

Tony McLain Architects

Land Capability and Wastewater Management Options Assessment: Proposed Dwelling and Horse Stables, 113 Orchard Street, Warriewood, NSW



ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



CIVIL



PROJECT
MANAGEMENT



P2108165JR05V03
July 2024

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Head Office
Suite 201, 20 George Street
Hornsby, NSW 2077, Australia
ACN 070 240 890 ABN 85 070 240 890
Phone: +61-2-9476-9999
Fax: +61-2-9476-8767
Email: mail@martens.com.au
Web: www.martens.com.au

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Robert Mehaffey		Gray Taylor Andrew Norris		Gray Taylor			
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All enquiries regarding this project are to be directed to the Project Manager.



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1 Overview

1.1 Background

Martens & Associates (MA) has prepared this wastewater assessment to support a development application (DA) for the construction of new dwelling and horse stables at 113 Orchard Street, Warriewood, NSW ('the site'). This report provides an assessment of onsite wastewater management requirements and land capability.

1.2 Development Proposal

Based on correspondence with the client, it is our understanding that the proposed development will involve:

- Demolition of existing dwelling and construction of new four bedroom dwelling.
- Construction of a new horse arena located in the eastern portion of the site.
- Construction of a horse stable for up to four horses with associated yards and amenities.
- Construction of paddocks upslope (west) of the proposed stables.

Proposed development plans prepared by Tony McLain Architects (2021) are provided in Attachment B.

1.3 Aims and Objectives

The aims and objectives of this assessment are:

1. Characterise site effluent land capability and assess suitability and design loading for onsite effluent disposal.
2. Estimate site wastewater generation rates of the stables based on proposed site usage numbers provided by the Client.
3. Provide recommendations for appropriate onsite wastewater management system and outline effluent management requirements.

1.4 Relevant Standards and Policy

Guidelines and standards considered in this study include:

1. NSW Department of Local Government *et al.* (1998) *On-site Sewage Management for Single Households*.
2. NSW Health (2001) *Septic Tank and Collection Well Accreditation Guideline*.
3. Standards Australia (2012) *Australian /New Zealand Standard 1547: On-site domestic wastewater management*.

2 Site Description

2.1 Summary

A summarised site description is provided in Table 1 and site plan is provided in Map 01 (Attachment A).

Table 1: Site description summary.

Item	Description / Detail
Site address	113 Orchard Street, Warriewood, NSW.
Lot/DP ¹	Lot 6 DP749791.
Local Government Area (LGA) ¹	Northern Beaches Council (NBC).
Current land use ¹	RU2 Rural Landscape.
Proposed development	Demolition of existing dwelling and construction of new four bedroom dwelling, horse stables, arena and paddocks.
Site description	The site is a rural lot with an existing dwelling, grassed landscaped areas and bushland.
Surrounding land uses	The site is bordered by bushland to the west, bushland and rural lots to the north and south and Orchard Street and residential lots to the east.
Topography	<p>Site slopes range between 55% in the western portion of the site and 19% near the lower southeast portion of the site with an easterly aspect. Site elevation is approximately 18 mAHD near the southeast boundary, rising to 43 mAHD near the central west portion of the site (Source: Axiom Surveying, 2018).</p> <p>A survey map showing the topography of the site is presented in (Attachment C).</p>
Expected Geology and Soils	<p>The Sydney 1:100,000 Geological Series Sheet 9130 (1983) identifies the site as Hawkesbury Sandstone from the Wianamatta Group, consisting of medium to coarse grained quartz sandstone, very minor shale and laminate lenses.</p> <p>The NSW Environment and Heritage eSPADE website identifies the site as having soils from the Warriewood landscape consisting of deep well sorted, sandy humus podzols and dark, mottled siliceous sands, overlying acid peats in depressions with deep podzols and pale siliceous sands on sandy rises.</p>

Note:

¹. NSW Planning Portal

2.2 Site Investigations

MA completed the following site investigations on November 24, 2021:

- Walkover inspection to assess existing site conditions, local topography, geology, soil characteristics, hydrology and vegetation.
- Excavation and logging of four boreholes using hand operated hydraulic push tube to a maximum depth of 1.0 m below ground level (mbgl).
- Collection of representative soil samples from boreholes for future reference.

