COSTIN ROE CONSULTING

CIVIL ENGINEERING REPORT FOR DEVELOPMENT APPLICATION

14 AQUATIC DRIVE

FRENCHS FOREST

Prepared for:

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1-11 Hayes Road
ROSEBERY NSW 2018

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1 INTRODUCTION

1.1 Introduction

This Civil Engineering Report has been prepared by Costin Roe on behalf of Goodman Property Services (Aust.) Pty Ltd (Goodman) to accompany a development application for self-storage units and warehouse and distribution centre uses at 14 Aquatic Drive, Frenchs Forest.

This site is located on the southern side of Warringah Road and within the broader Frenchs Forest Business Park. It currently hosts an existing four storey commercial building which is proposed for demolition under this application.

The proposed development comprises construction of a three-storey industrial building including:

- 153 self-storage units at ground floor and on Level 1;
- 72 warehouse units on Levels 1 and 2;
- 123 car parking spaces across all levels;
- outdoor breakout spaces for staff at ground floor and Level 2;
- shared lobby across all levels;
- landscaping; and
- associated infrastructure/servicing works.

Approval is sought for 24/7 operation of the proposed self-storage and warehouse and distribution units.

1.2 Scope

Costin Roe Consulting Pty Ltd has been engaged by Goodman Property Pty Ltd to prepare this Engineering Report in support of the proposed Development Application for the site.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Earthworks & Retaining Walls;
- Stormwater Management;
- Flooding/ Overland Flow; and
- Erosion Control.

The engineering objectives for the development are to create a site which, based on the proposed architectural layout, responds to the topography and site constraints and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives.

A set of drawings have been prepared to show the proposed finished levels, retaining walls, stormwater drainage and water quality requirements for the development. These drawings are conceptual only and subject to change during detail design.

1.3 Authority Jurisdiction

The consent authority for this development is Northern Beaches Council. The requirements of the *Northern Beaches Council WSUD & MUSIC Modelling Guidelines (2016)* and *Warringah Development Control Plan (2011)* apply.

2 DEVELOPMENT SITE

2.1 Location

The proposed development is in the suburb of Frenchs Forest at 14 Aquatic Drive, as shown in **Figure 2.1**. The proposed development will be positioned on Lot 102 of DP1211755, in a SP4 Enterprise zone.

The site is bounded north by Warringah Road, south by Aquatic Drive, east by industrial buildings and west by buildings on Tilley Lane.

Figure 2.1 - Locality Map (Source: Nearmaps)

2.2 Existing Site

The lot is currently occupied by an offices building and car parking facilities. All the lot is accessed from the Aquatic Drive. It is noted that easements on the west for stormwater drainage, sewer and transmission lines run from north to south.

A detailed survey for design purposes has been undertaken by LTS dated 31/11/2022 (refer to **Figure 2.2** and **Appendix E**).

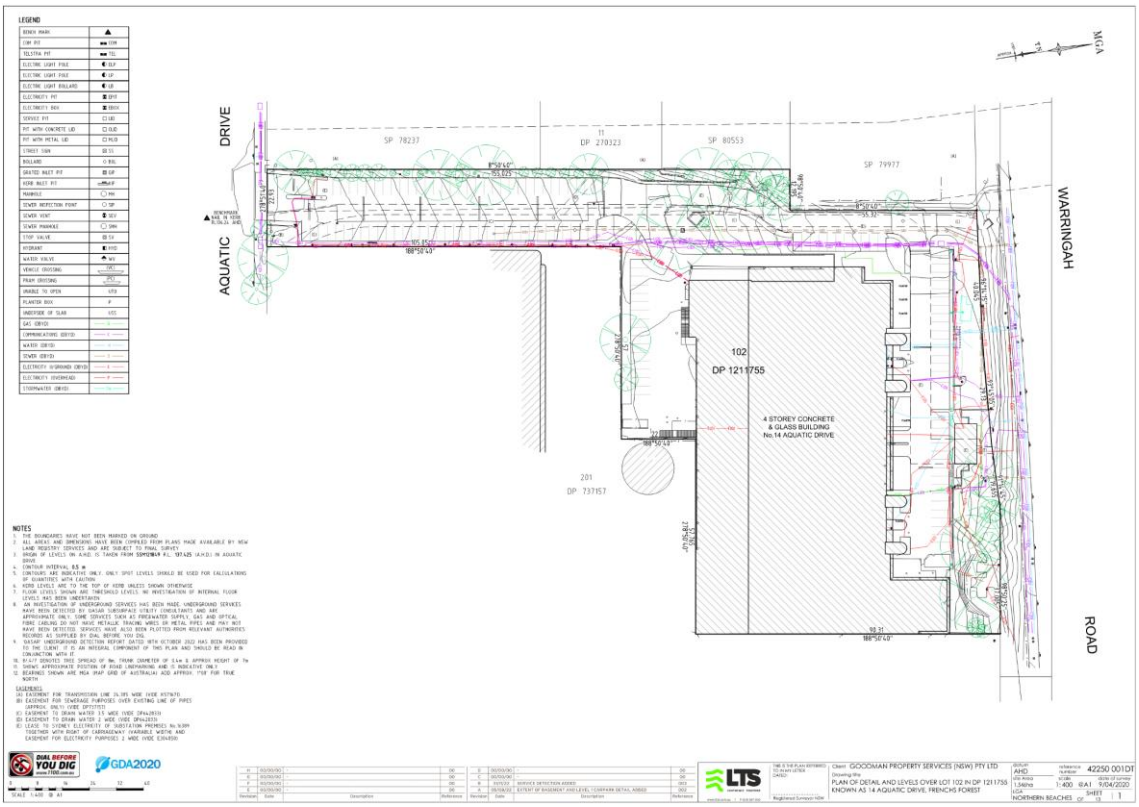

Figure 2.2 - Detailed Survey (Source: LTS, November 2022)

2.3 Proposed Development

The proposed development comprises construction of a three-storey industrial building including:

- 153 self-storage units at ground floor and on Level 1;
- 72 warehouse units on Levels 1 and 2;
- 123 car parking spaces across all levels;
- outdoor breakout spaces for staff at ground floor and Level 2;
- shared lobby across all levels;
- landscaping; and
- associated infrastructure/servicing works.

The development layout is based on the architectural layout by SBA, as shown in **Figure 2.3**.

The proposed works will be limited to the site's northern portion, which is approximately 1.28 hectares, while the southern section, where the car parks are currently located, will remain as existing.

The proposed buildings consist of self-storage units, warehouses units and proposed offices. Truck loading/ circulation areas are provided from Aquatic Drive and through the central hardstand. Car parking spaces will be available south of the site and in the development's central area.

Access to the development will be made via the Aquatic Drive on the south of the site, with one entry/exit to access.

Figure 2.3 - Proposed Development Layout (Ref. SBA Drawing DA200_P11)

3 SITE WORKS

3.1 Bulk Earthworks

Bulk earthworks will be required for the development to provide the required pad levels and stormwater quality tank to accommodate the proposed development site's proposed masterplan arrangement.

The objective for the site will be;

- to provide a flat building pad for ground storage level,
- to keep the requirement for new retaining structures to a minimum,
- to facilitate acceptable site access,
- to drain the stormwater system via gravity,
- and to achieve a balanced cut-and-fill earthworks volume,

An earthworks and volume estimate assessment has been completed for the development site based on the proposed development layout and an averaged pavement thickness of 300mm throughout the development.

The earthworks volume estimates are as follows:

Table 3.1 – Earthworks Quantities

	Development Site
Cut	- 2,100 m^3
Fill	+ 2,300 m^3
Detailed Excavation	- 2,600 m^3
Balance	- 2,400 m^3

The existing surface levels and the proposed bulk earthworks levels are as shown on drawing **CO9431.01-DA30** included to this report under **Appendix A.**

A detailed assessment of the earthworks level will be completed during detailed design.

Soil Erosion and Sediment Control measures including sedimentation basins will also be provided during the construction works in accordance with the approved drawings and the preliminary Erosion and Sediment Control Plan in **Section 8** of this report. Minor changes will be made to suit the current layout and site requirements.

3.2 Embankment Stability

To assist in maintaining embankment stability permanent batter slopes will be no steeper than the limits set by the geotechnical engineer. Generally, permanent

batters in clay can be expected to be no steeper than 3 horizontal to 1 vertical. Temporary batters will be no steeper than 2 horizontal to 1 vertical.

Permanent batters will be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Erosion and Sediment Control Plan in **Section 8** of this report.

3.3 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

4 STORMWATER MANAGEMENT

4.1 Hydrologic Modelling and Analysis

4.1.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Northern Beaches Council and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "*Australian Rainfall and Runoff*" (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI event have been assessed.

4.1.2 Minor/ Major System Design

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

4.1.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.1.4 Runoff Models

In accordance with the recommendations and standards of the Northern Beaches Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS.

The design parameters for the DRAINS model are to be based on the recommendations as defined by Northern Beaches and parameters for the area and are as follows:

Table 4.1 - DRAINS Parameters

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

4.2 Hydraulics

4.2.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.2.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground/ grate level, for the peak runoff from the Minor System runoff.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building.

4.2.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.2.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.2.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the estate road and associated drainage infrastructure.

4.3 Site Drainage

4.3.1 Existing Site Drainage

Minor stormwater drainage infrastructure is on the site as part of the existing improvements on the property. These systems comprise roof catchments, direct runoff to a rainwater tank, pavement areas and grassed area catchments, which all drain to On-Site Detention tanks and then to the existing 1050mm diameter council's stormwater pipeline.

Figure 4.1 - Northern Beaches Council's stormwater network (Source: Northern Beaches Council website)

4.3.2 Proposed Site Drainage

As per general engineering practice and the guidelines of Northern Beaches Council, the proposed development stormwater drainage system will comprise a minor and major system to safely and efficiently collect stormwater runoff from the development to the legal point of discharge.

The minor system comprises a piped drainage system designed to accommodate the 1 in 20-year ARI storm event (Q20). The piped system can convey all stormwater runoff up to and including the Q20 event, which meets the requirements of the Northern Beaches Council and is the minimum recommended capacity for industrial development.

The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will use defined overland flow paths, such as roads and open channels, to convey excess runoff from the site safely.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice and accepted engineering practices. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1988 Edition), Volumes 1 and 2 (AR&R).

Stormwater Management must be provided for water quantity and quality per the requirements of the Northern Beaches Development Control Plan 2011.

Further discussion on the Stormwater Management Strategy is provided in **Sections 5** and **6** of this report. The reference to drawing **Co9431.01-DA40** to **44** shows the proposed drainage layout and the catchment allowances

4.3.3 Site Discharge

The proposed stormwater management system integrates a dual major/minor design, effectively conveying surface runoff from various sources including the building's roof, Level 2 hardstand, driveways, parking zones, and landscaped areas. This system incorporates multiple water quality improvement devices to treat runoff before it discharges into the existing 1050mm diameter council stormwater pipeline.

Due to elevation constraints on the southern part of the site, specifically where the proposed access driveway and carpark are located, this area will bypass the On-Site Detention (OSD) tank and additional stormwater quality enhancement devices. Instead, runoff from these areas will directly enter the existing council stormwater pipeline. The bypass area encompasses approximately 0.287 hectares, representing about 19% of the total site catchment. To compensate for this bypass, the OSD tank and associated stormwater treatment devices have been appropriately sized and engineered.

Reference to drawing **CO9431.01-DA40** shows the proposed drainage layout including the stormwater management measures which include separate water quantity and quality management systems. Further discussion on the stormwater management measures is made in **Sections 5** & **6** of this report.

Figure 4.2 – Development Catchment Areas (Green refers to stormwater quantity and quality catchment, Orange refers to bypass catchment)

5 STORMWATER QUANTITY MANAGEMENT

5.1 General Design Principles

Northern Beaches Council requires on-site detention to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by the development.

Northern Beaches Council adopts the principles of water quantity management, also known as "On-site Detention (OSD)", to ensure the cumulative effect of development does not have a detrimental impact on the existing stormwater infrastructure and watercourses located within their LGA downstream from the development site.

Section 4 of Northern Beaches Council's *On-Site Stormwater Detention Technical Specification* states, "The general requirement of Council's OSD Specification is to ensure that the site's stormwater runoff after any development does not exceed the runoff prior to the development."

5.2 Methodology

A hydrological analysis was undertaken to estimate the impact o the site development on the peak flows at the downstream extent of the site. Modelling of the stormwater quantity was considered from the pre-existing case and for the operational phase of the development.

As the site area is greater than 1200m^2, the simplified method consists of PSD/SSR rates, as described in Section 4.2.2. of the Warringah Council's *On-site Stormwater Detention Technical Specification* cannot be used in calculating the storage and discharge relationship for the site. Council's preferred modelling software, DRAINS, has been used to assess the site detention and storage relationship.

In order to assess the existing and operational phase peak discharges from the development site, a DRAINS hydrological model was used to estimate peak flows from the catchments on site from various storm durations for Q5 year ARI to Q100 year ARI events.

5.3 Water Quantity Management Features

5.3.1 Existing

The existing site comprises residual drainage associated with former uses on the site.

There are existing local runoff management measures or on-site detention systems.

The existing runoff is based on a developed impervious condition, given the long period on which the contributing catchment has comprised a large impervious surface present on the site.

5.3.2 Proposed

As per general engineering practice and the guidelines of Northern Beaches Council, the proposed development stormwater drainage system will comprise a minor and major system to safely and efficiently collect stormwater runoff from the development to the legal point of discharge.

The minor system consists of a piped drainage system designed to accommodate the 1 in 20-year ARI storm event (Q20). The piped system can convey all stormwater runoff up to and including the Q20 event, which meets the requirements of the Northern Beaches Council and is the minimum recommended capacity for industrial development.

The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will use defined overland flow paths, such as roads and open channels, to convey excess runoff from the site safely.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice and accepted engineering practices. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1988 Edition), Volumes 1 and 2 (AR&R).

Stormwater Management must be provided for water quantity and quality per the requirements of the Northern Beaches Development Control Plan 2011.

Further discussion on the Stormwater Management Strategy is provided in **Sections 5** and **6** of this report. The reference to drawing **Co9431.01-DA40** to **44** shows the proposed drainage layout and the catchment allowances.

The proposed infrastructure drainage system runs north to south and east to west of the property and discharges from the site to the existing 1050mm diameter, as shown in drawing **Co9431.01-DA42**.

The discharge will be performed via a new outlet reinforced concrete pipe to the existing pits.

5.4 Pre-development & Post-development Peak Flows

Table 5.1 shows the existing and developed flows at the downstream discharge point.

Table 5.1 - Q5, Q20 & Q100 ARI Peak Flows from Development

ARI	Design Storm Duration	Peak Flow (m^3/s)		
		Undeveloped	Developed	
			Site (no attenuation)	Site (+ attenuation)
5	25	0.351	0.538	0.260

20	25	0.549	0.733	0.468
100	25	0.730	0.925	0.717

The post-development (with site attenuation flows) is lower than the pre-developed peak flows. The required detention storage for the development site is discussed in the following section.

5.5 Proposed Water Quantity Management

As previously discussed, detention storage on the development site is required to reduce local outflows. The proposed site layout allows for one OSD system to be located in the mid-south of the site, in the car parking areas.

The proposed OSD will be provided within an underground, combined water quantity and water quality management tank.

A number of combinations of storage and outlet arrangements have been modelled. The adopted arrangement models the tank configuration as shown in **Table 5.2.** and the proposed layout can also be observed on drawing **Co9431.01-DA41** and **42**.

Table 5.2 - OSD Characteristics (Post-Development)

ARI	Duration (mins)	Peak Flow (m^3/s)					Depth (m)	Storage (m^3)
		No Atten.	OSD Tank		Site Bypass	Total		
			Low	Bypass				
5	25	0.538	0.250	0	0.020	0.260	1.75	196
20	25	0.733	0.291	0.151	0.026	0.468	1.75	255
100	25	0.925	0.313	0.416	0.034	0.717	2.17	289

Table 5.2. OSD1 Characteristics (Post-Developed)

The hydrologic analysis shows that, with the provision of the on-site detention system detailed above, the post-development peak flows from the site will be attenuated to less than pre-development; hence the requirements of Northern Beaches Council have been met.

6 STORMWATER QUALITY CONTROLS

6.1 Regional Parameters

There is a need to provide a design incorporating the Water Sensitive Urban Design (WSUD) principles to target pollutants present in the stormwater, minimise the adverse impact these pollutants could have on receiving waters, and meet the specified requirements by Northern Beaches Council.

In Section 8.1.1 of their PL 850 WATER – Water Management Policy, Northern Beaches Council has nominated the requirements for stormwater quality to be performed on a catchment-wide basis. These are presented in terms of annual percentage pollutant reductions on a developed catchment and are as follows:

Table 6.1 – Pollutant Reduction Targets

Pollutants	Percentage Reduction Required
Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%

6.2 Proposed Stormwater Treatment System

The developed impervious areas, including roofs, hardstand, car parking, roads and other extensive paved areas, must be treated by Stormwater Treatment Measures (STMs). The STMs shall be sized according to the catchment area of the developed site. The STMs for the development shall be based on a treatment train approach to ensure that all objectives are met.

Components of the treatment train for the development are as follows:

- The primary treatment of parking, hardstand areas and a portion of the roof will be performed via Ocean Protect OceanGuard Pit Inserts.
- Tertiary treatment to the warehouse roof areas, the hardstand and the car parking areas will be performed via 15x690mm high PSORB cartridges Ocean Protect Stormfilters in the OSD tank.
- A portion of the roof will also be treated via rainwater reuse and settlement within the rainwater tank.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

The MUSIC model was chosen to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set out in *Section 8.1.1* of their *PL 850 WATER – Water Management Policy* and nominated in Section 6.1 of this report were used to assess the effectiveness of the selected treatment trains.

The MUSIC model "*9431.01_Rev1.sqz*" was set up to examine the effectiveness of the water quality treatment train and to predict if Northern Beaches Council's requirements have been achieved. The model was set up using the Northern Beaches Council parameters from the *WSUD and MUSIC Modelling Guidelines (2016),* and the layout of the MUSIC model is presented in **Appendix B**.

6.3.2 Rainfall Data

Six-minute pluviographic data was provided by Northern Beaches Council, which has been sourced from the Bureau of Meteorology (BOM) as nominated below. Evapotranspiration data for the period was sourced from the Sydney Monthly Areal PET data set supplied with the MUSIC software.

Table 6.2 - Rainfall Data

Input	Data Used
Rainfall Station	066062 – Sydney Observatory
Rainfall Period	1981 - 1985 (5 years)
Mean Annual Rainfall (mm)	857
Evapotranspiration	Sydney Monthly Areal PET
Model Timestep	6 minutes

6.3.3 Rainfall Runoff Parameters

Table 6.3 - Rainfall Runoff Parameters

Parameter	Value
Rainfall Threshold	1.50
Soil Storage Capacity (mm)	350
Initial Storage (% capacity)	30
Field Capacity (mm)	144
Infiltration Capacity Coefficient a	360

Infiltration Capacity exponent b	0.5
Initial Depth (mm)	10
Daily Recharge Rate (%)	100
Daily Baseflow Rate (%)	50
Daily Seepage Rate (%)	0 (Sandy Clay Loam)

6.3.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are based on Northern Beaches Council land use parameters as per **Table 6.4:**

Table 6.4 - Pollutant Concentrations

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	-	-	-	-	-	-
	Sealed Roads	-	-	-	-	-	-
	Landscaping	1.20	0.17	-0.85	0.19	0.11	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.30	0.19
	Landscaping	2.15	0.32	-0.60	0.25	0.30	0.19

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 6.4** above and the catchments shown on drawings **CO9431.01-DA40**. The relevant stormwater catchment sizes are listed below in **Table 6.5** and shown in **Appendix B.**

Table 6.5 - Music Model Source Nodes

Catchment	Area (Ha)	Source Node	% Impervious	Stormwater Treatment
ROOF	0.393	Roof	100	Rainwater Tank + Filters
HARDSTAND GROUND	0.122	Sealed Road	100	Pit Baskets + Filters
LANDSCAPE	0.257	Revegetated Land	0	Pit Baskets + Filters
HARDSTAND LVL 2	0.477	Sealed Road	100	Pit Baskets + Filters
LANDSCAPE TO BYPASS	0.097	Revegetated Land	0	Pit Baskets
HARDSTAND BYPASS	0.201	SealedRoad	100	Pit Baskets

Total	1.547

6.3.5 Treatment Nodes

Rainwater tanks nodes, Ocean Protect OceanGuard nodes and Ocean Protect StormFilter nodes have been used in the modelling of the development.

6.3.6 Results

Table 6.6 shows the results of the MUSIC analysis for the site. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

Table 6.6 – MUSIC analysis results

	Source	Residual Load	% Red-uction	% Red. Target	Target Met
Total Suspended Solids (kg/yr)	3240	336	89.6	85	Y
Total Phosphorus (kg/yr)	5.99	2.04	65.9	65	Y
Total Nitrogen (kg/yr)	33.5	16.3	51.2	45	Y
Gross Pollutants (kg/yr)	336	0.613	99.8	90	Y

The model results indicate that, through the use of the STMs in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen, and Gross Pollutants will meet the requirements of Northern Beaches Council – Water Management Policy on an overall catchment basis.

6.3.7 Modelling Discussion & Hydrocarbons/ Free Oils

MUSIC modelling has been performed to assess the selected treatment trains' effectiveness and ensure that the pollutant retention requirements of Section 8.1.1 of Northern Beaches Council PL 850 WATER – Water Management Policy have been met.

The MUSIC modelling has shown that the proposed treatment train of SQIDs will provide a stormwater treatment that will meet the Northern Beaches Council requirements effectively and economically.

Hydrocarbon removal cannot be modelled with MUSIC software. The proposed distribution/ storage facility would be expected to produce low source loadings of hydrocarbons. Potential sources of hydrocarbons would be limited to leaking engine sumps or accidental fuel spills/leaks and leaching of bituminous pavements (car parking only). The potential for hydrocarbon pollution is low, and published data from the CSIRO indicates that average concentrations from Industrial sites are in the order of 10mg/L and would expect source loading from this site to be near or below this concentration. Hydrocarbon pollution would also be limited to surface areas which will be treated via bio-retention swales predicted to achieve a 90% reduction of this pollutant.

Given the expected low source loadings of hydrocarbons and removal efficiencies of the treatment devices, we consider that the requirements of the Northern Beaches Council have been met.

6.4 Stormwater Harvesting

Stormwater harvesting refers to collecting stormwater from the development's internal drainage system for reuse in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater, where the flow is from roof areas, or stormwater, where the flow is from all areas of the development.

For this development, we refer to a rainwater harvesting system, where the benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for this development with reuse for non-potable applications. Internal uses include such applications as toilet flushing, while external applications will be used for irrigation. The aim is to reduce the water demand for the development and satisfy Northern Beaches Council's requirements.

Generally, the rainwater harvesting system will be an in-line tank for collecting and storing rainwater. When the rainwater storage tank is full, rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

A rainwater tank has been designed using MUSIC software to balance supply and demand and reduce non-potable water.

6.4.1 Internal Base Water Demand

Indoor water demand has been estimated at 0.1kL/day/toilet or urinal for industrial development. No allowance is required for accessible toilets.

