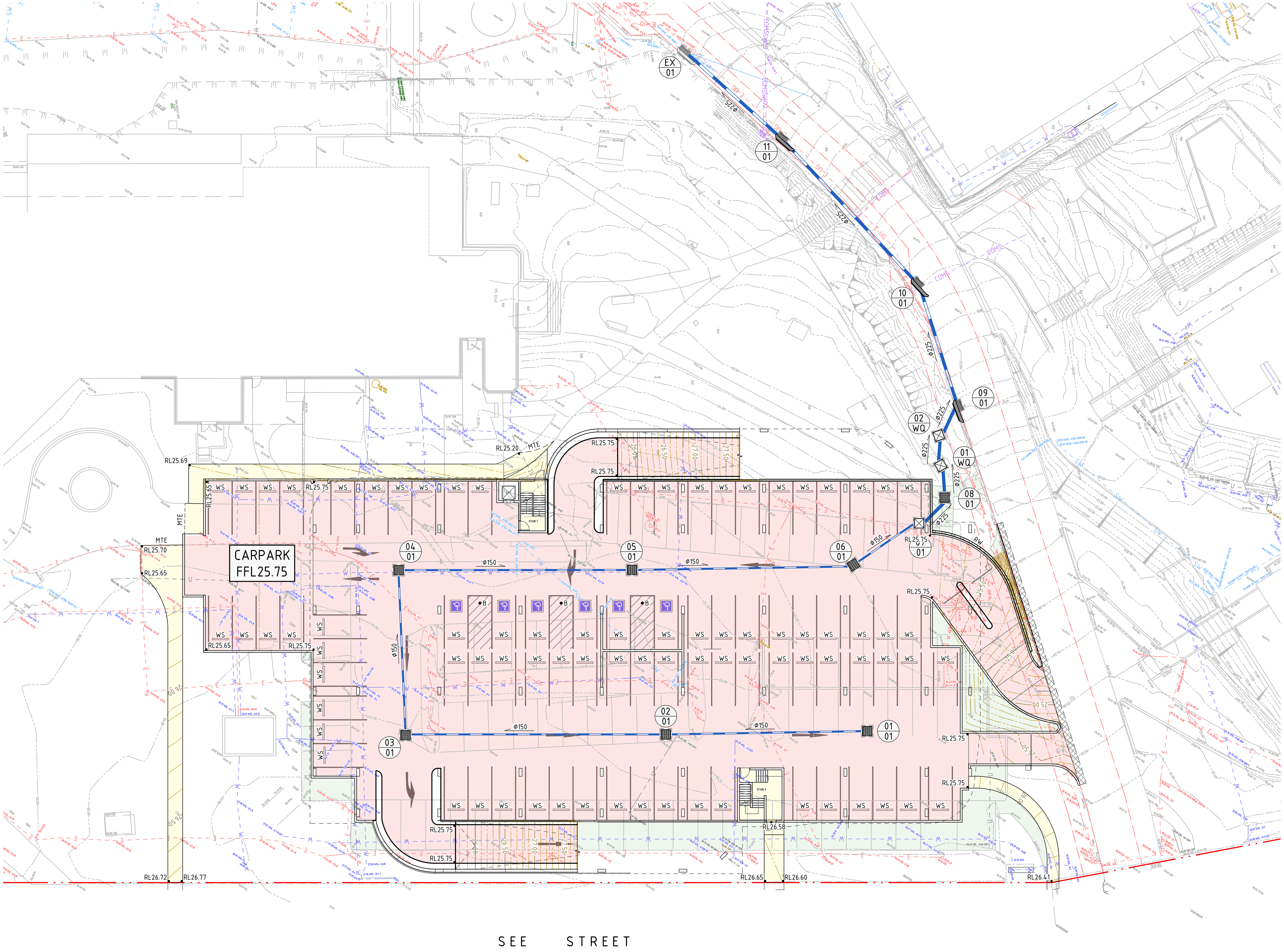
PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK SEDIMENT AND SOIL EROSION CONTROL DETAILS

JOB NUMBER: 193030
DRAWING NUMBER: DAC02.11
REVISION: 1
DRAWING SHEET SIZE = A1

Found : \\2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC02.11.dwg
Plotted By : JOHN O
Date : 19.11.2019 1:35 PM



LEGEND

	SITE BOUNDARY LINE
	EASEMENT LINE
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
eXX	EXISTING KERB 'TYPE AS BELOW'
KO	KERB ONLY
KG	KERB AND GUTTER
⊗ X.XXm	KERB TRANSITION (OVER LENGTH SHOWN)
WS	WHEEL STOP
MTE	MATCH TO EXISTING
• RLXX.XX	PROPOSED SPOT HEIGHT
FFLXX.XX	PROPOSED FINISHED FLOOR LEVEL
XX.XX	CONTOURS
XX.XX	EXISTING CONTOURS
	EXISTING DRAINAGE STRUCTURE
	NEW DRAINAGE STRUCTURE
•B	BOLLARD
RW	RETAINING WALL
	CARPARK PAVEMENT
	PEDESTRIAN FOOTPATH
	LANDSCAPE

GENERAL NOTES:

1. REFER SPECIFICATIONS NOTES FOR STORMWATER AND SITEWORKS GENERAL REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
3. CAD FILES TO BE SUPPLIED IN AUTOCAD FORMAT FOR SETOUT PURPOSES (UPON REQUEST).
4. SUBSOIL DRAINAGE TO RETAINING WALLS, KERBS AND SWALE DRAINS NOT SHOWN FOR CLARITY – REFER RELEVANT DETAILS.
5. REFER HYDRAULIC ENGINEERS / ARCHITECTS DRAWINGS FOR DOWNPIPE LOCATIONS AND SIZING.
6. PROVIDE DRAINAGE CONNECTIONS TO KERB IN ACCORDANCE WITH COUNCIL STANDARD DETAILS AND SPECIFICATION.
7. CONTRACTOR TO ALLOW TO ADJUST AND LIAISE WITH RELEVANT SERVICE AUTHORITIES IN RELATION TO EXISTING SERVICE ADJUSTMENT AND MODIFICATIONS.
8. WHEEL STOPS TO BE INSTALLED TO ALL CAR SPACES AS SHOWN AND INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND MANUFACTURERS SPECIFICATIONS. IF WHEEL STOPS ARE NOT SHOWN, ALLOW FOR WHEEL STOPS WHERE CAR SPACES ARE FRONTING A WALL

DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:
DRAWN: JOHN O

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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ARCHITECT: GRAY PUKSAND

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SCALE 1:200@ A1 — 0 2 4 6 8 10m

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PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK SITEWORKS AND STORMWATER MANAGEMENT PLAN