Borehole logs are provided in Attachment D.

2.3 Sub Surface Conditions

Soil characteristics encountered during borehole investigations in potential onsite effluent management areas (EMAs) consisted of sand, sandy loam and clayey sands topsoils to depths of approximately 400 mm overlying clay loams grading to light to medium clays at depth. The locations of the boreholes are shown in Map 02 (Attachment A).

Indicative depths based on borehole investigations are summarised in Table 2 with detailed borehole logs provided in Attachment D.

Table 2: Summary of typical soil horizon characteristics.

Layer	Depth (m)	Agricultural Classification	Soil Permeability Category ¹
Sandy LOAM	0.0 - 0.2	SL	2a
Sandy CLAY LOAM	0.15 - 0.4	SCL	4a
Light CLAY	0.3 - 1.0	LC	5b

Note:

¹ In accordance with Table 8 of NSW Department of Local Government et al. (DLG et al, 1998).

2.4 Climate

A summary of local meteorological data from the closest operational BOM Station with rainfall data (Mona Vale Golf Club - station 66149, 1969 to 2021) and mean daily evaporation (Prospect Reservoir - station 67019, 1965 to 2018) are provided in Table 3.

Table 3: Meteorological data.

Month	Mean Monthly Rainfall (mm)	Mean Daily Evaporation (mm)
January	107.3	5.5
February	128.4	4.7
March	128.7	3.9
April	111.0	2.9
May	98.3	2.0
June	124.6	1.6
July	64.5	1.7
August	73.8	2.5
September	61.0	3.6
October	72.0	4.4
November	91.7	5.0
December	72.0	5.6
Annual	1154.1	1342.8

2.5 Hydrogeological Data

Review of WaterNSW Real-time Water Data database indicated that no groundwater bores were located within 500 metres of the site.

No groundwater was encountered during onsite borehole investigations up to 1.0 mbgl.

3 Wastewater Assessment

3.1 Proposed Wastewater Management System

A new wastewater treatment and disposal system is to be constructed at the site to service a new four bedroom dwelling and horse stable at the site. It is understood that stable bedding will be regularly changed and will absorb horse urine.

Based on the above, a new wastewater treatment and disposal system is proposed to manage wastewater from the following development elements:

- The new four bedroom dwelling.
- Toilet for stable users.

To service the above elements, it is recommended that a new NSW DOH accredited aerated wastewater treatment system (AWTS) and onsite surface drip irrigation system be installed to manage wastewater from the proposed development.

3.2 Land Capability Assessment for On-site Effluent Disposal

Landform and soil constraints for onsite wastewater management in the proposed EMA are summarised, in Table 4, in accordance with NSW DLG *et al.* (1998).

Table 4: Site suitability for on site effluent management systems, according to NSW Department of Local Government, (1998).

Feature	Details of Irrigation Areas	Limitation Rating
Flood potential	Above 1 in 20 years	Minor
Sun and wind exposure	Moderate	Major / Minor
Slope (%)	>20 %	Major ¹
Landform	Convex side slope	Minor
Erosion potential	None – low erosion potential	Minor
Site drainage	No visible signs of dampness	Minor
Fill	No Fill	Minor
Rock outcrop	<10%	Minor
Geology	No major discontinuities	Minor
Depth to bedrock (m)	> 1.0 ¹	Moderate / Minor
Depth to water table (m)	>1.0 m	Minor
Soil permeability category	Topsoil 2a / 4a	Minor

Feature	Details of Irrigation Areas	Limitation Rating
	Subsoil 5b	Moderate
Coarse fragments (%)	Generally, 0 – 20%	Minor

Note:

¹Assumes sub surface drip irrigation system in proposed EMA based on BH101 and BH102.