The above rates result in the following internal non-potable demand:

Estimate	75 Toilets	7.5 kL/day

6.4.2 External Base Water Demand

The external base water demand has been estimated at 0.3kL/year/m^2 as PET-Rain for subsurface irrigation for industrial development.

The above regime for the landscaped area for the site gives the following yearly outdoor water demand:

Irrigated Area (0.3kL/year/m^2)	3540m^2	1,062 kL/year

6.4.3 Rainwater Tank Sizing

The use of rainwater reduces the mains water demand and the amount of stormwater runoff. By collecting the rainwater run-off from roof areas, rainwater tanks provide a valuable water source suitable for flushing toilets and landscape irrigation.

Rainwater tanks have been designed, using MUSIC software to balance the supply and demand, based on the calculated base water demands and proposed roof catchment areas. Allowances in the MUSIC model have been made for high flow bypass which will be managed by a dual high flow (225mm downpipe) and low flow (100mm downpipe) roofwater collection configuration, or a syphonic system with a high flow bypass manifold.

Table 6.7 - Rainwater Reuse Requirements

Roof Catchment (m^2)	High Flow Bypass (L/s)	Tank Size in MUSIC (kL)	Predicted Demand Reduction (%)	Provided Tank (kL)
3927	100	40	43.15	50

The MUSIC model, results summarised in **Table 6.7**, predicts that there will be a 68.6% reduction in non-potable water demand for the development with the provision of a minimum 50 kL rainwater tank.

We note that the final configuration and sizing of the rainwater tank are subject to detailed design considerations and optimum site utilisation.

6.5 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.8** below) to assist in the effective operation and maintenance of the various water quality components.

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

Table 6.8 - Indicative Maintenance Schedule

Maintenance Action	Frequency	Responsibility	Procedure
Landscaped Areas			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Check for any evidence of	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed

channelisation and erosion			swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Rainwater Tank			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet -leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
Inlet & Junction Pits			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of pits	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
Proprietary Treatment Devices (Ocean Protect)			
Refer to Manufacturers Operation and	Annually	Maintenance Contractor	Refer to Manufacturers Operation and

Maintenance Manual			Maintenance Manual
Stormwater System			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.

7 FLOODING AND OVERLAND FLOW

7.1 Introduction

A desktop review of overland flow and flooding about the proposed development has been completed. The assessment confirms the requirements of Northern Beaches Council's DCP have been met.

Our review and assessment have been based on a review of the detailed survey, the proposed development, and the evaluation of the site regarding the flood modelling and documented flood behaviour included in *Manly Lagoon Floodplain Risk Management Study & Plan – 2018*.

The site is located around 750m north of Manly Creek and about 3.5km North of the Manly Dam. The site is noted as required to provide stormwater attenuation, as discussed in **Section 5** of this report.

The site has formal inground drainage systems, with most stormwater piped into the Ø1050 drainage. It is understood that the existing buildings on the property discharge their roof water and part of the hardstand into the on-site detention tank and the council's drainage system.

7.2 Manly Floodplain Risk Management Study & Plan – 2018

Northern Beaches Council provided extracts from a flood study of the Manly Lagoon catchment. The study involved a hydrological and hydraulic assessment of the catchment at a regional level.

We provide excerpts of flooding associated with the 1% AEP storm event from the report in **Figure 7.1**, **Figure 7.2**, and **Figure 7.3** below. **Figure 7.1** is an excerpt of the 1% AEP Flood Hazard; **Figure 7.2** is an excerpt of the 1% AEP Flood Depth; **Figure 7.3** is an excerpt of the 1% AEP Flood Velocity Depth Products.

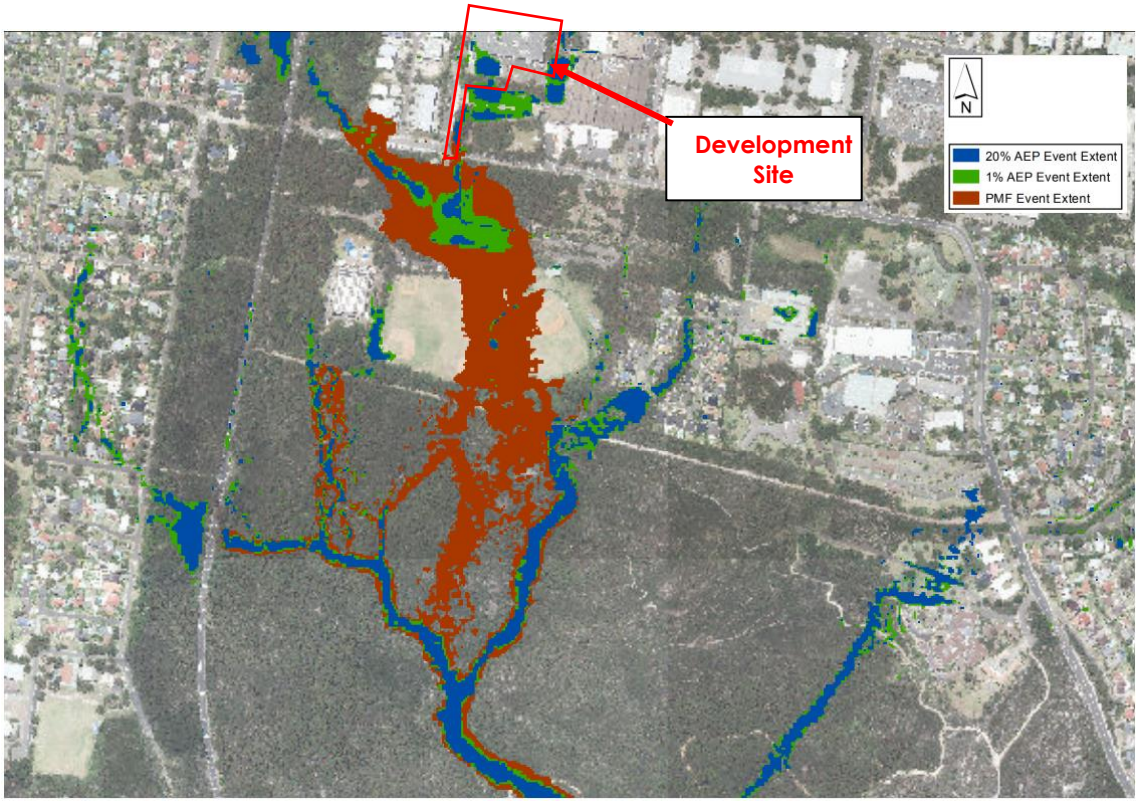

Figure 7.1 – Design Flood Extents – PMF, 1% and 20% AEP Events.

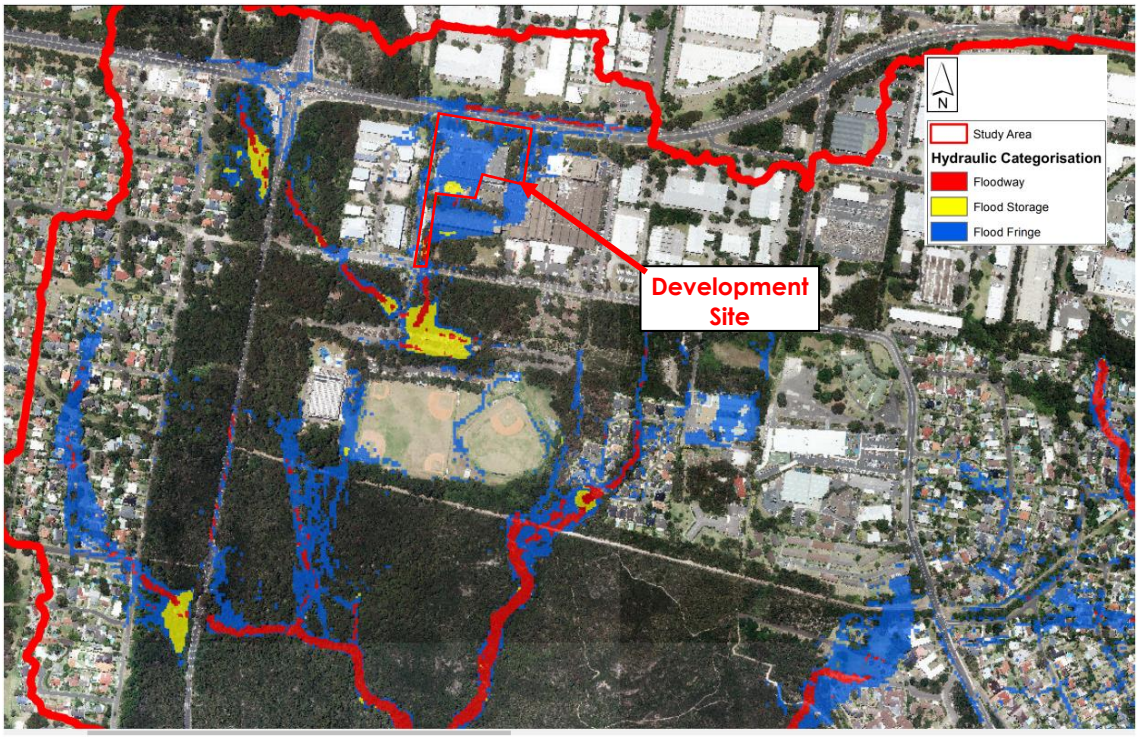

Figure 7.2 – Hydraulic Categorisation – 1% AEP Event.

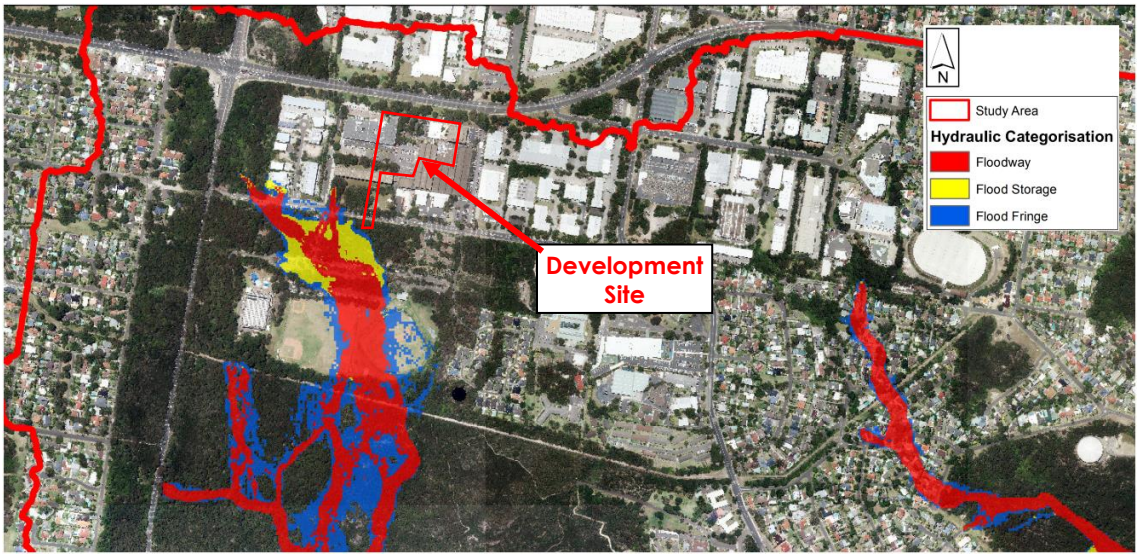

Figure 7.3 – Hydraulic Categorisation – PMF Event.

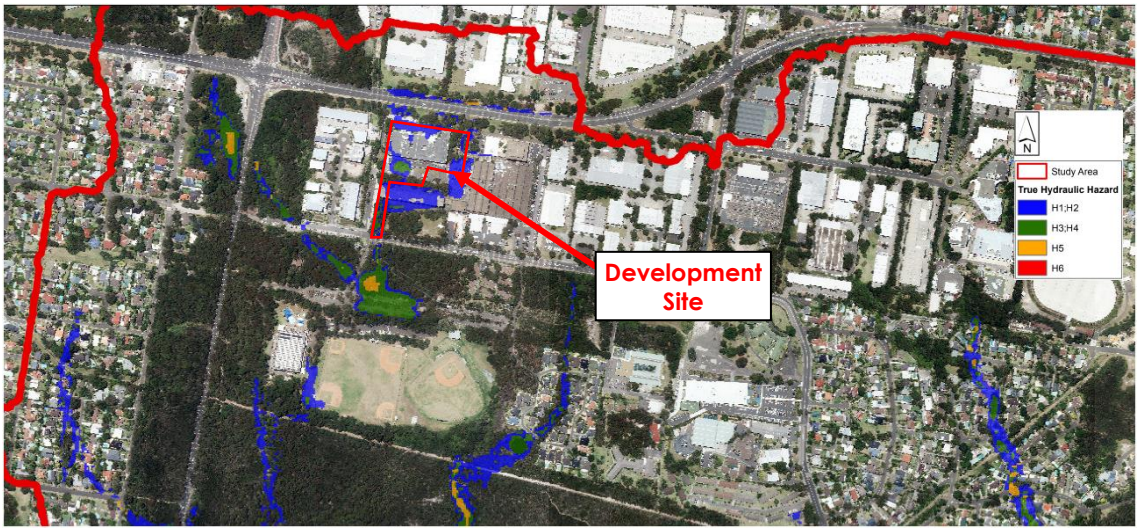

Figure 7.4 – True Hydraulic Hazard – 1% AEP Flood Event.

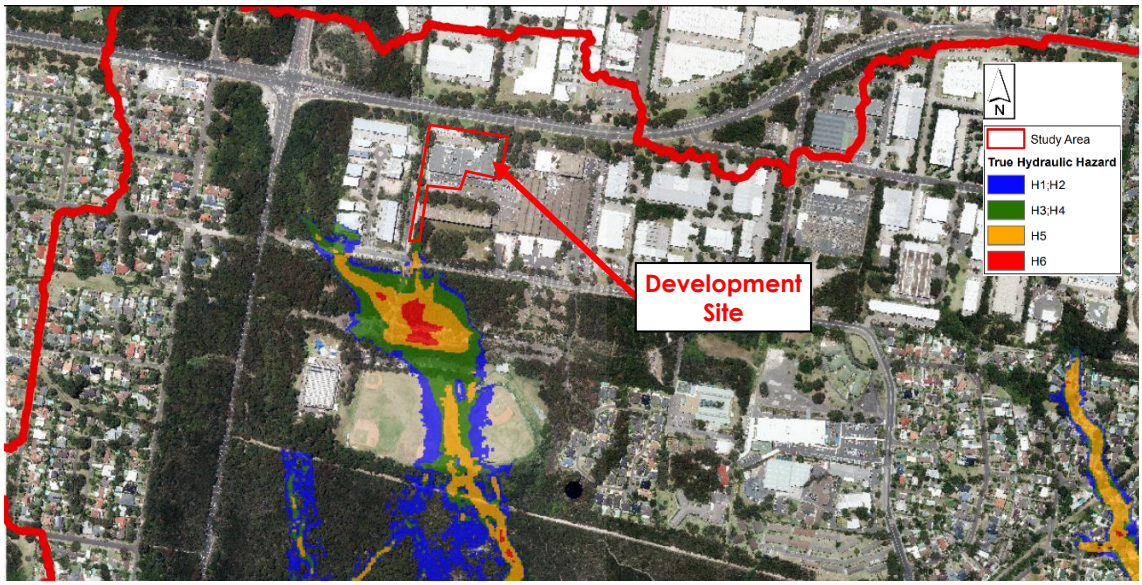

Figure 7.5 – True Hydraulic Hazard – PMF Flood Event.

Figure 7.1 illustrates flood extents for the 20% AEP and 1% AEP events, while no flood extents are shown for the PMF event. Similarly, **Figure 7.2**, **Figure 7.3**, **Figure 7.4**, and **Figure 7.5** depict the same occurrence.

Figure 7.2 identifies a large portion of the site as a "flood fringe," with a small area designated as "flood storage." The isolated flood encroachment is likely due to local grading and should not be attributed to overland flow or flooding within the site. However, it is worth noting that during the flood study, Warringah Rd's development was incomplete, incorporating a New Jersey barrier and multiple kerb inlet pits (**Figure 7.8**). It should also be noted that the northern catchment, which could flood the site, is limited and would not adversely affect the proposed development, as demonstrated in the Manly Lagoon Flood Study.

Figure 7.6 - Warringah Rd (Near Maps - Jul 2016).

Figure 7.7 - Warringah Rd (NearMaps - Mar 2023).

Figure 7.8 - Warringah Road (August 2022).

7.3 External Catchments and Overland Flow Provisions

An assessment of overland flow was conducted to determine the potential impact of complete blockage of the council's 1050mm diameter stormwater pipe.

Based on **Figure 7.9**, an estimated upstream catchment of 5.5ha for the 1050mm diameter pipe resulted in a peak flow rate of 3 m³/s for the 1% AEP event, calculated using the Rational Method. According to the LTS Detail Survey (**Appendix E**), the 1050mm diameter concrete pipe has an approximate slope of 6%, indicating a full capacity of 7.3 m³/s (Colebrook White Calculation), indicating the existing pipe is sufficient to convey the estimated catchment.

Figure 7.9 - Estimated 1050mm diameter upstream catchment.

The NSW Government - Spatial Services Digital Elevation Models (dated 06/2020) indicate that the grades at Warringah Rd were designed to direct flow towards the kerb inlet pits in front of the proposed development lot. To assess the risk of upstream overland flow impacting the site, a detailed analysis using DRAINS was conducted. This study evaluated the capacities of the Warringah Road kerb inlet pits in the context of the recent upgrades at the Warringah Road and Wakehurst Parkway intersection. The digital elevation model shows that the kerb & gutter sag is located approximately 90m west of the site, with a difference of approximately 800mm between the sag and the levels in front of the site.

The evaluation included all relevant inlet pits on Warringah Road, applying blockage factors of 0.5 for sag pits and 0.2 for on-grade pits. Additionally, the stormwater pipeline along the road were considered to have a diameter of 375 mm and to maintain a minimum longitudinal slope of 0.5%. Despite the segmented nature of the road, created by a median that divides the eastbound and westbound lanes, and

the high number of inlet pits within this section, the findings confirm that the kerb, gutter, and inlet pits collectively provide adequate capacity to handle stormwater for up to the 1% Annual Exceedance Probability (AEP) event, effectively preventing water ingress onto the site.

Moreover, in the event that the 1050mm diameter pipe at these kerb inlet pits becomes completely blocked, an overflow path will form diverting water towards the intersection of Warringah Road and Wakehurst Parkway underpass. This effectively safeguards the site from potential overland flow from upstream catchments during critical scenarios.

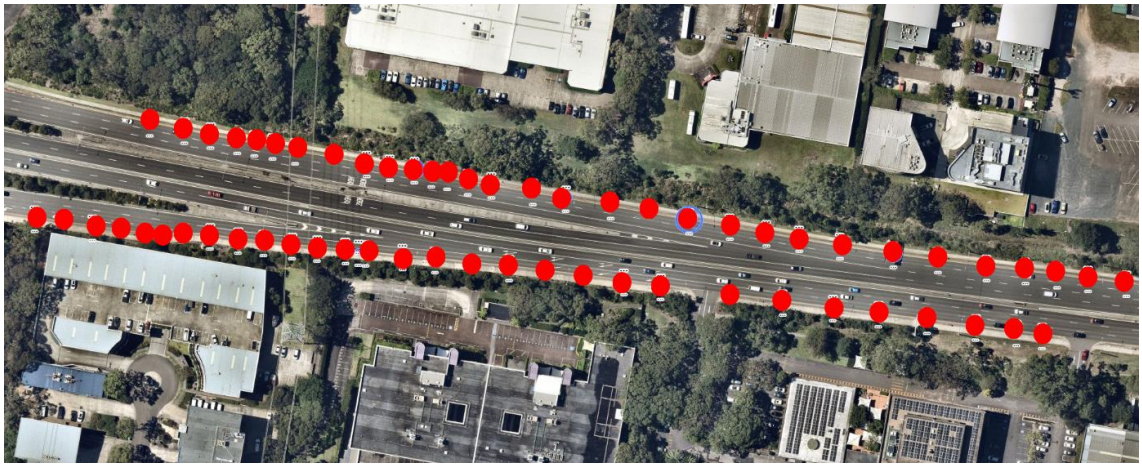

Figure 10 - Location of the pits at Warringah Road (Source: Nearmaps Jan/25)

7.4 Floodplain Management Considerations

7.4.1 Flood Planning Level

Introducing a Flood Planning Level (FPL) is an important flood risk management measure. FPLs are derived from a combination of a designated flood event, which can either be a historic flood or a design flood of a certain recurrence interval, plus a nominated freeboard depth.

The *NSW Floodplain Development Manual, 2005* recommends that the FPL generally be based on the 100-year ARI event. It suggests that although this event can vary, it should only be done in exceptional circumstances. Adopting the 1% AEP event for the proposed industrial development is considered appropriate.

The freeboard in an FPL is the flood level difference between its base level and the FPL. Freeboard is designed to provide reasonable certainty that the reduced risk exposure provided by the chosen FPL is warranted, taking into account factors such as:

Uncertainties in the estimate of flood levels;

Differences in water levels across the floodplain;

Wave action resulting from wind and vehicular/marine traffic during the flood event;

Changes in rainfall patterns due to climate change;

The cumulative effect of subsequent infill development on existing zoned land.

The *Floodplain Development Manual* recommends a freeboard of 0.5m for most new industrial developments, and it is considered appropriate to adopt this freeboard for the proposed development.

The FPL defined in the *Floodplain Development Manual* is noted to be consistent with that of the Bankstown Council.

7.4.2 Hydraulic and Hazard Categorisation

Floodwaters can vary significantly, both in time and place across the floodplain. They can flow fast and deep at some locations and slow and shallow at other locations. That can result in large variations in the personal danger and physical property damage from the flood.

The Floodplain Development Manual recognises three hydraulic categories of flood-prone land: floodway, flood storage and flood fringe. These are then further separated into two hazard categories: high and low.

Floodways

Floodways are those areas where a significant volume of water flows during floods and are often aligned with natural channels. They are areas that, even if only partially blocked, would cause a substantial redistribution of flood flow, which could adversely affect other areas. They can also be areas with deeper and higher velocity flow.

Flood Storage

Flood storage areas are the parts of the floodplain that provide temporary storage for floodwaters during the passage of a flood. If a reduction in the flood storage area is experienced due to the filling of land or construction of a levee bank, it can result in adverse effects on the flood levels and peak flow rates in other areas.

Flood Fringe

Flood fringe areas are the remaining area of land affected by flooding. The development of flood fringe land does not generally have any major impact on the pattern of flood flows and/or levels.

The preparation of a flood study is almost always required in the determination of hydraulic categories. That is so that peak depths, velocities and the extent of flooding can be determined across the catchment.

Hazard Categories

Flood hazard categories are divided into high and low hazards for each hydraulic category. High-hazard areas are defined as those with a possible danger to personal safety and the potential for significant structural damage. Non-disabled adults would have difficulty wading to safety. With low-hazard areas, should it be necessary, a truck could evacuate people and their possessions, and non-disabled adults would have little difficulty in wading to safety.