JOB NUMBER: 193030

DRAWING NUMBER: DAC04.01

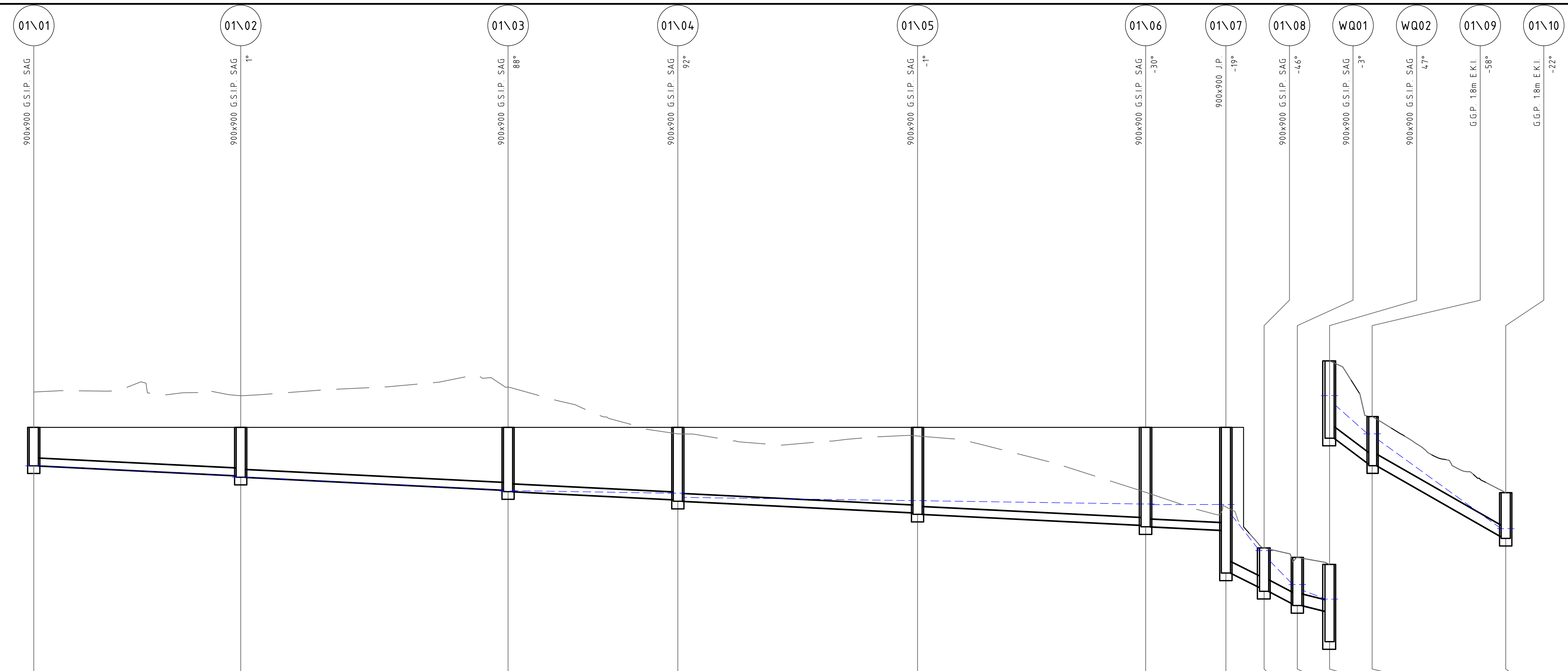
REVISION: 1

DRAWING SHEET SIZE = A1

Found : 1:\2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC04.01.dwg

Plotted By : JOHN O

Date : 19.11.2019 1:35 PM



	01\01–01\02	01\02–01\03	01\03–01\04	01\04–01\05	01\05–01\06	01\06–01\07	01\07–01\08	01\08–WQ01	WQ01–WQ02	WQ02–01\09	01\09–01\10
PIPE CLASS	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC	UPVC
PIPE GRADE (%)	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	10.0%	10.5%	5.0%	15.0%	11.4%
PIPE SIZE (mm)	150	150	150	150	150	150	225	225	225	225	225
MINIMUM COVER (m)	0.60	0.82	1.11	1.30	1.55	1.80	0.60	0.60	0.70	0.67	0.60
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.00	Vf=0.00	Vf=0.00	Vf=0.70	Vf=0.86	Vf=0.99	Vf=2.78	Vf=2.75	Vf=2.75	Vf=2.70	Vf=3.23
Q - PIPE FLOW (L/s)	Q=0	Q=0	Q=-1	Q=10	Q=14	Q=17	Q=111	Q=109	Q=109	Q=107	Q=113

DATUM RL 17.0 / 13.0

	H.G.L.	FINISHED SURFACE	NATURAL SURFACE	PIPE INVERT LEVEL	DEPTH TO INVERT	CO-ORDINATED SETOUT	CHAINAGE
01\01	24.994 / 24.994	25.750	26.445	24.994	0.756	E323419.882 N6256683.209	0.000
01\02	24.800 / 24.770 / 24.770	25.750	26.371	24.800 / 24.770	0.950 / 0.980	E323404.155 N6256670.303	20.345
01\03	24.516 / 24.498 / 24.507	25.750	26.544	24.516 / 24.486	1.234 / 1.264	E323383.614 N6256653.902	46.630
01\04	24.455 / 24.455 / 24.374	25.750	25.622	24.328 / 24.298	1.422 / 1.452	E323372.704 N6256666.531	63.320
01\05	24.310 / 24.310 / 24.308	25.750	25.580	24.071 / 24.041	1.679 / 1.709	E323391.154 N6256681.195	86.887
01\06	24.244 / 24.244 / 24.231	25.750	24.474	23.826 / 23.796	1.924 / 1.954	E323408.347 N6256695.498	109.314
01\07	24.234 / 24.234 / 24.052	25.750	24.187	23.726 / 22.887	2.024 / 2.863	E323410.946 N6256702.923	117.203
01\08	23.327 / 23.327 / 23.148	23.381	23.381	22.602 / 22.527	0.779 / 0.854	E323411.343 N6256706.544	120.956
WQ01	22.661 / 22.661 / 22.552	23.194	23.194	22.278 / 22.248	0.916 / 0.946	E323409.016 N6256708.838	124.224
WQ02	22.381 / 22.374 / 22.206	23.057	23.057	22.135 / 21.537	0.922 / 1.519	E323406.976 N6256711.094	127.391
01\09	21.623 / 21.623 / 21.527	21.962	21.962	21.026 / 20.996	0.937 / 0.967	E323407.055 N6256715.233	131.577
01\10	19.759 / 19.759	20.466	20.466	19.598	0.868	E323395.703 N6256721.780	144.713

LINE CP 01

VERIFIER:
JOB MANAGER: J. GILLIGAN
DESIGNED: T. BUGAEV
DRAWN: JOHN O

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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ARCHITECT: GRAY PUKSAND

SCALE 1:250@A1 H 0 2 4 6 8 10 12m
SCALE 1:5@A1 V 0 50 100 150 200 250mm

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PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
STORMWATER LONGITUDINAL SECTION - SHEET 01

JOB NUMBER: 193030
DRAWING NUMBER: DAC04.21
REVISION: 1
DRAWING SHEET SIZE = A1

Found : I:\2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC04.21.dwg
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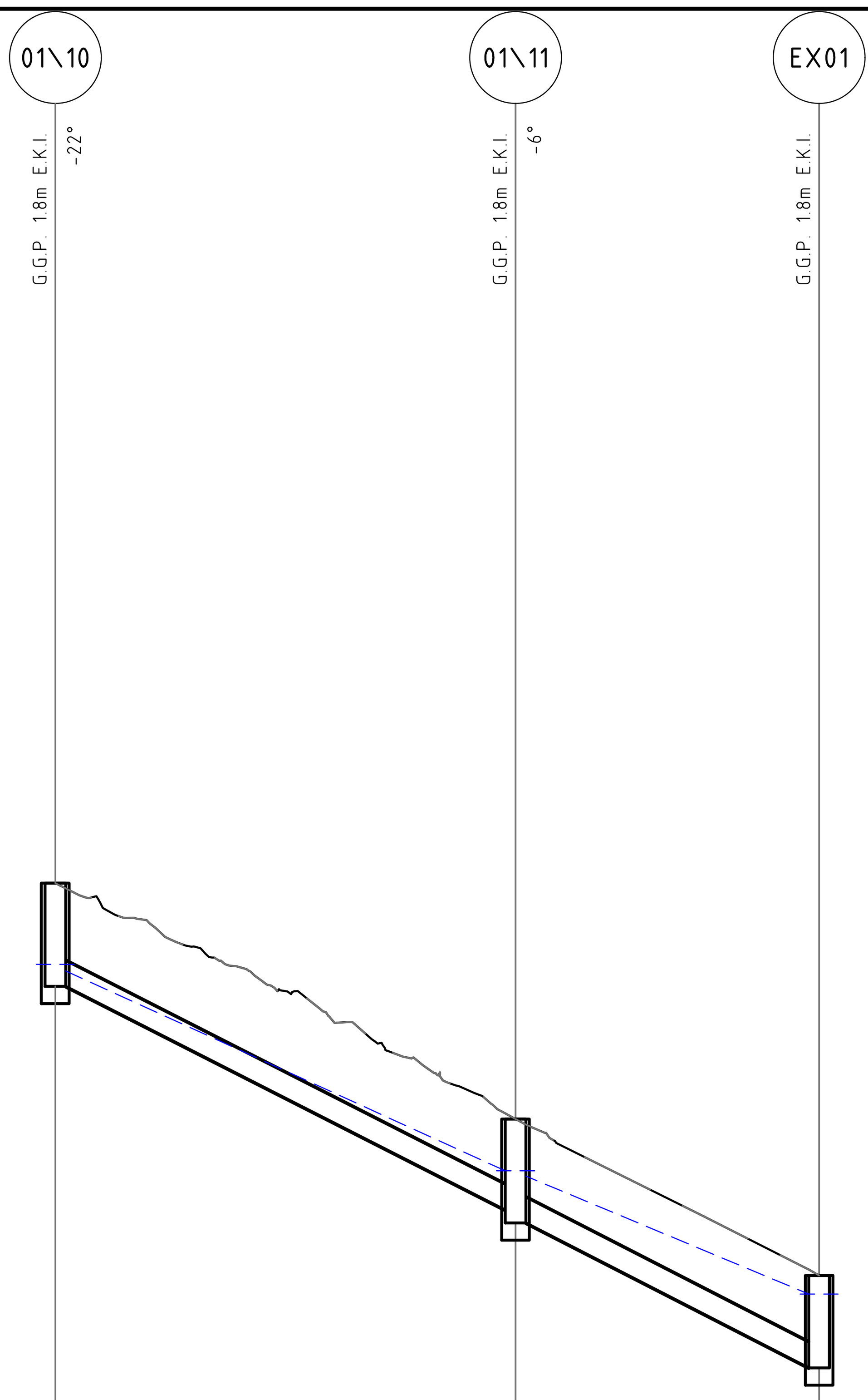