Land and soils capability assessment indicate the majority of site features pose a minor limitation to disposal of effluent. Features with moderate to major limitations are:

- Slope – slope across the site varies locally. Areas within the proposed EMA have slopes between 20 - 30% and therefore a reduction of 50% of the AS/NZS 1547 (2012) effluent application rates are to be adopted to account for limitations posed by the slope.
- Sun and wind exposure – Vegetation across the site present a limitation by reducing sun and wind exposure, however it is assumed that additional plant uptake from vegetation (i.e. due to the increase in necessary EMA due to slopes) can offset exposure limitations.
- Rock outcropping – While minor rock outcropping was noted at the site, it was generally localised and limited to large boulders. Site investigations (Section 2) identified deep soils (>1.0 m) in proposed EMA areas.
- Depth to bedrock – effluent application rates are reduced from those recommended in AS/NZS 1547 (2012) based on soil texture, to account for this limitation.
- Subsurface irrigation in upper 400 mm of soil (i.e., topsoil) addresses limitation of subsoil permeability.

3.3 Soil Profile and Effluent Application Rates

Site investigations within the proposed EMA (BH101 and BH102) identified a consistent soil profile of sandy loam overlying sandy clay loam to 0.4 mbgl. Based on observed soil texture and assuming a subsurface LPED irrigation system, a DIR of 3.5 mm/day is recommended by AS/NZS 1547 (2012). To account for the shallow soil profile and slopes, this rate is reduced by 50%. The adopted DIR for the site is therefore 1.75 mm/day for onsite irrigation.

3.4 Buffers and Setbacks to Effluent Management Area

Relevant setbacks have been assessed against NSW DLG *et al.* (1998) guidelines (Table 5). Site analyses determine that setbacks to the proposed effluent management area (EMA) are generally achieved. While no setback is specified a 1.0 m setback is provided to the internal horse track.

Table 5: Recommended setback distances in metres.

Site Feature	Distance (m) NSW DLG <i>et al.</i> (1998)
Natural waterbodies (rivers, creeks, lakes, etc.)	100
Other waters (farm dams, intermittent streams, etc.)	40
Domestic well used for household water supply	250
Buildings, driveways, swimming pools and boundaries	6 / 3 ¹

Notes:

¹ Upslope / downslope buffer.

3.5 Site Wastewater Generation Rates

3.5.1 Dwelling

Dwelling generation rates are based on a reticulated water supply and 150 L/person/day in accordance with Table H1 of AS/NZS1547 (2012). Occupancy rates are based on two people in the first bedroom and one additional occupant per extra bedroom.

3.5.2 Stables

Stables are expected to be used by site residents only. The use of the amenities is likely to be occasional and minor (residents are more likely to use amenities in the dwelling), a conservative value of one 'staff' is assumed for design.

AS/NZS 1547 (2012) does not provide commercial wastewater flow allowances for Australia, therefore the New Zealand standard of rural factories 50 L/person/day (Table H4) has been used which is considered the most appropriate design flow allowance for the horse stables. Typically, generation rates for comparable New Zealand situations are higher in the standard than for corresponding Australian situations, therefore Table H4 values may be adopted as a conservative design approach. Design flow rate for toilet use within the stables is calculated as 50 L/day.

All horse urine will be absorbed by stable bedding and removed daily. As such, no additional wastewater load will be generated by these elements.

We have assumed reticulated water supply to the site with design hydraulic load for the development presented in Table 6.

Table 6: Design wastewater loads for 113 Orchard Street, Warriewood, NSW.

Development Element	Design Occupants	Wastewater Generation Rate L/d	Design Wastewater Load (L/d)
Residents	5	150 L/day ¹	750
Stable 'staff'	One staff (daily)	50 L/day ²	50
Design			800

Note:

¹ Based on Table H1 AS/NZS 1547 (2012).

² Based on Table H4 'Rural Factories' AS/NZS 1547 (2012).

3.6 Effluent Management Area Sizing and Location

The effluent management area is sized based on the design wastewater load of 800 L/day. Using the adopted DIR of 1.75 mm/day (Section 3.3), a minimum 458 m² EMA is required for irrigation.

Site plans in Attachment A demonstrate an available EMA located in the southeastern portion of the site, to the south of the proposed new dwelling.

3.7 Wastewater Management System

It is recommended that a new NSW DOH accredited AWTs be installed at the site to treat generated wastewater. The AWTs is to be sized to treat the peak flow of 800 L/day.

