

18 June 2024

# **CIVIL ENGINEERING SERVICES**

Forest Lodge, 8 Forest Road Warriewood Water Management Report





## **DOCUMENT CONTROL**

01	14 <sup>th</sup> April 2023	ISSUE FOR 70% DETAILED DESIGN	Previous
02	3 <sup>rd</sup> November 2023	ISSUE FOR S4.56 SUBMISSION	Previous
03	18 <sup>th</sup> June 2024	ISSUE TO ADDRESS COUNCIL RFI	Current
Rev #	Date	Description of Change	Status

# **APPROVALS**

02	Isabella Oke Senior Engineer – Civil & Water Engineering Isabella Oke	James Georgiades <i>Team Leader – Civil &amp; Water Engineering</i> James Georgiades
Rev #	Senior Engineer – Civil & Water Engineering Author	Team Leader – Civil & Water Engineering Approver

PREPARED BY: WSCE PTY LTD Consulting Engineers ACN 668 655 141 ABN 75 668 655 141 Level 20, 66 Goulburn Street Sydney 2000 NSW Australia

**T** 02 9299 1312



PREPARED FOR: KUATRO BUILD PTY LTD *Project Managers* ABN 16 648 675 496 Suite 1/3b Macquarie Street Sydney 2000 NSW Australia T 02 8076 4500



Hydraulic Fire Civil Utilities Infrastructure



# **CONTENTS**

1.	INTRODUCTION	. 1
2.	ABBREVIATIONS AND DEFINITIONS	. 3
3.	CIVIL SERVICES GENERAL	. 4
4.	OVERLAND FLOW AND FLOODING	. 5
5.	WATER QUANTITY MANAGEMENT	. 6
6.	WATER QUALITY MANAGEMENT	. 9
7.	SEDIMENT AND EROSION CONTROL	14

# **SCHEDULES**

SCHEDULE 1	CIVIL DRAWINGS	18
SCHEDULE 2	HYDROGRAPHS	19
SCHEDULE 3	MONITORING REQUIREMENTS AND ACCEPTANCE CRITERIA	22
SCHEDULE 4	DOCUMENTATION CHECKLIST	23

# **CIVIL ENGINEERING SERVICES**

# 1. INTRODUCTION

Warren Smith Consulting Engineers (WSCE) has been engaged by Kuatro Build Pty Ltd to prepare an updated Water Management report for the proposed development for Forest Lodge Residential Development at 8 Forest Road, Warriewood.

This report provides updates for the purpose of a Section 4.56 submission with reference to a previous Water Management Report prepared by Martens Consulting Engineers dated February 2017.

The Section 4.56 modification of Approval N0440/15 in The Northern Beaches LGA proposes the following design alterations to the original Development Application submission:

- Removal of the internal 5.5m wide road between Buildings A & D and Buildings B & C.
- Provision of a community space between Buildings A & D and Buildings B & C including:
  - $\circ$  4m wide shared path
  - o BBQ areas
  - $\circ \quad \text{Seating areas} \quad$
  - $\circ$  Outdoor gym area
  - Swimming pool
- Provision of a 4m wide ring road around the apartment building developments.

The above modifications impacts the following civil design elements:

- Site grading and retaining
- Bulk earthworks
- Internal stormwater drainage layout
- Upstream diversion trunk drainage pipe alignment and invert levels
- Overland flow paths
- Ring road alignment, longitudinal sections and cross sections.

#### 1.1 BACKGROUND

The existing site is located at 8 Forest Road, Warriewood approximately 35km North-East of the Sydney CBD. The development site is bound by Narrabeen Creek to the north, residential development to the east, and dense bushland to the west and south. Refer to Figure 1.1 which shows the extent of the development site area in which the proposed works are to be undertaken.



Figure 1.1: Aerial View of Property Boundary (Source: SIXMaps)

The proposed development is for townhouses and multi-storey residential buildings with connecting roads.

# 2. ABBREVIATIONS AND DEFINITIONS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
DN	Diameter (mm)
EY	Exceedances per Year
IFD	Intensity-Frequency-Duration
L/s	Litres per second
m/s	Metres per second
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
OSD	On-Site Detention
PSD	Permissible Site Discharge
RCP	Reinforced Concrete Pipe
RWT	Rainwater Reuse Tank
SID	Safety In Design
SSR	Site Storage Requirement
WSC	Water Services Coordinator
WSUD	Water Sensitive Urban Design

#### The Use of Must, Shall & Should:

In accordance with the International Organisation for Standardisation (ISO) Directives, the word "shall" is used to state that a requirement is strictly to be followed in order to conform to a Performance Requirement. Consequently, there can be no deviation from that requirement, other than a specific tolerance.

It is noted that in legislation and specifications it is common to use the word "must" to express a requirement. The word "shall" in this document should be considered as equivalent to "must" in the legislation.

The word "should" introduces a suggestion or recommendation that is not a requirement. It is not necessary that such recommendations or suggestions be followed in order to comply with the Performance Requirement.

# 3. CIVIL SERVICES GENERAL

#### 3.1 PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide an updated report for a Section 4.56 Modification on Approval N0440/15 with reference to the Water Management Report prepared by Martens Consulting Engineers dated February 2017.

#### 3.1.1 DESIGN CRITERIA

#### Table 3.1: Design Criteria

ltem	Design Criteria
Stormwater Drainage Works	AS/NZS 3500.3 – 2015 – Stormwater Drainage AS 2865 – 2009 Safe Working in a Confined Space Warriewood Valley Water Management Specification 2001 Pittwater 21 Development Control Plan Section C6.1
On-Site Detention (OSD)	AS/NZS 3500.3 – 2015 – Stormwater Drainage AS 2865 – 2009 Safe Working in a Confined Space Pittwater 21 DCP Section 5.7 Warriewood Valley Water Management Specification 2001 Warringah Council On-site Stormwater Detention Technical Specifications
Water Quality Requirements and Proposed Treatment System	Draft NSW MUSIC Modelling Guidelines 2010 Pittwater 21 DCP Section B5.9 Stormwater Management – Water Quality - Other than low-Density Residential Warriewood Valley Water Management Specification 2001
Sediment and Erosion Control	Landcom 'Blue Book' – Managing Urban Stormwater Soils and Construction Guideline Edition 4

With reference to the above-mentioned documents, the Council requirements for this report are as presented below:

#### Water Quantity

With reference to the Warriewood Valley Water Management Specification:

- Minimum site storage requirements (SSR) to be satisfied as per Table A1.
- Permissible site discharges (PSD) to be satisfied as per Table A2.
- The post-development hydrograph is no more than 10% greater than the pre-development hydrograph.

This is further addresses in Section 5 of the report.

#### Water Quality

With reference to the Warriewood Valley Water Management Specification:

- Water quality assessment and monitoring
- Water quality management based on local conditions and local water acceptance criteria
- Details and management of Stormwater Quality Improvement devices

This is further addresses in Section 6 of the report.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

# 4. OVERLAND FLOW AND FLOODING

A number of flooding assessments have been undertaken for the proposed development. This report references the information detailed within the Flood Study by Martens Consulting Engineers dated February 2017, and the Flood Assessment by GRC Hydro dated 14<sup>th</sup> April 2022.

#### 4.1 EXISTING CONDITIONS

The site falls within a High Flood Risk zone as identified by Northern Beaches Council. Narrabeen Creek is situated immediately to the north of the site, however mainstream flooding from the creek does not inundate the proposed development up to and including the PMF.

The property is currently affected by overland flooding from an upstream catchment of approximately 81.6ha.

#### 4.2 PROPOSED DEVELOPMENT

The proposed development incorporates flood mitigation and risk minimising measures as part of the design.

The proposed stormwater drainage system associated with the flood mitigation consists of the following:

- Site is subject to upstream overland flow from the southern direction. A retaining wall has been proposed to act as a flood barrier which extends for almost the entire width of the site along the southern boundary. The top of retaining wall level has been nominated to be RL 30.8, which achieves 500mm freeboard to the 1% AEP flood level.
- Proposed swale, pit, and pipe (1500mm Diameter) network to capture upstream overland flow for all events up to 1% AEP and discharge via headwall outlet to Narrabeen creek.

# 5. WATER QUANTITY MANAGEMENT

The proposed drainage consists of minor and major systems. The minor system consists of below ground drainage consisting of pits and pipes and have been designed for the 5% AEP storm event. The Major system consists of above ground drainage, consisting of overland flow paths which have been designed to cater for the 1% AEP storm event.

The proposed stormwater drainage system consists of the following:

- A central 10kL rainwater tank located in the basement that services a portion of the multistorey buildings. The reuse from this tank is proposed to be used for irrigation and toilet flushing.
- The western portion of the site is captured via an internal drainage system consisting of a series of swales, pits and pipes and ultimately discharges via a headwall outlet connection (HW/4) to Narrabeen creek. Prior to discharge to the creek, Bioretention Basin 1 has been proposed upstream to the headwall outlet to control post-development flows back to predevelopment levels for all storm events up to and including the 1% AEP event.
- Similarly, the eastern portion of the site is captured via drainage network of swales, pits and pipes and discharged via headwall outlet (HW/5) connection to Narrabeen creek.
   Bioretention Basin 2 has been proposed upstream to headwall outlet to control post-development flows back to pre-development levels for all storm events up to and including the 1% AEP event.

Refer to the stormwater drawings within Schedule 1 for an illustration of the proposed stormwater & OSD system.

#### 5.1 ON-SITE DETENTION SYSTEM

#### 5.1.1 DRAINS INPUT PARAMETERS

The drainage system shall be modelled utilising DRAINS to ensure the system is designed to meet the Council's stormwater requirements. DRAINS is a stormwater drainage design and analysis program which performs hydraulic grade line analysis and generates the flows which would occur for a particular AEP storm event.

The catchment characteristic factor values which have been used in the DRAINS model are summarised below:

•	Paved (impervious) Area Depression Storage	1mm
•	Supplementary Area Depression Storage	1mm
•	Grassed (Pervious) Area Depression Storage	5mm
•	Soil Type - Normal	2.5
•	Antecedent Moisture Condition (AMC)	3.0
•	Minimum Pit Freeboard	150mm
•	Blockage Factor for On-Grade Pits	50%
•	Blockage Factor for Sag Pits	50%

Refer to Table 5.1 for the OSD1 and OSD2 details.

#### Table 5.1: On-Site Detention Basin Details

Item	Detail						
On-Site Detention Basin (OSD1) Summary							
Total Catchment Area Draining	0.844 Ha						
Average Base IL	22.19m AHD						
Outlet Diameter	225 mm						
Orifice Diameter	100 mm						
Outlet IL	21.49m AHD						
Provided Volume	682 m <sup>3</sup>						
On-Site Detention Ba	sin (OSD2) Summary						
Total Catchment Area Draining	1.168 Ha						
Average Base IL	20.20m AHD						
Outlet Diameter	300 mm						
Orifice Diameter	n/a						
Outlet IL	19.87m AHD						
Provided Volume	255 m <sup>3</sup>						

The minimum OSD storage requirement for the total site as specified in the Warriewood WMS 2001 is 368m<sup>3</sup>/Ha which equates to 741m<sup>3</sup> for the proposed development area of 2.012Ha. The 682m<sup>3</sup> and 255m<sup>3</sup> bioretention basins provide a total of 937m<sup>3</sup>, which satisfies this requirement.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

Refer to the stormwater drawings within Schedule 1 for an illustration of the proposed stormwater catchment.

#### 5.1.2 SITE DISCHARGE RESULTS

The site discharge results for the pre and post development 1% AEP storm events of varying duration are presented in the below Table 5.2.

Storm Duration	30 min	1 hr	2 hr	3 hr	6 hr
Council PSD Requirement (L/s/ha)	229	331	390	279	235
Required Site PSD (L/s)	472	682	803	575	484
Pre-Development Site Discharge (L/s)	824	625	541	373	322
Post Development Site Discharge (L/s)	460	294	253	231	221

#### Table 5.2: Site Discharge Results (Median Value)

The site discharge results as demonstrated above satisfy the permissible site discharge requirements as specified in the Warriewood Valley WMS 2001 Table A2.

The hydrographs were also analysed to determine that the post-development hydrograph is no more than 10% greater than the pre-development hydrograph. These hydrographs are provided in Schedule 2 and demonstrate that the post-development hydrograph does not exceed the pre-development hydrograph, and thus this condition is satisfied.

#### 5.2 STORMWATER QUANTITY MAINTENANCE

The pit and pipe network shall be inspected at intervals after a major storm event and not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum:

- 1. Check that all grates, covers and lintels are in sound condition and are undamaged. Any signs of deterioration should be noted.
- 2. Check all pits for accumulation of sediment, debris or litter.
- 3. If pits are found to be affected by sediment, debris or litter, an assessment should be made as to whether the upstream and downstream pipes require cleaning.
- 4. Inspect outlet and ensure it is in a sound, undamaged condition.

Maintenance of the pit and pipe system should be undertaken as required following the above inspections. Typical maintenance procedures that would need to be undertaken include:

- 1. Remove sediment, debris and litter from pits including lintels.
- 2. Remove sediment or other foreign material from pipes.

Rainwater tanks shall be inspected annually for any damages to gutters, first flush system or any other components that may need replacement.

The bioretention basin shall be also inspected at intervals after a major storm event and as indicated in Section 6.5 of this report.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

## 6. WATER QUALITY MANAGEMENT

To adhere to the Northern Beaches Council's requirements for the adequate treatment of the stormwater runoff, a treatment plan has been formulated for the development area to remove the suspended solids and nutrients before being discharged from the site.

### 6.1 POTENTIAL POLLUTANTS GENERATED

The pollutants that could potentially be generated as a result of the development are as follows:-

- Gross Pollutants, e.g. Litter;
- Sediments;
- Nutrients (Phosphorus and Nitrogen), and;
- Hydrocarbons.

The development has been modelled to demonstrate the performance of the stormwater treatment system utilising a program called MUSIC (Model for Urban Stormwater Improvements Conceptualisation). MUSIC models the proposed stormwater treatment devices and estimates their respective performance against the performance targets of the project. The pollutants modelled in MUSIC are Gross Pollutants (GP), Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN).