	01\10 – 01\11	01\11 – EX01
PIPE CLASS	UPVC	UPVC
PIPE GRADE (%)	10.2%	10.2%
PIPE SIZE (mm)	225	225
MINIMUM COVER (m)	0.61	0.60
Vf - FULL PIPE VELOCITY (m/s)	Vf=3.41	Vf=2.98
Q - PIPE FLOW (L/s)	Q=120	Q=118

DATUM RL 11.0

	01\10		01\11		EX01	
H.G.L.	19.759 19.759	19.702	17.963 17.963	17.917	16.890 16.890	16.890
FINISHED SURFACE	20.466		18.414		17.052	
NATURAL SURFACE	20.466		18.414		17.052	
PIPE INVERT LEVEL	19.598	19.568	17.621	17.509	16.248	16.248
DEPTH TO INVERT	0.868	0.898	0.792	0.904	0.804	0.804
CO-ORDINATED SETOUT	E323395.703	N6256721.780	E323375.886	N6256724.742	E323362.683	N6256725.412
CHAINAGE	144.713		164.752		177.972	

LINE CP 01

DRAWN: JOHN O
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER: .

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT
HANSENYUNCKEN
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ARCHITECT
GRAY PUKSAND

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SCALE 1:250@ A1 H — 0 2 4 6 8 10 12m
SCALE 1:5@ A1 V — 0 50 100 150 200 250mm

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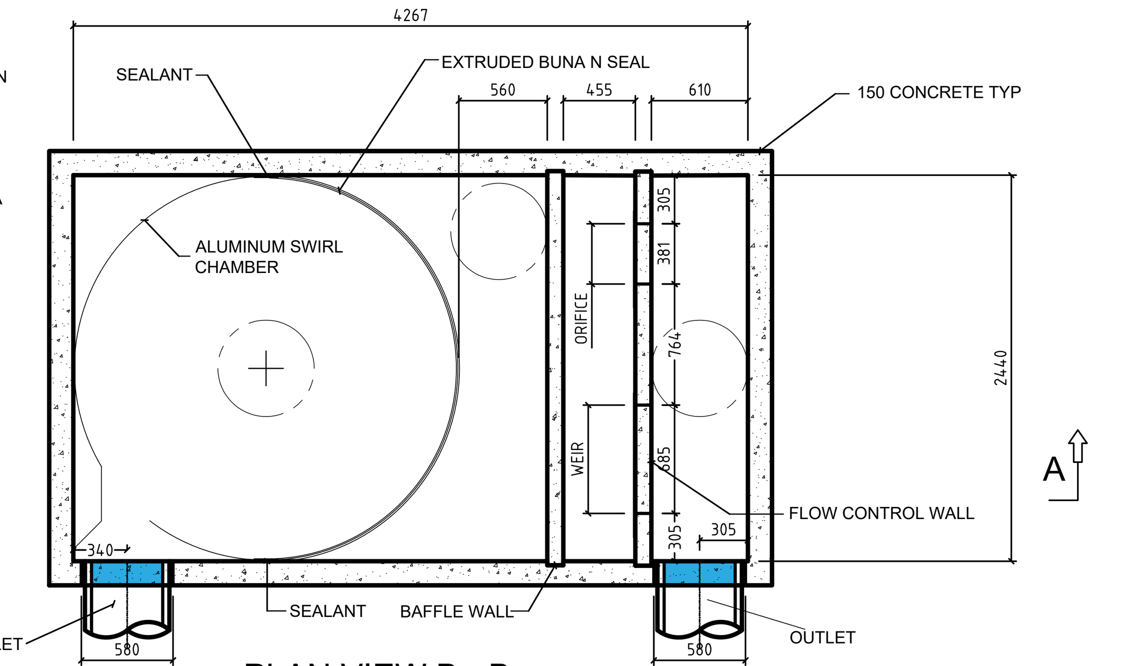
PROJECT
MEADOWBANK TAFE

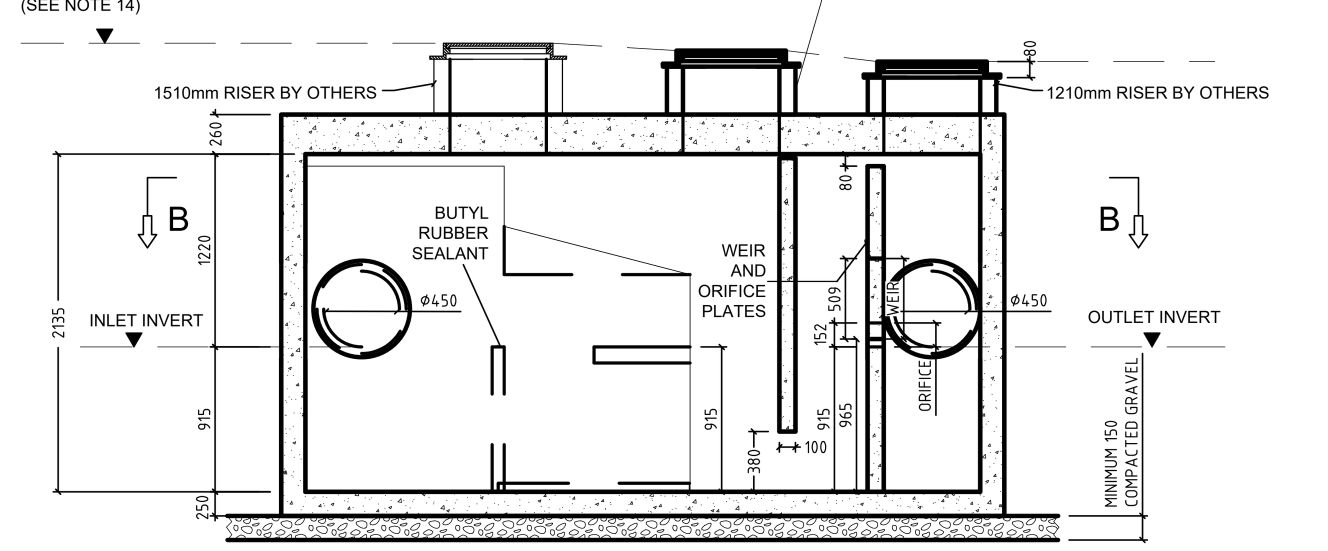
DRAWING TITLE
CIVIL DOCUMENTATION
CARPARK
STORMWATER LONGITUDINAL SECTION - SHEET 02

JOB NUMBER 193030
DRAWING NUMBER DAC04.22
REVISION 1
DRAWING SHEET SIZE = A1

NOTE:
VORTECHS SYSTEMS INSTALLED IN A BYPASS CONFIGURATION REQUIRE AN UPSTREAM DIVERSION STRUCTURE THAT SHALL BE DETAILED BY THE CONSULTING ENGINEER WITH ELEVATION AND WEIR WIDTH DATA PROVIDED BY CONTECH STORMWATER SOLUTIONS.



PLAN VIEW B - B



SECTION A - A

NOTES:
1. STORMWATER TREATMENT SYSTEM (SWTS) SHALL HAVE:
   PEAK TREATMENT CAPACITY: 311L/S
   SEDIMENT STORAGE: 3.06M3
   SEDIMENT CHAMBER DIA: 2438MM
2. SWTS SHALL BE CONTAINED IN ONE RECTANGULAR STRUCTURE
3. SWTS REMOVAL EFFICIENCY SHALL BE DOCUMENTED BASED ON PARTICLE SIZE
4. SWTS SHALL RETAIN FLOATABLES AND TRAPPED SEDIMENT UP TO AND INCLUDING PEAK TREATMENT CAPACITY
5. SWTS INVERTS IN AND OUT ARE TYPICALLY AT THE SAME ELEVATION
6. SWTS SHALL NOT BE COMPROMISED BY EFFECTS OF DOWNSTREAM TAILWATER
7. SWTS SHALL HAVE NO INTERNAL COMPONENTS THAT OBSTRUCT MAINTENANCE ACCESS
8. INLET PIPE MUST BE PERPENDICULAR TO THE STRUCTURE
9. PIPE ORIENTATION MAY VARY; SEE SITE PLAN FOR SIZE AND LOCATION
10. PURCHASER SHALL NOT BE RESPONSIBLE FOR ASSEMBLY OF UNIT
11. MANHOLE FRAMES AND PERFORATED COVERS SUPPLIED WITH SYSTEM, NOT INSTALLED
12. PURCHASER TO PREPARE EXCAVATION AND PROVIDE CRANE FOR OFF-LOADING AND SETTING AT TIME OF DELIVERY
13. VORTECHS SYSTEMS BY OCEAN PROTECT:
   AUCKLAND (09) 476 5586 BRISBANE (07) 3272 1872 SYDNEY (02) 9525 5833
14. VORTECHS SYSTEM HAS BEEN DESIGNED IN ACCORDANCE WITH RELEVANT AUSTRALIAN ANS NEW ZEALAND STANDARDS FOR 0-2m FILL AND T44 (HNHO-72) LIVE LOADINGS ONLY. FOR OTHER LOADING CONDITIONS PLEASE CONTACT OCEAN PROTECT.