Flood hazard criteria within the site have been defined as H1 in relation to the overland flow path on site.

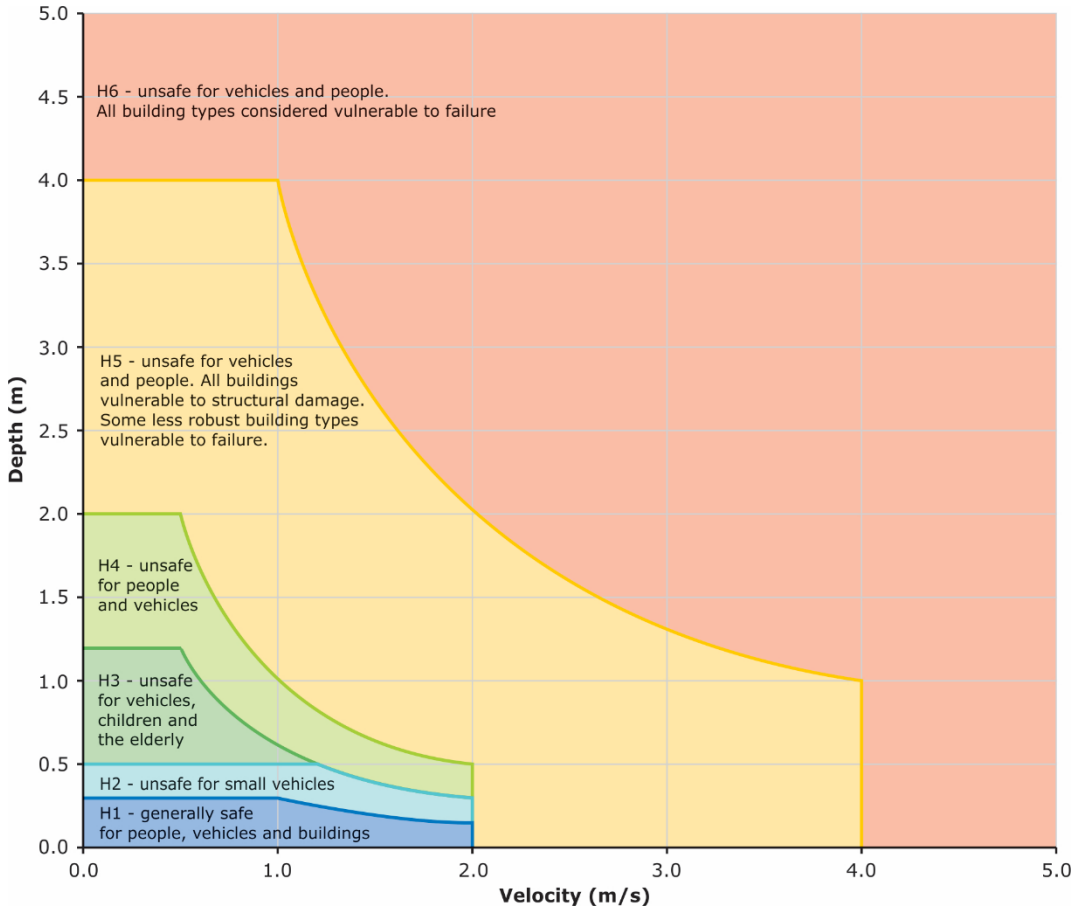

Figure 7.11 – Combined Flood Hazard Curves (Smith et al., 2014).

Table 6.7.3. Combined Hazard Curves - Vulnerability Thresholds (Smith et al., 2014)

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles. children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

Table 6.7.4. Combined Hazard Curves - Vulnerability Thresholds Classification Limits (Smith et al., 2014)

Hazard Vulnerability Classification	Classification Limit (D and V in combination)	Limiting Still Water Depth (D)	Limiting Velocity (V)
H1	D*V ≤ 0.3	0.3	2.0
H2	D*V ≤ 0.6	0.5	2.0
H3	D*V ≤ 0.6	1.2	2.0
H4	D*V ≤ 1.0	2.0	2.0
H5	D*V ≤ 4.0	4.0	4.0
H6	D*V > 4.0	-	-

Figure 7.12 – Adopted Hazard Criteria and Provisional Flood Hazard Chart (Australian Rainfall and Runoff 2019).

7.4.3 Flood Damages

Damage caused by floods is generally categorised as either tangible or intangible. Tangible damages are financial in nature and can be readily measured in monetary terms. They include direct damages, such as damage or loss caused by floodwaters wetting goods and property, and indirect damages, such as lost wages incurred during clean-up periods after the flood event. Intangible damage includes emotional stress and even mental and physical illness caused by the flood. It is difficult, if not impossible, to quantify intangible damages in financial terms.

From a flood planning perspective, it is important to consider the following direct damage categories:

Contents Damage – refers to damage to the contents of buildings, including carpets, furniture, and other personal property;

Structural Damage – refers to damage to the structural fabric of buildings, such as foundations, walls, floors, windows, and built-in fittings; and

External Damage – includes damage to all items external to buildings, such as cars, landscaping, and other outdoor features.

As there is no way to prevent a flood from occurring and excluding all development within flood-prone areas is unrealistic, establishing an FPL is to minimise the risk of direct damage when a flood occurs. By minimising the direct damage, there is a carry-on effect, whereby other associated indirect tangible damages and intangible damages are also minimised.

7.4.4 Emergency Response Planning

Flood planning refers to preparing a formal community-based plan of action to deal with the threat, onset and aftermath of flooding. It involves planning an event equal to or greater than the event used to derive the FPL.

The action plan should include an on-site response plan that addresses what measures should be undertaken once the threat of a flood is imminent. A flood evacuation strategy should also be included so that all persons within the precinct are familiar with the processes required if a flood occurs.

7.5 Flood Assessment Conclusion

In conclusion, the report indicates that the proposed development project in Northern Beaches Council has a low flood risk. The desktop review of overland flow and flooding revealed that the site is not susceptible to mainstream flooding in the local 1% AEP flood event or flooding in the PMF flood event from the Mainly Lagoon Catchment.

Although a small isolated encroachment at the centre of the site poses a medium risk, it is deemed a result of the existing grading and not considered overland flow or flooding within the subject site.

The existing council's 1050mm diameter stormwater pipe has enough capacity to convey the upstream flow. It was demonstrated that the proposed development has a safe route for the stormwater in case of 100% blockage of the 1050mm diameter.

The assessment and management strategy proposed in the report demonstrates that the development aligns with the current council flood policy and poses acceptable impacts regarding flooding and flood safety.

8 EROSION & SEDIMENT CONTROL PLANS

An erosion and sediment control plan (ESCP) are included in drawings **CO9431.01-DA20**, **DA21** and **DA25**. These plans show the works can proceed without polluting receiving waters. A detailed plan will be prepared after development consent is granted and before works commence.

8.1 General Conditions

1. The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in Managing Urban Stormwater, Soils and Construction (1998) and Northern Beaches specifications.
3. All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

8.2 Land Disturbance

- Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 8.1.**

Table 8.1 - Limitations to access

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

8.3 Erosion Control Conditions

Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.

- Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried, and topsoils remain on the surface at the completion of works.
- Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
- Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
- Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
- Where practical, foot and vehicular traffic will be kept away from all recently established areas
- Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:
    - 2H:1V where slope length is less than 7 metres
    - 2.5H:1V where slope length is between 7 and 10 metres
    - 3H:1V where slope length is between 10 and 12 metres
    - 4H:1V where slope length is between 12 and 18 metres
    - 5H:1V where slope length is between 18 and 27 metres
    - 6H:1V where slope length is greater than 27 metres
- All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
- During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

8.4 Pollution Control Conditions

1) Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways. Silt/ sediment fences and appropriate stabilisation of stockpiles are to be provided as detailed on the drawings.
2) Sediment fences will:
    a) Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.

b) Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and

c) Provide a return of 1-meter upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20-year tc discharge.

3) Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur,

4) Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.

5) Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

9 CONCLUSION

Goodman Property has commissioned Costin Roe Consulting Pty Ltd to prepare this *Civil Engineering Report* to support a Development Application for a new industrial development at 14 Aquatic Drive, Frenchs Forest, NSW.

A civil engineering strategy for the project has been developed, which provides a best-practice solution within the constraints of the existing landform and proposes a development layout. A stormwater quality management strategy has been designed to reduce the pollutant loads in stormwater leaving the proposed site.

The stormwater management for the development has been designed per *Section 8.1.1* of the Northern Beaches Council's *PL 850 WATER – Water Management Policy*.

During the construction phase, a Sediment and Erosion Control Plan will be in place to protect the downstream drainage system and receiving waters from sediment-laden runoff.

During the operational phase of the development, a treatment train incorporating Stormwater Treatment Measures (STMs) comprising a proprietary treatment train of gross pollutant trap and filtration unit has been proposed to mitigate the increase in stormwater pollutant loads generated by the development. MUSIC modelling results indicate that the proposed STM effectively reduces pollutant loads from the stormwater discharging from the site and that the provided treatment meets the requirements of the Northern Beaches Council. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

This report provides sufficient information to show the council that the legal points of discharge and a suitable stormwater management strategy are available for the development and the associated requirements. The management strategies in this report are recommended to be approved and incorporated into the future detailed design.

10 REFERENCES

- Managing Urban Stormwater, Soils and Construction (1998) – The Blue Book, Landcom
- Northern Beaches Council WSUD & MUSIC Modelling Guidelines (2016)
- PL 850 WATER – Water Management Policy (2017), Warringah
- Warringah Council On-site Stormwater Detention Technical Specification
- Warringah Development Control Plan (2011)
- Manly Lagoon Floodplain Risk Management Study & Plan (2018)

11 APPENDICES

APPENDIX A
DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED INDUSTRIAL BUILDING

14 AQUATIC DRIVE, FRENCHS FOREST, NSW, 2086

CIVIL DRAWINGS FOR DEVELOPMENT APPLICATION

DRAWING LIST:

DRAWING NO.	DRAWING TITLE
C09431.01-DA10	DRAWING LIST & GENERAL NOTES
C09431.01-DA20	EROSION AND SEDIMENT CONTROL PLAN - SHEET 1
C09431.01-DA21	EROSION AND SEDIMENT CONTROL PLAN - SHEET 2
C09431.01-DA25	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1
C09431.01-DA26	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2
C09431.01-DA30	BULK EARTHWORKS & CUT/FILL KEY PLAN- SHEET 1
C09431.01-DA31	BULK EARTHWORKS & CUT/FILL KEY PLAN- SHEET 2
C09431.01-DA35	BULK EARTHWORKS SECTION - SHEET 1
C09431.01-DA36	BULK EARTHWORKS SECTION - SHEET 2
C09431.01-DA40	STORMWATER DRAINAGE PLAN - KEY PLAN
C09431.01-DA41	STORMWATER DRAINAGE PLAN - GROUND FLOOR-SHEET 1
C09431.01-DA42	STORMWATER DRAINAGE PLAN - GROUND FLOOR-SHEET 2
C09431.01-DA43	STORMWATER DRAINAGE PLAN - LEVEL 1
C09431.01-DA44	STORMWATER DRAINAGE PLAN - LEVEL 2
C09431.01-DA45	STORMWATER DRAINAGE DETAILS - SHEET 1
C09431.01-DA46	STORMWATER DRAINAGE DETAILS - SHEET 2
C09431.01-DA48	MUSIC CATCHMENT PLAN
C09431.01-DA50	FINISHED LEVELS PLAN - KEY PLAN
C09431.01-DA51	FINISHED LEVELS PLAN - GROUND FLOOR- SHEET 1
C09431.01-DA52	FINISHED LEVELS PLAN - GROUND FLOOR- SHEET 2
C09431.01-DA53	FINISHED LEVELS PLAN - LEVEL 1
C09431.01-DA54	FINISHED LEVELS PLAN - LEVEL 2
C09431.01-DA55	TYPICAL SECTIONS

GENERAL NOTES:

1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
3. ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE.
   ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
   ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT.
   REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
4. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
5. UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
6. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

EXISTING SERVICES NOTES:

1. DURING THE EXECUTION OF WORKS, THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF EXISTING SERVICES. THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED TO THE EXISTING SERVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE RELEVANT SERVICE AUTHORITY, AT NO COST TO THE PRINCIPAL.
2. WHERE IT IS NECESSARY TO REMOVE, DIVERT OR CUT INTO ANY EXISTING SERVICE, THE CONTRACTOR SHALL GIVE AT LEAST THREE (3) DAYS NOTICE OF ITS REQUIREMENTS TO THE SUPERINTENDENT, WHO WILL ADVISE WHAT ARRANGEMENTS SHOULD BE MADE FOR THE ALTERATION OF SUCH EXISTING WORKS.
3. EXISTING SERVICES HAVE BEEN PLOTTED FROM SUPPLIED DATA. THE ACCURACY IS NOT GUARANTEED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO COMMENCING WORK. ALL CLEARANCES AND APPROVALS SHALL ALSO BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY PRIOR TO THE COMMENCEMENT OF WORK.
4. ALL NEW AND EXHUMED SERVICES THAT CROSS EXISTING AND FUTURE ROADS/PAVEMENTS WITHIN THE SITE SHALL BE BACKFILLED WITH DGB20 MATERIAL TO SUBGRADE LEVEL AND COMPACTED TO 98% STANDARD DENSITY RATIO. SUBJECT TO PRIOR APPROVAL FROM RELEVANT AUTHORITY.
5. ON COMPLETION OF SERVICES INSTALLATION. ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL AREAS, GRASSED AREAS AND ROAD PAVEMENTS.
6. CARE TO BE TAKEN WHEN EXCAVATING NEAR UTILITY SERVICES. NO MECHANICAL EXCAVATION TO BE UNDERTAKEN OVER SERVICES. LIAISE WITH RELEVANT AUTHORITY.
7. THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL IF REQUIRED OF ALL EXISTING SERVICES IN AREAS AFFECTED BY THE WORKS WITHIN THE CONTRACT AREA AS SHOWN ON THE DRAWINGS UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT. ALL TO REGULATORY AUTHORITY STANDARDS AND APPROVAL.
8. THE CONTRACTOR IS TO MAINTAIN EXISTING STORMWATER DRAINAGE FLOWS THROUGH THE ROADS AT ALL TIMES. MAKE DUE ALLOWANCE FOR ALL SUCH FLOWS AT ALL TIMES.
9. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL OBTAIN THE SUPERINTENDENT'S APPROVAL OF THE PROGRAM FOR THE RELOCATION/CONSTRUCTION OF TEMPORARY SERVICES.
10. CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES AS REQUIRED 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.
11. INTERRUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE OR DAMAGE TO THE ADJACENT RESIDENCES. CONTRACTOR TO GAIN APPROVAL OF THE SUPERINTENDENT FOR TIME OF INTERRUPTION.
12. THE CONTRACTOR SHALL UNDERTAKE A DIAL BEFORE YOU DIG (DBYD 1100) SERVICES SEARCH BEFORE THE COMMENCEMENT OF ANY WORKS.

LOCALITY PLAN
SCALE N.T.S

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

FOR DEVELOPMENT APPLICATION

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ISSUED FOR INFORMATION	28.02.25	A

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

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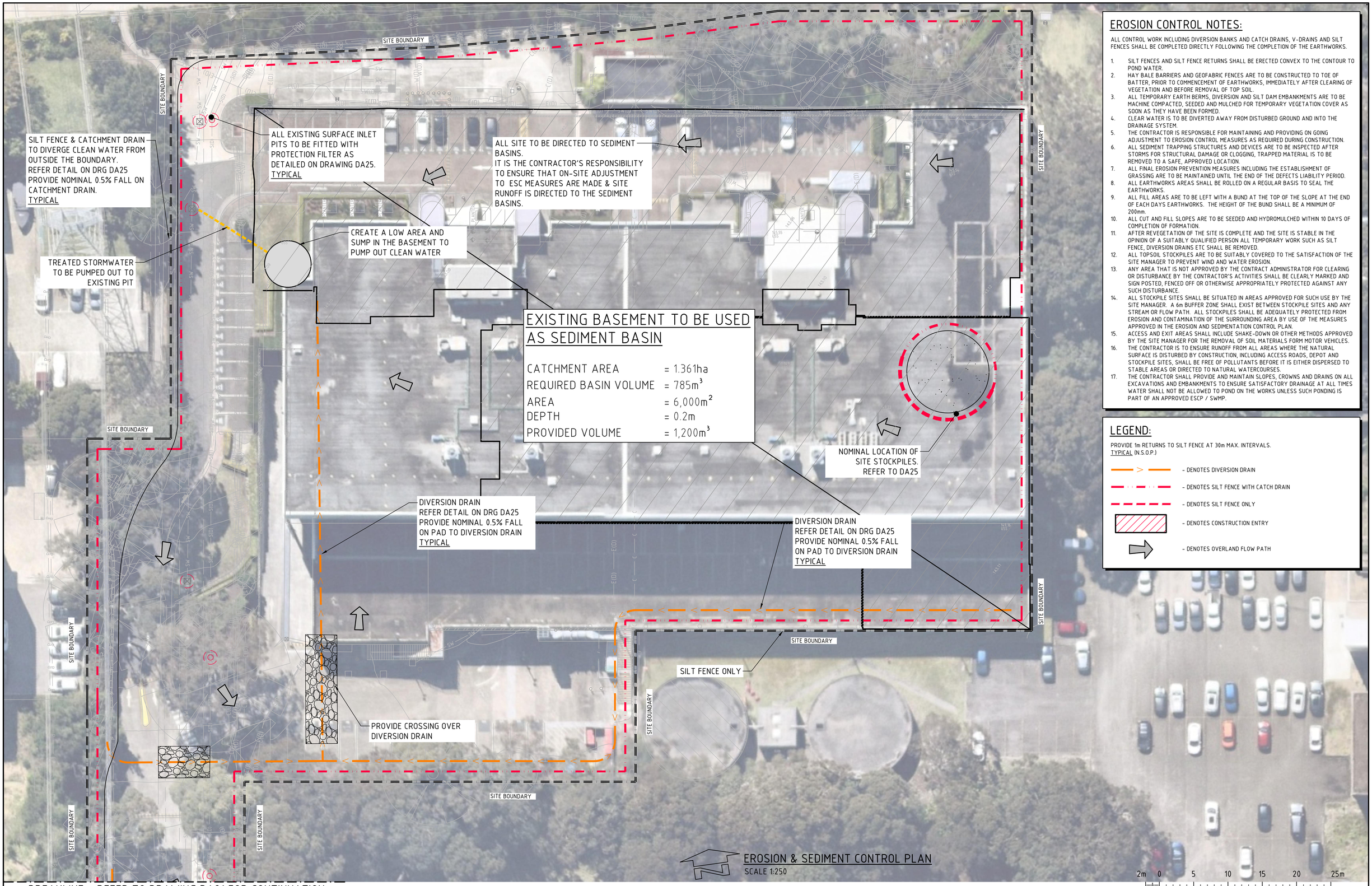
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
DRAWINGS LIST & GENERAL NOTES

DRAWING No C09431.01-DA 10
ISSUE B



EROSION CONTROL NOTES:

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200mm.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- DENOTES DIVERSION DRAIN
- DENOTES SILT FENCE WITH CATCH DRAIN
- DENOTES SILT FENCE ONLY
- DENOTES CONSTRUCTION ENTRY
- DENOTES OVERLAND FLOW PATH

EROSION & SEDIMENT CONTROL PLAN
SCALE 1:250

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

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CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
SHEET 1

DRAWING No C09431.01-DA20
ISSUE B

BREAKLINE - REFER TO DRAWING DA20 FOR CONTINUATION

SITE BOUNDARY

SILT FENCE ONLY

DIVERSION DRAIN
REFER DETAIL ON DRG DA-25
PROVIDE NOMINAL 0.5% FALL ON PAD TO DIVERSION DRAIN
TYPICAL

ALL EXISTING SURFACE INLET PITS TO BE FITTED WITH PROTECTION FILTER AS DETAILED ON DRAWING DA25.
TYPICAL

ALL SITE TO BE DIRECTED TO SEDIMENT BASINS.
IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ON-SITE ADJUSTMENT TO ESC MEASURES ARE MADE & SITE RUNOFF IS DIRECTED TO THE SEDIMENT BASINS.

SEDIMENT BASIN 2:

CATCHMENT AREA	= 0.246Ha
REQUIRED BASIN VOLUME	= 142m³
BASE DIMENSION (LxB)	= 10m x 2m
TOP DIMENSION (LxB)	= 19m x 11m
MAX SIDE SLOPE	= 1V:3H
DEPTH	= 1.5m
PROVIDED BASIN VOLUME	= 147m³

OVERFLOW SPILL WAY TO EXISTING PIT

CONSTRUCTION SITE ENTRY
REFER TO DETAIL DA25

KERB INLET CONTROL
REFER DETAIL ON DRG DA25
TYPICAL

1 DA25

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LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS.
TYPICAL (N.S.O.P.)

- DENOTES DIVERSION DRAIN
- DENOTES SILT FENCE WITH CATCH DRAIN
- DENOTES SILT FENCE ONLY
- DENOTES CONSTRUCTION ENTRY
- DENOTES OVERLAND FLOW PATH

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING Co9431.01-DA-25.

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'.

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWAER-THE BLUE BOOK'. CAPACITY BASED ON 5-DAY RAINFALL DEPTHS AT 85th PERCENTILE INTENSITY (43.2mm).

APPROXIMATE AREA OF DISTURBED SITE = 1.55Ha

SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE TO BE MADE DURING BENCHING OF SITE TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASINS.

NOTES:
1. ASSUME TYPE D SOIL (CLAY/SILTY CLAY)
2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)
3. Cv = 0.89 & LENGTH TO WIDTH RATIO OF 2 (MIN.)