#### 6.2 RAINFALL

The rainfall data used in the MUSIC model was based on the Bureau of Meteorology data and is presented in Table 6.1. A five (5) year continuous rainfall period with the maximum available data has been adopted in accordance with the Northern Beaches Council's WSUD & MUSIC Modelling Guidelines.

#### Table 6.1: Rainfall Data for MUSIC Modelling

Rainfall Station	Rainfall Period	Rainfall Period Dates	Time Step
066062 Sydney Observatory	5 years	1 Jan 1981 – 31 Dec 1985	6 minutes

The average potential evapotranspiration (PET) data used in the MUSIC model was based on the average monthly PET data for the Sydney region and is presented in Table 6.2.

#### Table 6.2: Monthly Evapotranspiration Data for MUSIC Modelling

Month	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PET (mm)	180	135	128	85	58	43	43	58	88	127	152	163

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

### 6.3 RAINFALL RUNOFF PROPERTIES

Table and Table present the rainfall-runoff properties which have been utilised in the MUSIC model.

Parameter	Units	Rainfall Pe	iod Dates		
Impervious Area Parameters					
Rainfall Threshold	mm	0.3 (Roofs) 1.5 (Roads/Pathways)			
Pervious Area Parameters					
		Sand	Sandy Clay Loam		
Soil Capacity	mm	350	108		
Initial Storage	%	30	30		
Field Capacity	mm	144	73		
Infiltration Capacity Coefficient – a		360	250		
Infiltration Capacity Coefficient – b		0.5 1.3			
Groundwater Properties	-				
		Sand	Sandy Clay Loam		
Initial Depth	mm	10	10		
Daily Recharge Rate	%	100	60		
Daily Baseflow Rate	%	50 45			
Deep Seepage	%	0	0		

#### Table 6.3: Soil Properties for MUSIC Source Nodes

#### Table 6.4: Stormwater Water Quality Parameters for MUSIC Source Nodes\*

Land Use Category		Log₁₀TS	S (mg/L)	Log₁₀Tl	P (mg/L)	Log₁₀TN (mg/L)		
		Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	
Roofa	Mean	1.30	*	-0.89	*	0.30	*	
ROOIS	Std Dev	0.32	*	0.25	*	0.19	*	
Mixed	Mean	2.20	*	-0.45	*	0.42	*	
Landscape)	Std Dev	0.32	*	0.25	*	0.19	*	

\*Base flows are only generated from pervious areas; therefore, these parameters are not relevant to impervious areas

Hydraulic Fire Civil Utilities Infrastructure

#### 6.4 STORMWATER TREATMENT WSUD DEVICES

Stormwater quality treatment is primarily achieved via two bioretention basins. The basins are proposed in the north-east and north-west of the site, with bioretention filter areas of 127m<sup>2</sup> and 173m<sup>2</sup> respectively. The bioretention system will degrade pollutants and nutrients through the planting and filter media layers. Treated water then exits through the underdrain to the discharge control pit.

Rainwater tanks also provide a level of stormwater quality treatment by implementing a first flush system which flushes the first polluted water that collects on the roof.

Refer to the stormwater drawings in Schedule 1 for stormwater quality treatment device locations and details.

#### 6.5 MUSIC MODEL TREATMENT RESULTS

The stormwater quality treatment system has been modelled using the MUSIC software. Refer to **Figure 6.1** for the treatment plan and **Table 6.5 6.5** for the treatment results.



Figure 6.1: MUSIC Model Treatment Plan

Pollutant Type	Source (kg/yr)	Residual Load (kg/yr)	Reduction % Achieved	Council Target Reduction %
Gross Pollutants (GP)	446	8.58	98.1	90.0
Total Suspended Solids (TSS)	2280	341	85.0	85.0
Total Phosphorus (TP)	5.39	1.68	68.9	65.0
Total Nitrogen (TN)	45.4	18.0	60.3	45.0

#### Table 6.5: Percentage Based Load Reduction in Pollutant Results

As demonstrated within the above results table, the proposed treatment strategy satisfies Northern Beaches Council's targets for pollutant load reduction.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

#### 6.6 STORMWATER QUALITY MAINTENANCE

The bioretention basin shall be inspected at intervals after a major storm event and as per the intervals shown in Table 6.5:

ltem	Description	Frequency
	Check for and remove any build-up or litter from the basin surface.	3 months
	Check for and remove any sediment from inlet pipes, outlet pipes and pits, and filter media.	3 months
Filter Media	Check for any erosion or scour. Replace or provide additional energy dissipation measures.	3 months
	Replace filter media as required if at capacity or surface is clogged.	10 years or as required
	Assess and treat plant disease or pests and replace if required.	3 months
Planting	Check plant density is consistent with original requirements. Replant as required at appropriate spacings (6-10 plants per m <sup>2</sup> ).	3 months
	Check for weeds and remove.	3 months
	Check the underdrain is not blocked. Remove any blockages.	6 months
Drainage	Check grates, weirs, inlets and outlets are clear of litter and debris. Repair any damages if identified.	Monthly
General	Check for any operational issues and repair/manage as required.	6 months

	Table 6.5:	Stormwater	Quality	Maintenance
--	------------	------------	---------	-------------

#### 6.7 STORMWATER QUALITY MONITORING

Stormwater quality monitoring is proposed to be carried out in the following three locations in the vicinity of the proposed site:

- 1. Upstream of the site on the south to determine the existing conditions;
- 2. Downstream of the Basin 1 outlet; and
- 3. Downstream of the Basin 2 outlet in order to assess the results and impact of the stormwater quality treatment.

Two water and sediment samples are proposed to be taken at each of the above locations – one in dry conditions and one in wet conditions. These samples are to be taken once prior to construction and again at completion of construction for assessment.

The monitoring requirements indicating the variables to be tested are provided in Table C1 from the Warriewood WMS 2001. The acceptance criteria for these variables are shown in Table C2 from the Warriewood WMS 2001. Refer to Schedule 3 for these tables.

#### 6.8 MOSQUITO RISK ASSESSMENT

A mosquito risk assessment has been undertaken to identify possible locations where ponding water can occur and therefore pose a risk of mosquito breeding. The assessment also identified proposed strategies to minimize this risk.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

#### 6.8.1 POTENTIAL LOCATION

The below locations have been identified as possible locations where water may lie stagnant and therefore provide a potential breeding environment for mosquitoes:

- General surface areas
- In-ground stormwater pits
- Bioretention/OSD Basins
- Narrabeen Creek

#### 6.8.2 MANAGEMENT STRATEGIES AND RISK ASSESSMENT

The below management strategies or design conditions are listed below for the potential breeding locations:

- General surface areas Site grading has been designed such that no areas will allow for ponding without in-ground drainage. Overland flow paths have been designed to be directed towards the bioretention basins and ultimately Narrabeen Creek.
- In-ground stormwater pits The in-ground stormwater system freely drains by gravity and benching has been provided in all pits such that no water will pond within the pits or pipes. Regular maintenance should be carried out in accordance with the stormwater maintenance plan.
- Bioretention/OSD Basins The basins drain via gravity through the discharge control pit towards Narrabeen Creek. The basins are generally dry in between storm events. Regular maintenance should be carried out in accordance with the stormwater maintenance plan.
- Narrabeen Creek The creek is well graded with minimal localised flat or low areas at risk of ponding water. The creek runs from a west to east direction.

Per the above management strategies, the mosquito risk for the proposed development is considered to be relatively low.

# 7. SEDIMENT AND EROSION CONTROL

The Contractor for the works is required to provide Sedimentation and Erosion Control in accordance with the guidelines set out in Landcom's Managing Urban Stormwater Soils & Construction Guidelines and the general requirements outlined below.

#### 7.1 SITE PROTECTION MEASURES

The Contractor for the works is required to provide Sedimentation and Erosion Control in accordance with the requirements outlined below to inhibit the movement of sediment off the site during demolition and construction phases.

#### 7.1.1 SITE ACCESS

Construction vehicles leaving the site shall be required to pass over a Temporary Construction Vehicle Entry / Exit consisting of a 1.5m long by 3m wide 'cattle rack'.

#### 7.1.2 SEDIMENT CONTROL

All exposed earth areas where it may be possible for runoff to transport silt downslope shall be protected with a sediment and erosion control silt fence generally installed along the boundaries of the site.

The fence will be constructed in accordance with details provided by the Department of Conservation and Land Management incorporating geotextile fabric which will not allow suspended particles greater than 50mg/L non-filterable solids to pass through, and as such comply with the appropriate provisions of the Clean Waters Act 1970.

The construction of the silt fence will include the following: -

- Geotextile fabric buried to a maximum of 150mm below the surface. Refer to Figure 7.1 for details;
- Overlapping any joins in the fabric;
- Turning up on the ends for a length of 1 meter in order to prevent volumes of suspended solids escaping in a storm event;

Refer to Figure 7.1 for details.



Figure 7.1: Sediment Control Fence Detail

Check Dams have also been proposed to reduce erosive energy levels of concentrated water within drainage channels. They can be built with various materials, including rocks, logs, sandbags, and straw bags under the following requirements:

- Trench the check dam 200mm into the ground across its whole width. Where rock is used, fill the trench to at least 100mm above the ground surface to reduce the risk of undercutting.
- Their maximum height should not exceed 600mm above the gully floor. The centre should act as a spillway, being at least 150mm lower than the outer edges.



Refer to Figure 7.2 below for details.

Figure 7.2: Rock Check Dam (NTS)

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

#### 7.1.3 TEMPORARY STORMWATER SYSTEM (WHERE REQUIRED)

Site runoff within the zones of the excavation will be drained towards a central holding well within the excavation and sediment basins as shown on the Soil and Water Management Plan. The runoff will be allowed to settle out suspended particles and debris, and acceptable water of 50mg per litre of Non-Filterable Residues (NFR) is required to be achieved before discharge.

Upstream catchment runoff is proposed to be diverted through the site as "clean / unaffected water", directly to Narrabeen Creek via a diversion channel.

#### 7.1.4 DUST CONTROL

The following dust control procedures will be adhered to:

- Loose loads entering or leaving the site will be securely covered by a tarpaulin or like material in accordance with TfNSW and local Council Guidelines;
- Soil transport vehicles will use the single main access to the site;
- There will be no burning of any materials on site;
- Water sprays will be used across the site to suppress dust. The water will be applied either by water sprinklers or water carts across ground surfaces whenever the surface has dried out and has the potential to generate visible levels of dust either by the operation of equipment over the surface or by the wind. The watercraft will be equipped with a pump and sprays;
- Spraying water at the rate of not less than three (3) L/s and not less than 700kPa pressure. The area covered will be small enough that surfaces are maintained in a damp condition and large enough that runoff is not generated. The water spray equipment will be kept on-site during the construction of the works;
- During excavation all trucks/machinery leaving the site will have their wheels washed and/or agitated prior to traveling on Council Roads, and;
- Fences will have shade cloth or similar fabric fixed to the inside of the fence.

#### 7.1.5 SEDIMENT PUMP OUT PITS

Sediment pump out pits shall be installed within the extent of proposed basement. A perforated riser outlet pipe shall be installed to pump any rainwater collected in these pits and shall discharge into a grated inlet pit along the southern boundary of the site. Refer to Figure 7.3 for details of a perforated riser outlet pipe.

The pump out pit within the basement are to discharge to Sediment Basins 1 & 2.

Hydraulic Fire Civil Utilities Infrastructure



Figure 7.3: Pump Out Pit Outlet Pipe Detail

#### 7.1.6 MAINTENANCE

Generally, the following maintenance measures shall be adhered to during construction:

- It will be the responsibility of the site foreman for the building contractor to ensure sediment and erosion control devices on site are maintained. The devices shall be checked daily, and the appropriate maintenance to be undertaken as necessary;
- Prior to the closing of the site each day, the road shall be swept, and materials deposited back onto the site;
- Gutters and roadways will be kept clean regularly to maintain them free of sediment;
- Appropriate covering techniques, such as the use of plastic sheeting will be used to cover excavation faces, stockpiles, and any unsealed surfaces;
- If dust is being generated from a given surface, and water sprays fail; a new work method statement must be provided by the contractor to ensure levels are reduced to a manageable level;
- If fugitive emissions have the potential to cause the ambient quality to foul the ambient air quality, measures must be taken in order to safely enclose emissions or implement a local extraction ventilation system;
- The area of soils exposed at any one time will be minimised wherever possible by excavating in a localised progressive manner over the site;
- Materials processing equipment suitable to comply with regulatory requirements. The protection will include the covering of feed openings with rubber curtains or socks, and;
- Suitable and approved bins shall be utilised for the containment of hard waste, including concrete slurries, building waste, and litter. In the case of accidental spills, particularly within the public reserve, the material shall be swept and contained, and not washed into a gutter or waterway.

It is considered that by complying with the above, appropriate levels of protection are afforded to the site and the adjacent public roads, footpaths, and environment.

📕 Hydraulic 📕 Fire 📕 Civil 📕 Utilities Infrastructure

# SCHEDULE 1 CIVIL DRAWINGS

Hydraulic Services Fire Protection Civil Engineering Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

# FOREST LODGE WARRIEWOOD **CIVIL & STORMWATER ISSUE FOR S4.56**



	Sheet List Table	
DWG No	DRAWING TITLE	ISSUE
C1.00 Arrangeme	nt and Overview Plans	
C1.01	Cover Sheet	4
C1.02	Specification Notes	1
C1.03	Exsiting Survey	1
C2.00 Sediment a	and Erosion Control	
C2.01	Sediment & Erosion Control Plan	4
22.02	Sediment & Erosion Control Details	1
C3.00 Earthworks	;	
3.01	Bulk Earthworks Levels Plan	4
4.00 Siteworks F	Plans	
24.01	General Arrangement Plan-Sheet 1	2
4.02	General Arrangement Plan-Sheet 2	4
4.51	Siteworks Details	2
5.00 Road Long	itudinal and Cross Sections	
5.01	Road Set-Out Plan	3
5.11	Road Long Sections - Access Road	
5.12	Road Long Sections - Ring Road	2
5.21	Road Cross Sections - Access Road	1
5.22	Road Cross Sections - Ring Road Sheet 1	3
5.23	Road Cross Sections - Ring Road Sheet 2	3
6.00 Stormwate	r Drainage	
6.01	Stormwater Layout Plan-Sheet 1	2
ð.02	Stormwater Layout Plan-Sheet 2	4
6.04	Stormwater Pit Schedule	4
6.06	Stormwater Drainage Details - Sheet 1	2
6.07	Stormwater Drainage Details - Sheet 2	2
6.11	Bioretention Basin Plan - Sheet 1	3
6.12	Bioretention Basin Plan - Sheet 2	2
6.13	Bioretention Basin Sections - Sheet 1	1
6.14	Bioretention Basin Sections - Sheet 2	1
26.21	Stormwater Catchment Plan - Sheet 1	3
6.22	Stormwater Catchment Plan - Sheet 2	3
6.41	Trunk Drainage Longitudinal Section	3

LOCALITY AERIAL NOT TO SCALE



WSce Pty Ltd ACN 668 655 141 ABN 75 668 655 141 fo@wsce.com.au



Driven by excellence, built on experience.