PROPRIETARY INFORMATION - NOT TO BE USED FOR CONSTRUCTION PURPOSES

www.OCEANPROTECT.com.au
www.OCEANPROTECT.co.nz

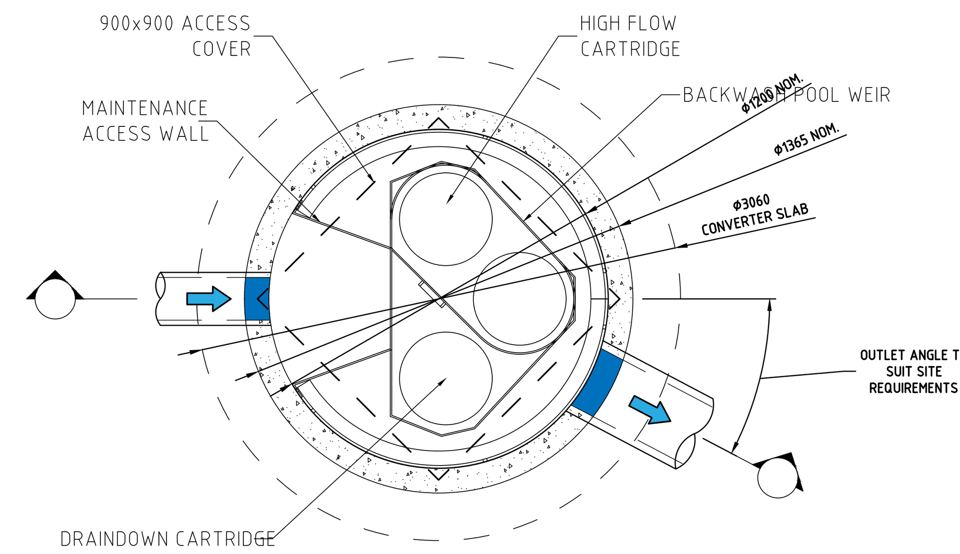
OCEAN PROTECT
STORMWATER TREATMENT SYSTEM
VORTECHS MODEL 7000 METRIC
STANDARD DETAIL

DRAWING 1 B

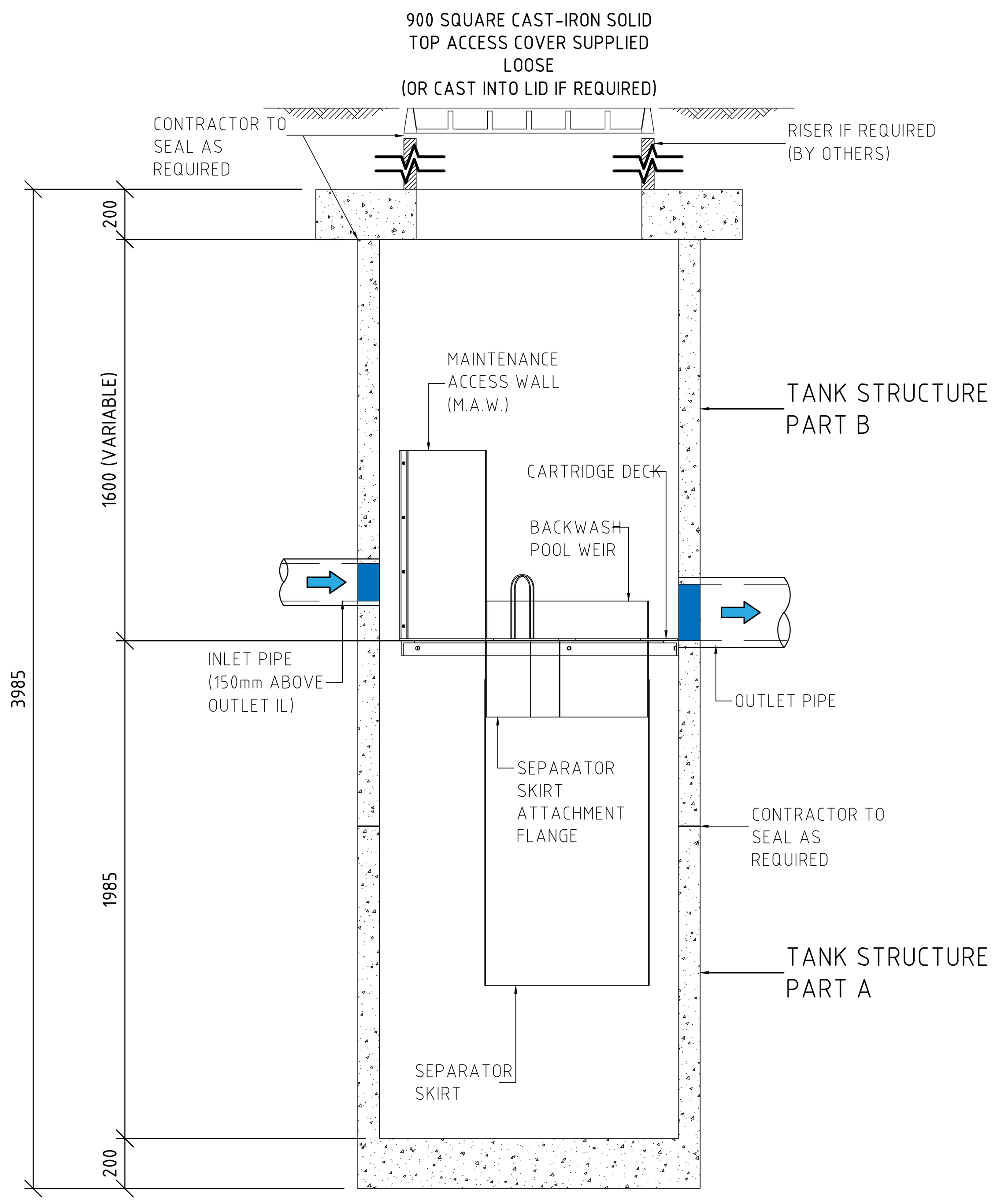
PHONE: 1300 354 722 www.oceanprotect.com.au

DATE: | SCALE: | FILE NAME: | DRN: | CHK:

NOT FOR CONSTRUCTION



JELLYFISH PLAN



JELLYFISH SECTION

LAST MODIFIED: 24-04-20

JELLYFISH DESIGN TABLE

JELLYFISH TREATMENT FLOW IS A FUNCTION OF THE NUMBER OF CARTRIDGES AND THE DEVICE TOTAL HEAD DIFFERENTIAL. IF THE PIPE FLOW EXCEEDS THE TREATMENT FLOW THEN AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

REQUIRED DEVICE TOTAL HEAD DIFFERENTIAL [mm]	460	230
CARTRIDGE FLOW RATE FOR HIGH-FLOW / DRAINDOWN [L/s]	5 / 2.5	2.5 / 1.25
CARTRIDGE LENGTH [mm]	1375	1375
OUTLET INVERT TO STRUCTURE INVERT [mm])	1985	1985

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	[ ]
WATER QUALITY FLOW RATE (L/S)	[ ]
# OF CARTRIDGES REQUIRED (HF + DD)	-]
CARTRIDGE SIZE	1375

PIPE DATA:	I.L.	MATERIAL	DIAMETER
INLET PIPE	[ ]	[ ]	[ ]
OUTLET PIPE	[ ]	[ ]	[ ]

LID WEIGHT	APPROX. 1,500kg
PART A & B WEIGHT (SEPARATE)	APPROX. 2,500kg

NOTE: TANK SUPPLIED IN TWO PARTS; PARTS A & B TO BE JOINED ON SITE

GENERAL NOTES

1. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF THE PROJECT.
2. PRECAST STRUCTURE SUPPLIED WITH CORE HOLES TO SUIT OUTER DIAMETER OF NOMINATED PIPE SIZE / MATERIAL.
3. PRECAST STRUCTURE SHALL MEET W80 WHEEL LOAD RATING ASSUMING A MAXIMUM EARTH COVER OF 2.0m AND A GROUND WATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER TO CONFIRM ACTUAL GROUNDWATER ELEVATION.PRECAST STRUCTURE SHALL BE IN ACCORDANCE WITH AS3600.
4. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE TREATMENT FLOW RATE OF THE SYSTEM, AN UPSTREAM BYPASS STRUCTURE IS REQUIRE.
5. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
6. SITE SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED ON PLACEMENT OF ORDER.
7. DRAWING NOT TO SCALE.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE SPECIFIC DESIGN CONSIDERATION AND SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER.
B. CONTRACTOR TO PROVIDE ALL EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING DETAIL PROVIDED SEPARATELY).
C. CONTRACTOR TO INSTALL AND LEVEL THE STRUCTURE, APPLY SEALANT TO ALL JOINTS AND TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES.
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. CARTRIDGE INSTALLATION, BY OCEANPROTECT, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT OCEAN PROTECT TO COORDINATE CARTRIDGE INSTALLATION WITH SITE COMPLETION.