SOIL TYPE TO BE ASSESSED BY A GEOTECHNICAL ENGINEER

EROSION & SEDIMENT CONTROL PLAN
SCALE 1:250

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
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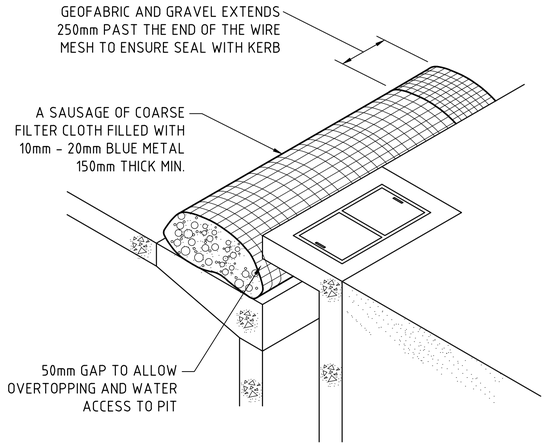
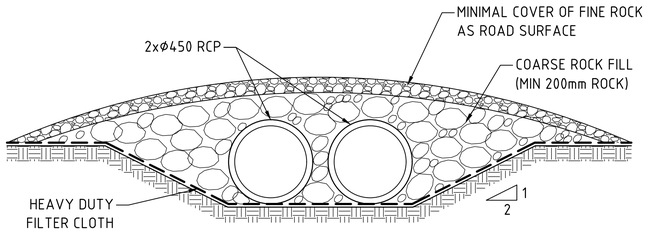
DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
SHEET 2

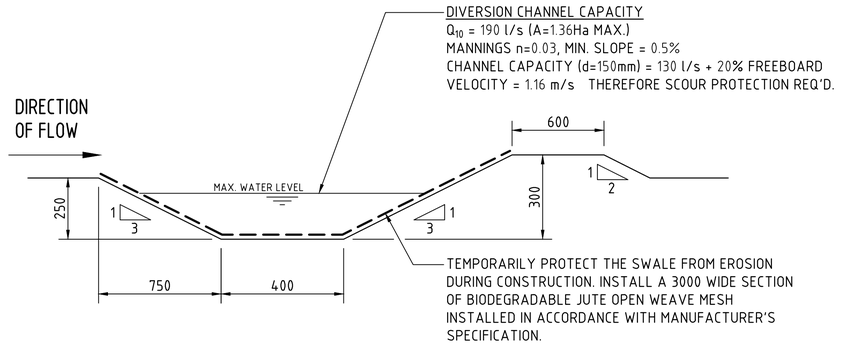
DRAWING No C09431.01-DA21
ISSUE B



KERB INLET CONTROL
N.T.S

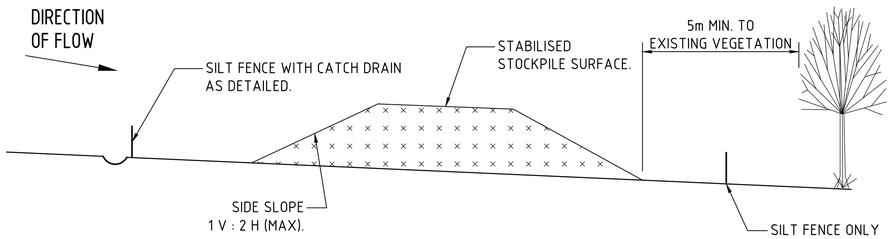


TYPICAL CROSSING OVER DIVERSION CHANNEL
SCALE 1:20



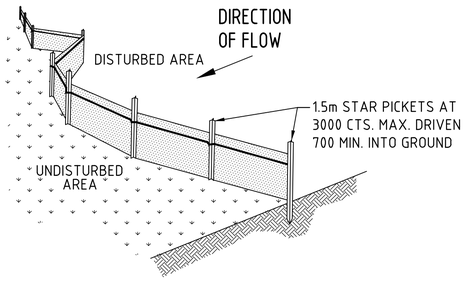
DIVERSION DRAIN SECTION
SCALE 1:20

NOTE :
ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.

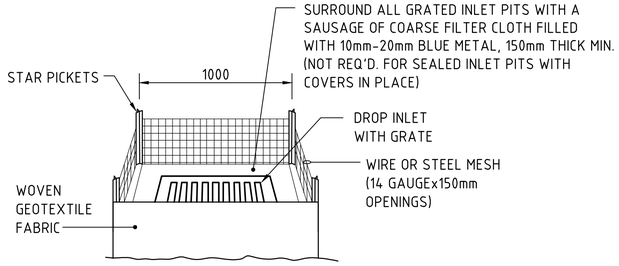


TYPICAL STOCKPILE DETAIL
N.T.S

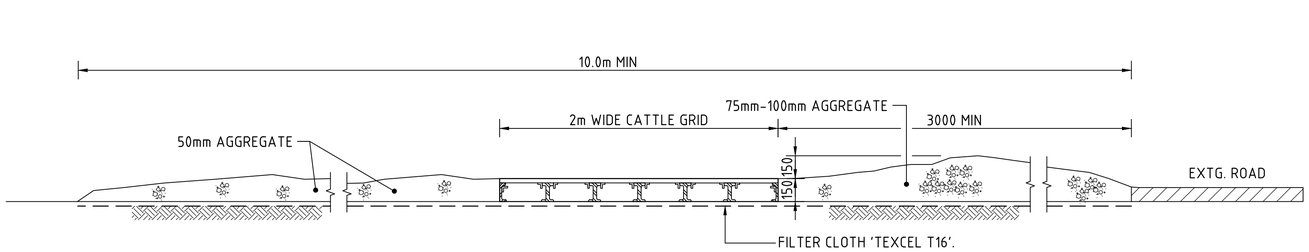
STOCKPILE NOTES
1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V: 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH – 16 TONNE/Ha.
5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.



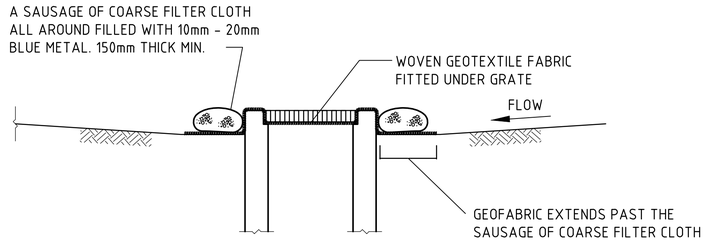
TYPICAL SILT FENCE DETAIL
N.T.S
NOTE: PROVIDE 1m RETURNS AT 30m INTERVALS. TYPICAL



'STAGE 1'
GRATED INLET PIT FILTER DETAIL
PAVEMENT TO REMAIN
N.T.S



SECTION 1:20 (1 / DA20) : STABILISED CONSTRUCTION ENTRANCE 'TRUCK SHAKER'



'STAGE 2'
GRATED INLET PIT FILTER DETAIL
PAVEMENT REMOVED
N.T.S

NOTE :
ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A1 SIZE SHEET

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DRAWING TITLE
EROSION & SEDIMENT CONTROL DETAILS
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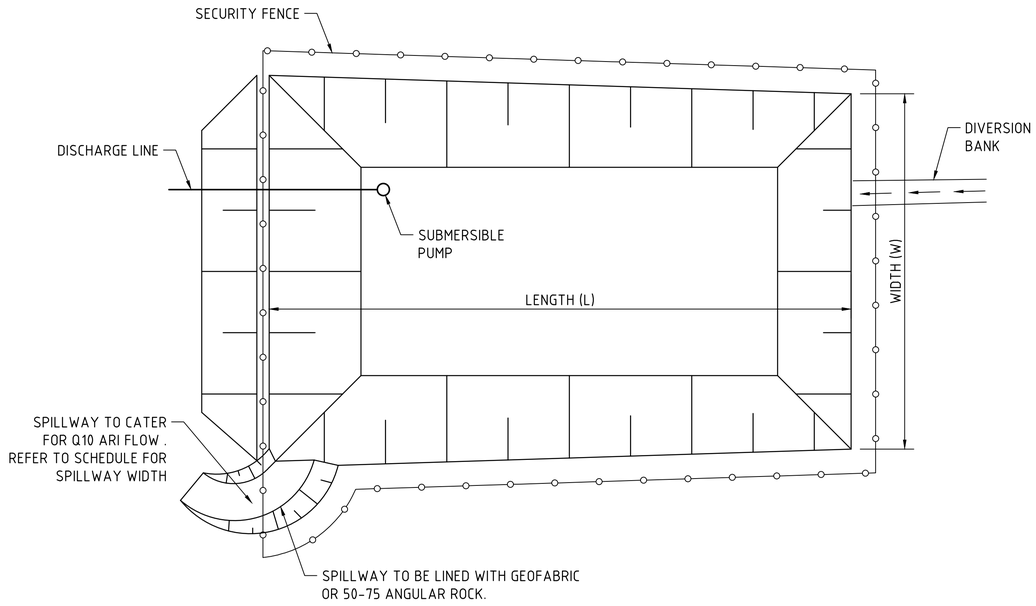
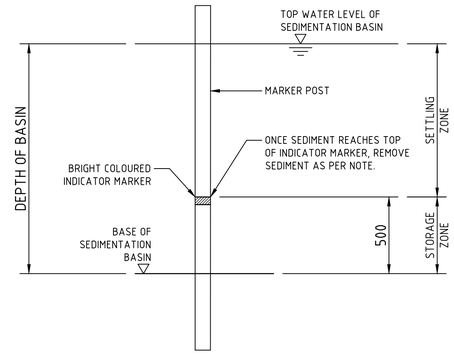


TYPICAL SEDIMENT CONTROL POND PLAN

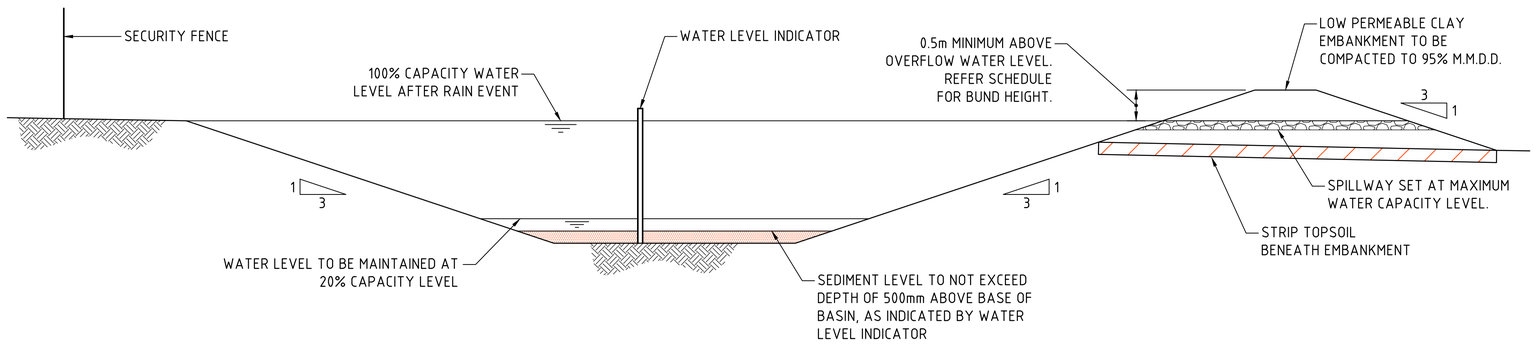
SCALE 1:250

SPILLWAY SCHEDULE					
CATCHMENT (Ha)	FLOW (m^3/s)	WIDTH (m)	FLOW DEPTH (m)	ROCK SIZE (mm)	BUND HEIGHT ABOVE SPILLWAY (m)
1	0.3	2	0.20	200	0.70
2	0.6	4	0.20	200	0.70
5	1.4	5	0.30	200	0.80
10	2.8	8	0.35	200	0.85
20	2.8	8	0.35	200	0.85



SEDIMENT STORAGE MARKER

SCALE 1:20



TYPICAL SEDIMENT CONTROL BASIN SECTION

SCALE 1:50

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

500mm 0 1 2 3 4 5m

SCALE 1:50 AT A1 SIZE SHEET

200mm 0 500 1000 1500 2000mm

SCALE 1:20 AT A1 SIZE SHEET

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CRC COSTIN ROE CONSULTING

CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE

EROSION & SEDIMENT CONTROL DETAILS
SHEET 2

DRAWING No C09431.01-DA 26

ISSUE B

SITE PREPARATION NOTES:

1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL ENGINEER.
2. EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY LTS TITLED 42250001DT DATED31/11/2022.
3. STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED. TOPSOIL BLENDING IS NOT ACCEPTABLE. ANY BLENDING PROPOSAL IS TO BE REFERRED TO THE ENGINEER.
4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/−10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/−20mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION. WHERE EXPOSED ROCK (WEATHERED SHALE OR SANDSTONE) IS ENCOUNTERED AT CUT SUBGRADE LEVEL, THE EARTHWORKS CONTRACTOR IS TO ALLOW TO RIP THE SURFACE TO A NOMINAL 0.3–0.4m DEPTH AND RECOMPACT (PER THE ENGINEERING SPEC) AS REQUIRED.
6. AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
7. SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
8. IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
9. ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 mm SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HILF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 mm SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 mm SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION
10. ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION.
11. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
12. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
13. MATCH EXISTING LEVELS AT BATTER INTERFACE.
14. CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.
15. DURING EARTHWORKS THE CONTRACTOR IS TO ENSURE ALL AREAS ARE FREE DRAINING & WILL NOT RETAIN WATER DURING RAINFALL. PROVIDE TEMPORARY MEASURES AS REQUIRED TO ENSURE FREE FLOWING RUNOFF THROUGH MANAGED DRAINAGE PATHS, DIVERSION DRAINS OR OTHER SUITABLE DISPOSAL METHOD AS AGREED DURING THE WORKS. REFER ANY CONCERNS TO THE ENGINEER. REFER TO EROSION AND SEDIMENT CONTROL DRAWINGS AND NOTES.

EARTHWORK ESTIMATES

SITE AREA	= 1.55 Ha
TOPSOIL STRIP (200mm OVER 1.35Ha)	=(−2,700m³) (TO BE EXPORTED/REUSED)
CUT	= −2,100m³
FILL	= +2,300m³
ALLOWANCES	
DETAILED EXCAVATION (1,500m³/Ha)	= −2,000m³
OSD TANK	= − 600m³
DIFFERENCE	= −2,400m³ (i.e. CUT OVER FILL)

NOTE:
VOLUMES BASED ON 200mm TOPSOIL STRIP OVER THE NOMINATED AREA AND ON A NOMINAL 300mm PAVEMENT DEPTH.
. EARTHWORKS VOLUMES ARE APPROXIMATE ONLY.
NO ALLOWANCE HAS BEEN MADE FOR DELETERIOUS MATERIAL, EROSION AND SEDIMENT CONTROL, BULKING OR COMPACTION OF FILLED SOILS, THE REMOVAL OF UNCONTROLLED OR CONTAMINATED MATERIAL OR ANY OTHER UNSPECIFIED EXCAVATION RELATED TO CONSTRUCTION ACTIVITIES. DETAILED EXCAVATION ALLOWANCE IS APPROXIMATE ONLY AND ACCOUNTS FOR STORMWATER/SERVICES TRENCHING AND FOUNDATIONS. THE DETAILED EXCAVATION VOLUMES ARE TO BE CONFIRMED BY THE CONTRACTOR. REFER ANY CONCERNS TO ENGINEER.

DEPTH RANGE

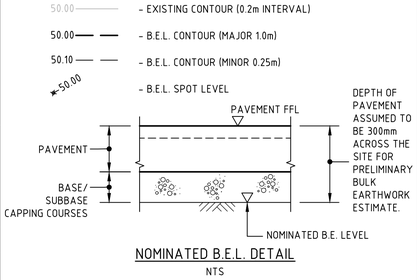
No.	FROM DEPTH	TO DEPTH	COLOUR
1	−4.000	−3.500	
2	−3.500	−3.000	
3	−3.000	−2.500	
4	−2.500	−2.000	
5	−2.000	−1.500	
6	−1.500	−1.000	
7	−1.000	−0.500	
8	−0.500	0.000	
9	0.000	0.500	
10	0.500	1.000	
11	1.000	1.500	
12	1.500	2.000	
13	2.000	2.500	
14	2.500	3.000	
15	3.000	3.500	
16	3.500	4.000	

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- 50.00 – EXISTING CONTOUR (0.2m INTERVAL)
- 50.00 – B.E.L. CONTOUR (MAJOR 1.0m)
- 50.10 – B.E.L. CONTOUR (MINOR 0.25m)
- ×50.00 – B.E.L. SPOT LEVEL



NOMINATED B.E.L. DETAIL
NTS

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

BREAKLINE – REFER TO DRAWING DA31 FOR CONTINUATION

BULK EARTHWORKS & CUT/FILL PLAN
SCALE 1:250

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT
sba

CLIENT
Goodman
LEVEL 17,
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SYDNEY
NSW, 2000, Australia
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Fax (02) 9230 7444

PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA30

CONSULT AUSTRALIA

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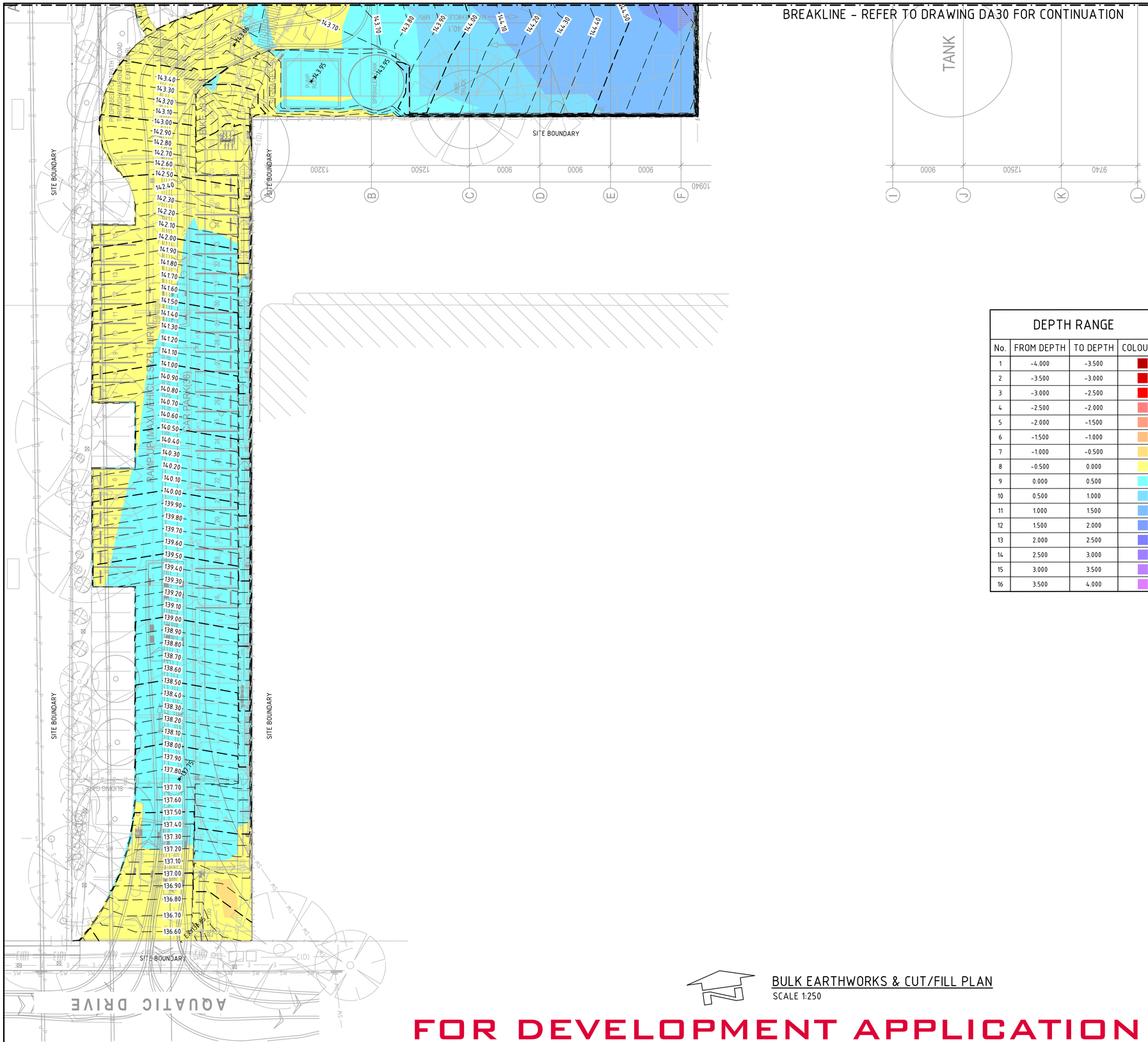
COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
BULK EARTHWORKS & CUT/FILL PLAN
SHEET 1

DRAWING No C09431.01-DA30
ISSUE B



DEPTH RANGE

No.	FROM DEPTH	TO DEPTH	COLOUR
1	-4.000	-3.500	
2	-3.500	-3.000	
3	-3.000	-2.500	
4	-2.500	-2.000	
5	-2.000	-1.500	
6	-1.500	-1.000	
7	-1.000	-0.500	
8	-0.500	0.000	
9	0.000	0.500	
10	0.500	1.000	
11	1.000	1.500	
12	1.500	2.000	
13	2.000	2.500	
14	2.500	3.000	
15	3.000	3.500	
16	3.500	4.000	

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4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION. WHERE EXPOSED ROCK (WEATHERED SHALE OR SANDSTONE) IS ENCOUNTERED AT CUT SUBGRADE LEVEL, THE EARTHWORKS CONTRACTOR IS TO ALLOW TO RIP THE SURFACE TO A NOMINAL 0.3-0.4m DEPTH AND RECOMPACT (PER THE ENGINEERING SPEC) AS REQUIRED.
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11. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
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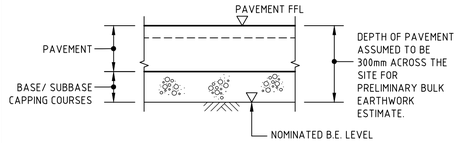
LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- 50.00 – EXISTING CONTOUR (0.2m INTERVAL)
- 50.00 – B.E.L. CONTOUR (MAJOR 1.0m)
- 50.10 – B.E.L. CONTOUR (MINOR 0.25m)
- ★50.00 – B.E.L. SPOT LEVEL



NOMINATED B.E.L. DETAIL
NTS

BULK EARTHWORKS & CUT/FILL PLAN
SCALE 1:250

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT
sba

CLIENT
Goodman
LEVEL 17,
60 Castlereagh Street
SYDNEY
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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 31

CONSULT AUSTRALIA

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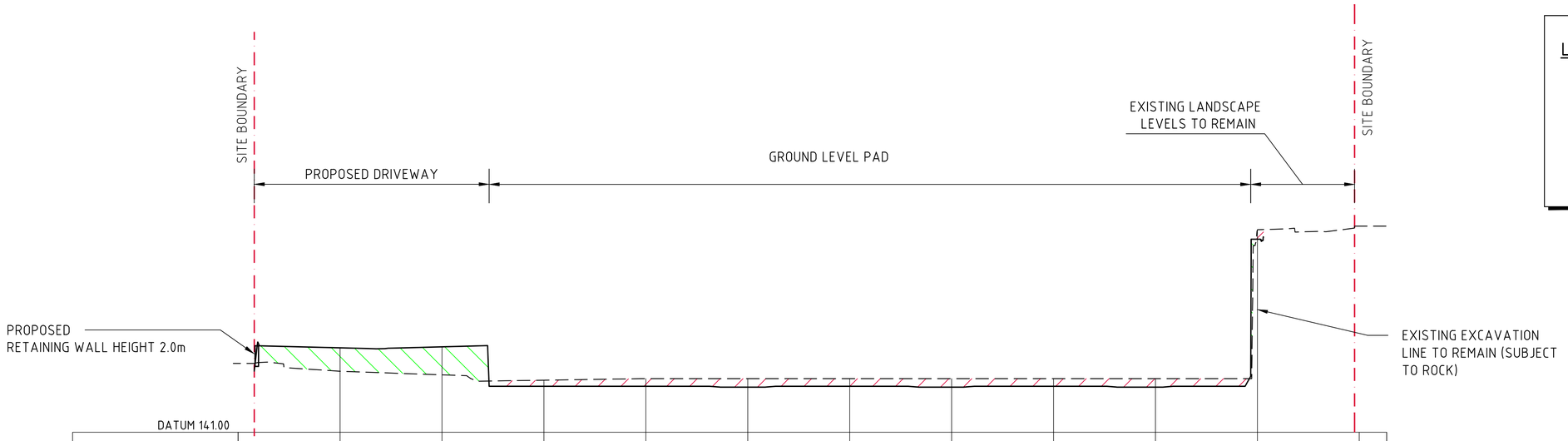
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
BULK EARTHWORKS & CUT/FILL PLAN
SHEET 2