It is recommended that effluent application in the proposed EMA be via a covered surface drip irrigation (in accordance with Figure M1 of AS/NZS 1547 (2012)) to minimise impact to tree roots in the area.

3.8 Construction Requirements

Minimum requirements for the wastewater management system are summarised as:

- A new, suitably sized (min. 800 L/day) NSW DOH approved AWTS is to be installed to treat site wastewater.
- The EMA is to be a covered drip irrigation field and be constructed in accordance with Figure M1 of AS/NZS 1547 (2012).
- Driplines are to be pressure compensating 13 mm netafim lines installed above ground, pegged in (minimum 150 mm long staples) and covered with mulch to avoid surface pooling.
- It is recommended that additional vegetation planting be undertaken within the EMA around driplines to increase nutrient uptake.
- Minimum area of EMA to be 458 m². EMA area is to exclude any rock outcropping.
- Effluent transfer and flushing mains to be HDPE.
- Flushing main to be connected to the AWTS and have manual valve to allow for periodic flushing of the driplines.
- No stormwater disposal upslope or within EMA. All upslope stormwater to be diverted around EMA with minimum buffer of 2 m from edge of EMA for all stormwater associated infrastructure.
- Irrigation areas identified on the report plans are indicative only. Final location of all system elements is to be confirmed on site and to be subject of a Section 68 application to install.
- The existing septic tank and wastewater system is to be suitably decommissioned.

3.9 Inspection and Maintenance Schedule

The proposed wastewater treatment and effluent management systems are to be designed and installed, then inspected and certified by a person acceptable to Northern Beaches Council prior to system commissioning.

Installation, operations and maintenance for the system is summarised as follows:

- Prior to installation a Section 68 approval to install shall be obtained from Northern Beaches Council.
- Prior to operation a Section 68 approval to operate shall be obtained from Northern Beaches Council.

- The new wastewater management system shall be maintained by a suitably qualified person or persons. As a minimum this shall include periodic inspection and maintenance of all system components including all pumps, plumbing, float switches and alarm system.
- Periodic solids management will be required for the AWTs, with all waste transported to a suitable off site facility for treatment and disposal. Frequency of solids management depends on use and occupation of the site, but tends to be of the order of once every 3 - 5 years for a system such as this.
- Regular visual inspection of the EMA by owner should be undertaken to verify that the irrigation areas are operating satisfactorily. All leaks and signs of system malfunction are to be remediated as soon as practical with licenced plumber's assistance as required.
- Periodic flushing of irrigation driplines will be required at a minimum of once every 3 months or in accordance with the manufacturer's specifications.

4 References

Australian / New Zealand Standard 1547 (2012), *On-site domestic wastewater management*.

Axiom Surveying (2018) Plan showing Detail and Levels over Lot 6 in DP749791 Being No. 113 Orchard Street, Warriewood, For Design Purposes and to Support a Development Application.

Department of Local Government, NSW Environment Protection Authority, NSW Health Department, NSW Department of Land and Water Conservation and the NSW Department of Urban Affairs and Planning (1998), *Environment and Health Protection Guidelines - On-site Sewage Management for Single Households*, Referenced a DLG et al, 1998.

Pennsylvania State University (PSU) (2000) *Horse stable manure management*.

NSW Department of Primary Industries (1983) - Sydney 1:100,000 Geological Series Sheet 9130.

NSW Department of Local Government et al. (1998) *On-site Sewage Management for Single Households*.

NSW Health (2001) *Septic Tank and Collection Well Accreditation Guideline*.

Standards Australia (2012) *Australian /New Zealand Standard 1547: On-site domestic wastewater management*.

Tony McLain (2021) *Pre-DA Site Plan - Proposed Horse Arena and Facilities and Additions to Existing Dwelling. Lot 6 DP749791. 113 Orchard St., Warriewood*.

5 **Attachment A: Mapset and Figures**

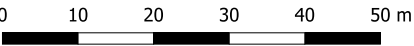
Legend

Site boundary

Map 03 viewport



Map	Title
Map 01	Site Location Map
Map 02	Borehole Location Map
Map 03	Proposed Effluent Management Area (EMA)



1:1000 @ A3
Viewport
Source of Aerial Photo: Nearmap.