PHONE: 1300 354 722 www.oceanprotect.com.au

OCEAN PROTECT
JELLYFISH 2250
STANDARD PRODUCT DRAWING

DRAWN: JOHN O
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

Found : 1:\2019 jobs\sy193030 - meadowbank school and tafe\d-drawings\d-northrop\C-CIVIL\2-CAD\2-CAD FILES\1-SSDA-CP\193030_DAC04.31.dwg
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Date: 19.11.2019 1:35 PM

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

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

ARCHITECT: GRAY PUKSAND

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE

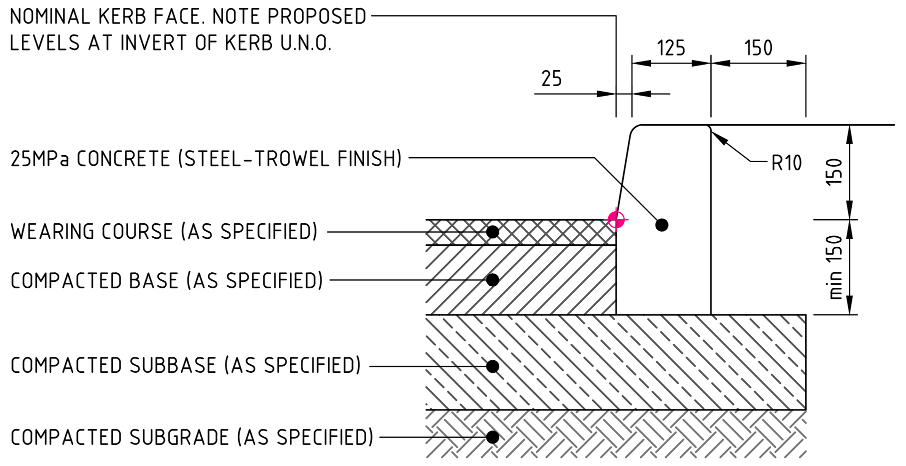
NOT TO SCALE

NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: MEADOWBANK TAFE

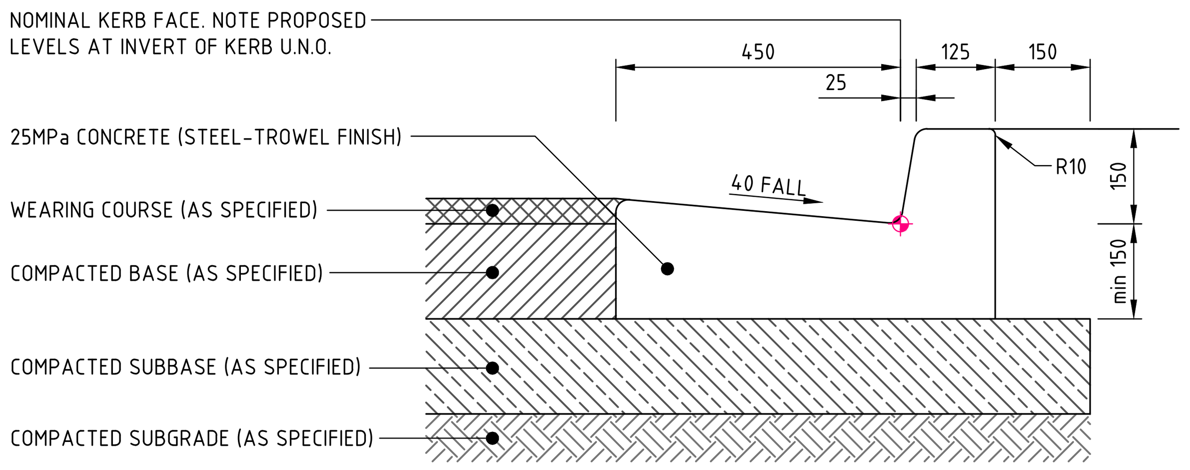
DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
STORMWATER MANAGEMENT DEVICES

JOB NUMBER: 193030
DRAWING NUMBER: DAC04.31
REVISION: 1
DRAWING SHEET SIZE = A1



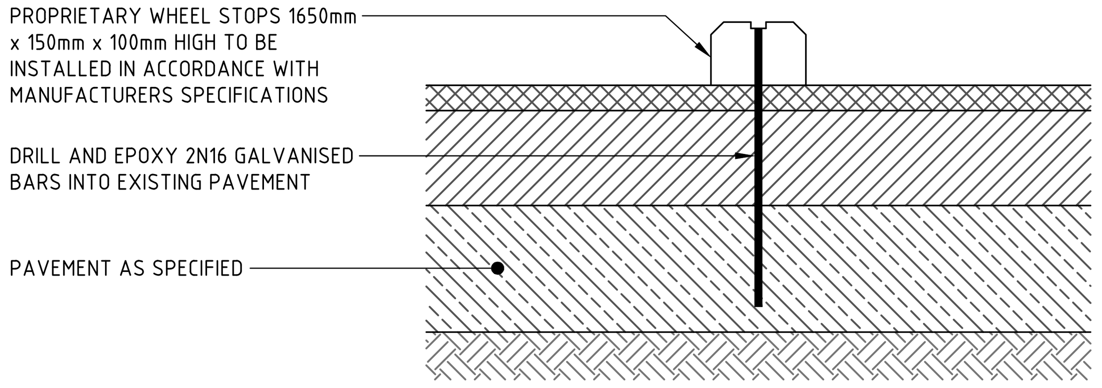
KERB ONLY 'KO'

EXPANSION JOINTS @ MAX 12m CTRS / TOOL JOINTS @ MAX 3m CTRS
ALL RADII TO BE 20mm U.N.O.



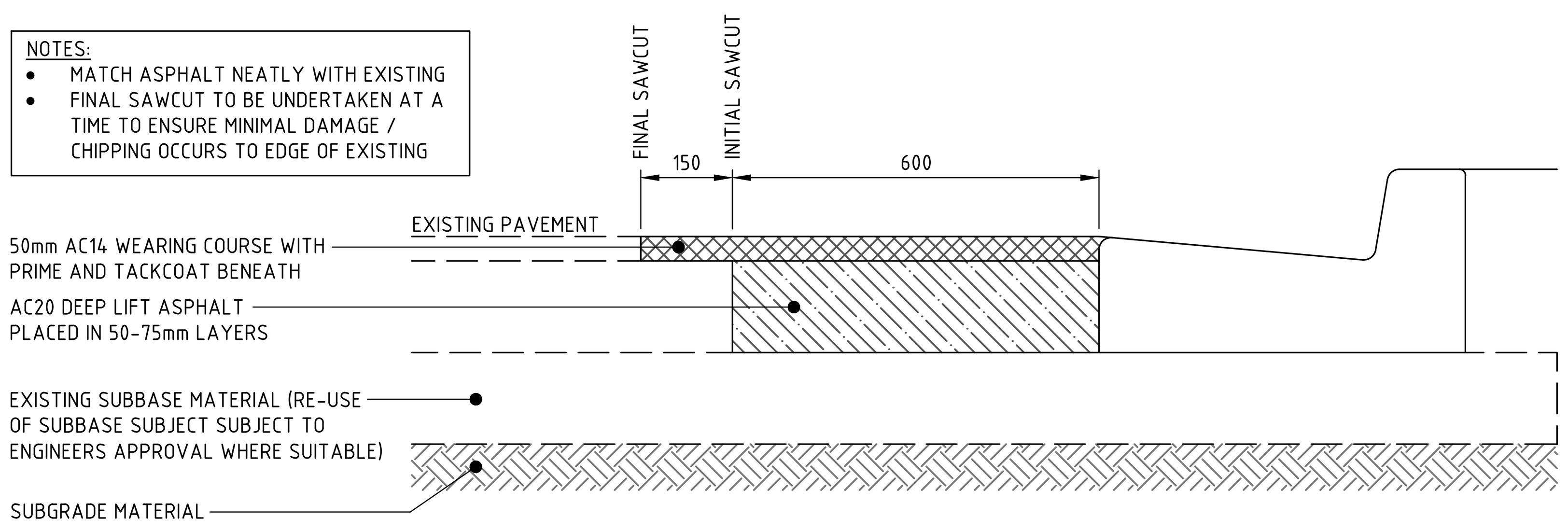
KERB & GUTTER 'KG'

EXPANSION JOINTS @ MAX 12m CTRS / TOOL JOINTS @ MAX 3m CTRS
ALL RADII TO BE 20mm U.N.O.