DRAWING No C09431.01-DA 31
ISSUE B



DATUM 141.00

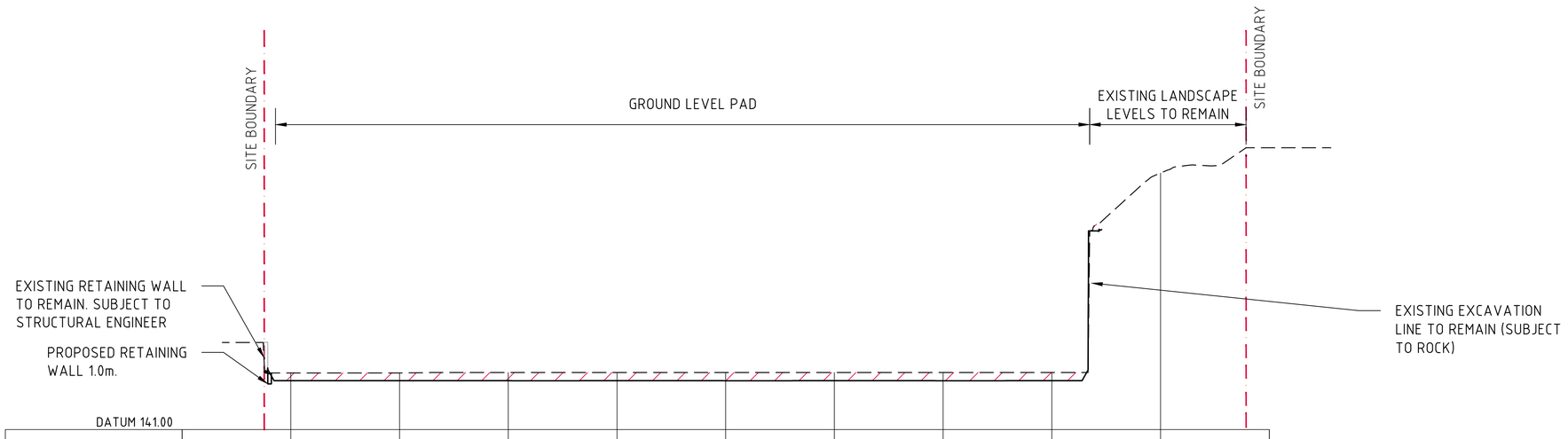
CUT/FILL DEPTH		-0.919	-1.098	0.240	0.300	0.332	0.300	0.332	0.300	0.331	0.354	
BULK EARTHWORKS LEVEL		144.311	144.348	142.800	142.800	142.768	142.800	142.768	142.800	142.769	148.572	
EXISTING SURFACE LEVEL		144.311	144.348	142.800	142.800	142.768	142.800	142.768	142.800	142.769	148.572	
CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	112.699

SECTION 02

HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100

LEGEND:

- DENOTES BULK EARTHWORKS PROFILE
- DENOTES EXISTING PROFILE
- DENOTES AREA IN CUT
- DENOTES AREA IN FILL



DATUM 141.00

CUT/FILL DEPTH		0.281	0.283	0.300	0.300	0.305	0.300	0.305	0.300		
BULK EARTHWORKS LEVEL		142.800	142.798	142.800	142.800	142.795	142.800	142.795	142.800		
EXISTING SURFACE LEVEL		142.800	142.798	142.800	142.800	142.795	142.800	142.795	142.800		
CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000

SECTION 01

HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100

1m 0 1 2 3 4 5 6 7 8 9 10m
SCALE 1:100 AT A1 SIZE SHEET

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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PROJECT
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14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA35

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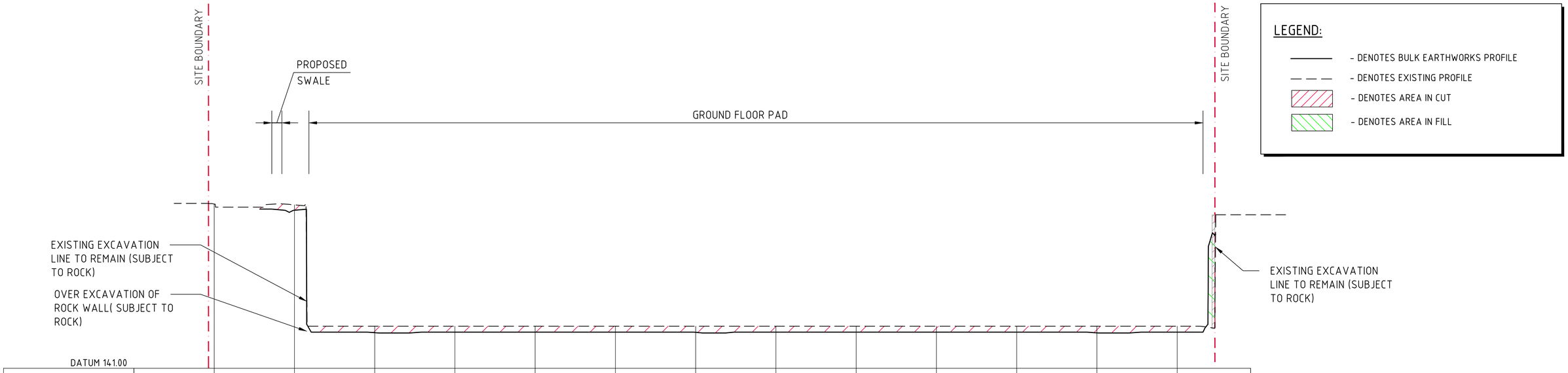
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
BULK EARTHWORKS SECTION
SHEET 1

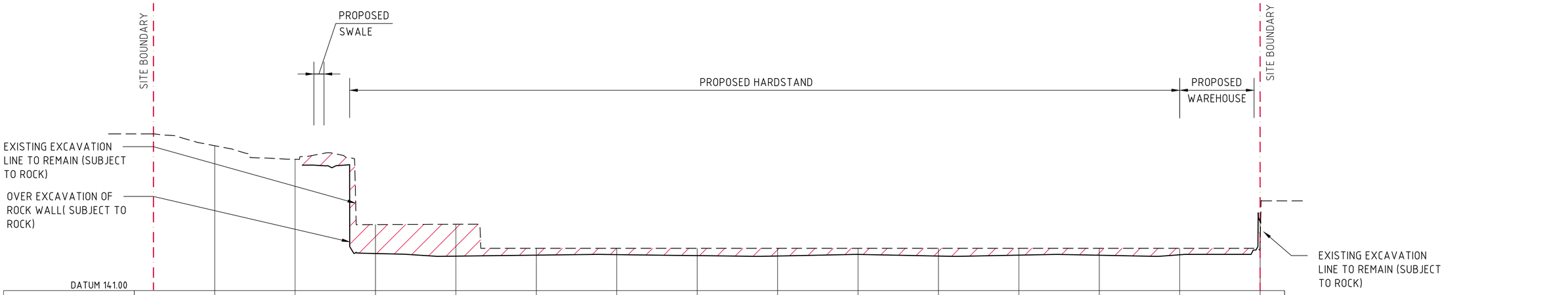
DRAWING No C09431.01-DA35
ISSUE B



DATUM 141.00

CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	139.154
CUT/FILL DEPTH		0.271	0.327	0.300	0.300	0.300	0.308	0.300	0.300	0.300	0.300	0.336	0.300		
BULK EARTHWORKS LEVEL		140.881	142.773	142.800	142.800	142.800	142.792	142.800	142.800	142.800	142.800	142.764	142.800		
EXISTING SURFACE LEVEL		140.881	142.773	142.800	142.800	142.800	142.792	142.800	142.800	142.800	142.800	142.764	142.800		

SECTION 04
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100



DATUM 141.00

CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	143.037
CUT/FILL DEPTH			1.438	1.586	0.338	0.312	0.362	0.380	0.301	0.383	0.337	0.342	0.320	-1.159		
BULK EARTHWORKS LEVEL			142.843	142.711	142.762	142.788	142.738	142.720	142.799	142.717	142.763	142.758	142.780	144.412		
EXISTING SURFACE LEVEL			142.843	142.711	142.762	142.788	142.738	142.720	142.799	142.717	142.763	142.758	142.780	144.412		

SECTION 03
HORIZONTAL SCALE 1:250
VERTICAL SCALE 1:100

1m 0 1 2 3 4 5 6 7 8 9 10m
SCALE 1:100 AT A1 SIZE SHEET

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

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DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 36

CONSULT AUSTRALIA

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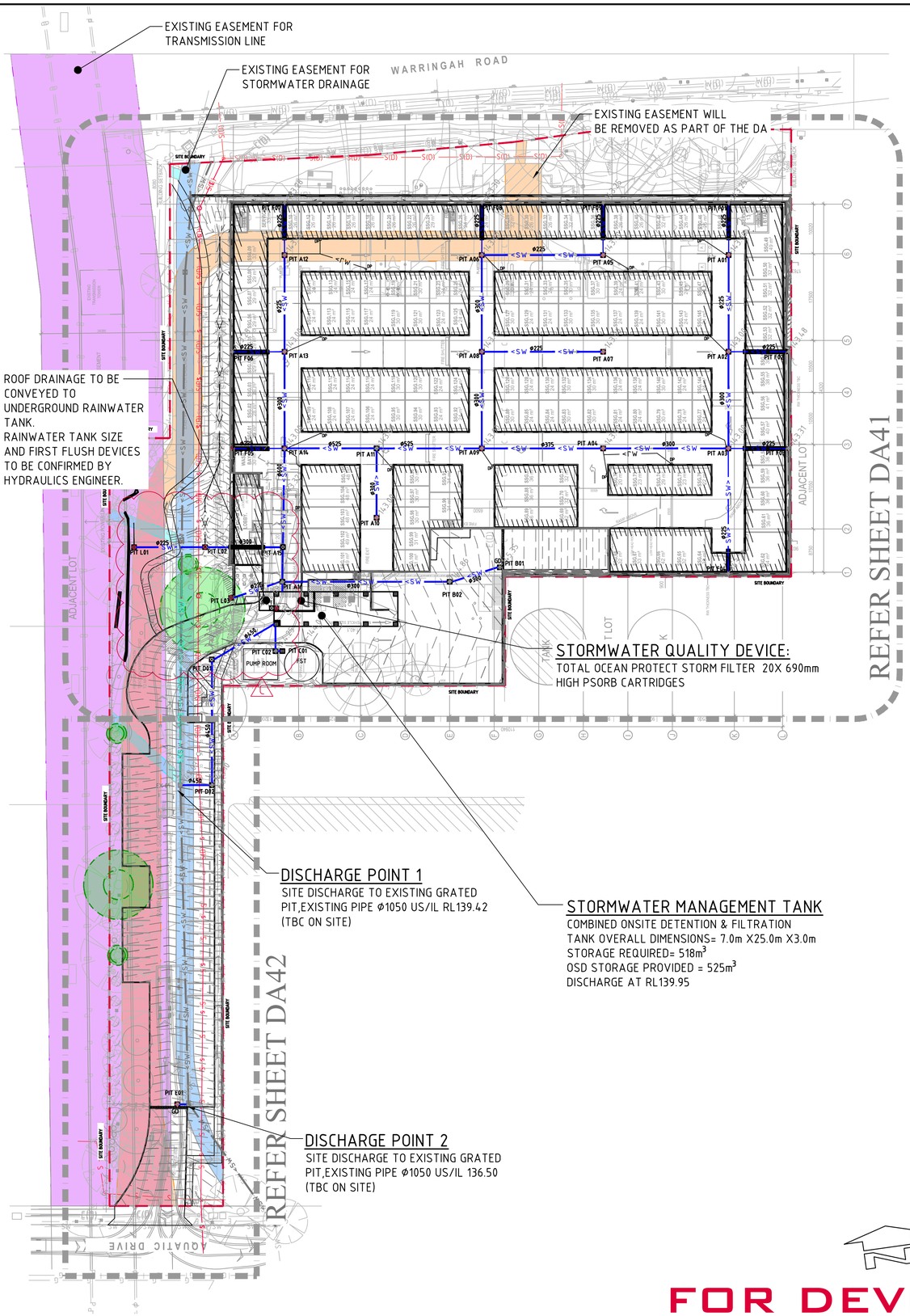
DRAWING TITLE
BULK EARTHWORKS SECTION
SHEET 2

DRAWING No C09431.01-DA 36
ISSUE B



PIT SCHEDULE - NETWORK A

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT A01	143.00	870	SGGP	900X900	900X900	◇
PIT A02	143.00	980	SGGP	900X900	900X900	◇
PIT A03	143.00	1090	SGGP	900X900	900X900	◇
PIT A04	143.00	1230	SGGP	900X900	900X900	◇
PIT A05	143.00	870	SGGP	900X900	900X900	◇
PIT A06	143.00	870	SGGP	900X90	900X90	◇
PIT A07	143.00	900	SGGP	900X900	900X900	◇
PIT A08	143.00	980	SGGP	900X900	900X900	◇
PIT A09	143.00	1370	SGGP	900X900	1200X900	◇
PIT A10	143.00	900	SGGP	900X900	900X900	◇
PIT A11	143.09	1580	SJP	900X900	1200X900	
PIT A12	143.00	870	SGGP	900X900	900X900	◇
PIT A13	143.00	980	SGGP	900X900	900X900	◇
PIT A14	143.00	1600	SGGP	900X900	1200X900	◇
PIT A15	143.00	1670	SJP	900X900	1200X900	
PIT A16	143.86	2630	SJP	900X900	1200X900	

PIT SCHEDULE - NETWORK B

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT B01	145.36	900	SGGP/GD	900X900	900X900	◇
PIT B02	144.86	900	SJP	900X900	900X900	

PIT SCHEDULE - NETWORK C

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT C01	144.00	900	SGGP	900X900	900X900	
PIT C02	144.00	900	SGGP	900X900	900X900	

PIT SCHEDULE - NETWORK D

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT D01	143.95	4310	SJP	900X900	900X900	
PIT D02	142.20	2630	SJP	900X900	900X900	

PIT SCHEDULE - NETWORK D

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT E01	138.04	900	SGGP/GD	900X900	900X900	◇

PIT SCHEDULE - NETWORK F

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT F01	143.10	900	SGGP	900X900	900X900	◇
PIT F02	143.10	900	SGGP	900X900	900X900	◇
PIT F03	143.10	900	SGGP	900X900	900X900	◇
PIT F04	143.10	900	SGGP	900X900	900X900	◇
PIT F05	143.10	900	SGGP	900X900	900X900	◇
PIT F06	143.10	900	SGGP	900X900	900X900	◇
PIT F07	143.10	900	SGGP	900X900	900X900	◇
PIT F08	143.10	900	SGGP	900X900	900X900	◇
PIT F09	143.10	900	SGGP	900X900	900X900	◇

PIT SCHEDULE - NETWORK L

PIT No.	GRATE RL	DEPTH	TYPE	GRATE SIZE	CHAMBER SIZE	COMMENT
PIT L01	145.11	900	SGGP	900X900	900X900	◇
PIT L02	144.93	930	SGGP	900X900	900X900	◇
PIT L03	144.10	1140	SGGP	900X900	900X900	◇

STORMWATER DRAINAGE NOTES:

1. ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
3. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS SSDA50.
4. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
5. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
6. ALL STORMWATER PIPES ø375 OR GREATER SHALL BE CLASS 2 (WITH HS2 SUPPORT) REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
7. ALL PIPES UP TO AND INCLUDING ø300 TO BE uPVC GRADE SN8 UNO.
8. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
9. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c=25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
10. IN ADDITION TO ITEM 9 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
11. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
12. CONCRETE PIPES UNDER, OR WITHIN THE ZONE OF INFLUENCE OF PAVED AREAS SHALL BE LAID USING HS2 TYPE SUPPORT, AS A MINIMUM, IN ACCORDANCE WITH AS 3725. AGGREGATE BACKFILL SHALL NOT BE USED FOR PIPE BEDDING AND OR HAUNCH/SIDE SUPPORT.
13. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED ø100 uPVC TO EACH SIDE OF PIPE.
14. ALL SUBSOIL DRAINAGE LINES SHALL BE ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
15. WHERE SUBSOIL DRAINAGE PASSES UNDER A PAVEMENT OR A SLAB, UNSLOTTED UPVC ARE TO BE PROVIDED UNLESS NOTED OTHERWISE.
16. ALL PIPE GRADES 1 IN 200 MINIMUM UNO.
17. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
18. MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
19. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
20. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
21. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
22. PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.
23. WHERE CONNECTION TO EXISTING INGROUND DRAINAGE SYSTEMS, OPEN SWALES, CHANNELS OR ANY OTHER EXISTING SYSTEM, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION AND INVERT ON SITE AT THE BEGINNING OF THE CONSTRUCTION PERIOD. REFER ANY VARIANCE FROM DOCUMENTATION OR SURVEYS TO THE ENGINEER FOR CLARIFICATION.

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- SW> - PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- DP - ROOFWATER DOWNPIPE (INDICATIVE)
- rw> - ROOFWATER LINE
- ss> - SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- S - EXISTING SEWER
- DENOTES AREA DRAINING TO RAINWATER TANK
- SWALE

NOTES:

1. ALL SURFACE INLET PITS & ROOFWATER COLLECTION PITS DENOTED WITH ◇ TO BE FITTED WITH OCEANPROTECT OCEANGUARD OG200 PIT INSERTS.
2. PROVIDE SUBSOIL LINES TO ALL PAVEMENT, LANDSCAPE INTERFACES AND WALLS IN ACCORDANCE TO NOTE 14.

STORMWATER DRAINAGE - KEY PLAN
SCALE 1:500

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	23.04.25	C
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT: sba

CLIENT: Goodman
LEVEL 17, 60 Castlereagh Street SYDNEY NSW, 2000, Australia
Tel (02) 9230 7400 Fax (02) 9230 7444

PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST, NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 40

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DRAWING TITLE
STORMWATER DRAINAGE KEY PLAN

DRAWING No C09431.01-DA 40
ISSUE C

EXISTING EASEMENT FOR TRANSMISSION LINE

SITE BOUNDARY

EXISTING EASEMENT FOR STORMWATER DRAINAGE

EXISTING SEWER MANHOLE LID TO BE ADJUSTED TO SUIT FINAL LEVELS

EXISTING EASEMENT FOR STORMWATER DRAINAGE

RETAINING BY BUILDING PRE-CAST WALL

EXISTING EASEMENT FOR STORMWATER DRAINAGE

EXISTING RETAINING WALLS TO REMAIN

EXISTING TREE TO REMAIN. ALL WORKS WITHIN THE TPZ TO BE COMPLETED IN ACCORDANCE WITH THE ARBORIST REQUIREMENTS.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

EXTENT OF BASEMENT. EXCAVATION TO MATCH EXISTING U.N.O.

EXISTING EASEMENT WILL BE REMOVED AS PART OF THE DA

SITE BOUNDARY

BUILDING SETBACK

ADJACENT LOT

RAMP ABOVE

RAMP BELOW

FIRE SHUTTER

PLANTER

PIT F07 · PIT F08 · PIT F09 · PIT F01 · PIT F02 · PIT F03 · PIT F04 · PIT F05 · PIT F06

PIT A12 · PIT A06 · PIT A05 · PIT A01 · PIT A13 · PIT A08 · PIT A07 · PIT A02 · PIT A14 · PIT A11 · PIT A09 · PIT A04 · PIT A03 · PIT A10 · PIT A15 · PIT A16

PIT L01 · PIT L02 · PIT L03 · PIT B01 · PIT B02 · PIT C01 · PIT C02 · PIT D01

PUMP ROOM · FCT

STORMWATER QUALITY DEVICE:

TOTAL OCEAN PROTECT STORM FILTER XX 690mm HIGH PSORB CARTRIDGES

STORMWATER MANAGEMENT TANK

COMBINED ONSITE DETENTION & FILTRATION
TANK OVERALL DIMENSIONS= 7.0m X25.0m X3.0m
STORAGE REQUIRED= 518m³
OSD STORAGE PROVIDED = 525m³
DISCHARGE AT RL139.95

PROPOSED RETAINING WALL IN FILL
MAX H=3.5m

PROPOSED RETAINING WALL IN FILL
MAX H=2.5m

PROPOSED RETAINING WALL IN CUT
MAX H=1.0m

RETAINING BY BUILDING PRE-CAST WALL

ROOF DRAINAGE TO BE CONVEYED TO UNDERGROUND RAINWATER TANK. RAINWATER TANK SIZE AND FIRST FLUSH DEVICES TO BE CONFIRMED BY HYDRAULICS ENGINEER.

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- SW> – PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- DP – ROOFWATER DOWNPIPE (INDICATIVE)
- rw> – ROOFWATER LINE
- ss> – SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- 50.00 – FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 – FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- S – EXISTING SEWER
- DENOTES AREA DRAINING TO RAINWATER TANK
- SWALE

NOTES:

1. REFER TO DRAWING DA40 FOR STORMWATER DRAINAGE NOTES.
2. REFER TO DRAWING DA40 FOR PIT SCHEDULE.
3. ALL SURFACE INLET PITS & ROOFWATER COLLECTION PITS DENOTED WITH ◇ TO BE FITTED WITH OCEANPROTECT OCEANGUARD OG200 PIT INSERTS.
4. PROVIDE SUBSOIL LINES TO ALL PAVEMENT, LANDSCAPE INTERFACES AND WALLS IN ACCORDANCE TO NOTE 14.