#### GENERAL

- DESIGN HEREIN HAS BEEN PREPARED BY WARREN SMITH CONSULTING CIVIL ENGINEERS PTY LTD, LEVEL 20, 66 GOULBURN ST, SYDNEY NSW 2000 G1. TEL: (02) 9299 1312. FAX: (02) 9290 1295.
- THE DRAWINGS HEREIN SHALL BE READ AS G2 THE DRAWINGS HEREIN SHALL BE READ AS REQUIRED IN CONJUNCTION WITH ARCHITECT DRAWINGS BY: ADS ARCHITECTS 1/7 MURRAY ROSE AVE SYDNEY OLYMPIC PARK NSW 2127 TEL: (02) 9648 6663
- G3. ALL DIMENSIONS IN MILLIMETRES UNO. REDUCED LEVELS AND CHAINAGES ARE IN METRES. DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS.
- THE PROPOSED WORKS DETAILED HEREIN SHALL BE CONSTRUCTED TO THE REQUIREMENTS OF COUNCIL GENERALLY AS DETAILED HEREUNDER. G4.
- ALL EXISTING SERVICES SHALL BE VERIFIED FOR G5. ALL EADSTING SERVICES SHALL BE VEHIFIED FOR DEPTH AND HORIZONTAL POSITION BY PHYSICAL MEANS PRIOR TO EXCAVATION. ANY DISCREPANCIES SHALL BE BROUGHT FORTHWITH TO THE PROJECT MANAGEDE ATTENTION
- REFERENCE SHALL BE MADE TO THE CONSTRUCTION G6. MANAGEMENT PLAN FOR ALL SITE WORKS DETAILED HEREIN

STORMWATER & SUB-SOIL DRAINAGE MATERIALS:

- STW1. PIPES AND FITTINGS FOR STORMWATER
- DRAINAGE SHALL BE AS FOLLOWS UNO ON THE DRAINAGE SHALL BE AS FOLLOWS UNO ON THE DRAWINGS: SEWER GRADE UPVC (SN8) WITH SOLVENT WELDED
- SEWER GRADE uPVC (SN8) WITH SOLVENT WELDED JOINTS FOR BELOW GROUND DRAINAGE UP TO 225mm. REINFORCED CONCRETE WITH RUBBER RINGS, Β. CLASS 3, FOR PIPE DIA'S GREATER THAN 225mm OR
- WHERE REQUIRED BY AS3500 FOR EXCESSIVE DEPTH. C. INSTALL IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500 EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
- PIPES & FITTINGS FOR SUBSOIL DRAINAGE SHALL BE SLOTTED POLYVINYL CHLORIDE (PVC) WITH SOLVENT STW2. WELDED JOINTS, MIN. 150mm DIAMETER.
- STW3. IN GROUND DRAINAGE PIPEWORK SERVING DP's SHALL BE MINIMUM 150mm DIA UNO
- GRATED DRAINS SHALL BE 150mm NOM. A. 150mm NOM. WIDTH IN NON TRAFFICABLE AREAS. B. 225mm NOM. WIDTH IN TRAFFICABLE AREAS. STW4
- STW5. STORMWATER PITS ARE AS SHOWN & SPECIFIED ON THE PLANS . PRECAST TYPE ACCEPTABLE WITH STEP RONS FOR DEPTH GREATER THAN 1200, BENCH ALL PITS MIN. 50mm & FORM SMOOTH TRANSITION FROM NLET TO OUTLET.
- SELECT FILL SHALL BE MATERIAL OBTAINED FROM EXCAVATION OF THE PIPE TRENCH OR IMPORTED WITH A PARTICLE SIZE FOR ROCK NOT GREATER THAN 75mm OR FOR OTHER THAN ROCK NOT GREATER THAN 150mm.
- MPORTED FUL SHALL BE FITHER, AND GENERALLY STW7. CONSIST OF SINGLE STEED AGGREGATE WITH PARTICLE SIZE NOT GREATER THAN 5mm WRAPPED ALL ROUND WITH GEOTEXTILE FILTER FABRIC OR ADDROVED URLU ADAUGTON AUTO OF ADDROVED APPROVED HIGH COMPACTION SAND OR APPROVED CRUSHED ROAD GRAVEL CONFORMING TO RTA FORM 3051 OR SIMILAR.
- STW8 STORMWATER PITS AND GRATES TO CONFORM WITH STANDARD COUNCIL REQUIREMENTS, WHERE ON PUBLIC LAND, GRATES TO BE SUPPLIED IN CLASS SHOWN ON THE DRAWINGS.

#### INSTALLATION REQUIREMENTS

- STW9 PIPES SHALL BE TRUE TO GRADES SHOWN AND ALIGNED SO THAT THE CENTRES OF THE INLET PIPES NITERSECT WITH THE CENTRE OF THE INLET PIPE AT THE DOWNSTREAM FACE OF THE PIT.
- STW10. MINIMUM GRADES FOR GRAVITY STORMWATER DRAINAGE SHALL CONFORM TO AS3500 PART3 AS FOLLOWS, UNO: 1% FOR 100 AND 150 mm DIA. 0.5% EOR 225 mm DIA 0.5% FOR 300 mm DIA 0.4% FOR 375 mm DIA
- STW11. MINIMUM DEPTH OF COVER SHALL BE :-300mm IN PRIVATE PROPERTY (NON VEHICULAR TRAFFIC). - 450mm N PUBLIC AREAS. - 600mm IN VEHICULAR TRAFFICABLE AREAS FOOTWAY/ROADWAY)

- STW12. BED ALL PIPES FIRMLY AND EVENLY ONTO IMPORTED BEDDING FILL MATERIAL.
- STW13. LAY AND JOINT ALL PIPES IN ACCORDANCE WITH THE ANUFACTURERS RECOMMENDATIONS AND AND THE AND TH CULVERTS. AS 3500-1990 NATIONAL PLUMBING & DRAINAGE CODE. PART 2, SANITARY PLUMBING AND SANITARY DRAINAGE.
- SYDNEY WATER REQUIREMENTS. STW14. ALLOW TO TEST ALL PIPES AND PITS TO MANUFACTURERS REQUIREMENTS.

#### CONCRETE WORKS

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600, THE STANDARDS ASSOCIATION AUSTRALIA, STANDARDS CITED IN AS3600, C1. THE DRAWINGS AND THE SPECIFICATION.
- C2. ALL CONCRETE SHALL BE 80mm NOMINAL SLUMP, 20mm ALL CONCRETE SHALL BE 80mm NOMINAL SLUMP; 20mm MAXIMUM AGREGATE WITH NO ADMIXTURES OR FLY ASH, UNLESS OTHERWISE APPROVED, ALL CONCRETE WORK IN CONTACT WITH SEWER TO HAVE TYPE SL PORTLAND CEMENT, OTHERWISE TYPE A CEMENT FOR BRIDGE WORKS, A MAXIMUM 56 DAYS SHRINKAGE OF 600 MEROPORTIAN A MINIMUM COLLECT CONTROL SECTION MICROSTRAIN, A MINIMUM CEMENT CONTENT 350kg/m3 AND MAXIMUM WATER: CEMENT RATIO OF 0.40.
- C3. STRENGTH GRADE OF CONCRETE SHALL BE : 25 MPa (KERBS, EDGE STRIPS & CONCRETE ENCASEMENT) AND 32 MPa ELSEWHERE.
- CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED C4. AND USED ONLY WHERE SHOWN OR APPROVED. GENERALLY FOR HAND PLACED KERB & GUTTER 6mm THICK APPROVED BITUMINOUS MASTIC JOINTING THICK APPROVED BITUMINOUS MASTIC JOINTING MATERIAL SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 6m, FOR MACHINE PLACED KERB & GUTTER 6mm THICK APPROVED BITUMINOUS MASTIC JOINTING MATERIAL SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 12m & GUILLOTINED DUMMY GROOVED JOINTS, 25mm IN DEPTH, SHALL BE FORMED EVERY 3m OF GUTTER, JOINTS ARE ALSO REQUIRED AT EACH END OF GUTTER CROSSING AND GULLY PITS. JOINTS SHALL BE SET VERTICAL AND SQUARE TO THE KERB
- REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND IS NOT NECESSARILY SHOWN IN TRUE PROJECTION. C5.
- ELDING OR SPLICES IN REINFORCEMENT SHALL BE USED C6. ONLY IN POSITIONS APPROVED BY THE ENGINEER.
- C7. CONCRETE CURING SHALL BE IN ACCORDANCE WITH CONTINUE OF AN ANY COMPARIAN CONTINUE OF THE ASSOCIATION OF A COMMENCE OF THIS HING OPERATIONS AND SHALL BE CONTINUED FOR A MINIMUM OF SEVEN DAYS BY AN APPROVED PROPRIETARY COMPOUND OR BY KEEPING CONTINUOUSLY WET.
- FORMWORK SHALL BE DESIGNED AND CONSTRUCTED IN C8. ACCORDANCE WITH AS3610. FORMWORK SHALL NOT BE STRIPPED NOR PROPS REMOVED WITHOUT APPRO
- FABRIC LAP DETAILS SHALL BE IN ACCORDANCE WITH C9. FIG.13.2.4 OF AS3600
- HOOKS, LAPS AND BENDS SHALL BE IN ACCORDANCE C10. WITH AS3600 UNO.
- C11 ALL CHEMICAL ANCHORS SHALL BE FITHER 'CHEMSET' ALL CHEMICAL ANCHORS SHALL BE EITHER CHEM BY "RAMSET" WITH THE GLASS CAPSULE SYSTEM INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS OR HILTI HVU ADHESIVE ANCHOR WITH FOIL CAPSULE SYSTEM INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTION.
- C12. ALL CHEMICAL ANCHORS SHALL BE HOT DIPPED GALVANIZED AND BE MIN M16 DIA. U.N.O.

GENERAL EARTHWORKS, SITEWORKS & FILLING: FILLING

- THESE CLAUSES SHALL BE READ IN CONJUNCTION WITH CARDNO REPORT OF GEOTECHNICAL ASSESSMENT, DATED 22 DECEMBER 2021. SGE1.
- THE RECOMMENDATIONS CONTAINED IN THE GEOTECH SGE2. REPORT SHALL OVERRIDE THE CLAUSES PRESENTED HEREIN.
- SGE3 STRIP ALL TOPSOIL AND LINDERLYING FILL AND STOCKPILE TOPSOIL FOR LATER REUSE FOR LANDSCAPING PURPOSES.
- NEW FILL REQUIRED TO REINSTATE CUT LEVELS TO SGE4. PROPOSED BENCHING LEVELS SHALL BE SOURCED FROM OTHER PARTS OF THE EXCAVATION AS SELECT FILL OR IMPORTED FILL AS SPECIFIED BELOW IN SGE 5 AND SGE 6.

- SGE5. SELECT FILL SHALL CONSIST OF LOCALLY DERIVED OR CUT NATURAL CLAYS.
- IMPORTED FILL SHALL CONSIST OF RIPPED SANDSTONE SGE6. OR SHALE OR SIMILAR MATERIAL WITH MAXIMUM PARTICLE SIZE NOT GREATER THAN 120mm AND A MOISTURE CONTENT WITHIN 2-3% OF STANDARD
- ALL FILL (COHESIVE SOIL) SHALL BE PLACED IN LAYERS SGF7 OF 200mm MAXIMUM THICKNESS, COMPACTED BY MACHINE ROLLING TO ACHIEVE A DRY DENSITY RATIO OF NOT LESS THAN 98% STANDARD MAXIMUM AT A CORRESPONDING MOISTURE CONTENT WITHIN 2-3% OF STANDARD OPTIMUM.
- IN AREAS WHERE HIGH IMPACT ROLLING IS USED TEST EACH FINAL LAYER OF NOT GREATER THAN 300mm TO 400mm TO ACHIEVE A DRY DENSITY SGE8. RATIO OF NOT SGE8. LESS THAN 98% STANDARD MAXIMUM AT A CORRESPONDING MOISTURE CONTENT WITHIN 2-3% OF STANDARD OPTIMUM.
- EXCAVATION BATTERS: TION BATTERS: ALL TEMPORARY BATTERS CUT IN CLAY SUBSTRATE SHALL BE 1 HORIZ: 1 VERT, ALL LONG TERM EXPOSED BATTERS CUT IN CLAY SUBSTRATE SHALL BE 2 HORIZ: 1 VERT, ALL DETENTION BAST BATTERS IN CLAY SUBSTRATE SHALL BE 3 HORIZ: 1 VERT, ALL DETENTION DEPENDENTED RECORDINGTED TO GIVE BE VERD BASIN BATTERS IN ROCK SUBSTRATE SHALL BE NEAR VERTICAL
- SGE10. GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO AT LEAST LEVEL 1 CONTROL OF FILL COMPACTION STANDARD, AS DEFINED IN AS. 3738 AS FOLLOWS
- FOR GENERAL FILL OR CUT AREAS OVER THE AREA PROVIDE ONE (1) TEST PER 200mm LAYER, OVER AN AREA NOT GREATER THAN 500 m<sup>2</sup>
- FOR GENERAL FILL AREAS IN CONCENTRATED AREAS FOR GENERAL FILL AREAS IN CONCENTRATED AREA ADJACENT TO AND BEHIND THE STRUCTURE AND ADJACENT TO AND BEHIND RETAINING WALLS PROVIDE ONE (1) TEST PER 200mm LAYER, OVER AN DEA NOT COPENTED & 10A 10A<sup>2</sup> AREA NOT GREATER THAN 50m
- SGE11. SUBMIT ALL GEOTECHNICAL TEST RESULTS TO WARREN SMITH CONSULTING ENGINEERS FOR REVIEW PRIOR TO CONTINUATION WITH SUBSEQUENT SECTION OF WORK

#### EARTH WORKS FOR SERVICES

- EXCAVATE TRENCHES AND STOCKPILE ALL MATERIAL FOR INSPECTION WITH REGARD TO RE-USE FOR TRENCH BACKFILL, REMAINING MATERIAL TO BE REMOVED FROM E1.
- BEDDING MATERIAL SHALL CONSIST OF IMPORTED FILL E2. ONLY, THICKNESS OF BEDDING LAYER SHALL BE 75mm IN O.T.R. AND 200mm IN ROCK.
- EMBED ALL PIPES WITH IMPORTED FILL PROVIDE 200mm SIDE SUPPORT AND 150mm OVERLAY ABOVE E3. PIPE CROWN.
- TRENCH FILL ABOVE THE EMBEDMENT ZONE TO THE E4. UNDERSIDE OF THE ROAD PAVEMENT OR FOOTWAY FILL MATERIAL SHALL BE AS FOLLOWS :

#### UNDER ROADWAY

TRENCH FILL MATERIAL SHALL CONSIST OF IMPORTED FILL AS SPECIFIED HEREIN OF EITHER HIGH GRADE COMPACTION SAND OR APPROVED CRUSHED ROAD GRAVEL CONFORMING TO RTA FORM 3051 OR SIMILAR.