WHEEL STOP 'WS'

WHEEL STOPS TO BE INSTALLED IN ACCORDANCE WITH
AUSTRALIAN STANDARDS AS2890.1



PAVEMENT INTERFACE 'INT1'

DRAWN: JOHN O
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER: .

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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CLIENT: HANSENYUNCKEN

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ARCHITECT: GRAY PUKSAND

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NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
DETAILS - SHEET 01

JOB NUMBER: 193030

DRAWING NUMBER: DAC09.01

REVISION: 1

DRAWING SHEET SIZE = A1

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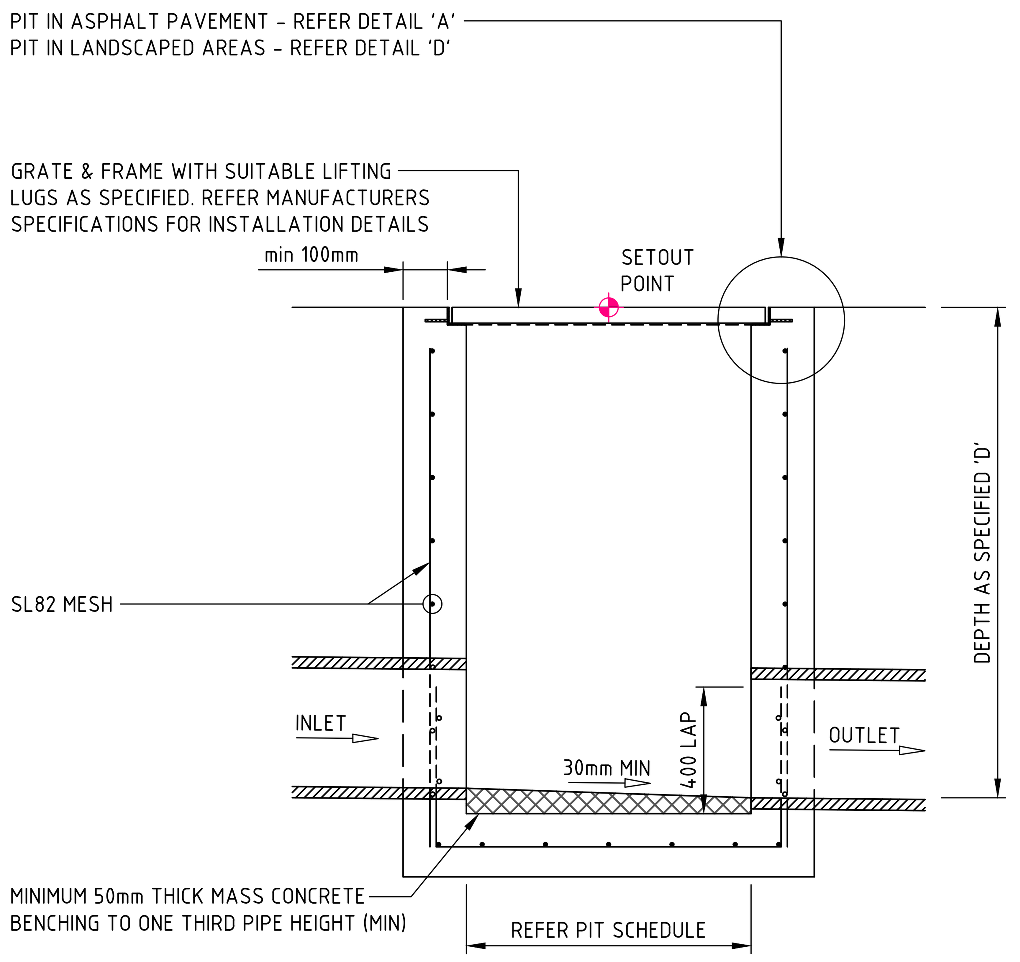
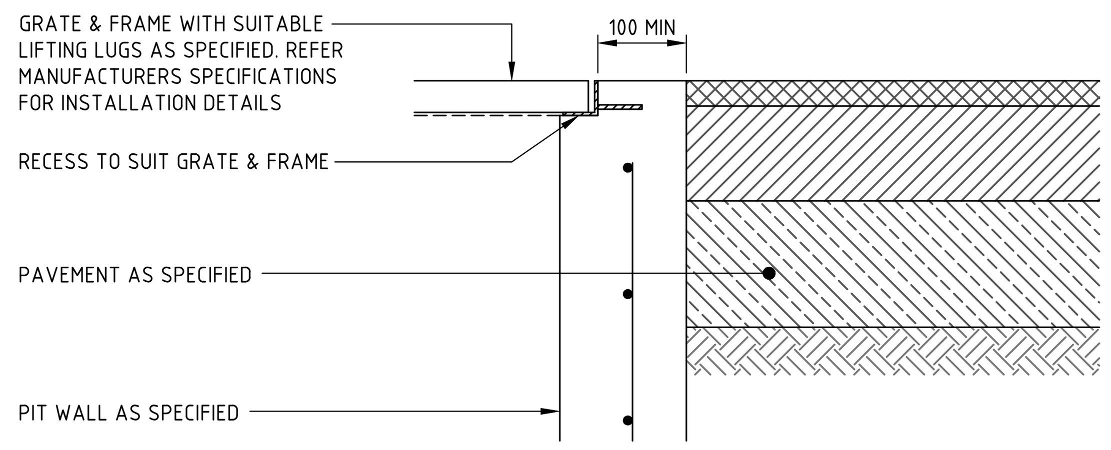
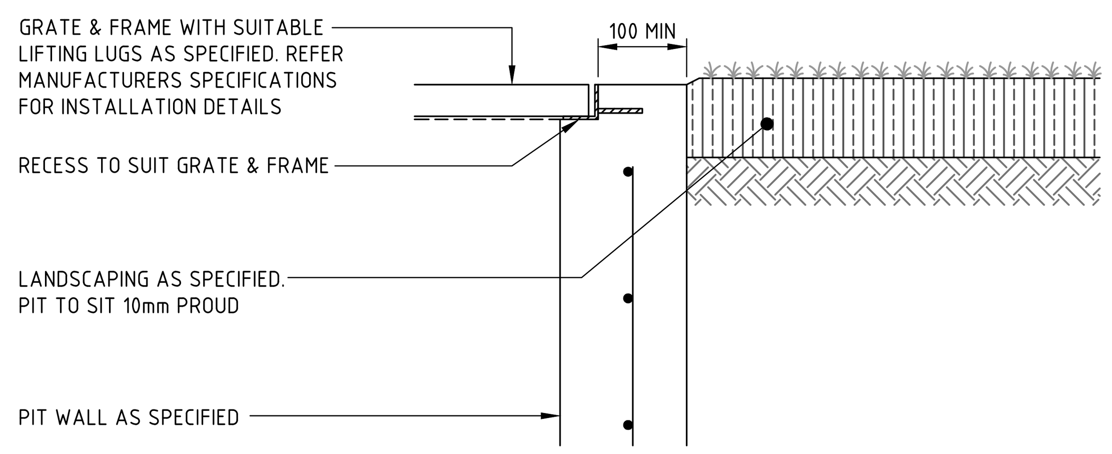
Date : 19.11.2019 1:35 PM



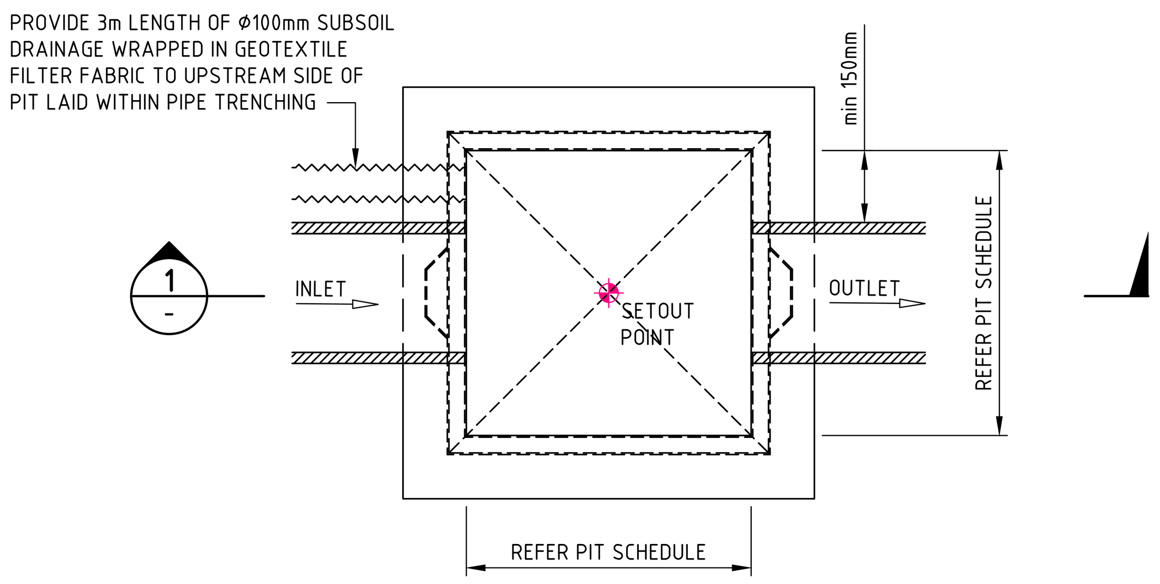
SECTION 1 -



PIT INTERFACE - DETAIL 'A'