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

BREAKLINE - REFER TO DRAWING DA42 FOR CONTINUATION

STORMWATER DRAINAGE - SHEET 1

SCALE 1:250

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
REVISED AS CLOUDED	23.04.25	C
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT: sba

CLIENT: Goodman
LEVEL 17, 60 Castlereagh Street SYDNEY NSW, 2000, Australia
Tel (02) 9230 7400 Fax (02) 9230 7444

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST, NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 41

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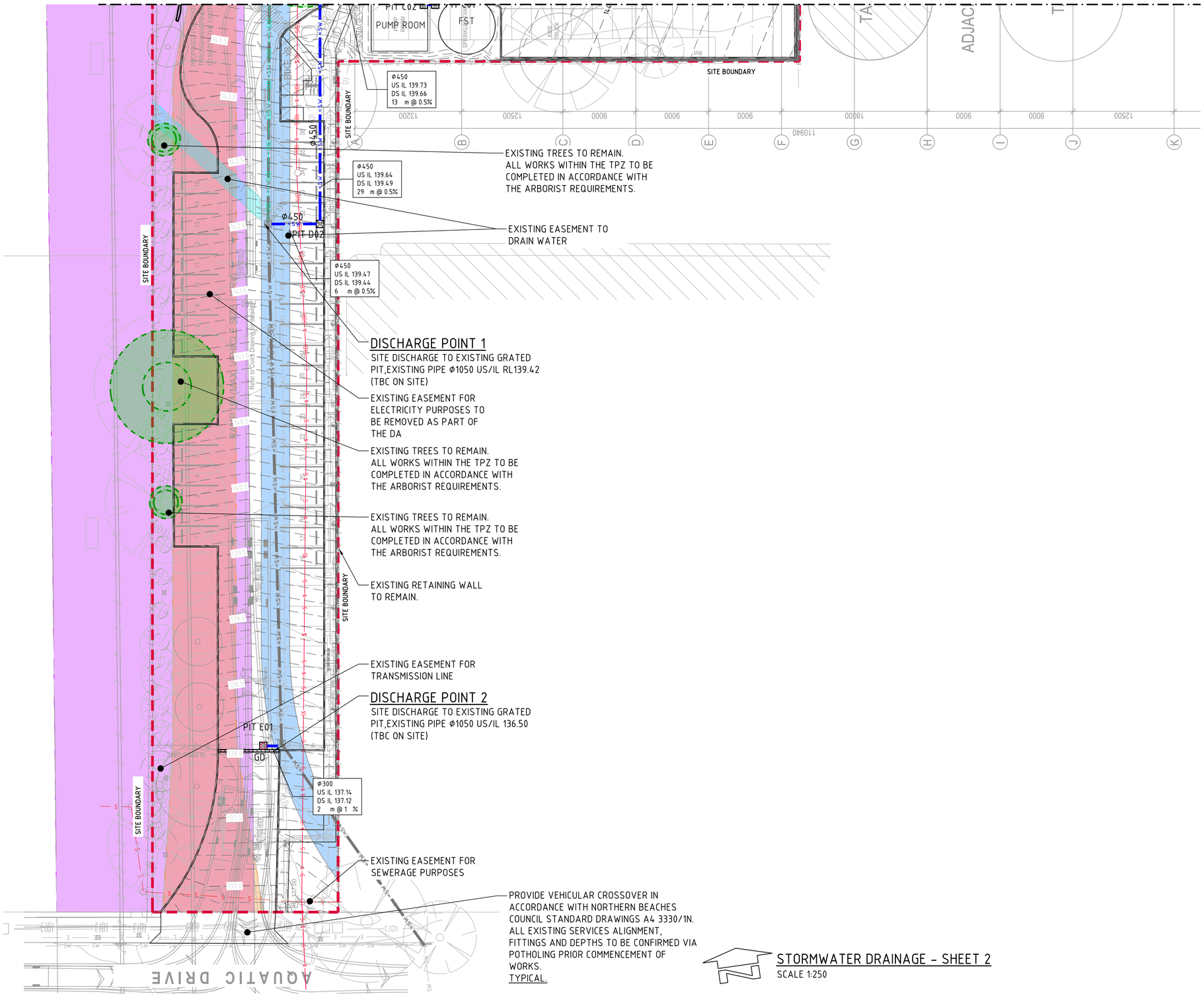
DRAWING TITLE: STORMWATER DRAINAGE PLAN GROUND FLOOR SHEET 1

DRAWING No C09431.01-DA 41 ISSUE C

BREAKLINE - REFER TO DRAWING DA41 FOR CONTINUATION



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
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- EXISTING DRAINAGE LINE
- DP - ROOFWATER DOWNPIPE (INDICATIVE)
- RW> - ROOFWATER LINE
- SS> - SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- S - EXISTING SEWER
- DENOTES AREA DRAINING TO RAINWATER TANK
- SWALE

NOTES:

1. REFER TO DRAWING DA40 FOR STORMWATER DRAINAGE NOTES.
2. REFER TO DRAWING DA40 FOR PIT SCHEDULE.
3. ALL SURFACE INLET PITS & ROOFWATER COLLECTION PITS DENOTED WITH TO BE FITTED WITH OCEANPROTECT OCEANGUARD OG200 PIT INSERTS.
4. PROVIDE SUBSOIL LINES TO ALL PAVEMENT, LANDSCAPE INTERFACES AND WALLS IN ACCORDANCE TO NOTE 14.

STORMWATER DRAINAGE - SHEET 2
SCALE 1:250

2m 0 5 10 15 20 25m
SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT
sba

CLIENT
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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 42

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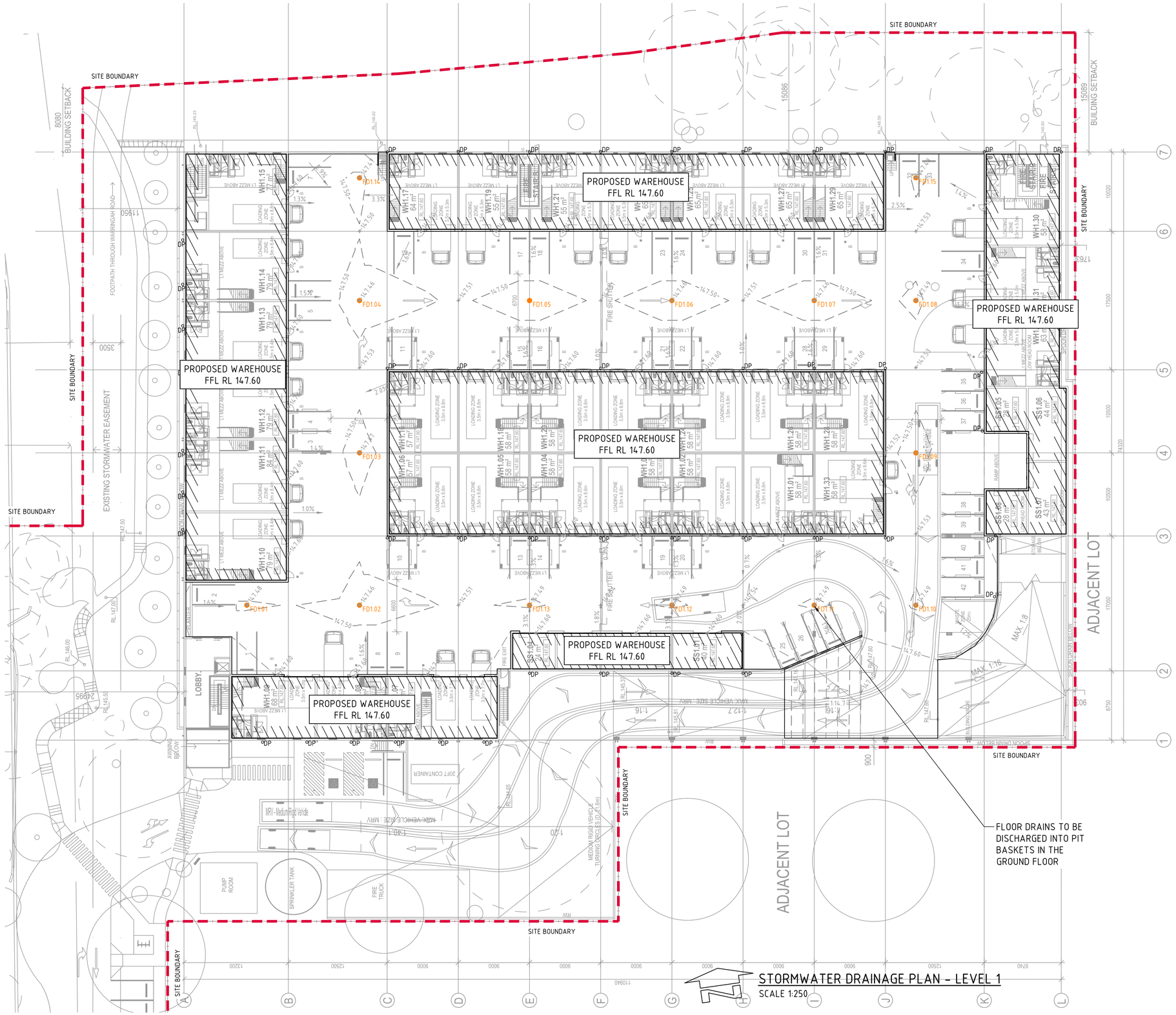
COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
STORMWATER DRAINAGE PLAN
GROUND FLOOR
SHEET 2

DRAWING No C09431.01-DA 42
ISSUE B



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
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- EXISTING DRAINAGE LINE
- DP - ROOFWATER DOWNPIPE (INDICATIVE)
- RW> - ROOFWATER LINE
- SS> - SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- S - EXISTING SEWER
- DENOTES AREA DRAINING TO RAINWATER TANK
- SWALE
- FD2.07 - FLOOR DRAIN

NOTES:

1. REFER TO DRAWING DA40 FOR STORMWATER DRAINAGE NOTES.
2. REFER TO DRAWING DA40 FOR PIT SCHEDULE.
3. ALL SURFACE INLET PITS & ROOFWATER COLLECTION PITS DENOTED WITH T TO BE FITTED WITH OCEANPROTECT OCEANGUARD OG200 PIT INSERTS.
4. PROVIDE SUBSOIL LINES TO ALL PAVEMENT, LANDSCAPE INTERFACES AND WALLS IN ACCORDANCE TO NOTE 14.

STORMWATER DRAINAGE PLAN - LEVEL 1

SCALE 1:250

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT
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CLIENT
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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 43

CONSULT AUSTRALIA

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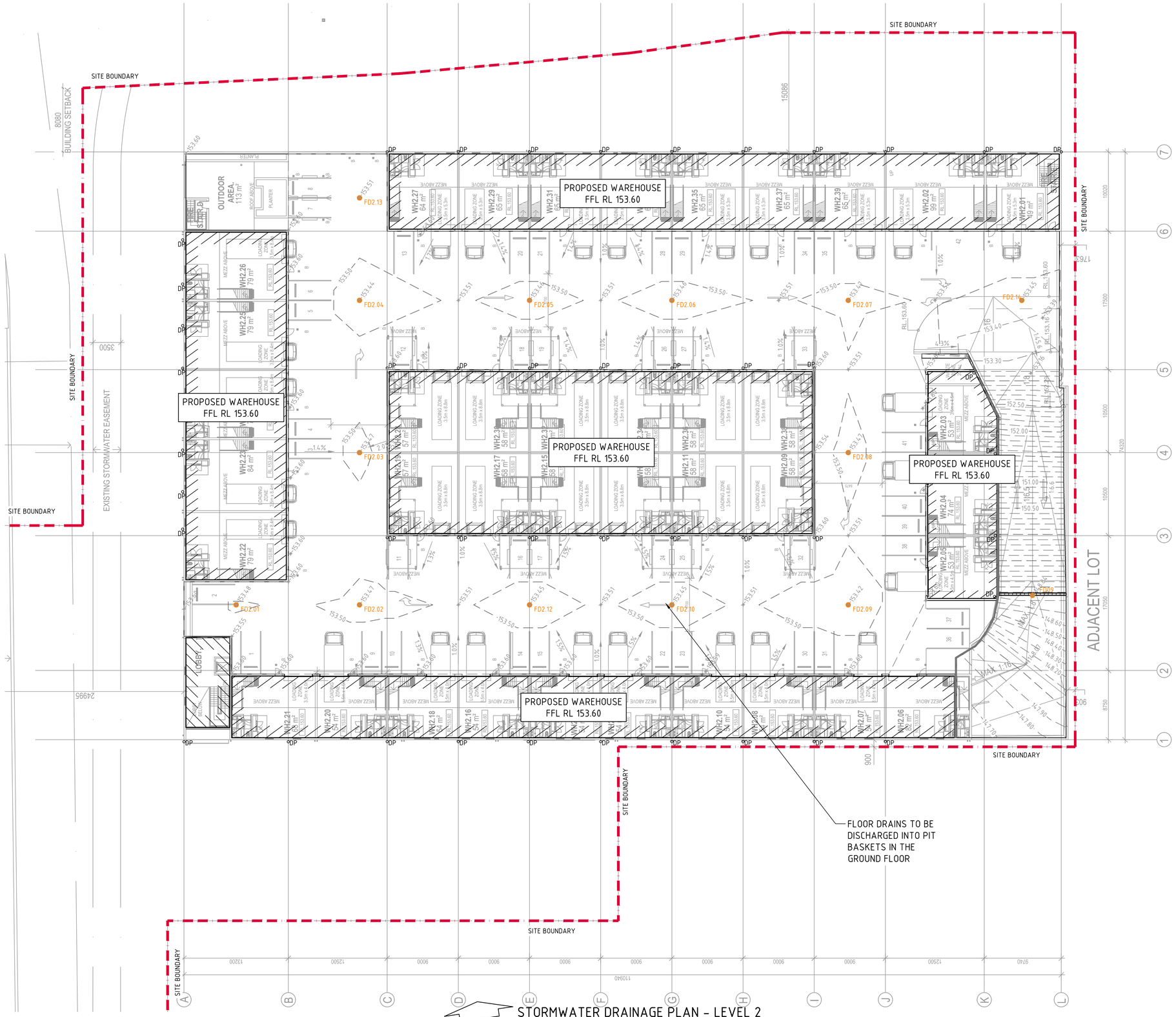
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
STORMWATER DRAINAGE PLAN
LEVEL 1

DRAWING No C09431.01-DA 43

ISSUE B



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LTS DATED 31/11/2022.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- SW> – PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- DP – ROOFWATER DOWNPIPE (INDICATIVE)
- RW> – ROOFWATER LINE
- SS> – SUBSOIL LINE
- OVERLAND FLOW DIRECTION
- 50.00 – FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 – FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- S – EXISTING SEWER
- DENOTES AREA DRAINING TO RAINWATER TANK
- SWALE
- FD2.07 – FLOOR DRAIN

NOTES:

1. REFER TO DRAWING DA40 FOR STORMWATER DRAINAGE NOTES.
2. REFER TO DRAWING DA40 FOR PIT SCHEDULE.
3. ALL SURFACE INLET PITS & ROOFWATER COLLECTION PITS DENOTED WITH TO BE FITTED WITH OCEANPROTECT OCEANGUARD OG200 PIT INSERTS.
4. PROVIDE SUBSOIL LINES TO ALL PAVEMENT, LANDSCAPE INTERFACES AND WALLS IN ACCORDANCE TO NOTE 14.

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

STORMWATER DRAINAGE PLAN - LEVEL 2

SCALE 1:250

FOR DEVELOPMENT APPLICATION

ISSUE	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A
AMENDMENTS	DATE	ISSUE

ARCHITECT
sba

CLIENT
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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA44

CONSULT AUSTRALIA

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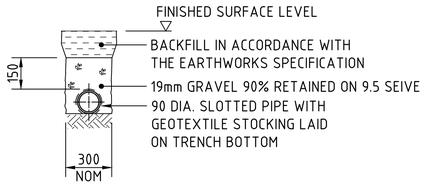
CRC COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

DRAWING TITLE
STORMWATER DRAINAGE PLAN
LEVEL 2

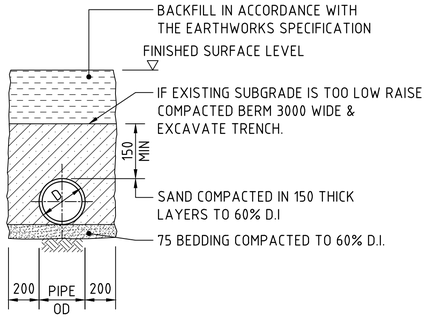
DRAWING No C09431.01-DA 44

ISSUE B



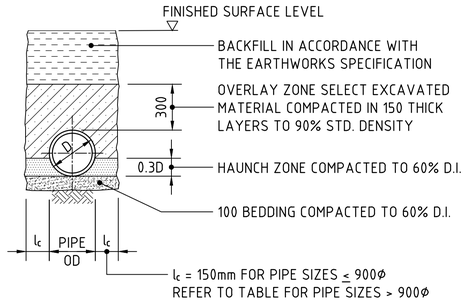
SUPPORT TO AGRICULTURAL DRAIN

SCALE 1:20



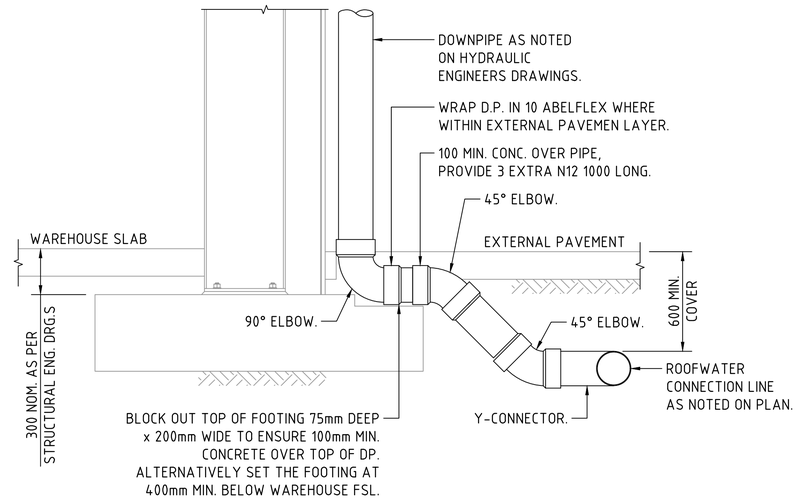
SUPPORT TO uPVC PIPES

SCALE 1:20



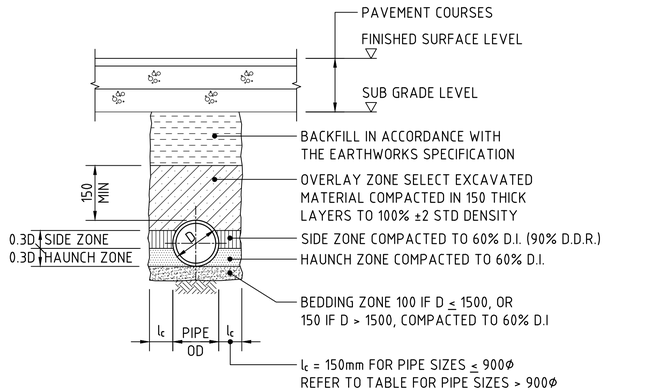
TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS

SCALE 1:20



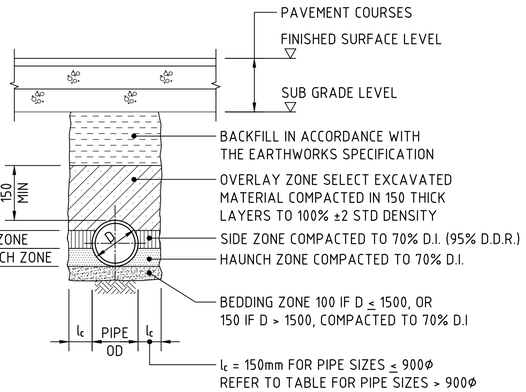
DOWNPIPE TURN-UP DETAIL A

(AT FOOTING LOCATION)
SCALE 1:20



TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20
D ≤ 1350, MAX FILL = 4.0m
D > 1350, MAX FILL = 3.0m



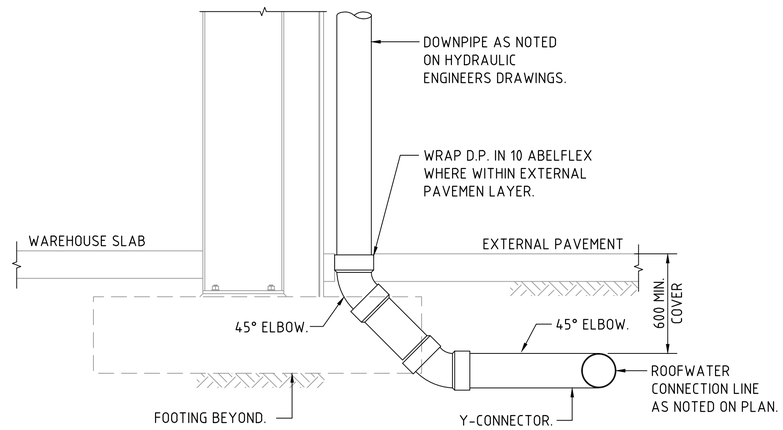
TYPE HS3 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

SCALE 1:20
D ≤ 1050, MAX FILL = 6.0m
D > 1050, MAX FILL = 4.8m

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE WIDTH	
PIPE SIZE (mm)	l_c (mm)
≤ 900Ø	150
1050Ø	175
1200Ø	200
1350Ø	225
1500Ø	250
1650Ø	275
1800Ø	300
ENGINEER TO SPECIFY TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800Ø	

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE (mm)	WEIGHT PASSING (%)
19.0	100
9.5	100 TO 50
2.6	100 TO 30
0.60	50 TO 15
0.075	25 TO 0
SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725	



DOWNPIPE TURN-UP DETAIL B

(CLEAR OF FOOTING)
SCALE 1:20

200mm 0 500 1000 1500 2000mm

SCALE 1:20 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 45

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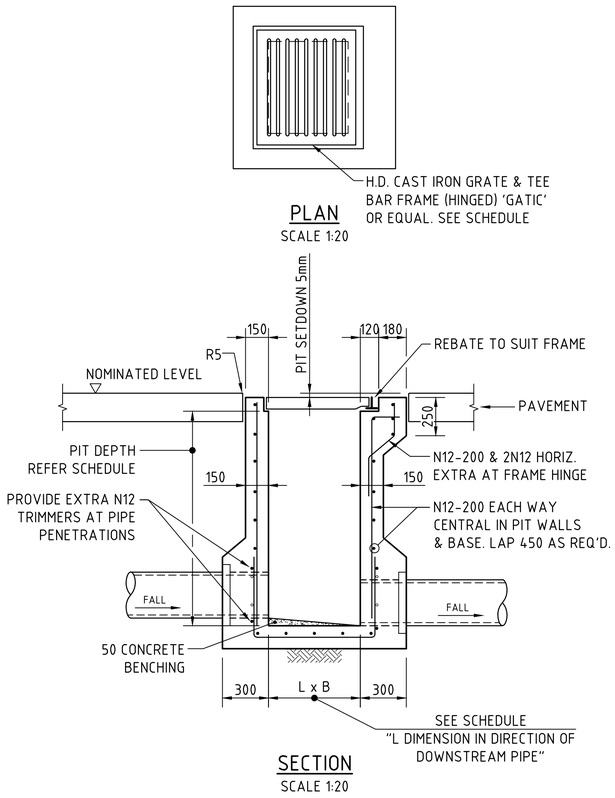
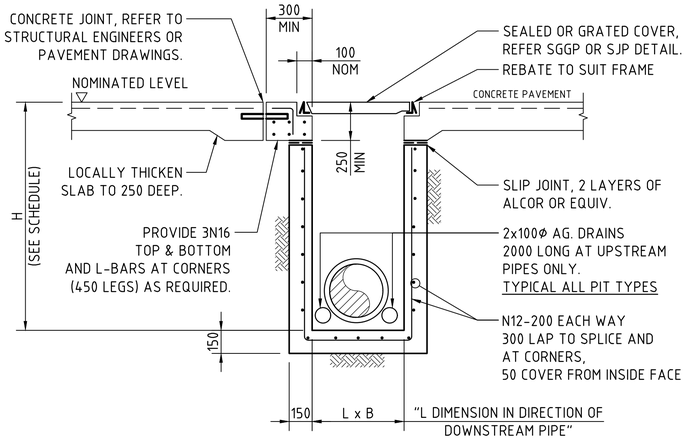
DRAWING TITLE
STORMWATER DRAINAGE DETAILS
SHEET 1