#### OTHER THAN ROADWAY

TRENCH FILL MATERIAL EXCAVATED SHALL CONSIST OF SELECT FILL AS SPECIFIED HEREIN AND SHALL NOT CONTAIN MORE THAN 20% OF STORES OF SIZE BETWEEN 75mm & 150mm AND NONE LARGER THAN 150mm, PRIOR TO THE USE OF THE EXCAVATED MATERIAL IT SHALL BE INSPECTED AND APPROVED BY THE CONSULTANT

COMPACT BEDDING, EMBEDMENT AND TRENCH FILL MATERIALS AS FOLLOWS: E5.

> EMBEDMENT: FOR GRANULAR FILL MATERIAL (NON-COHESIVE SOILS) EG. COARSE AGGREGATE FILL, HIGH GRADE COMPACTION SAND, THE DENSITY INDEX (ID) SHALL BE NOT LESS THAN 70%

TRENCH FILL:-FOR GRANULAR MATERIAL (NON-COHESIVE SOILS), THE DENSITY INDEX (ID) SHALL BE NOT LESS THAN 70%.

FOR NON-GRANULAR FILL MATERIAL (COHESIVE SOILS), THE DRY DENSITY RATIO (RD) SHALL BE NOT LESS THAN 05%

MEASURE OF COMPACTION:-E6. THE DEGREE OF COMPACTION SHALL BE MEASURED BY ONE OF THE FOLLOWING PARAMETERS :-

> GRANULAR FUL (NON-COHESIVE SOLIS) THE DENSITY GRANIOLAR HEL (MONEORESIVE SOLS). HE DENSIT NIDEX (ID) DETERMINED IN ACCORDANCE WITH AS 1289.E6.1 BASED ON THE MAXIMUM AND MINIMUM DRY DENSITIES IN ACCORDANCE WITH AS 1289.E5.1 AND THE FIELD DRY DENSITY IN ACCORDANCE WITH AS 1289.5.3.2, AS 1289 E3 5 OR AS 1289 E8 1.

NON-GRANULAR FILL (COHESIVE SOILS). THE DRY NON-BORNINGLAR HEL (COREAVE SOLD), THE DKT DENSITY RATION (RD) DETERMINED IN ACCORDANCE WITH AS 1289.5.4.1 BASED ON THE FIELD DRY DENSITY IN ACCORDANCE WITH AS 1289.5.3.2 AND THE MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289.5.1.1

- GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO AT E7. LEAST LEVEL 1 CONTROL OF FILL COMPACTION STANDARD, AS DEFINED IN AS, 3738 AS FOLLOWS
- TEST FACH 300mm | AYER ABOVE PIPE CROWN TEST BASE & SUBBASE LAYERS WHERE APPLICABLE. TEST BASE & SUBBASE LAYERS WHERE APPLICABLE. TESTS SHALL BE REQUIRED AT EACH 50m CENTRES WHERE THE LENGTH OF TRENCH IS WITHIN THE 50m REQUIREMENT.
- SUBMIT ALL GEOTECHNICAL TEST RESULTS TO WARREN E8. CONSULTING ENGINEERS FOR REVIEW PRIOR TO CONTINUATION WITH SUBSEQUENT SECTION OF WORK.

#### RESTORATION

- RESTORE ALL TRAFFIC AREAS TO PRE EXISTING CONDITION. RES1.
- FOR ALL SURFACES OTHER THAN IN TRAFFIC AREAS RESTORE DISTURBED SURFACES TO PRE-EXISTING CONDITIONS AND COMPACT AS SPECIFIED. RES2.
- RESTORE ALL AUTHORITY OWNED AREAS TO COUNCIL RES3

#### ROAD WORKS, DRIVEWAYS & CARPARKS

- ALLOW FOR LEVEL 2 TESTING AND SUB-GRADE R1 ALLOW FOR LEVEL 2 TESTING AND SUB-GRADE CONDITIONS & PAVEMENT THICKNESS TO BE VERIFIED BY GEOTECHNICAL CONSULTANT AFTER INSPECTION OF PRELIMINARY BOXING.
- ALLOW FOR ANY SUB-GRADE REPLACEMENT WORK TO R2. BE DETERMINED AS REQUIRED BY GEOTECHNICAL CONSULTANT AT THE TIME OF PAVEMENT CONSTRUCTION
- MINIMUM DRY DENSITY RATIOS (AS 1289 3.4.1-1993) TO R3.

BASE COURSE: 98% MODIFIED SUB-BASE: 95% MODIFIED SUB-GRADE 100% STANDARD SUB-GRADE REPLACEMENT: 100% STANDARD

- PAVEMENT MATERIALS TO COMPLY WITH RMS R4. SPECIFICATION No. 3051 OR SIMILAR AS APPROVED BY GEOTECHNICAL CONSULTANT.
- PROVIDE (1) TEST FOR EACH LAYER NOT EXCEEDING R5. 250mm THICK BEING BASECOURSE, SUB-BASE & SUB-GRADE OVER AN AREA NOT GREATER THAN 500m
- SUBMIT ALL GEOTECHNICAL TEST RESULTS TO WARREN CONSULTING ENGINEERS FOR REVIEW PRIOR TO CONTINUATION WITH SUBSEQUENT SECTION OF WORK. R6.

#### APPROVALS

- THE AS CONSTRUCTED WORKS SHALL BE INSPECTED BY DESIGN CONSULTANT. MINIMUM 48 HOURS NOTICE A1. SHALL APPLY TO ALL INSPECTIONS.
- THE DESIGN PLANS HEREIN ARE SUBJECT TO LOCAL A2 COUNCIL APPROVAL PRIOR TO CONSTRUCTION OBTAIN EXPRESS (WRITTEN) ADVICE TO PROCEED FROM PROJECT MANAGER PRIOR TO COMMENCEMENT.
- SUBMIT WORK-AS-EXECUTED DRAWINGS IN CIVILCAD OR A3. DXF DIGITAL FORMAT AND HARD COPY FORMAT. VERIFY ALL CONSTRUCTION WORKS SHOWN HEREON.
- CERTIEV THAT THE AS CONSTRUCTED SYSTEM HAS A4 BEEN BUILT IN ACCORDANCE WITH THE APPROVED PLANS ISSUED FOR CONSTRUCTION.

#### SERVICES UNDER ROAD SURFACES

ALL OTHER SERVICES INCLUDING BUT NOT LIMITED TO S1. ALL OTHER SERVICES INCLUDING BUT NOT LIMITED TO WATER, HYDRANT, GAS, SEWER, ELECTRICAL AND COMMUNICATIONS CONDUITS OR CABLES SHALL BE LAID WITH MINIMUM 600mm U.N.O. COVER BELOW PROPOSED ROAD SURFACE OR APPROVED OTHER MEANS TO PROTECT DURING CONSTRUCTION.

DO NOT SCALE FROM			REVISION	AMENDMENT	DATE	REVISION	N AMENDM	DMENT	DATE	CLIENT	PREPARED BY		TITLE			
DRAWINGS, CHECK &		DRAWING COLOON CODED - PHINT ALL COPIES IN COLOON	1	ISSUE FOR \$4.56	03/11/23					<b>IZELATOO</b>						
& LEVELS BEFORE										KIIAIRO	WSce Pty Ltd		SPEC	IFICATI	<b>ON NOTI</b>	ES
COMMENCEMENT OF			<u> </u>								ACN 668 655 141 ABN 75 668 655 141	WS				
ANY WORK.			<u> </u>							PROJECT	info@wsce.com.au wsce.com.au		SCALE DR	WN DE	SIGNED CHECKED	D APPROVED
THIS DRAWING IS NOT TO			<b>├</b> ──		<u> </u>	<u> </u>					OWNER		AS SHOWN	I.K.	I.O. J.G	G. J.G.
WHOLE WITHOUT WRITTEN										FOREST LODGE	den a		JOB No.	DR	AWING No.	ISSUE
PERMISSION FROM												Driven by excellence,	1 73680	02	C1.02	2   1
CONSULTING ENGINEERS.										WARKIEWOOD	ISO 9001 Centified	built on experience.	DATE ST/	TUS		<u> </u>
													SEPTEMBER 2023	ISS	SUE FOR S4.	.56
CONSULTING ENGINEERS.	60 70 80 90 100	0 110 120 130 140 150									ISO 9001 Centiled		DATE SEPTEMBER 2023	TUS ISS	SUE FOR S4.	.56

#### ROAD SIGNS & LINE MARKING

- ALL SIGNS AND LINEMARKING SHALL BE TO ROADS & TRAFFIC AUTHORITY STANDARDS AND SPECIFICATIONS AND AS.1742, MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES RS1.
- RS2 ALL LINEMARKING SHALL BE AUGMENTED BY RETROREFLECTIVE RAISED PAVEMENT MARKERS (RRPMs) AND ALL SHALL BE TO AS 1742.2 - 1994 AND AS 742.2 /AMDT 1/199
- ALL ROAD SIGNS AND POSTS SHALL BE TO AS 1742.2 -1994 AND AS 1742.2 /AMDT 1/1997-10-05 RS3.

#### PROTECTION OF FLORA - REFER SPECIFICATION

- ANY TRENCHES WITHIN 3m OF TREES SHALL BE HAND DUG TO AVOID DAMAGE TO TREE ROOTS.
- IF IT IS CONSIDERED NECESSARY TO PERFORM ANY IF IT IS CONSIDERED INECESSARY TO PERFORM ANY WORK ON TREES, INCLUDING TRIMINING, LOPPING, ROOT CUITING, REPAIR AND REMOVAL, APPLICATION IN WRITING SHALL BE MADE BY THE CONTRACTOR TO THE SUPERINTENDENT, ANY WORK PERMITTED TO BE DONE ON TREES TO BE RETAINED SHALL BE PERFORMED IN CONCEPTION FOR UNIT UNIT CONCEPTION FOR THE DATA ACCORDANCE WITH THE ARBORISTS REPORT.
- 3. MATURE TREES AND SHRUBS ARE TO BE REMOVED IN ACCORDANCE WITH THE ARBORISTS REPORT

#### AUTHORITY STANDARDS

LGA 1. THE DRAWINGS HEREIN SHALL BE READ IN CONJUNCTION WITH NORTHERN BEACHES COUNCIL COUNCIL STANDARDS & SPECIFICATIONS WHICH SHALL OVERRIDE SPECIAL DETAILS SHOWN ON THE DRAWINGS

#### TRAFFIC NOTE:

A TRAFFIC CONTROL PLAN IS TO BE PREPARED BY AN ACCREDITED RMS 1, TRAFFIC CONTROLLER AND SUBMITTED TO COUNCIL. THIS TRAFFIC PLAN IS TO BE CERTIFIED BY AND IMPLEMENTED TO THE SATISFACTION OF AN ACCREDITED RMS TRAFFIC CONTROLLER

PRIOR TO COMMENCEMENT OF WORK

2. ALL TRAFFIC CONTROL WORKS SHALL ONLY BE CARRIED OUT BY 2. ACCREDITED RMS TRAFFIC CONTROLLERS

CLOSED CIRCUIT COLOUR TV (CCTV)

- CCTV 1. UNDERTAKE A CCTV INSPECTION OF ALL THE COMPLETED DRAINAGE IN ACCORDANCE WITH THE GUIDELINES OF THE AUSTRALIAN CONDUIT CONDITION EVALUATION MANUAL (ACCEM)
- CCTV 2. APPLY THE FOLLOWING REQUIREMENTS TO THE CCTV NSPECTION:-A. USE DATA CAPTURE SOFTWARE APPROVED BY
  - SYDNEY WATER
  - B. USE CERTIFIED CCTV OPERATORS C. THE CCTV FOOTAGE SHALL BE OF QUALITY TO ALLOW ACCURATE ASSESSMENT OF THE INTERNAL CONDITION OF THE PIPE, FURNISH TO THE DESIGN CONSULTANT:-
- CCTV 3. A. VIDEOS IN MPG FORMAT B. CCTV REPORT AND SURVEY DATA IN PDF FORMAT

#### PROTECTION OF TREES

WHERE STORMWATER DRAINAGE IS LAID WITHIN THE VICINITY OF TREES, / CANOPIES OF TREES, WORK IS TO BE COMPLETED TO THE PROJECT ARBORIST'S REQUIREMENTS AND SPECIFICATIONS.