PIT INTERFACE - DETAIL 'D'



PLAN
SURFACE INLET 'SIP' / JUNCTION PIT 'JP'

PIT STRUCTURE TO BE 200mm THICK UNLESS SHOWN OTHERWISE. DRILL AND EPOXY PLASTIC PROPRIETARY STEP IRONS IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND MANUFACTURERS SPECIFICATIONS (PITS > 1000mm DEPTH).
REFER PIT INTERFACE DETAIL 'F' FOR CORNER REINFORCEMENT

DRAWN: JOHN O
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER: .

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JO		JG	24.04.20

CLIENT: HANSENYUNCKEN

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ARCHITECT: GRAY PUKSAND

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

PROJECT: MEADOWBANK TAFE

DRAWING TITLE: CIVIL DOCUMENTATION CARPARK
DETAILS - SHEET 02

JOB NUMBER: 193030
DRAWING NUMBER: DAC09.02
REVISION: 1
DRAWING SHEET SIZE = A1

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Plotted By : JOHN O
Date : 19.11.2019 1:35 PM

Appendix C. Water Quality Devices – Product Specifications

Vortechs

Operations & Maintenance Manual

Table of Contents

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The Vortechs system is a high-performance hydrodynamic separator that effectively removes fine sediment, oil and grease, as well as floating and sinking pollutants. Its swirl concentrator and flow control features, work together to minimise turbulence and provide stable storage of captured pollutants. The design also allows for easy inspection and unobstructed maintenance access.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each stormwater treatment device is essential to ensuring that it works properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It’s also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up).

Health and Safety

Access to a Vortechs unit requires removing heavy access covers/grates, additionally it might become necessary to enter into a confined space. Pollutants collected by the Vortechs will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your Vortechs require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the Vortechs, precautions should be taken in order to minimise (or, when possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

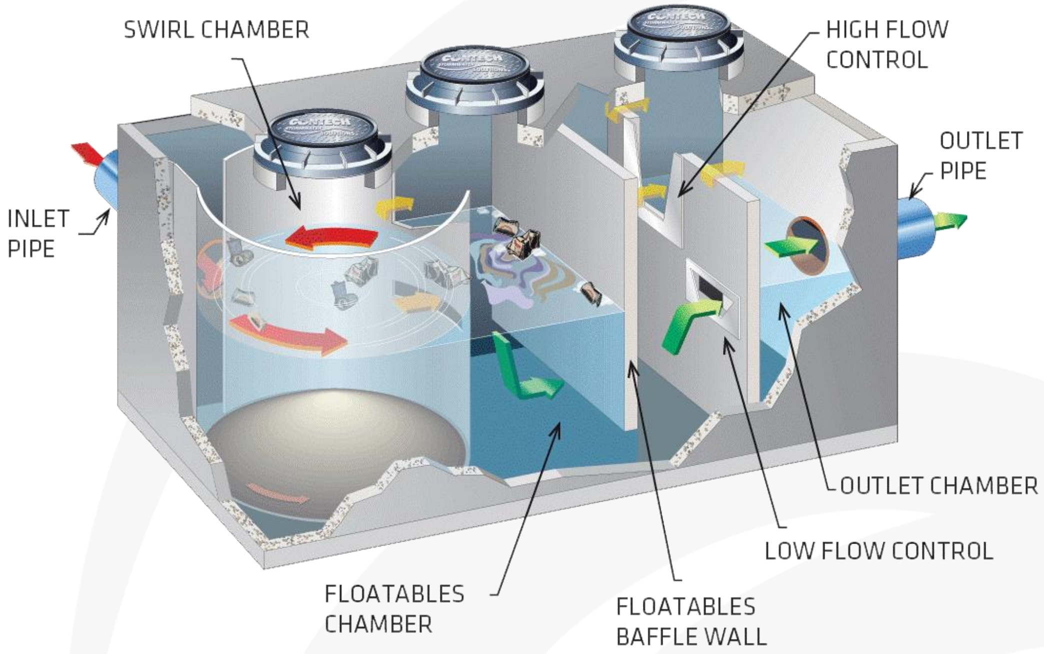
- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst the minor maintenance for the Vortechs can be performed from surface level, there may be a need to enter the pit (confined space) during major services. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification in confined space entry requirements.

How does it Work?

Stormwater enters the swirl chamber at a tangent, creating a swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floating pollutants are stopped at the floatables baffle wall. During larger storms, the water level rises above the low flow control and begins to flow through the high flow control.



As a storm event increases in intensity, the swirling action increases proportionately, this assists in in the prevention of re-suspension. When flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs should be sized so that previously captured pollutants are retained in the system even during these infrequent events. As a storm subsides, treated runoff decants out of the Vortechs system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet and outlet pipes.

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the Vortechs requires a minor service every 6 months and a major service every 12 months.

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the Vortechs.

	Description of Typical Activities	Frequency
Minor Service	Visual inspection of swirl, floatables and outlet chambers Removal of large floatable pollutants Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants Inspection of the swirl chamber, baffle wall and outlet controls	At 12 Months

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to assess the condition of the device and record necessary information that will inform the activities to be undertaken during a major service.

1. Establish a safe working area around the access point
2. Remove access cover over the swirl chamber
3. Visually inspect the chamber
4. Remove large floatable pollutants with a net
5. Measure and record sediment depth
6. Replace access cover
7. Repeat steps 2-6 for floatable and outlet chambers

Major Service

This service is designed to return the Vortechs device back to optimal operating performance.

1. Establish a safe working area around the access point
2. Remove access cover over the swirl chamber
3. Using a vacuum unit remove any floatable pollutants
4. Decant water until water level reaches accumulated sediment
5. Remove accumulated sediment and gross pollutants with vacuum unit (if required)
6. Repeat steps 2-5
7. Inspect the swirl chamber, baffle wall and outlet controls
8. Use high pressure water to clean sump area (if required)
9. Replace access covers

When determining the need to remove accumulated sediment from the Vortechs unit, the specific sediment storage capacity for the size of unit should be considered (see table below).

Vortechs Model	Swirl Chamber Diameter (m)	Sediment Storage Capacity (m^3)
VX1000	0.9	0.5
VX2000	1.2	0.9
VX3000	1.5	1.4
VX4000	1.8	1.8
VX5000	2.1	2.4
VX7000	2.4	3.1
VX9000	2.7	3.7
VX11000	3.0	4.3
VX16000	3.7	5.4

Additional Types of Maintenance

The standard maintenance approach is designed to work towards keeping the Vortechs operational during normal conditions. From time to time, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the Vortechs unit that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event.

Blockages

In the unlikely event that flooding occurs upstream of the Vortechs system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Decant water from Vortechs unit in preparation for confined space entry
3. Inspect the high flow and low flow control elements as well as both inlet and outlet pipes for obstructions, if present remove any built up pollutants or blockages.

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the Vortechs after a major storm event. The focus is to inspect for higher than normal sediment accumulation that may result from localised erosion, where necessary accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the Vortechs must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the system has been exposed to any hazardous or unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our Vortechs system we offer long term pay-as-you-go contracts and pre-paid once off servicing.

For more information please visit www.OceanProtect.com.au

Jellyfish Filter

Operations & Maintenance Manual

Table of Contents

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the Jellyfish Filter as recommended by the manufacturer.

The Jellyfish Filter is a stormwater quality treatment technology featuring high surface area and high flow rate membrane filtration at low driving head. By incorporating pre-treatment with light-weight membrane filtration, the Jellyfish Filter removes floatables, trash, oil, debris, TSS and a high percentage of particulate-bound pollutants; including phosphorus and nitrogen, metals and hydrocarbons.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that suitably qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the Jellyfish.