DRAWING No C09431.01-DA45
ISSUE B

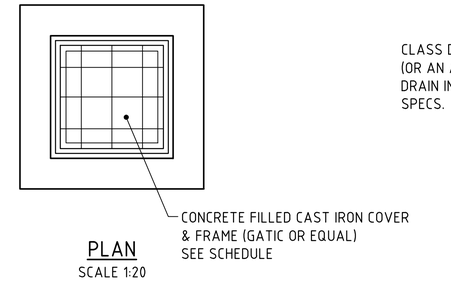


SINGLE GRATED GULLY PIT - SGGP

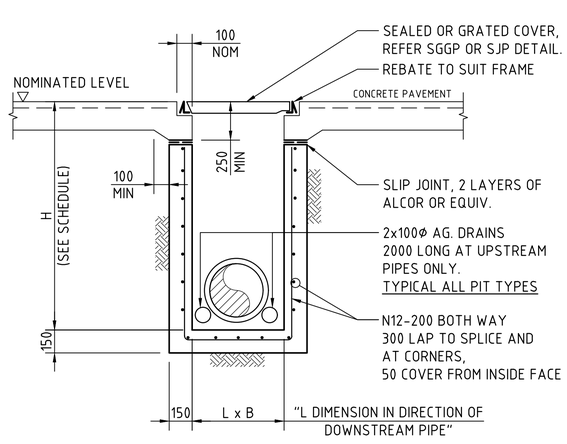


SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

(ADOPT IN CONCRETE PAVEMENT FOR SGGP's & SJP's, WHERE PITS ARE LOCATED IN THE CORNER OF SLAB PANELS OR ADJACENT TO SLAB PANEL JOINTS)

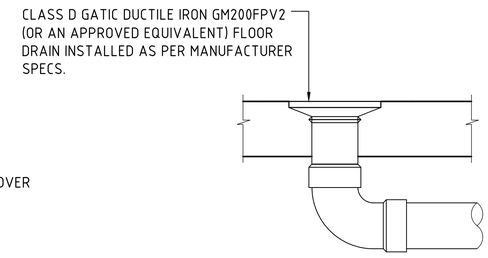


SEALED JUNCTION PIT - SJP



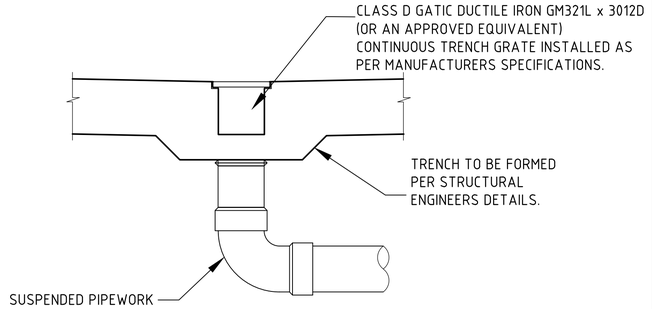
SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL GRATE/COVER SUPPORT CAST-INTO PAVEMENT SLAB

(ADOPT IN CONCRETE PAVEMENTS FOR SGGP's & SJP's, WHERE JOINTS ARE NOT LOCATED WITHIN PROXIMITY OF THE GRATE)



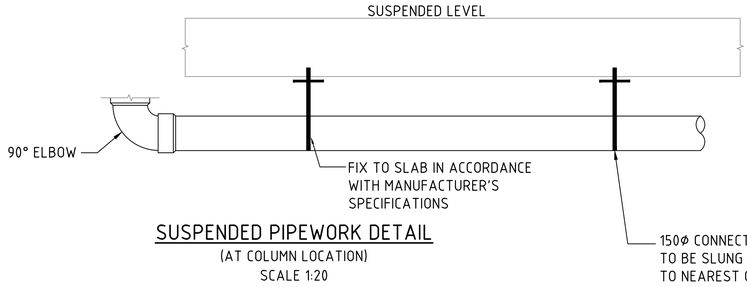
FLOOR DRAIN - FD

SCALE 1:10
(FOR USE IN SUSPENDED SLABS)



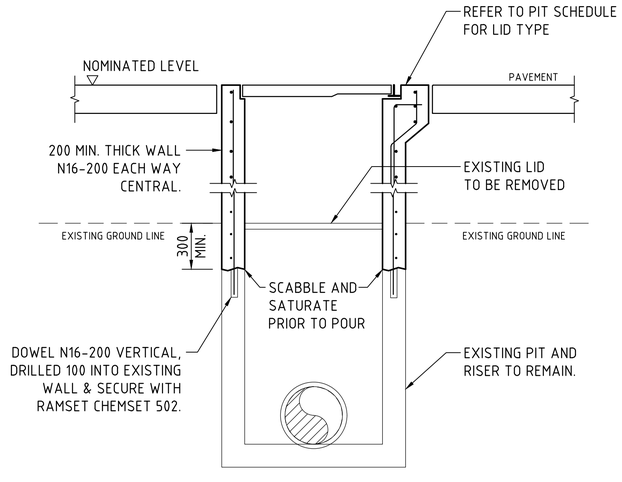
GRATED DRAIN - GD

SCALE 1:10
(FOR USE IN SUSPENDED SLABS)



SUSPENDED PIPEWORK DETAIL

(AT COLUMN LOCATION)
SCALE 1:20



SECTION
SCALE 1:20

DRAINAGE PIT RISER DETAIL

100mm 0 200 400 600 800 1000mm
SCALE 1:10 AT A1 SIZE SHEET

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A1 SIZE SHEET

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 46

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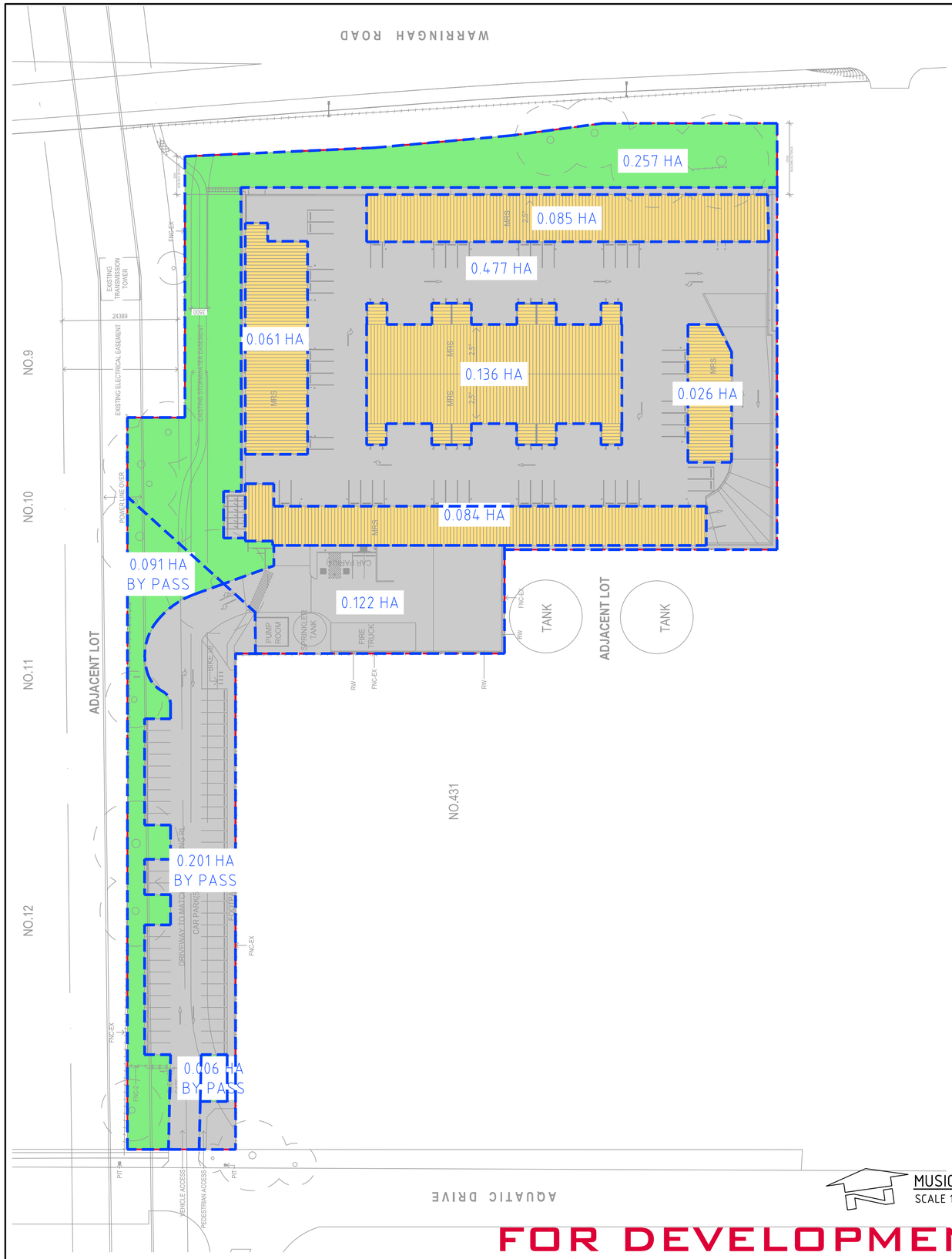
DRAWING TITLE
STORMWATER DRAINAGE DETAILS
SHEET 2

DRAWING No C09431.01-DA 46
ISSUE B



LEGEND:

– PROPOSED MUSIC CATCHMENT

NOTES:

1. REFER TO DRAWING DA40 FOR STORMWATER DRAINAGE NOTES.

MUSIC CATCHMENT PLAN

SCALE 1:500

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	A
AMENDMENTS	DATE	ISSUE

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PROJECT

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NSW, 2086

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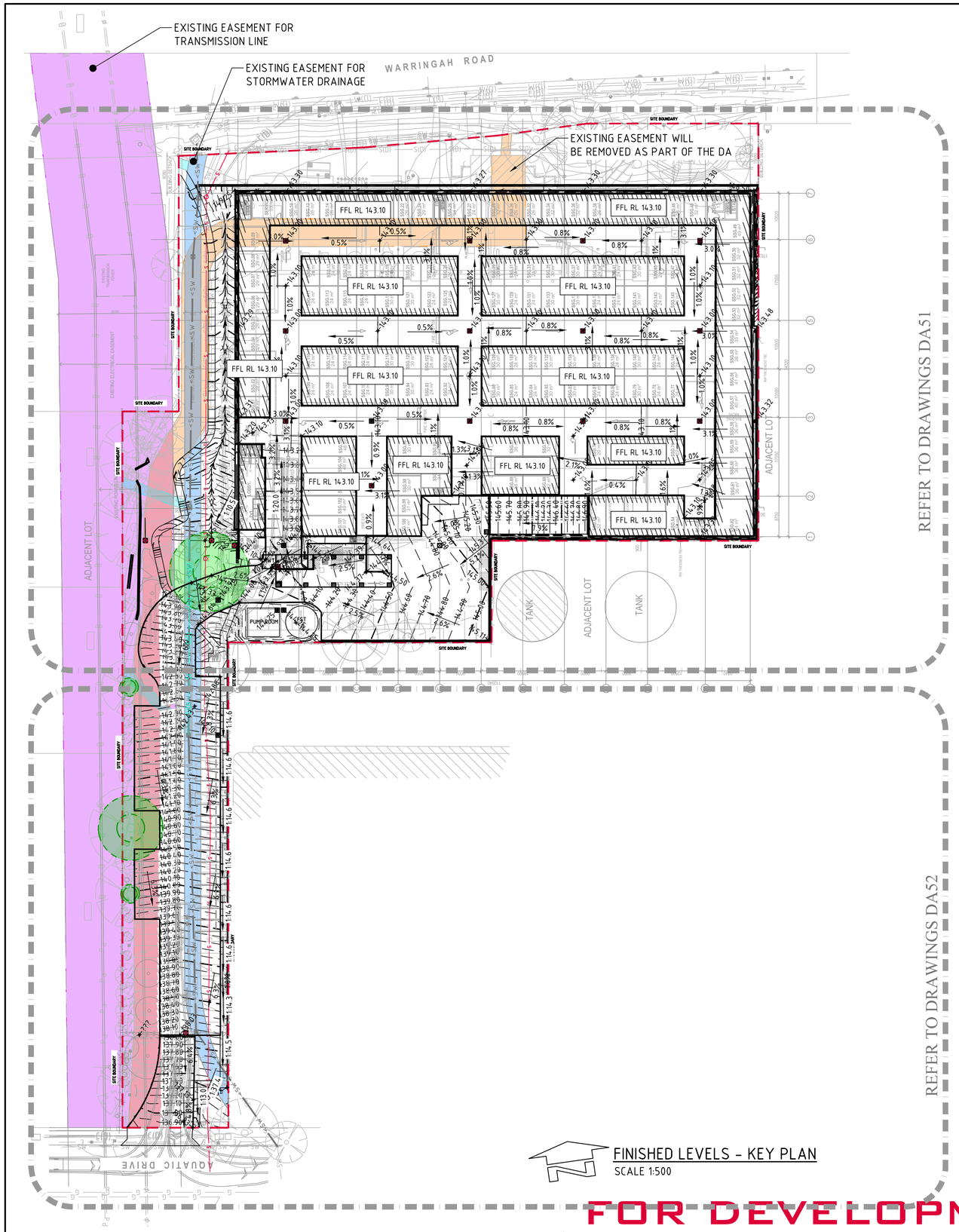
DRAWING TITLE

MUSIC CATCHMENT PLAN
BASEMENT

DRAWING No C09431.01-DA48

ISSUE A



FINISHED LEVELS - KEY PLAN
SCALE 1:500

FINISHED LEVELS PLAN NOTES:

1. LEVELS DATUM IS AUSTRALIAN HEIGHT DATUM (A.H.D.).
2. GRADING REQUIREMENTS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS2890.1, AS2890.2 AND AS2890.6.
3. ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
4. CONTOUR INTERVALS
   - THE MINOR CONTOUR INTERVAL IS 0.1m.
   - THE MAJOR CONTOUR INTERVAL IS 0.5m.
5. HARDSTAND GRADING
   - MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
   - GRADING OF ON-GRADE DOCKS TO BE 1:100 (1%) FALL AWAY FROM THE DOCK FACE FOR A LENGTH OF 15m U.N.O.
   - GRADING OF TRUCK CIRCULATION ZONES TO BE MINIMUM AS NOTED ABOVE, 3-4% NOMINAL AND MAX. 5%.
6. CAR PARKING AREA GRADES
   - MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%), DESIRABLE MINIMUM GRADE 1:50 (2%).
   - MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) N CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
   - DISABLED ACCESS PARKING ZONES AND SHARED SPACE TO BE MAXIMUM OF 1:33 (3%) IN ASPHALT PAVEMENT AND MAXIMUM OF 1:40 (2.5%) IN CONCRETE PAVEMENT.
   - CARPARK RAMP GRADES TO BE MAX 1:5 WITH 2.5m SMOOTH TRANSITION AT TOP AND BOTTOM U.N.O.
7. TRUCK RAMP GRADES
   - MAXIMUM B-DOUBLE OR 19.0m A.V. RAMP GRADES ARE TO BE 1:8.3 (12%) U.N.O. ON PLAN
   - PROVIDE MINIMUM 4.0m LONG TRANSITION WHERE CHANGES OF GRADE EXCEED 1:20 (5%) AT A CREST U.N.O.
   - PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGE OF GRADE EXCEED 1:20 (5%) AT A SAG U.N.O.
   - TRANSITIONS ARE TO PROVIDE A SMOOTH CONTINOUS CIRCULAR AND TANGENTIAL CHANGE IN GRADE TO ENSURE NO SHARP OR ACUTE CHANGES IN GRADE ARE PRESENT.
8. WHERE FIRE BRIGADE ACCESS IS REQUIRED, MAXIMUM RAMP GRADIENTS ARE TO BE 1:6 (16.6%), DESIRABLE RAMP GRADIENTS ARE TO BE 1:8 (12.5%) WITH 7m TRANSITION TOP AND BOTTOM U.N.O. ON PLAN.
9. PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H U.N.O. BASED ON GEOTECHNICAL ASSESSMENT. PROVIDE MINIMUM 0.5m BERM BETWEEN THE BACK OF KERB OR PAVEMENT EDGES AND THE TOP OR TOE OF A BATTER.
10. ALL BATTER SLOPE WITH GRADES AT OR EXCEEDING 1V:6H ARE TO BE TURFED IMMEDIATELY OR APPROPRIATE EROSION CONTROL IS TO BE PROVIDED TO THE SATISFACTION OF THE ENGINEER.
11. ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL. GRADE.
12. ALL PAVEMENTS ARE TO BE SET AT 30mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS. PROVIDE LOCAL FEATHERING AT DOORWAYS OR ROLLER SHUTTERS TO PROVIDE FLUSH FINISH AS REQUIRED.
13. WHERE NEW AND EXISTING INTERFACING IS REQUIRED, MATCH EXISTING LEVELS AND PROVIDE SMOOTH INTERFACE BETWEEN NEW AND EXISTING GRADIENTS. REFER ANY CONCERNS TO THE ENGINEER.

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A
AMENDMENTS	DATE	ISSUE

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 50

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DRAWING TITLE
FINISHED LEVELS
KEY PLAN

DRAWING No C09431.01-DA50
ISSUE B

EXISTING EASEMENT FOR TRANSMISSION LINE

EXISTING EASEMENT LEASE TO SYDNEY ELECTRICITY OF SUBSTATION PREMISES TOGETHER WITH RIGHT OF CARRIAGEWAY

EXISTING LEVELS TO REMAIN

SITE BOUNDARY

EXTENT OF BASEMENT. EXCAVATION TO MATCH EXISTING U.N.O.

EXISTING EASEMENT WILL BE REMOVED AS PART OF THE DA

EXISTING EASEMENT FOR STORMWATER DRAINAGE

EXISTING SEWER MANHOLE LID TO BE ADJUSTED TO SUIT FINAL LEVELS

EXISTING EASEMENT FOR STORMWATER DRAINAGE

RETAINING BY BUILDING PRE-CAST WALL

EXISTING LEVELS TO REMAIN

SITE BOUNDARY

EXISTING EASEMENT FOR STORMWATER DRAINAGE

EXISTING RETAINING WALLS TO REMAIN

EXISTING TREE TO REMAIN. ALL WORKS WITHIN THE TPZ TO BE COMPLETED IN ACCORDANCE WITH THE ARBORIST REQUIREMENTS.

RAMP WITH MAXIMUM GRADE AS SHOWN AND TRANSITION TOP AND BOTTOM PER NOTE 7 ON DA50

PROPOSED RETAINING WALL IN CUT MAX H=1.0m

PROPOSED RETAINING WALL IN FILL MAX H=2.5m

PROPOSED RETAINING WALL IN FILL MAX H=3.5m

RAMP WITH MAXIMUM GRADE AS SHOWN AND TRANSITION TOP AND BOTTOM PER NOTE 7 ON DA50

RETAINING BY BUILDING PRE-CAST WALL

BREAKLINE - REFER TO DRAWING DA52 FOR CONTINUATION

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

NOTES:

REFER TO DRAWING DA50 FOR FINISHED LEVELS NOTES.

FINISHED LEVELS PLAN - GROUND FLOOR - SHEET 1

SCALE 1:250

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
REVISED AS CLOUDED	23.04.25	D
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	C
LEVELS COORDINATED WITH LATEST ARCHITECTURAL LAYOUT	21.03.25	B
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PROJECT

PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA51

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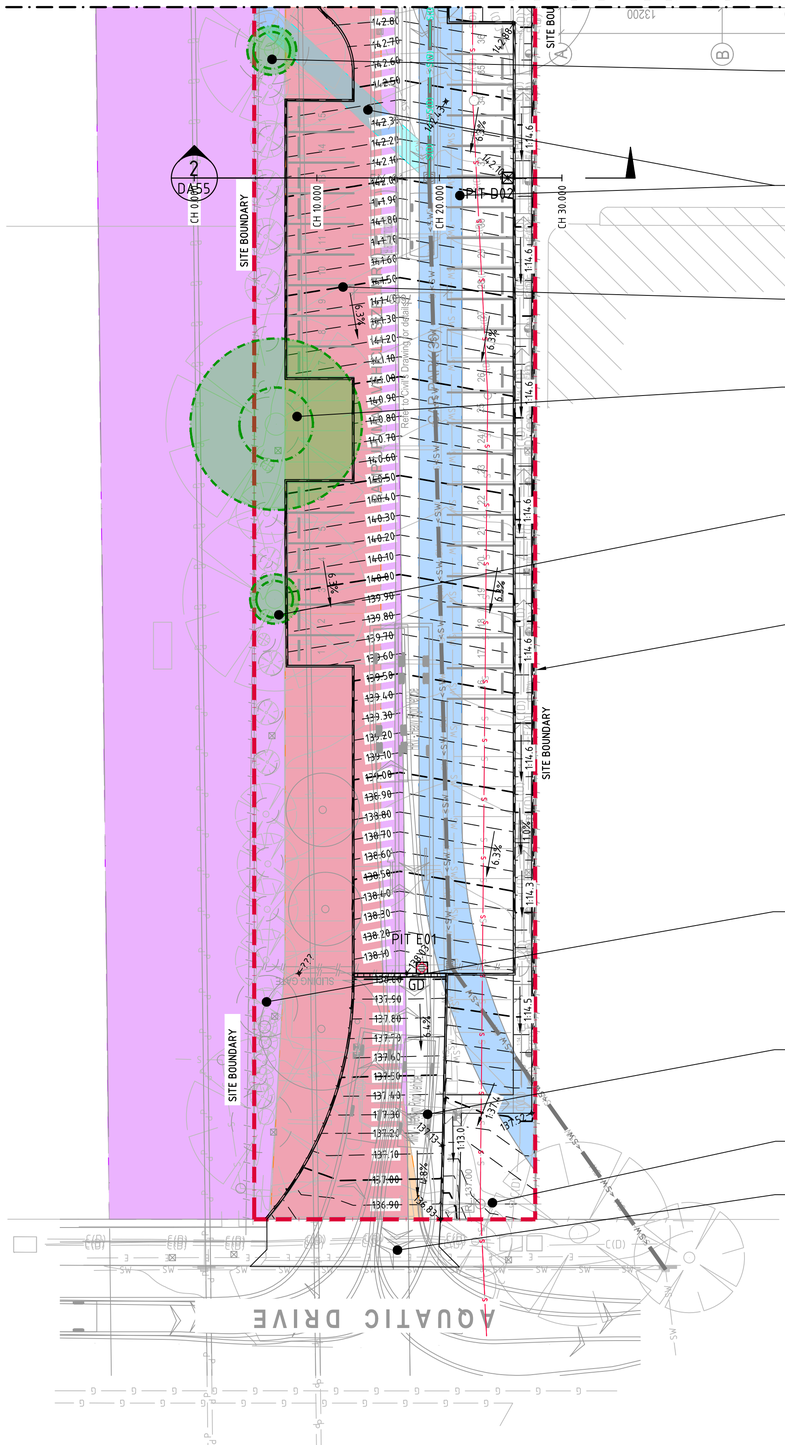
DRAWING TITLE

FINISHED LEVELS PLAN
GROUND FLOOR
SHEET 1

DRAWING No C09431.01-DA51

ISSUE D

BREAKLINE - REFER TO DRAWING DA51 FOR CONTINUATION



EXISTING TREES TO REMAIN.
ALL WORKS WITHIN THE TPZ TO BE COMPLETED IN ACCORDANCE WITH THE ARBORIST REQUIREMENTS.