8 E E					
Cad FI	DO NOT SCALE FROM			REVISION	AMEN
7368I	DRAWINGS, CHECK &		DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	1	ISSU
ce; X tewar	VERIFY ALL DIMENSIONS				
Surfa me: is	& LEVELS BEFORE				
cisting gin Na	ANY WORK				
10		Č Š			
556:10					
23@1	WHOLE WITHOUT WRITTEN				
11.20X	PERMISSION FROM	NORTH	12,5 0 5 10 15 20 25m		
3680C e: 03.	WARREN SMITH		PLAN SCALE 1:750 A1 SHEET		
ot Dat	CONSULTING ENGINEERS.				
× ± L 0	10 20 30 40 50	60 70 80 90 100	110 120 130 140 150		

-	CLIENT	PREPARED B1	
	KUATRO	WSce Pty Ltd ACN 668 655 141 ABN 75 668 655 141	V
	PROJECT	info@wsce.com.au wsce.com.au	
	FOREST LODGE WARRIEWOOD	OF ANY	Driv buil

LEGEND					
	SITE BOUNDARY				
	EXISTING OVERHEAD ELECTRICTY				
ew	EXISTING WATER MAIN				
esw	EXISTING STORMWATER MAIN				
et	EXISTING TELECOMMS LINE				





THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARREN SMITH CONSULTING ENGINEERS. 60 70 80 90 100 110 120 130 140 150 50

10.0

5,0 10.0 15.0

COLLE

20.0

A .

NORTH

FOREST LODGE WARRIEWOOD

PROJECT



X SEDIMENT FENCE
SEDIMENT TRAP FOR KERB INLET - SAND BAGS
SEDIMENT BASIN
→ DIVERSION BANK AND CHANNEL
1. GEOTEXTILE INLET FILTER BAGS TO BE FITTED IN ALL EXISTING AND PROPOSED STORMWATER GRATED PITS WITHIN THE DEVELOPMENT AREA WHICH ARE IN USE.
<ol> <li>STOCKPILE LOCATION SHALL BE DETERMINED ON SITE DURING CONSTRUCTION STAGE. STOCKPILE ARE TO REMAIN CLEAR OF SITE ACCESS, DRAINS AND PAVED AREAS. HEIGHT OF STOCKPILE SHALL NOT EXCEED 2m.</li> </ol>
<ol> <li>INSTALLATION OF ALL EROSION AND SEDIMENT CONTROL MEASURES IS TO BE IN ACCORDANCE WITH THE LATEST EDITION OF THE 'BLUE BOOK - MANAGING URBAN STORMWATER', ALL CONTROLS ARE TO BE INSTALLED PRIOR TO CONSTRUCTION COMMENCING.</li> </ol>
4. THE CONTRACTOR IS RESPONSIBLE FOR THE CORRECT INSTALLATION AND ONGOING MAINTENANCE OF THE CONTROLS. REFER TO DRG C2.02 FOR MAINTENANCE REQUIREMENTS.
5. SUITABLE AND APPROVED BINS SHALL BE UTILISED FOR THE CONTAINMENT OF ALL HARD WASTE, INCLUDING CONCRETE SLURRIES, BUILDING WASTE AND LITTER. IN THE CASE OF ACCIDENTAL SPILLS OF SOLI OR OTHER MATERIAL, PARTICULARLY IN THE PUBLIC RESERVE, THE MATERIAL SHALL BE SWEPT AND CONTAINED AND NOT WASHED INTO A GUTTER.
SEDIMENT BASIN NOTE:
SEDIMENT BASINS HAVE BEEN SIZED BY USING PROCEDURES DETAILED IN THE 'BLUE BOOK - MANAGING URBAN STORWWATER' FOR TYPE D BASINS. A SUMMARY OF THE CALCULATED AND PROVIDED VOLUMES IS PROVIDED BELOW.
SEDIMENT BASIN 1:       REQUIRED VOLUME     = $339 \text{ m}^3$ BASE AREA     = $167 \text{ m}^2$ TOP AREA     = $726 \text{ m}^2$ DEPTH     = $2,11 \text{ m}$ MAX SIDE SLOPE     = $11/2 \text{ FH}$
VOLUME PROVIDED = 942 m <sup>3</sup>
PROVIDE 2m SPILLWAY TO CREEK.
SEDIMENT BASIN 2:           REQUIRED VOLUME         = 376 m <sup>3</sup> BASE AREA         = 157 m <sup>2</sup> TOP AREA         = 511 m <sup>2</sup> DEPTH         = 1.2 m           MAX SIDE SLOPE         = 1/2.25H           VOLUME PROVIDED         = 400 m <sup>3</sup>
PROVIDE 2m SPILLWAY TO CREEK.
SEDIMENT & EROSION

7368002

DATE SEPTEMBER 2023

STATUS

C2.01

ISSUE FOR S4.56

4



0 20 30 40 50 60 70 80 90 100 110 120 130 140 150

50 60 70 80 90 100 110 120 130

A .

CONSTRUCTION SITE	IBER SLATS OR METAL GRILLE Imm HIGH SPACED 200mm APART		
	N LENGTH 15m		
	MIN WIDTH 200		
RUNOFF FROM PAD DIRECTED TO SEDIMENT TRAP	EXISTING ROADWAY		
<u>STABILIZED CONST</u>	RUCTION SITE RY/EXIT		
4 SITE ENTRY/EXIT NOTES:-			
ALL VEHICLE ENTRANCES & EXITS 1. STABILIZED TO PREVENT THEM BE PROVIDING A VEHICLE SHAKE AREA CONCRETE OR STEEL SHAKER GRID	TO THE CONSTRUCTION SITE MUST COMING A SOURCE OF SEDIMENT, BY THIS MAY CONSIST OF A TIMBER, OR RUBBLE AREA.	BE	
2. THE VEHICLE EXIT AREA IS TO BE SERVICEABLE CONDITION DURING TH	MAINTAINED IN A CLEAN & 16 TOTAL TIME OF USAGE.		
ANY UNSEALED ROAD BETWEEN TH TO BE TOPPED WITH 100mm THICK.	E DEVICE AND COUNCILS ROADWAY 40mm NOMINAL SIZE AGGREGATE.	IS	
<ol> <li>PUBLIC ROADS MUST BE KEPT FRE TRACKED ONTO THE PUBLIC ROADV CONSTRUCTION SITE IS TO BE SWE</li> </ol>	E OF DIRT AND MUD. SEDIMENT /AY BY VEHICLES LEAVING THE PT UP IMMEDIATELY.		
<ol> <li>FENCES SHOULD BE ERECTED TO E THE STABILIZED ACCESS POINTS, U AREA.</li> </ol>	VSURE VEHICLES CAN NOT BYPASS INLESS COMING FROM A STABILIZED		
THE			
GALVANIZED HEAVY STEEL STRAPS (50x3mr TO EACH HARDWOOD BEAM, STRAPS SPACED 1000mm APAPT 8.	) FIXED		
A 250mm FROM EDGE.	/Smm STEEL SPIKES (PRE-DRILL HOLES)		
100mm SQ HARDWOOD BEAMS, SPACED 200mm APART (3000-3500mm LONG)	/ GEOTEXTILE FABRIC		
VEHICLE SHA	KER GRID		
SITE ENTRY/EXIT CONSTR 1. STRIP TOP SOIL & LEVEL SITE.	UCTION_NOTES:- PROVIDE CATCH DRAIN AT SIDES T	) DIRECT	
RUNOFF WATER TO SEDIMENT T	RAPS. VE ANY HIGH POINTS.		
3. COVER AREA WITH GEOTEXTILE PUNCHED PRODUCT WITH A MINI 2500 N.	FABRIC. THIS MAY BE WOVEN OR N MUM CBR BURST STRENGTH (AS3706	EEDLE .4-90) OF	
4. CONSTRUCT 200mm THICK RUBBI 30-40mm AGGREGATE. MINIMUM MINIMUM WIDTH 3 METRES. CONS BOUNDARY TO DIVERT WATER	E PAD OVER GEOTEXTILE USING RO LENGTH 15 METRES OR TO BUILDING TRUCT 300mm HIGH HUMP IMMEDIAT O A SEDIMENT TRAP.	AD BASE OR ALIGNMENT. ELY WITHIN	
5. WHERE GRIDS ARE USED FIRST FABRIC. LEVEL THIS IN BOTH DI BASE AND ENSURE THAT NO PA THE SPACES BETWEEN THE GRIC	CONSTRUCT A 150 THICK PAD OVER RECTIONS. LOWER GRID ON TO THE RT IS SITTING ON ANY HIGH POINT IS TO WITHIN SOMM OF THE TOP.	GEOTEXTILE PREPARED 5. BACKFILL	
<ol> <li>PROVIDE RAMPS AT ENDS AND RAMPS DURING USE. ADD ADDIT</li> </ol>	SIDE OF GRIDS. IF DEPRESSIONS OCI IONAL MATERIAL.	UR IN THE	
\$			
MAINTENANCE REQU	IREMENTS:-		
TO 1. ACCUMULATED SILT & SEDIMENT INTERVALS AND AFTER EACH MA	MUST BE REMOVED AT REGULAR		
<ol> <li>SILT &amp; SEDIMENT MUST BE REMO APPROVED LOCATION WITHIN THE</li> </ol>	IVED FROM OFF THE SITE OR TO A SITE, WHERE IT WILL NOT ERODE.	COUNCIL	
D 3. THE SEDIMENT FENCES, BALES & N THE ESPECIALLY AFTER RAIN AND KE D. CONDITION AT ALL TIMES.	TRAPS SHALL BE REGULARLY INSE PT IN GOOD REPAIR AND FUNCTION	PECTED. NG	
IERE 4. CONSTRUCTION OPERATIONS SHA THAT SEDIMENT, EROSION & WA	LL BE CARRIED OUT IN SUCH A MAN FER POLLUTION SHALL BE MINIMIZED	INER	
5. THE SEDIMENT TRAPS SHALL BE WHEN THE CONSTRUCTION AREA	REMOVED AND THE AREA STABILIZ HAS BEEN PROPERLY STABILIZED.	ED	
	TITLE		
Sce		F& EROSION	
	SCALE DRAWN AS SHOWN I.K.	DESIGNED CHECKED I.O. J.G.	APPROVED J.G.
n by excellence,	<sup>J0B №.</sup> 7368002	C2.02	ISSUE

VIE	0
EPTEMBER 2023	

ISSUE FOR S4.56



10

50 60 70 80 90 100 110 120 130 140 150 40

A .A

	LEGEND
	SITE BOUNDARY
	NATURAL SURFACE CONTOUR
-2.0	DEPTH CONTOUR

NC	DTE:								
1.	VOLUMES ARE <u>PRELIMINARY ONLY</u> AND IS SUBJECT TO CHANGE. CONTRACTOR TO CONFIRM BULK EARTHWORKS VOLUMES AND LEVELS BASED ON THEIR OWN ASSUMPTIONS AND CALCULATIONS. THE FOLLOWING DEPTH PROFILES WERE ADOPTED FOR THE BULK EARTHWORKS. NOTE: ASSUMED LEVELS, SUBJECT TO CHANGE DURING DETAILED DESIGN STAGE.								
	- ASPHALT PAVEMENT (TRAFFICABLE)       = 290 mm         - CONCRETE PAVEMENT (TRAFFICABLE)       = 330mm         - CONCRETE PAVEMENT (NON-TRAFFICABLE)       = 275mm         - CONCRETE FOOTPATH IN ROAD RESERVE       = 175mm         - CONCRETE STRUCTURAL SLABS       = 200 mm         - LANDSCAPING TOP SOIL       = 200 mm								
2.	VOLUMES FROM PIPE TRENCH HAVE NOT BEEN INCLUDED IN THESE CALCULATIONS.								
3.	A TOPSOIL REMOVAL OF 300mm HAS BEEN INCLUDED FOR THE OVERALL SITE.								
4.	BULKING FACTORS HAVE NOT BEEN INCLUDED.								
5.	ALLOW A +/-15% TOLERANCE FOR THESE VOLUMES.								
6.	EXTENT OF VERTICAL CUTS IN ROCK TO BE CONFIRMED ON SITE BY CONTRACTOR AND GEOTECHNICAL ENGINEER.								
7.	EXTENT OF CUTTING/FILLING IN THE VICINITY OF EXISTING TREES SHALL BE CONFIRMED BY THE PROJECT ARBORIST.								
8.	TREE PROTECTION ZONES TO BE CONFIRMED BY THE PROJECT ARBORIST.								
9.	ALLOW A +/-15% TOLERANCE FOR THESE VOLUMES. CUT 6,700 m <sup>3</sup> FILL 4,900 m <sup>2</sup> NET 1,800 m <sup>2</sup> EXPORT								

Sce	BULK	BULK EARTHWORKS LEVELS									
	SCALE AS SHOWN	DRAWN I.K.	DESIGNED	CHECKED J.G.	APPROVED J.G.						
	JOB No. DRAWING No.										
n by excellence, on experience.	7368	002		C3.01 4							
	DATE SEPTEMBER 2023	DATE SEPTEMBER 2023 ISSUE FOR S4.56									

![](_page_27_Figure_0.jpeg)

![](_page_28_Figure_0.jpeg)

тн	
ENON/EEDO	PI AN
ENGINEERS.	FLAN

![](_page_28_Picture_2.jpeg)

![](_page_29_Figure_0.jpeg)

![](_page_29_Figure_1.jpeg)

![](_page_29_Figure_2.jpeg)

![](_page_29_Figure_3.jpeg)

![](_page_29_Figure_4.jpeg)