Health and Safety

Access to a Jellyfish unit requires removing heavy access covers/grates, and entry into a confined space. Pollutants collected by the Jellyfish will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your Jellyfish require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the Jellyfish, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended:

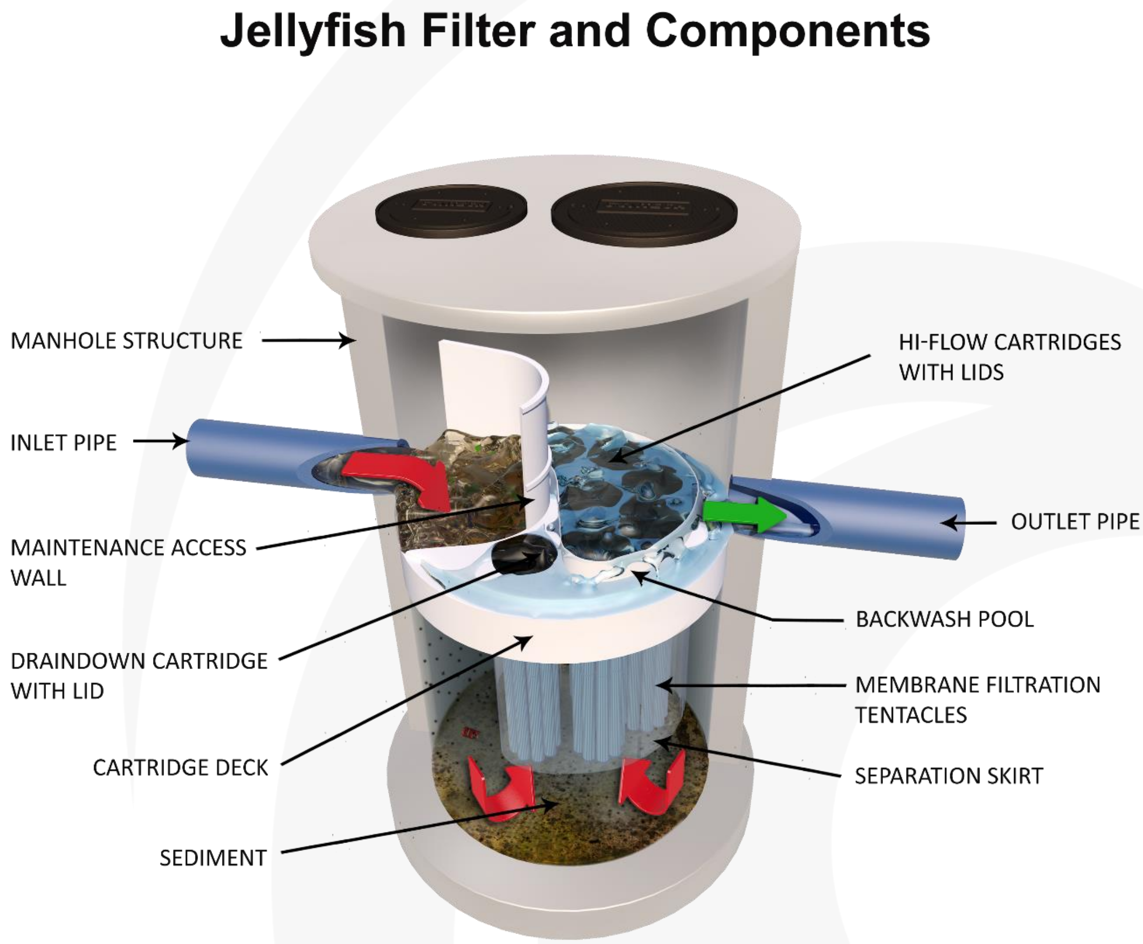
- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of Jellyfish maintenance can be performed from surface level, there will be a need to enter the Jellyfish pit (confined space) for both minor and major services. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it Work?

Stormwater enters the Jellyfish system through the inlet pipe where floatable pollutants are captured behind the maintenance access wall. As stormwater enters the treatment chamber a separation skirt ensures the retention of oils whilst simultaneously protecting the filtration cartridges and allowing coarse particles to settle below on the chamber floor. Stormwater then passes through the Jellyfish cartridges and onto the Jellyfish deck, at this point the backwash pool will fill and overflow allowing treated stormwater to exit via the outlet pipe.



As the storm event subsides, the treated water held in the backwash pool passes back through the high flow cartridges into the treatment chamber. This passive backwash helps to clear the cartridge surface by dislodging sediment onto the chamber floor. The drain down cartridge(s) located outside the backwash pool enables water levels to balance, leaving the cartridge deck level free of standing water.

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically the Jellyfish requires a service every 6 months, additionally as the Jellyfish cartridges capture pollutants they will need to be replaced (expected cartridge life is 2-5 years with a maximum cartridge life of 5 years).

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the Jellyfish.

	Description of Typical Activities	Frequency
Minor Service	Removal & rinsing of cartridges Wash down of deck level Removal of large floatable pollutants Removal of accumulated sediment (if required)	Every 6 Months
Major Service	Replacement of Jellyfish cartridges	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to assess the condition of the Jellyfish cartridges and record necessary information that will establish whether a major service is required.

1. Establish a safe working area around the access point
2. Remove access covers
3. Using a vacuum unit or net remove any floatable gross pollutants contained behind the maintenance access wall
4. Using a vacuum unit decant the water until the level drops below the base of the cartridges
5. Remove Jellyfish cartridges*
    a. Remove cartridge lid
    b. Remove cartridges vertically from chamber, lifting from eye nut lifting points only
    c. Replace and secure cartridge lid back into deck to reduce trip hazards during maintenance
6. Unscrew all 11 tentacles from the cartridge head plate, keep all components for reassembly*
7. Rinse each tentacle individually NOTE: excessive water pressure may damage the tentacles
    a. Position tentacle in a container (to capture runoff) with the open end facing down
    b. Rinse entire length of cartridge using only low pressure water source (e.g. garden hose).
    c. Evaluate and note the condition of the tentacles
    d. Ensure runoff is disposed appropriately
    e. Re-assemble cartridges ready for reinstallation*
8. Wash down deck level to remove any built up sediment (if required)
9. Measure the level of accumulated sediment in the chamber if depth is greater than 300mm use vacuum unit to remove sediment.
10. Re-install Jellyfish cartridges
    a. Remove cartridge lid
    b. Lower cartridge into chamber, lifting from eye nut lifting points only
    c. Insert cartridge vertically into cartridge receptacle, and secure cartridge lid back in place
11. Replace access covers

**Refer appendix 1 for Jellyfish Cartridge Schematic*

Major Service (Filter Cartridge Replacement)

For the Jellyfish system a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event	Maintenance Action
Rinsing does not remove accumulated sediment from the tentacles	Replace Jellyfish tentacles[1]
Jellyfish tentacles are damaged	Replace Jellyfish tentacles[1]
Jellyfish cartridges have been in operation for 5 years	Replace Jellyfish tentacles[1]

[1] Replacement filter tentacles and components are available for purchase from Ocean Protect.

This service is designed to return the Jellyfish device back to optimal operating performance

1. Establish a safe working area around the access point
2. Remove access covers
3. Using a vacuum unit or net remove any floatable gross pollutants contained behind the maintenance access wall
4. Using a vacuum unit decant the water until the level drops below the base of the cartridges
5. Remove Jellyfish cartridges*
    a. Remove cartridge lid
    b. Remove cartridges vertically from chamber, lifting from eye nut lifting points only
    c. Replace and secure cartridge lid back into deck to reduce trip hazards during maintenance
6. Unscrew all 11 tentacles from the cartridge head plate for disposal, keep all components for fixing of new tentacles to existing head plate*
7. Wash down deck level to remove any built up sediment (if required)
8. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
9. Install replacement tentacles into each head plate*
10. Install Jellyfish cartridges
    a. Remove cartridge lid
    b. Lower cartridge into chamber, lifting from eye nut lifting points only
    c. Insert cartridge vertically into cartridge receptacle, and secure cartridge lid back in place
11. Replace access covers

**Refer appendix 1 for Jellyfish Cartridge Schematic*

Additional Types of Maintenance

Occasionally events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the Jellyfish unit should be inspected and serviced accordingly. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess their contamination, depending on the type of spill event it may be necessary to replace the filtration cartridges.

Blockages

The Jellyfish treatment system is designed to operate in an offline arrangement, where an upstream high flow bypass structure is in used. In the unlikely event that flooding occurs upstream of the Jellyfish system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure to ensure that it is free of debris and pollutants
2. Inspect the Jellyfish unit checking both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed.

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the Jellyfish after a major storm event. The focus is to inspect for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary, damaged components should be replaced and accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the Jellyfish must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter cartridges have been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our Jellyfish system we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement cartridges.

For more information please visit www.OceanProtect.com.au

Appendix 1 – Jellyfish Cartridge Schematic