EXISTING EASEMENT TO DRAIN WATER

EXISTING EASEMENT FOR ELECTRICITY PURPOSES TO BE REMOVED AS PART OF THE DA

EXISTING TREES TO REMAIN.
ALL WORKS WITHIN THE TPZ TO BE COMPLETED IN ACCORDANCE WITH THE ARBORIST REQUIREMENTS.

EXISTING TREES TO REMAIN.
ALL WORKS WITHIN THE TPZ TO BE COMPLETED IN ACCORDANCE WITH THE ARBORIST REQUIREMENTS.

EXISTING RETAINING WALL TO REMAIN.

EXISTING EASEMENT FOR TRANSMISSION LINE

RAMP WITH MAXIMUM GRADE AS SHOWN AND TRANSITION TOP AND BOTTOM PER NOTE 7 ON DA50

EXISTING EASEMENT FOR SEWERAGE PURPOSES

PROVIDE VEHICULAR CROSSOVER IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL STANDARD DRAWINGS A4 3330/1N. ALL EXISTING SERVICES ALIGNMENT, FITTINGS AND DEPTHS TO BE CONFIRMED VIA POTHOLING PRIOR COMMENCEMENT OF WORKS.
TYPICAL.

LEGEND:

LEVELS DATUM IS AHD.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

NOTES:

REFER TO DRAWING C09431.01-DA50 FOR FINISHED LEVELS NOTES.

FINISHED LEVELS PLAN - GROUND FLOOR - SHEET 2

SCALE 1:250

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	C
LEVELS COORDINATED WITH LATEST ARCHITECTURAL LAYOUT	21.03.25	B
ISSUED FOR INFORMATION	28.02.25	A

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
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DRAWING TITLE
FINISHED LEVELS PLAN
GROUND FLOOR
SHEET 2

DRAWING No C09431.01-DA52

ISSUE C

WARRINGAH ROAD

SITE BOUNDARY

8080 BUILDING SETBACK

15086

15089 BUILDING SETBACK

PROPOSED WAREHOUSE
FFL RL 147.60

PROPOSED WAREHOUSE
FFL RL 147.60

PROPOSED WAREHOUSE
FFL RL 147.60

PROPOSED WAREHOUSE
FFL RL 147.60

PROPOSED WAREHOUSE
FFL RL 147.60

ADJACENT LOT

ADJACENT LOT

EXISTING TRANSMISSION TOWER

EXISTING ELECTRICAL EASEMENT

EXISTING STORMWATER EASEMENT

EXISTING POWER LINE

EXISTING RETAINING WALL

FOOTPATH THROUGH WARRINGAH ROAD

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

RAMP WITH MAXIMUM GRADE AS SHOWN AND TRANSITION TOP AND BOTTOM PER NOTE 7 ON DA50

RAMP WITH MAXIMUM GRADE AS SHOWN AND TRANSITION TOP AND BOTTOM PER NOTE 7 ON DA50

LOBBY

FIRE STAIR

RAMP ABOVE

MAX 1:8

MAX 1:16

MRV - Medium Rigid Vehicle

MEDIUM RIGID VEHICLE TURNING CIRCLES (D=12.65m)

LEGEND:

LEVELS DATUM IS AHD.

- FLOOR DRAIN
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 - FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 - FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

NOTES:

REFER TO DRAWING C09431.01-DA50 FOR FINISHED LEVELS NOTES.

FINISHED LEVELS PLAN – LEVEL 1

SCALE 1:250

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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DRAWING TITLE
FINISHED LEVELS PLAN
LEVEL 1

DRAWING No C09431.01-DA53

ISSUE B

LEGEND:

LEVELS DATUM IS AHD.

- FLOOR DRAIN
- GD, GRATED DRAIN (300W x 225D UNO)
- 50.00 – FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 – FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS

NOTES:

REFER TO DRAWING C09431.01-DA50 FOR FINISHED LEVELS NOTES.

WARRINGAH ROAD

SITE BOUNDARY

8080 BUILDING SETBACK

PROPOSED WAREHOUSE FFL RL 153.60

OUTDOOR AREA 115 m²

FIRE STAIR B

LOBBY

EXISTING TRANSMISSION TOWER

EXISTING ELECTRICAL EASEMENT

EXISTING STORMWATER EASEMENT

EXISTING POWER LINE

ADJACENT LOT

FD2.01 FD2.02 FD2.03 FD2.04 FD2.05 FD2.06 FD2.07 FD2.08 FD2.09 FD2.10 FD2.11 FD2.12 FD2.13 FD2.14

FINISHED LEVELS PLAN - LEVEL 2

SCALE 1:250

2m 0 5 10 15 20 25m

SCALE 1:250 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT

sba

CLIENT

Goodman

LEVEL 17,
60 Castlereagh Street
SYDNEY
NSW, 2000, Australia

Tel (02) 9230 7400
Fax (02) 9230 7444

PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA54

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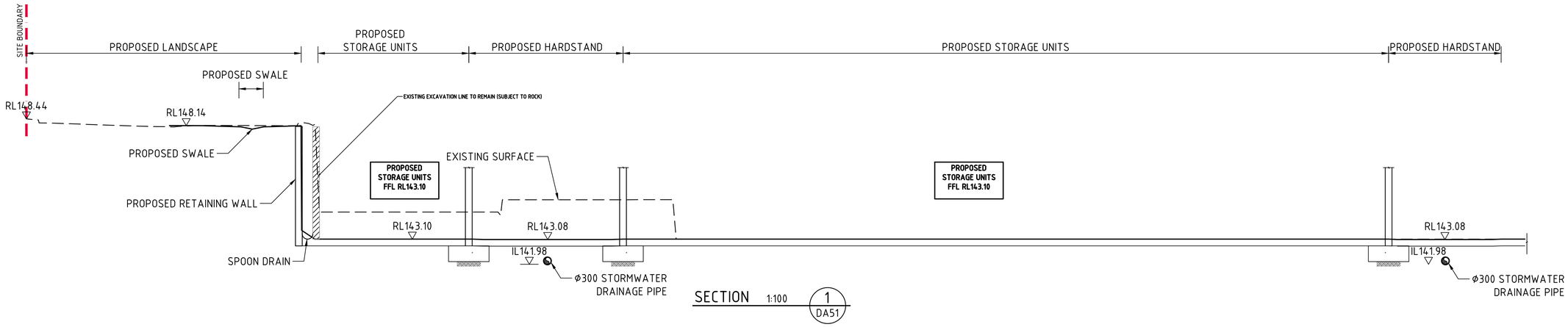
COSTIN ROE CONSULTING
CIVIL & STRUCTURAL ENGINEERS

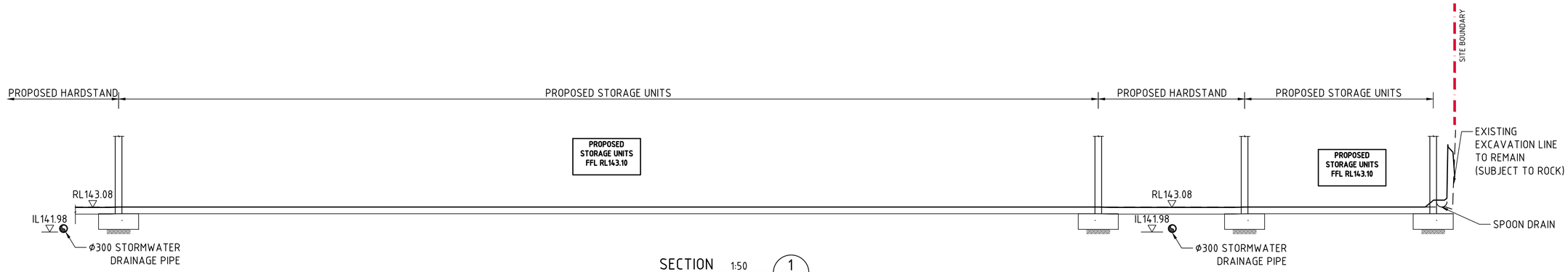
DRAWING TITLE
FINISHED LEVELS PLAN
LEVEL 2

DRAWING No C09431.01-DA54

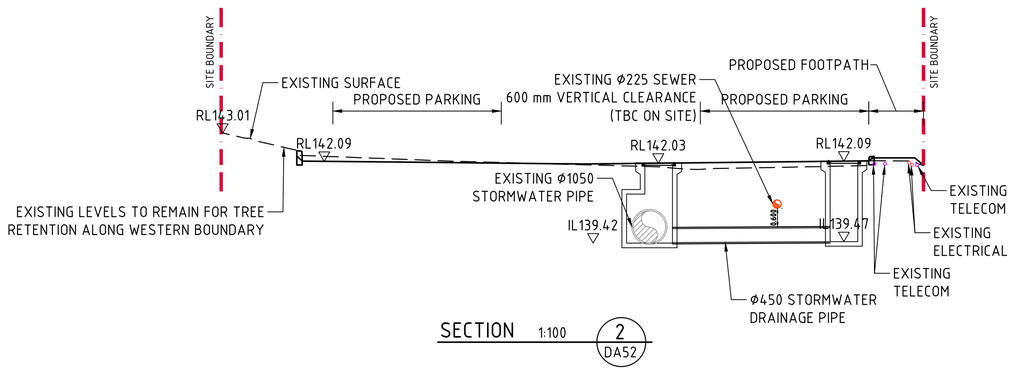
ISSUE B



SECTION 1:100 — 1 / DA51



SECTION 1:50 — 1 / DA51



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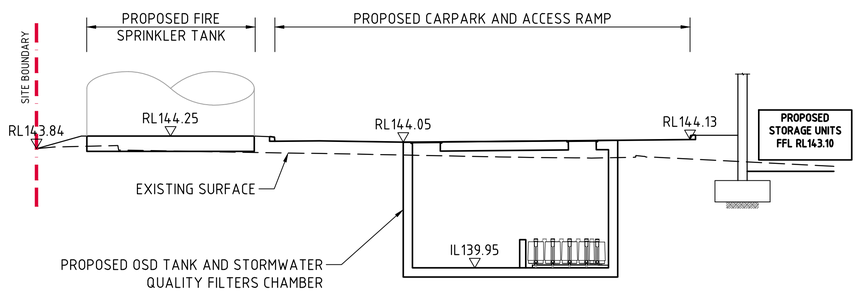

SECTION 1:100 — 3 / DA51

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

SCALE 1:100 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.04.25	B
ISSUED FOR INFORMATION	28.02.25	A

ARCHITECT: sba

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PROJECT
PROPOSED INDUSTRIAL DEVELOPMENT
14 AQUATIC DRIVE, FRENCHS FOREST,
NSW, 2086

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
IL	RN	JAN '25	XC	A1	AS SHOWN	C09431.01-DA 55

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CIVIL & STRUCTURAL ENGINEERS

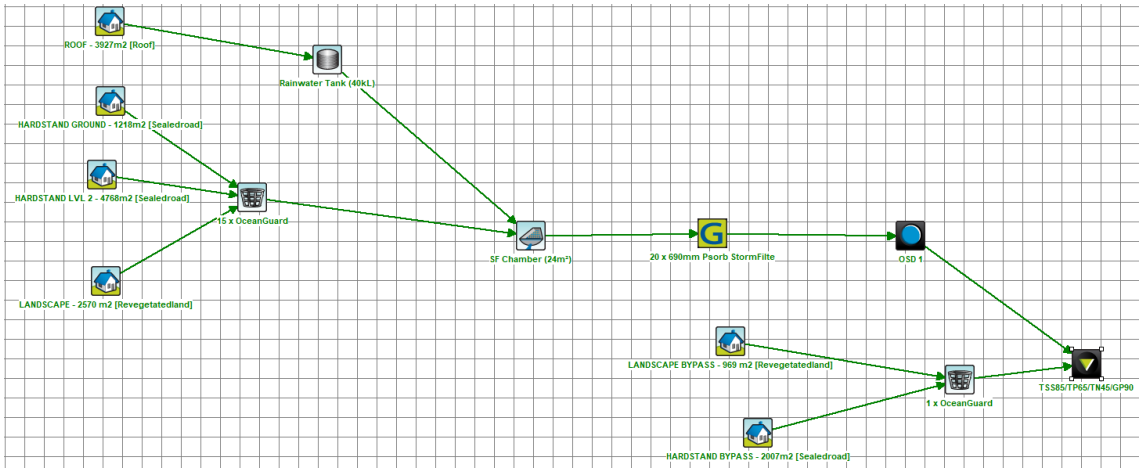
DRAWING TITLE
TYPICAL SECTIONS

DRAWING No C09431.01-DA 55

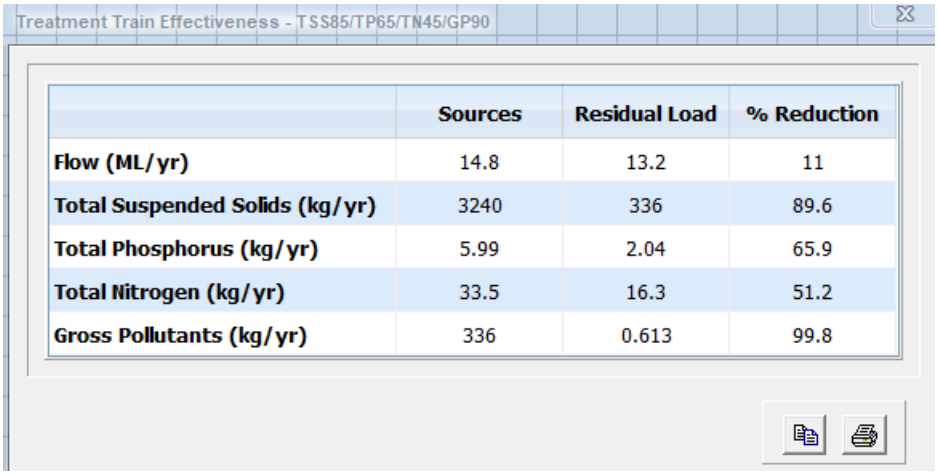
ISSUE B

APPENDIX B
MUSIC MODEL CONFIGURATION & REPORT

Post-Developed MUSIC Layout



MUSIC Results



	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.8	13.2	11
Total Suspended Solids (kg/yr)	3240	336	89.6
Total Phosphorus (kg/yr)	5.99	2.04	65.9
Total Nitrogen (kg/yr)	33.5	16.3	51.2
Gross Pollutants (kg/yr)	336	0.613	99.8

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APPENDIX C
EROSION CONTROL CHECK SHEET

EROSION AND SEDIMENT CONTROL
WEEKLY SITE INSPECTION SHEET

LOCATION . . . . . .
INSPECTION OFFICER . . . . . .DATE . . . . . .
SIGNATURE . . . . . .

Legend: □ OK □ Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	. . . . .
2	Entry/exit pads clear of excessive sediment deposition.	. . . . .
3	Entry/exit pads have adequate void spacing to trap sediment.	. . . . .
4	The construction site is clear of litter and unconfined rubbish.	. . . . .
5	Adequate stockpiles of emergency ESC materials exist on site.	. . . . .
6	Site dust is being adequately controlled.	. . . . .
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	. . . . .
8	Up-slope "clean" water is being appropriately diverted around/through the site.	. . . . .
9	Drainage lines are free of soil scour and sediment deposition.	. . . . .
10	No areas of exposed soil are in need of erosion control.	. . . . .
11	Earth batters are free of "rill" erosion.	. . . . .
12	Erosion control mulch is not being displaced by wind or water.	. . . . .
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	. . . . .
14	Sediment fences are free from damage.	. . . . .
15	Sediment-laden stormwater is not simply flowing "around" the sediment fences or other sediment traps.	. . . . .
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	. . . . .
17	All sediment traps are free of excessive sediment deposition.	. . . . .
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	. . . . .
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	. . . . .
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	. . . . .
21	Stabilised surfaces have a minimum 70% soil coverage.	. . . . .
22	The site is adequately prepared for imminent storms.	. . . . .
23	All ESC measures are in proper working order.	. . . . .

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APPENDIX D
DRAFT SOIL AND WATER MANAGEMENT PLAN

D.1 Introduction

An erosion and sediment control plan (ESCP) is shown on drawing **Co9431.01-DA20** and **DA21** with details on **DA25** and **DA26**. These conceptual plans only provide sufficient detail to clearly show that the works can proceed without undue pollution of receiving waters. A detailed program will be prepared once consent is given and before works start.

The ESCP considers initial site establishment, construction requirements, and development completion.

D.2 General Conditions

The ESCP will be read in conjunction with the engineering plans and any other plans or written instructions that may be issued concerning development at the subject site.

Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in *Managing Urban Stormwater, Soils and Construction (2004) "The Blue Book"* and Council specifications.

All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution in downslope areas.

D.3 Land Disturbance

Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in Table D.1.

Land Use	Limitation	Comments
Construction areas	It is limited to 5 (preferably 2) metres from the edge of any essential construction activity, as shown on the engineering plans.	Site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope), sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones on-site. They can vary in position to conserve existing vegetation best and protect downstream areas while considering the need for efficient work activities. All site

		workers will recognise these boundaries.
Remaining lands	Entry is prohibited except for essential management works.	

Table D.1 Limitation to access

D.4 Erosion Control Conditions

Clear visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work, and they shall enter the site only through the stabilised access points.

Soil materials will be replaced in the same order they are removed from the ground. All subsoils must be buried, and topsoils remain on the surface after work.

Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation is less than six months.

Notwithstanding this, the schedule works so that the duration from the conclusion of land shaping to the completion of final stabilisation is less than 20 working days.

Land recently established with grass species will be watered regularly until an adequate cover has been properly set, and plants grow vigorously. Further seed application might be necessary later in areas of inadequate vegetation establishment.

Where practical, foot and vehicular traffic will be kept away from all recently established areas

Earth batters shall be constructed per the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:

- 2H:1V where slope length is less than 4 metres
- 2.5H:1V where slope length is between 4 and 10 metres
- 3H:1V where slope length is between 10 and 12 metres
- 4H:1V where slope length is between 12 and 18 metres
- 5H:1V where slope length is between 18 and 27 metres
- 6H:1V where slope length is greater than 27 metres

All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.

During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. If water is not available in sufficient quantities, soil binders and/or dust retardants will be used, or the surface will be left in a cloddy state that resists removal by the wind.

D.5 Pollution Control Conditions

Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways. Silt/ sediment fences and appropriate stabilisation of stockpiles are to be provided as detailed on the drawings.

Sediment fences will:

- Install sediment controls as indicated on the drawings or at the site superintendent's discretion to contain coarse sediment (including aggregated fines) near its source.
- Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
- Provide a return of 1 metre upslope at intervals along the fence where the catchment area exceeds 720 square meters to limit discharge reaching each section to 10 litres/second in a maximum 20-year t_c discharge.

Sediment removed from any trapping device will be disposed of where further erosion and consequent pollution to downslope lands and waterways will not occur.

Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.

Temporary soil and water management structures will only be removed after the lands are protected and stabilised.

D.6 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

D.7 Site Inspection and Maintenance

A self-auditing program will be established based on a Check Sheet. The site manager will make a site inspection using the Check Sheet:

- At least weekly.
- Immediately before site closure.
- Immediately following rainfall events over 5mm in any 24-hour period.

The self-audit will include the following:

- Recording the condition of every sediment control device
- Recording maintenance requirements (if any) for each sediment control device
- Recording the volumes of sediment removed from sediment retention systems, where applicable
- Recording the site where sediment is disposed

- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information

In addition, a suitably qualified person will be required to oversee the installation and maintenance of all site soil and water management works. The person shall be required to provide a short monthly written report. The responsible person will ensure that:

- The plan is being implemented correctly
- Repairs are undertaken as required
- Essential modifications are made to the plan if and when necessary

The report shall carry a certificate that works have been carried out per the plan.

Waste bins will be emptied as required. Disposal of waste will be in a manner approved by the Site Superintendent.

Proper drainage will be maintained. To this end, drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially since,

- No low points exist that can overtop in a large storm event
- Areas of erosion are repaired (e.g. lined with a suitable material), and/or the velocity of flow is reduced appropriately through the construction of small check dams of installing additional diversion upslope.
- Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, or other causes).

Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include high-velocity water flows (e.g. waterways and gutters), paved areas and driveways.

Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.

Excessive vegetation growth will be controlled through mowing or slashing.

All sediment detention systems will be kept in good working condition. In particular, attention will be given to:

- Recent works to ensure they have not resulted in a diversion of sediment-laden water away from them
- Degradable products to ensure they are replaced as required, and
- Sediment removal to provide the design capacity or fewer remains in the settling zone.

Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution of downslope lands and waterways should not occur.

Additional erosion and sediment control measures can be constructed to properly protect downslope lands and waterways. The plan will be adjusted if it proves inadequate in practice or conditions at the worksite or elsewhere in the catchment change.

Erosion and sediment control measures will be maintained until all earthwork activities are completed, and the site is stabilised.

Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

APPENDIX E
DETAILED SURVEY - LTS 31/11/2022

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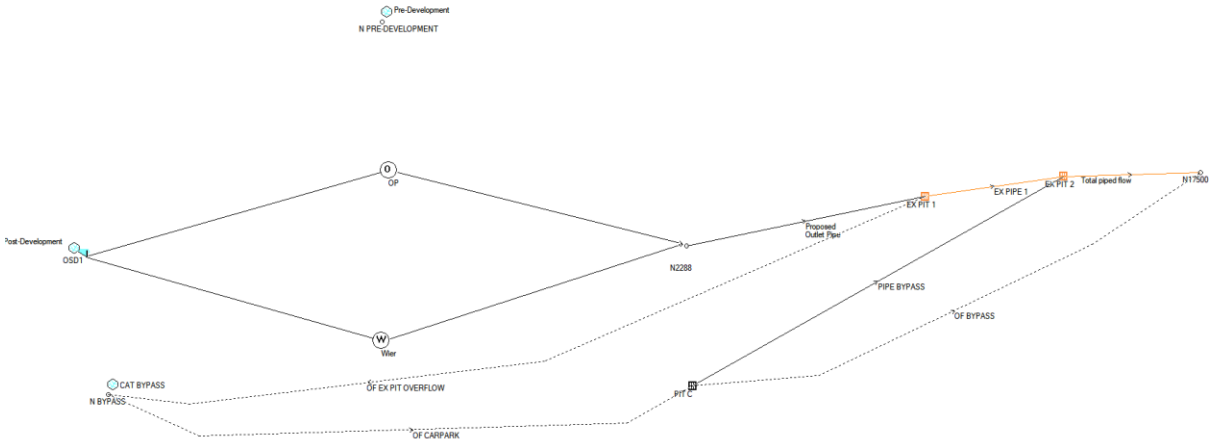
APPENDIX F
DRAINS MODEL CONFIGURATION

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