L												
Cad	DO NOT SCALE FROM			REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE	CLIENT	PREPARED BY	
P	DRAWINGS, CHECK &		DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	1	ISSUE FOR \$4.56	03/11/23						
leonal	VERIFY ALL DIMENSIONS			2	ISSUE FOR S4.56	17/06/24				KIIATDO		1
ame: 8	& LEVELS BEFORE COMMENCEMENT OF									NUAIRO	WSce Pty Ltd ACN 668 655 141	
ogin N	ANY WORK.										ABN 75 668 655 141	
8										PROJECT	wsce.com.au	
1H 14:075	BE COPIED IN PART OR		100 0 50 100 150 200mm								an COMPUNIC OF	
TB_A	WHOLE WITHOUT WRITTEN		PLAN SCALE 1:5 A1 SHEET							FORESTLODGE		
58002 4.06.2	PERMISSION FROM WARREN SMITH		100 0 100 200 300 400 500mm							WARRIEWOOD		Driven
: X-73	CONSULTING ENGINEERS.		PLAN SCALE 1:10 A1 SHEET							W/ U U U U U U U U U U U U U U U U U U U	ISO 9001 Certified	Stant O
Plot D												
0	0 10 20 30 40 50	60 70 80 90 10	0 110 120 130 140 150 🗛									

![](_page_29_Figure_6.jpeg)

![](_page_30_Figure_0.jpeg)

	TITLE								
Sce	R	ROAD SET-OUT PLAN							
	SCALE AS SHOWN	DRAWN	DESIGNED I.O.	CHECKED J.G.	APPROVED J.G.				
	JOB No.		DRAWING No. ISSUE						
en by excellence, on experience.	7368	002	C5	C5.01 3					
	DATE SEPTEMBER 2023	STATUS	ISSUE FO	SUE FOR S4.56					

![](_page_31_Figure_0.jpeg)

Access Road LONGITUDINAL SECTION HORIZONTAL SCALE 1:250 VERTICAL SCALE 1:50

O NOT SCALE FROM			REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE	CLIENT	PREPARED BY	
RAWINGS, CHECK &		DRAWING COLOUR CODED - PRINTALL COPIES IN COLOUR	1	ISSUE FOR \$4.56	03/11/23					1	
ERIFY ALL DIMENSIONS									KIIATDO	🗾	
LEVELS BEFORE OMMENCEMENT OF									<b>NUAIRO</b>	WSce Pty Ltd ACN 668 655 141	WS
NY WORK.										info@wsce.com.au	
HIS DRAWING IS NOT TO									PROJECT	wsce.com.au	
E COPIED IN PART OR										AN CONFUNCE OF	
HOLE WITHOUT WRITTEN									FOREST LODGE		
ERMISSION FROM		10.0 0 5.0 10.0 15.0 20.0m							WARRIEWOOD		Driven
ONSULTING ENGINEERS.		PLAN SCALE 1:500 A1 SHEET							WAINIEWOOD	ISO 9001 Certified	built on
10 20 30 40 50	60 70 80 90 100	0 110 120 130 140 150 A A									

![](_page_31_Picture_4.jpeg)

![](_page_32_Figure_0.jpeg)

RING ROAD LONGITUDINAL SECTION HORIZONTAL SCALE 1:200 VERTICAL SCALE 1:40

REVISION AMENDMENT DO NOT SCALE FROM DRAWINGS, CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK. DATE REVISION AMENDMENT DATE CLIENT PREPARED BY DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR 1 ISSUE FOR \$4.56 **KUATRO** 03/11/23 2 RE-ISSUE FOR S4.56 05/12/23 WSce Pty Ltd ACN 668 655 141 ABN 75 668 655 141 3 ISSUE FOR \$4.56 W 17/06/24 info@wsce.com.au wsce.com.au PROJECT THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARREN SMITH CONSULTING ENGINEERS. FOREST LODGE 10.0 PLAN 5,0 10.0 15.0 GCC WARRIEWOOD SCALE 1:500 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 ٨.4

n by excellence, on experience.

			2 4%	-3.0%	-3.0%	2 1%	_	_
				-3.0%	-3.0%			
DESIGN LEVEL	22.100	22.528	22.382	22.487	22.382	22.526	23.104	23.106
EXISTING LEVEL	22.240	22.300	22.358	19.200	19.200	19.200	19.200	19.200
OFFSET	-8.000	-5.650	-3.500	000.0	3.500	5.735	7.745	8.000
			CH/		SE 50	.00		
			V	ER HGAL S	GALE 1:20	U		
			2.5%	3 0%	3 //0/			
DESIGN LEVEL	2.200	.890	1.742	1.847	1.734	1.691	.799	.794
EXISTING LEVEL	2.131 23	2.170 2.	2.208 2	2.255 2.	1.804 2	1.848 2	1.891 2	1.901 2
OFFSET	000	650 22	500 22	000	388 2.	475 2	499 2	2 000
	<u>_</u>	-2	۳ CH	aina(	。 GE 40	ي 00.	7.	φ
			HOI VI	RIZONTAL S	SCALE 1:2 CALE 1:20	200 0		
	2		2.4%	3.0%	3.0%			
		(0 m			~			]
DESIGN LEVEL	22.200	22.146 21.493	21.347	21.452	21.347	21.366	21.454	21.466
EXISTING LEVEL	22.035	22.033 21.649	21.689	21.719	21.711	21.728	21.737	21.737
OFFSET	-8.000	5.650	-3.500	0.000	3.500	5.827	7.854	8.000
			CH/		SE 30 SCALE 1:2	.00		
			HO V	ERTICAL S	CALE 1:20	0		
			HO Vi	ERTICAL S	CALE 1:20	0		
			HO V	2.0%	CALE 1:20	2.0%		
			HO ∨ <u>2.4%</u>		CALE 1:20	0 <u>2.0%</u>		_
DESIGN LEVEL	2.017	1.227	H0 V		CALE 1:20	0 2.0%	1.259	-
DESIGN LEVEL	1.724 22.017	606 21.227	1.528 21.081 A O O O	3.0%	CALE 1:20	1.316 21.236 0	1.316 21.259	_
DESIGN LEVEL EXISTING LEVEL OFFSET	000 21.724 22.017	650 21.606 21.227	500 21.528 21.081 6 V		CALE 1:20 3.0% 51.320 050 51.080 010 010 010 000 010 000 000 000 000	838 21.316 21.236 00 00	435 21.316 21.259 000 21 346	-
DESIGN LEVEL EXISTING LEVEL OFFSET	-8.000 21.724 22.017 U	-5.650 21.606 21.227	<b>CH7</b> -3.500 21.528 21.081 A		3.0% _ 3.0% _ 3.0% _ 3.0% _ - 3.0% _ - 3.0% _ - 3.0% _ - 	0 5.838 21.316 21.236 21.336 200°	6.435 21.316 21.259 8.000 21.346	

				2.5%	-3.0% -		2.5%	
DESIGN LEVEL	24.600	24.600	24.660	24.513	24.618	24.513	24.660	24.600
EXISTING LEVEL	20.303	20.306	20.345	20.345	25.156	25.244	25.316	25.433
OFFSET	-8.000	-7.838	-5.650	-3.500	0.000	3.500	5.650	8.000
			(		RIZONTAL ERTICAL S	SCALE 1:20	0.00	
				2.5%	-3.0%	-3.0%	2.5%	
DESIGN LEVEL	24.305	24.343	24.375	24.227	24.332	24.227	24.375	24.491
EXISTING LEVEL	20.059	20.057	20.045	20.058	20.175	20,608	20.875	21.166
OFFSET	-8.000	7.803	-5.650	-3.500	0.000	3.500	5.650	8.000
			(		<b>INAG</b> RIZONTAL ERTICAL S	SCALE 1:20	0.00	
				2.5%	-3.0%	-3.0%	2.5%	
							;	
DESIGN LEVEL	24.086	24.150	24.154	24.006	24.111	24.006	24.154	24.600
EXISTING LEVEL	19.948	19.949	19.950	19.950	19.949	19,948	21.198	21.189
OFFSET	8.000	7 656	5.650	3.500	000.0	3,500	5.650	7.793
			(			SCALE 1:20	0.00	
		5		2.5%	-3.0%	-3.0%	2.5%	
DESIGN LEVEL	22.800	22.800	23.934	23.787	23.892	23.787	23.934	23.903

420 420

3.500 5.634 7.788 8.000

23.126 23.274 9 9

906 885

3.500 5.650 7.930 8.000

590

EXISTING LEVEL

OFFSET

700

8.000 7.687 5.650

200

500

399

8

CHAINAGE 100.00

HORIZONTAL SCALE 1:200 VERTICAL SCALE 1:200

000

2 2

								Γ
		~	<	2.6%	-3.0%	-3.0%	2.5%	
DESIGN LEVEL	28.810	28.803	28.327	28,174	28.278	28.173	28.320	30.899
EXISTING LEVEL	28.673	28.679	29.049	29,393	29.947	30.458	30.832	30.907
OFFSET	-8.000	-7.965	-5.653	-3.502	0.000	3.500	5.650	6.042
			(		<b>INAC</b> RIZONTAL ERTICAL S	SCALE 1:2 SCALE 1:20	<b>0.0</b>	)

		$\leq$	2.5%	-3.0%	-3.0%	2.5%
DESIGN LEVEL	27,654	27.071	26.923	27.028	26.923	27.071
EXISTING LEVEL	27.362	28.092	28.390	28.881	29.469	30.004
OFFSET	-8.000	-5.650	-3.500	0.000	3.500	5.650

CHAINAGE 160.00 HORIZONTAL SCALE 1:200 VERTICAL SCALE 1:200

				2.5%	- 3.0%	-3.6%	
DESIGN LEVEL	26.258	26.197	25.937	25.789	25.894	25.752	02.9 20
EXISTING LEVEL	25.940	25.947	25.988	26.451	27.213	27.758	202 200
OFFSET	-8.000	-7.652	-5.650	-3.500	0.000	3.494	
			(	СНА		GE 15	0.0

CHAINAGE 150.00 HORIZONTAL SCALE 1:200 VERTICAL SCALE 1:200

			2.5%	-3.0%	-3.0%			
DESIGN LEVEL	24.600	25.132	24.984	25.089	25.015	25.059	24.948	24.872
EXISTING LEVEL	25.695	25.754	25.907	26.350	26.431	26.511	26.573	26.598
OFFSET	-8.000	-5.650	-3.500	0.000	2.484	4.908	6.924	8.000
		(	СНА		GE 1	40.0	00	_

HORIZONTAL SCALE 1:200 VERTICAL SCALE 1:200

NOT SCALE FROM	DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	REVISION 1	AMENDMENT ISSUE FOR S4 56	DATE 03/11/23	REVISION	N AM	MENDMENT	DATE	CLIENT	PREPARED BY	TITLE				
AWINGS, CHECK & RIFY ALL DIMENSIONS EVELS BEFORE MMENCEMENT OF IY WORK.				00/11/20					KUATRO	ACN 464 555 511 ACN 464 555 511 ARN 75 566 855 511	ROAD	CRO ACCE	SS SECT SS ROA	rions D	-
IS DRAWING IS NOT TO						-			PROJECT	amoujinsce.com.au wise.com.au	SCALE DF AS SHOWN	I.K.	DESIGNED I.O.	CHECKED J.G.	APPROVED J.G.
COMED IN PART OR HOLE WITHOUT WRITTEN RMISSION FROM	2.5 0 2.5 5.0 7.5 10.0m					1			FOREST LODGE	Driven by excellence,	73680	02	DRAWING No.	21	ISSUE
ARREN SMITH DNSULTING ENGINEERS.	PLAN SCALE 1.200 A1 SHEET					-			WARRIEWOOD	built on experience.	DATE SEPTEMBER 2023	TATUS		<b>د ا</b>	

0.820

697 820

500 650 733

Login Name: istewart Xrefs: X-7368002-TB\_A1H Plot Date: 03.11.2023@15:28:88

Cad File

![](_page_33_Figure_12.jpeg)

![](_page_33_Figure_13.jpeg)

![](_page_33_Figure_14.jpeg)

3.6% - 3.0% 2.5%

![](_page_33_Figure_15.jpeg)

25.904 25.908

27.844 27.874

7.783

![](_page_33_Figure_16.jpeg)

![](_page_33_Figure_17.jpeg)

![](_page_33_Figure_18.jpeg)

![](_page_34_Figure_0.jpeg)

50 60 70 80 90 110 120 130 140 150

A 4

![](_page_34_Picture_6.jpeg)

DESIGN LEVE EXISTING LEV OFFSET	49000       53,937       34,901         49000       53,937       54,002         5000       54,938       54,002         5000       54,938       54,002         51,11       54,128       58,002         51,11       54,138       52,328         13,110       54,138       52,328         13,110       54,138       52,328         14,188       52,328       52,328         14,188       52,328       52,328         14,188       52,328       52,328         14,188       54,188       54,188         15,348       54,188       54,188         16,188       54,188       54,188         17,188       54,188       54,188	DESIGN LEVEL         2900         2300         2000	June         June <th< th=""><th></th></th<>		
DESIGN LEVE EXISTING LEV OFFSET	Line         State         State <ths< th=""><th>DESIGN LEVEL         115/23         123/24         140/23         161/25         163/25          <th 1<="" th=""><th>DESIGN LEVEL         1000000000000000000000000000000000000</th><th>DESIGN LEVEL         81/12         82/12         91/12</th></th></th></ths<>	DESIGN LEVEL         115/23         123/24         140/23         161/25         163/25 <th 1<="" th=""><th>DESIGN LEVEL         1000000000000000000000000000000000000</th><th>DESIGN LEVEL         81/12         82/12         91/12</th></th>	<th>DESIGN LEVEL         1000000000000000000000000000000000000</th> <th>DESIGN LEVEL         81/12         82/12         91/12</th>	DESIGN LEVEL         1000000000000000000000000000000000000	DESIGN LEVEL         81/12         82/12         91/12
DESIGN LEVE EXISTING LEV OFFSET	Line         State	DESIGN LEVEL         6000	DESIGN LEVEL         000000000000000000000000000000000000	DESIGN LEVEL         00000112         919217 <th< th=""></th<>	
DESIGN LEVER EXISTING LEV OFFSET	2.7% -3.1% 2.7% -3.1% 2.7% -3.1% 2.7% -2.1% 2.7%	DESIGN LEVEL         89 (1) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	<u> <u> </u></u>	DESIGN LEVEL         000000000000000000000000000000000000	
DO NOT SCALE FROM DRAWINGS, CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK. THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARE NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARE NOT TO STORED IN PART OR WHOLE WITHOUT WRITTEN WARE NOT TO DISCUSSION FROM WARE NOT TO DISCUSSION FROM	DRAWING COLOUR CODEL           2.5         0         2.5         5.0         7.6           PLAN         SCALE 1.200         A1 SH	PRINT ALL COPIES IN COLOUR      REVISION AMENDMENT      ISSUE FOR \$4.56      Z      RE-ISSUE FOR \$4.56      ISSUE FOR \$4.56      IESUE FOR \$4.56       IESUE FOR \$4.56       IESUE FOR \$4.56	DATE         REVISION         AMENDMENT         DATE         CLENT           03/11/23	CLAATRO       PREPARED BY         VISION PREVAIL       ACN 648 655 HILL         ACN 648 655 HILL       ACN 648 655 HILL         FOREST LODGE       WISION PREVAIL         WARRIEWOOD       WISION PREVAIL	

Plot Date: 7

PI AN 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

. .

WARRIEWOOD

![](_page_35_Figure_6.jpeg)

![](_page_36_Figure_0.jpeg)

![](_page_37_Figure_0.jpeg)

NAME	SURFACE FLEV (m)	PIT DEPTH (m)	DIT SIZE AND TYPE	EROM	то	LENGTH (m)	11/S IL (m)	D/S II (m)	SLOPE (%)		DIA (mm)	
	SORFACE ELLV. (III)			FROM	10	12.20	0/3 IE (III)	D/3 IL (III)				NO. PIPES
Pit 1/1	24.41	0.67	900SQ PIT WITH CLASS B GRATE	Pit 1/1	Pit 2/1	13.20	23.74	23.61	0.98	UPVC	225	1
Pit 2/1	24.50	1./3	900SQ PIT WITH CLASS B GRATE	Pit 2/1	Pit 3/1	17.80	22.//	22.59	1.01	uPVC	225	1
Pit 3/1	23.48	1.49	900SQ PIT WITH CLASS B GRATE	Pit 3/1	Pit 4/1	12.40	21.99	21.87	0.97	uPVC	225	1
Pit 4/1	22.69	0.87	600SQ PIT WITH CLASS B GRATE	Pit 4/1	Pit 5/1	12.00	21.82	21.70	1.00	uPVC	300	1
Pit 5/1	22.64	1.43	900SQ PIT WITH CLASS B GRATE	Pit 5/1	Pit 6/1	18.20	21.21	21.03	0.99	uPVC	300	1
Pit 6/1	21.97	0.99	600SQ PIT WITH CLASS B GRATE	Pit 6/1	Pit 7/1	13.70	20.98	20.84	1.02	uPVC	300	1
Pit 7/1	21.90	1.11	600SQ PIT WITH CLASS B GRATE	Pit 7/1	Pit 8/1	11.90	20.79	20.67	1.01	uPVC	300	1
Pit 8/1	22.09	1.47	900SQ PIT WITH CLASS B COVER	Pit 8/1	Pit 9/1	17.50	20.62	20.45	0.97	uPVC	300	1
Pit 9/1	21.31	1.01	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 9/1	Pit 10/1	7.10	20.30	20.26	0.56	RCP	375	2
Pit 10/1	21.33	1.09	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 10/1	Basin 2	7.20	20.24	20.20	0.56	RCP	375	2
Basin 2	21.40		OSD BASIN 2	Basin 2	HW4	28.20	19.25	18.00	4.43	uPVC	300	1
Pit 13/1	21.49	1.00	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 13/1	Basin 2	2.90	20.49	20.20	10	uPVC	225	1
Pit 1/2	25.80	1.27	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 1/2	Pit 2/2	9.60	24.53	24.01	5.42	uPVC	225	1
Pit 2/2	24.85	0.75	900SQ PIT WITH CLASS B GRATE	Pit 2/2	Pit 3/2	4.20	24.10	24.05	1.19	uPVC	225	1
Pit 3/2	24.86	0.96	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 3/2	Pit 4/2	7.00	23.90	23.83	1.00	uPVC	225	1
Pit 4/2	24.85	1.12	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 4/2	Pit 5/2	44.70	23.73	22.76	2.17	uPVC	225	1
Pit 5/2	23.61	1.01	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 5/2	Pit 6/2	15.40	22.60	22.19	2.66	uPVC	300	1
Pit 6/2	23.24	1.07	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 6/2	Pit 7/2	32.00	22.17	20.94	3.84	uPVC	300	2
Pit 7/2	21.85	0.97	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 7/2	Pit 9/1	7.70	20.88	20.40	6.23	uPVC	300	2
												-
Pit 1/3	23.60	0.90	18m LENGTH ACO TRENCH DRAIN WITH CLASS D GRATE	Pit 1/3	Pit 5/2	7.40	22.70	22.62	1.08	UPVC	150	2
110 1/ 5	25.00	0.50		110 2/3	1103/2	7.40	22.70	22.02	1.00	uive	150	
Dit 2/4	23.66	0.90	2.8m LENGTH ACO TRENCH DRAIN WITH CLASS D GRATE	Pit 2/4	Dit 4/4	10.70	22.76	22.34	3.03	uP\/C	150	
Di+ 4/4	23.00	0.50		Dit 4/4	Dit 6/2	7.40	22.70	22.34	1.09	urve urve	150	2
PIL 4/4	23.25	0.91	1.211 LENGTH ACO TRENCH DRAIN WITH CLASS D GRATE	FIL 4/4	Pit 0/2	7.40	22.34	22.20	1.08	UPVC	130	2
Dia 1 /F	21.05	0.01		Dit 1 /F	Dit 7/2	7.00	20.04	20.00	0.57		200	
Pit 1/5	21.85	0.91	900SQ PTI WITH CLASS D GRATE	Pit 1/5	Pit 7/2	7.00	20.94	20.90	0.57	UPVC	300	2
												-
Pit 1/6	26.10	1.10	900SQ PIT WITH CLASS B GRATE	Pit 1/6	Pit 2/6	1.80	25.00	24.85	8.33	uPVC	225	1
Pit 2/6	25.70	1.00	900SQ PIT WITH CLASS B GRATE	Pit 2/6	Pit 3/6	22.50	24.70	24.50	0.89	uPVC	225	1
Pit 3/6	25.46	1.01	900SQ PIT WITH 600 x 900 CLASS B SINGLE GRATE WITH 1.2m LENGTH ACO TRENCH DRAIN	Pit 3/6	Pit 4/6	18.80	24.45	24.27	0.96	uPVC	225	1
Pit 4/6	25.13	1.48	900SQ PIT WITH CLASS B GRATE WITH 2.8m LENGTH ACO TRENCH DRAIN	Pit 4/6	Pit 5/6	23.80	23.65	23.53	0.50	uPVC	300	1
Pit 5/6	25.19	1.69	900SQ PIT WITH 600 x 900 CLASS B SINGLE GRATE WITH 1.2m LENGTH ACO TRENCH DRAIN	Pit 5/6	Pit 6/6	10.20	23.50	23.44	0.59	uPVC	300	1
Pit 6/6	24.87	1.46	900SQ PIT WITH 600 x 900 CLASS B SINGLE GRATE WITH 1.2m LENGTH ACO TRENCH DRAIN	Pit 6/6	Pit 7/6	10.50	23.41	23.35	0.57	uPVC	300	1
Pit 7/6	24.63	1.31	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 7/6	Pit 8/6	17.80	23.32	23.23	0.51	uPVC	300	1
Pit 8/6	24.78	1.58	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 8/6	Pit 8/7	29.90	23.20	23.01	0.64	uPVC	300	1
	$\sim$	$\sim$		$\sim$	$\sim$	$\sim$	$\sim$	$\sim$	$\sim$	$\sim$	$\sim\sim$	$\sim$
Pit 1/7	28.80	0.85	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 1/7	Pit 2/7	6.40	27.95	27.70	3.91	uPVC	225	1
Pit 2/7	28.56	0.91	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 2/7	Pit 3/7	16.70	27.65	26.55	6.59	uPVC	225	1
Pit 3/7	27.43	0.93	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 3/7	Pit 4/7	20.40	26.50	25.45	5.15	uPVC	225	1
Pit 4/7	26.31	1.11	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 4/7	Pit 5/7	14.00	25.20	25.00	1.43	uPVC	225	1
Pit 5/7	25.87	0.92	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 5/7	Pit 6/7	19.80	24.95	24.40	2.78	uPVC	225	1
Pit 6/7	25.26	0.91	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 6/7	Pit 7/7	22.40	24.35	23.40	4.24	uPVC	300	1
Pit 7/7	24.66	1.76	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit 7/7	Basin 1	7.00	22.90	22.43	6.71	RCP	375	1
Pit 8/7	24.62	1.60	9005Q PHT-WITH 600 x 900 CLASS D-SINGLE GRATE WITH 1.8m LINTEL-OPENING	Pit 8/7	Pit 7/7	13.00	23.02	22.95	0.54	UPVC	300	
Basin 1	24.30	2.81	OSD BASIN 1	Basin 1	HW5	21.10	21.49	21.00	2.32	uPVC	150	1
Pit 1/8	28.62	1.55	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit1/8	Pit2/8	24.30	27.07	24.64	10.00	uPVC	225	1
Pit 2/8	25.49	0.88	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1.8m LINTEL OPENING	Pit2/8	Pit 1/2	4.80	24.61	24 56	1.04	uPVC	225	1
Pit 3/8	26.14	0.80	900SQ PIT WITH 600 x 900 CLASS D SINGLE GRATE WITH 1 8m LINTEL OF ENING	Pit 3/8	Pit2/8	7 20	25.01	24.50	8.47	11P\/C	225	1
11.3/0	20.14	0.05	Source in white one a sub-class of shirdle drafte white Long Envire	rit 3/0	r 112/0	1.20	23.23	24.04	0.47	urve	223	
pi+ 1 /0	22.00	0.06	DUUCU DIT MITH CLASS B CBATE	Di+ 1 /0	Di+ 2 /0	0.70	22.02	21.70	2 70	D\/C	200	1
PIL 1/9	22.99	0.90		Pit 2/0	Pit 2/9	8.70	22.03	21.70	3.79	UPVC	300	1
PIC 2/9	22.63	2.13	SUDSCIALE MILLE OF X 200 CTASS D SINGLE GRATE MILLE TSW FINTER OKENING	PIC 2/9	Basin 2	3.00	20.50	20.20	10.00	UPVC	300	+ 1
-		0				-						- ·
PIT 1/11	25.46	0.71	SUUSU PIT WITH CLASS & GRATE	Pit 1/11	Pit 2/6	2.90	24.75	24.72	1.03	UPVC	225	+ 1
					-							
Pit 1/12	23.05	0.95	900SQ PIT WITH CLASS B GRATE	Pit 1/12	Pit 1/9	3.70	22.10	22.06	1.08	uPVC	225	1
$\mid \sim $				$ h \sim $	$\rightarrow \sim \sim$	$\sim$	$\sim$	$\sim$		$\sim$	$\searrow$	$\frown$
Pit 1/14	26.72	0.87	600SQ PIT WITH CLASS B GRATE	Pit 1/14	Pit 2/14	7.70	25.85	25.45	5.19	uPVC	225	1
Pit 2/14	26.29	0.89	900SQ PIT WITH CLASS B GRATE & 3.8m LENGTH ACO TRENCH DRAIN	Pit 2/14	Pit 4/7	17.90	25.40	25.25	0.84	uPVC	225	1
Pit 3/14	25.66	0.96	900SQ PIT WITH CLASS B GRATE & 1.5m LENGTH ACO TRENCH DRAIN	Pit 3/14	Pit 6/7	18.20	24.70	24.40	1.65	uPVC	225	1
					harmondom harmonic		$\sim$	$\sim$	-	$\sim$		<u>r</u>
Pit 1/15	24.60	0.93	900SQ PIT WITH CLASS B COVER	Pit 1/15	Pit 8/7	7.10	23.67	23.05	8.73	uPVC	150	1

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR DATE REVISION AMENDMENT PREPARED BY 03/11/23 2 RE-ISSUE FOR \$4.56 05/12/23 WSce Pty Ltd ACN 668 655 141 ABN 75 668 655 141 info@wsce.com.au wsce.com.au 3 RE-ISSUE FOR \$4.56 01/02/24 4 ISSUE FOR \$4.56 17/06/24 PROJECT FOREST LODGE WARRIEWOOD GCC CONSULTING ENGINEERS. A 4

![](_page_38_Picture_3.jpeg)

![](_page_39_Figure_0.jpeg)

![](_page_39_Figure_1.jpeg)

Xrefs: Plot D

**TYPICAL PIPE TRENCH** NOT TO SCALE

![](_page_39_Figure_3.jpeg)

- SMDD. B) TRENCHES NOT UNDER PAVEMENTS 90% SMDD.

PIPE Ø + 100

**ORIFICE PLATE** SCALE 1:10

![](_page_39_Figure_14.jpeg)

 INCLUSS

 1. TRENCH WIDTH MAY NEED TO BE INCREASED SUBJECT TO ACHIEVING ADEQUATE COMPACTION,

 2. MINIMUM PIPE COVER NOT UNDER ROADS = 450mm UNO.

 MINIMUM PIPE COVER NOT UNDER ROADS = 600mm UNO.

 3. THE CONTRACTOR SHALL ENSURE THAT THE SHORING OF TRENCHES IS INSTALLED AS REQUIRED BY STATUTORY REQUIREMENTS.

 4. ENSURE BACKFILLING COMPACTION MEETS THE FOLLOWING STANDARDS;

 A) TRENCHES UNDER PAVED AREAS & BUILDINGS - 100% SMDD.

![](_page_39_Picture_20.jpeg)

EDGES MACHINED TO 0.5mm ACCURACY

Sce	STOF		ER DR/ - SHEI	AINAG ET 1	E
	SCALE AS SHOWN	DRAWN	DESIGNED	CHECKED J.G.	APPROVED J.G.
	JOB No.		DRAWING No.		ISSUE
by excellence, n experience.	7368	002	C6	.06	2
	DATE SEPTEMBER 2023	STATUS	SSUE FO	R S4.56	

2

![](_page_40_Figure_0.jpeg)

A .

![](_page_41_Figure_0.jpeg)

![](_page_42_Figure_0.jpeg)

![](_page_43_Figure_0.jpeg)

A .

		-							
Sce		BIC	BIORETENTION BAS SECTIONS - SHEET						
	SC/	ALE AS SHOWN	DRAWN I.K.	DESIGNED	CHECKED J.G.	APPROVED J.G.			
	JOE	3 No.		DRAWING No.		ISSUE			
n by excellence, on experience.		7368	002	C6	.13	1			
	DAT	TE EPTEMBER 2023	STATUS	SSUE FO	R S4.56				

![](_page_44_Figure_0.jpeg)

-SU - Existing Survey, 7368002-WSCE-CS-MO-0.	ad File: T:17368002/Drawings/AutoCAD/Civil/Desig	
1H; X-7368002-SW-Layout; X-7368002	09:23:25 Login Name: mtayfor C	

THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM WARREN SMITH CONSULTING ENGINEERS. Xrefs: Plot D

50

60

80 90

500

110 120 130 140

1000

150

A .

![](_page_44_Figure_3.jpeg)

info@wsce.com.au wsce.com.au

GCC

ROJEC

FOREST LODGE

WARRIEWOOD

![](_page_45_Figure_0.jpeg)

80 90

100

70

110 120 130 140 150

A 4

![](_page_46_Figure_0.jpeg)

DO NOT SCALE FROM			REVISION	4 AMENDMENT	DATE	REVISION AMENDMENT	DA	E CLIENT	PREPARED BY	TITLE
DRAWINGS, CHECK &		DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	1	ISSUE FOR \$4.56	03/11/23					
VERIFY ALL DIMENSIONS			2	RE-ISSUE FOR \$4.56	05/12/23					STORMWATER CATCHMENT
			3	ISSUE FOR \$4.56	17/06/24			NUAIRO	ACN 668 655 141	PLAN - SHEET 2
ANY WORK.									ABN 75 668 655 141	
	$\ll$ /							PROJECT	wsce.com.au	SCALE DRAWN DESIGNED CHECKED APPROVED
BE COPIED IN PART OR									au community of	AS SHOWN I.K. I.O. J.G. J.G.
WHOLE WITHOUT WRITTEN	NODTU							FOREST LODGE		
PERMISSION FROM	NURTH	5.0 0 2.5 5.0 7.5 10.0m						WARRIEWOOD	Driven by excellence,	7368002 6.22 3
CONSULTING ENGINEERS.		PLAN SCALE 1:250 A1 SHEET						VV/ARAIL/VOOD	to son centied	DATE STATUS
										SEPTEMBER 2023 ISSUE FOR S4.56

![](_page_47_Figure_0.jpeg)

UPSTREAM DIVERSION PIPE DRAINAGE LONG SECTION HORIZONTAL SCALE 1:250 VERTICAL SCALE 1:250

NOT SCALE FROM			REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE	CLIENT	PREPARED BY	
AWINGS, CHECK &		DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR	1	ISSUE FOR \$4.56	03/11/23						
RIFY ALL DIMENSIONS			2	RE-ISSUE FOR \$4.56	01/02/24				KIINIDO		
EVELS BEFORE			3	ISSUE FOR \$4.56	17/06/24				NUAIRV	WSce Pty Ltd ACN 668 655 141	M
WORK.										ABN 75 668 655 141	
									PROJECT	wsce.com.au	
COPIED IN PART OR										ALCONFLIANCE	
OLE WITHOUT WRITTEN									FORESTLODGE		
RMISSION FROM		5.0 0 2.5 5.0 7.5 10.0m							WARRIEWOOD	Necc	Drive
NSULTING ENGINEERS.		PLAN SCALE 1:250 A1 SHEET							WAINLEWOOD	ISO 9001 Certified	built
10 20 30 40 50	0 60 70 80 90 100	) 110 120 130 140 150 A J									

![](_page_47_Figure_4.jpeg)

![](_page_48_Figure_0.jpeg)

![](_page_48_Figure_1.jpeg)

SCHEDULE 2 HYDROGRAPHS

Hydraulic Services Fire Protection Civil Engineering Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

![](_page_49_Figure_0.jpeg)

![](_page_49_Figure_1.jpeg)

Hydraulic Services 📕 Fire Protection 📕 Civil Engineering 📕 Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

![](_page_50_Figure_0.jpeg)

Hydraulic Services Hire Protection Civil Engineering Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

SCHEDULE 3 MONITORING REQUIREMENTS AND ACCEPTANCE CRITERIA

Hydraulic Services Fire Protection Civil Engineering Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

# Table C2 Summary of Acceptance Criteria - Site Discharge and Creeks

Media	State	Variable	Units	During Construction Site	Post Construction Site	Instream Short Term (Status	In-Stream Medium Term	In- Stream Long
				Discharges/In sector	Discharges	Quo)		Term
Water	Physical	Visual	-	No litter	No litter	No litter	No litter	No litter
		Salinity (TDS)	mg/L	NA	NA	1000	1000	1000
		pH (Field)	-	NA	NA	6.6 - 8	6.6 - 8	6.6 - 8
		Temperature (Field)	°C	NA	NA	Status quo	Status quo	Status quo
		Dissolved Oxygen (Field)	%Sat	NA	NA	Status quo	90	90
		Turbidity (Field)	NTU	NA	NA	Status quo	50	20
		Suspended Solids	mg/L	100	50	Status quo	20	6
		Volume Gross Pollutants Removed	Tonne	NA	NA	NA	NA	NA
	Chemical	Total Nitrogen	mg/L	1.6	1.6	Status quo	1.6	1.0
		Ammonia-Nitrogen	mg/L	See Key	See Key	See Key	See Key	See Key
		Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-
		Nitrates and Nitrites	mg/L	-	-	-	-	-
		Total Phosphorous	mg/L	0.1	0.05	Status quo	0.1	0.04
		Ortho-Phosphate	mg/L	-	-	-	-	-
		Non-Filterable Phosphorous	mg/L	-	-	-	-	-
		Hardness (CaCO <sub>3</sub> )	mg/L	NA	NA	-	-	-
		Chromium	μg/L	NA	NA	Status quo	50% status quo	10
		Lead	μg/L	NA	NA	Status quo	50% status quo	1
		Zinc	μg/L	NA	NA	Status quo	50% status quo	50
		Arsenic	μg/L	NA	NA	Status quo	50% status quo	50
		Mercury	μg/L	NA	NA	Status quo	50% status quo	0.1
		Copper	μg/L	NA	NA	Status quo	50% status quo	2
		Phenolic Compounds	μg/L	NA	NA	Status quo	50% status quo	Note
		OC/OP Pesticides	ng/L	NA	NA	Status quo	50% status quo	Note
		Oil & Grease (H.E.M)	mg/L	NA	NA	50	20	5
		PAH	μg/L	NA	NA	Status quo	50% status quo	3
	<b>D</b> : 1 · · ·	Chlorophyll-a	mg/m°	NA	NA	15	15	10
	Biological	Algal Identification and Count	-	NA	NA	Status quo	No algal bloom	No algal bloom
		Faecal Coliform	Cfu/ 100mL	150	150	1000	150	150
		Biotic Index (SIGNAL)	-	NA	NA	Status quo	> 5	> 6
Sediment	Chemical	Chromium	mg/kg	NA	NA	Status quo	50% status quo	80
		Lead	mg/kg	NA	NA	Status quo	50% status quo	50
		Zinc	mg/kg	NA	NA	Status quo	50% status quo	200
		Arsenic	mg/kg	NA	NA	Status quo	50% status quo	20
		Mercury	mg/kg	NA	NA	Status quo	50% status quo	0.15
		Copper	mg/kg	NA	NA	Status quo	50% status quo	65
		Phenolic Compounds	mg/kg	NA	NA	Status quo	50% status quo	Note
		Organochlorine Pesticides	mg/kg	NA	NA	Status quo	50% status quo	Note
		Total PAH	mg/kg	NA	NA	Status quo	50% status quo	4000

Table C1	Summary	of Monitoring	Requirements
----------	---------	---------------	--------------

Media	State	Variable	Undeveloped*		Construction Phase**		Post-Construction Phase ***	
			Wet Weather	Dry Weather	Wet Weather	Dry Weather	Wet Weather	Dry Weather
Water	Physical	Visual		U/D/I	U/D/I/ESC	U/D/I		U/D/I
	Thyologi	Salinity	U/D	U/D	U/D	U/D	U/D	U/D
		pH (Field)	U/D	U/D	U/D	U/D	U/D	U/D
		Temperature (Field)	U/D	U/D	U/D	U/D	U/D	U/D
		Dissolved Oxygen	U/D	U/D	U/D	U/D	U/D	U/D
		Turbidity (Field)	U/D	U/D	U/D	U/D	U/D	U/D
		Suspended Solids	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Volume Gross Pollutants Removed	NA	NA	NA	SQID	NA	SQID
	Chemical	Total Nitrogen	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Ammonia-Nitrogen	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Total Kjeldahl Nitrogen	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Nitrates and Nitrites	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Total Phosphorous	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Ortho-Phosphate	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Non-Filterable Phosphorous	U/D/I	U/D/I	U/D/I/ESC	U/D/I	U/D/I/SQID	U/D/I
		Hardness (CaCO <sub>3</sub> )	NA	U/D	NA	U/D	NA	U/D
		Chromium	NA	U/D	NA	U/D	NA	U/D
		Lead	NA	U/D	NA	U/D	NA	U/D
		Zinc	NA	U/D	NA	U/D	NA	U/D
		Arsenic	NA	U/D	NA	U/D	NA	U/D
		Mercury	NA	U/D	NA	U/D	NA	U/D
		Copper	NA	U/D	NA	U/D	NA	U/D
		Phenolic Compounds	NA	U/D	NA	U/D	NA	U/D
		OC/OP Pesticides	NA	U/D	NA	U/D	NA	U/D
		Oil & Grease (H.E.M)	NA	U/D	NA	U/D	NA	U/D
		PAH	NA	U/D	NA	U/D	NA	U/D
		Chlorophyll-a	NA	NA	NA	NA	NA	U/D
	Biological	Algal Identification and Count	NA	U/D	NA	U/D	NA	U/D
		Faecal Coliform Count	U/D/I	U/D/I	U/D/I	U/D/I	U/D/I/SQID	U/D/I
		Biotic Index (SIGNAL)	NA	U/D	NA	U/D	NA	U/D
Sediment	Chemical	Chromium	NA	U/D	NA	U/D	NA	U/D
		Lead	NA	U/D	NA	U/D	NA	U/D
		Zinc	NA	U/D	NA	U/D	NA	U/D
		Arsenic	NA	U/D	NA	U/D	NA	U/D
		Mercury	NA	U/D	NA	U/D	NA	U/D
		Copper	NA	U/D	NA	U/D	NA	U/D
		Phenolic Compounds	NA	U/D	NA	U/D	NA	U/D
		Organochlorine Pesticides	NA	U/D	NA	U/D	NA	U/D
		PAH	NA	U/D	NA	U/D	NA	U/D

\*Up to Construction Certificate Issue \*\*Immediately after site works commence and up to Subdivision Certificate Issue \*\*\*Immediately after Subdivision Certificate Issue and up to Handover

# SCHEDULE 4 DOCUMENTATION CHECKLIST

Hydraulic Services Fire Protection Civil Engineering Sydney Water Accredited Water Servicing Co-ordinator - Design Project Management - Building Plan Approvals

# DOCUMENTATION CHECKLIST - CONSTRUCTION CERTIFICATE

(Detach and include with submissions)

Section	Item	Requirement	Check (√)
4 1	Water Cycle Assessment - Water Balance Modelling Pre & Post		(')
	Development		
4.1.1	Stream Gauging, infiltration testing and use of local rainfall data for modelling		
4.2.1	Water Quality Monitoring Plan	*******	
4.2.1	Water Quality Monitoring Sites Shown on Plan (at least three)	*******	
4.2.1, 2, C	Water Quality Monitoring Data	*******	
4.2.1, 2, C	Assessment and interpretation of water quality monitoring data	*******	
4.2.1, 2, C	Assessment and interpretation of water quality monitoring data from SQID's		
4.3	Water Quality Management Assessment - Load Modelling Pre and Post Development		
4.3.1, 3	Justification of assumptions for Event Mean Concentrations		
4.3.2	Identification of and details for Stormwater quality facilities	+++++++++	
4.3.2, 4.4.5	Mosquito Risk Assessment for both Watercourse and Water Quality/Quantity features	+++++++++++++++++++++++++++++++++++++++	
4.3.6, 4.6.5	Inspection and Cleaning Reports for SQID's and OSD		
4.3.6	Management Plan for Stormwater Quality Improvement Devices	+++++++++	
4.3.5	Environmental Management Plan (Soil and Water Aspects)	+++++++++	
4.3.4	Erosion and Sediment Control Plan	+++++++++	
4.4.3, 4, 5	Existing and Proposed Creek Corridor in plan with cross/long sections with flood levels	+++Note 1+++	
4.4.4	Proposed Creek Corridor Planting Schedule	+++Note 1+++	
4.4.5	Creek Corridor Vegetation Monitoring and Management Plan	♦ ♦ Note 1 ♦ ♦	
4.4.5	Vegetation and Creek Maintenance and Monitoring Reports		
4.5	Flood Analysis – existing design conditions	******	
4.5.2	Compliance of structures and creek corridor with flood planning levels	+++++++++	
4.5.4	Details of Interim Flood Protection Works	+++++++++	
4.6.3	Design Storm Hydrological Modelling of Site - Pre and Post Development	*******	
4.6.3	On-Site Detention Facilities	+++++++++	
4.6.4	Stormwater Retention Facilities	++++++++	
4.7	Stormwater Concept Drainage Plan		

KEY:

	Preliminary Calculations/Assessment Required		Work as Executed Plans		
	Concept Design Required	*****	Required/Reviewed/Updated		
++++++	Detailed Assessment/Calculations/Design		Not required		
Note 1 Even if the works are not to be constructed by the Applicant on the land to be transferred to Council under the Material Public Benefit Option in the Section 94 Plan, preliminary investigation for Rezoning and concept design at DA stage is required					

Completed by Principal Certifier:

Name:		
Title:		•••••••••••••••••
Organisation:		
Signature:		
Date:		
	-	