Map Title / Figure:

Site Location Map



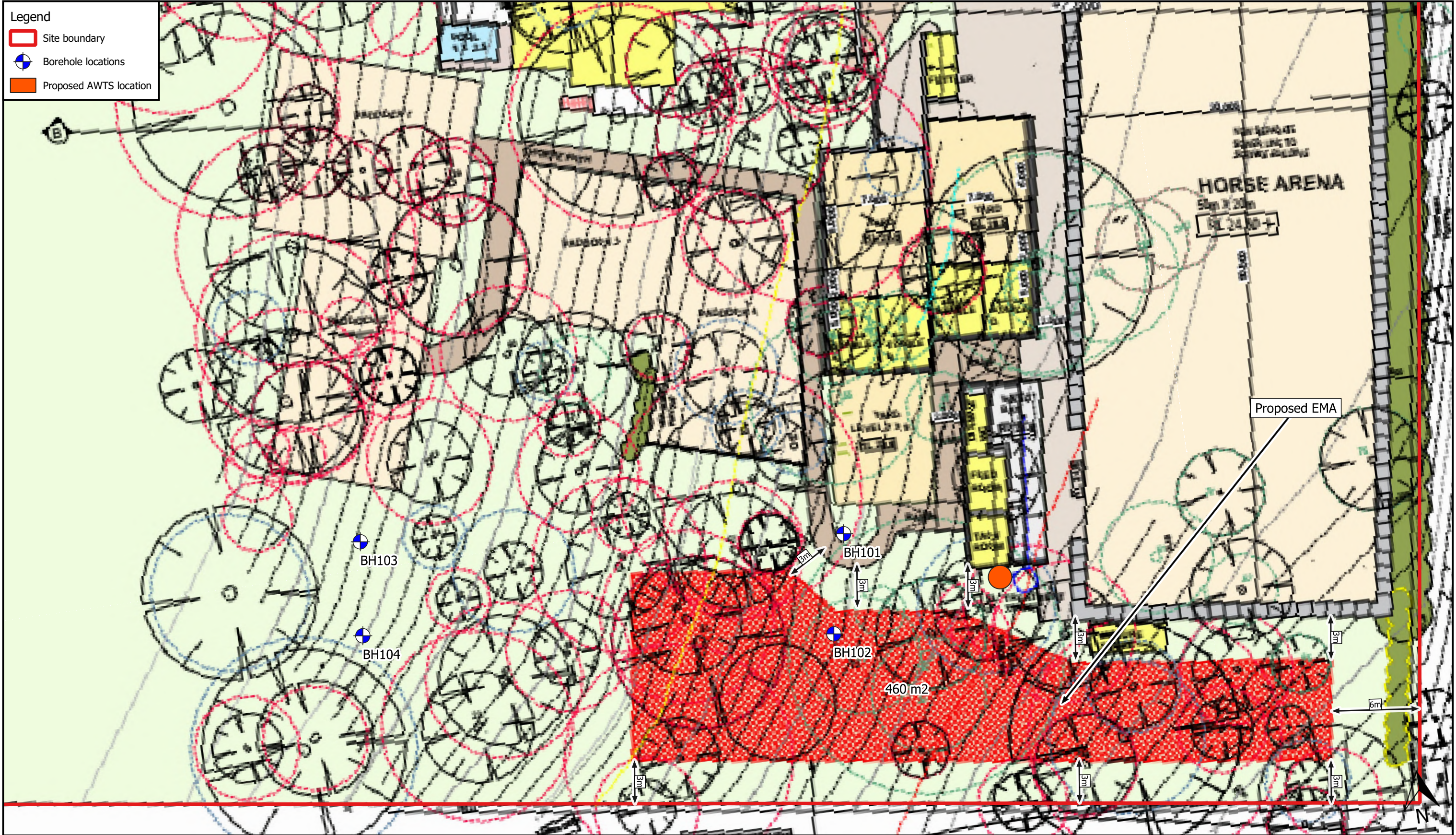
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1:1000 @ A3

Viewport

Source of contour lines: ELVIS Lidar.
Source of Aerial Photo: Nearmap.

Map Title / Figure:
Borehole Location Map



0 3 6 9 12 15 m

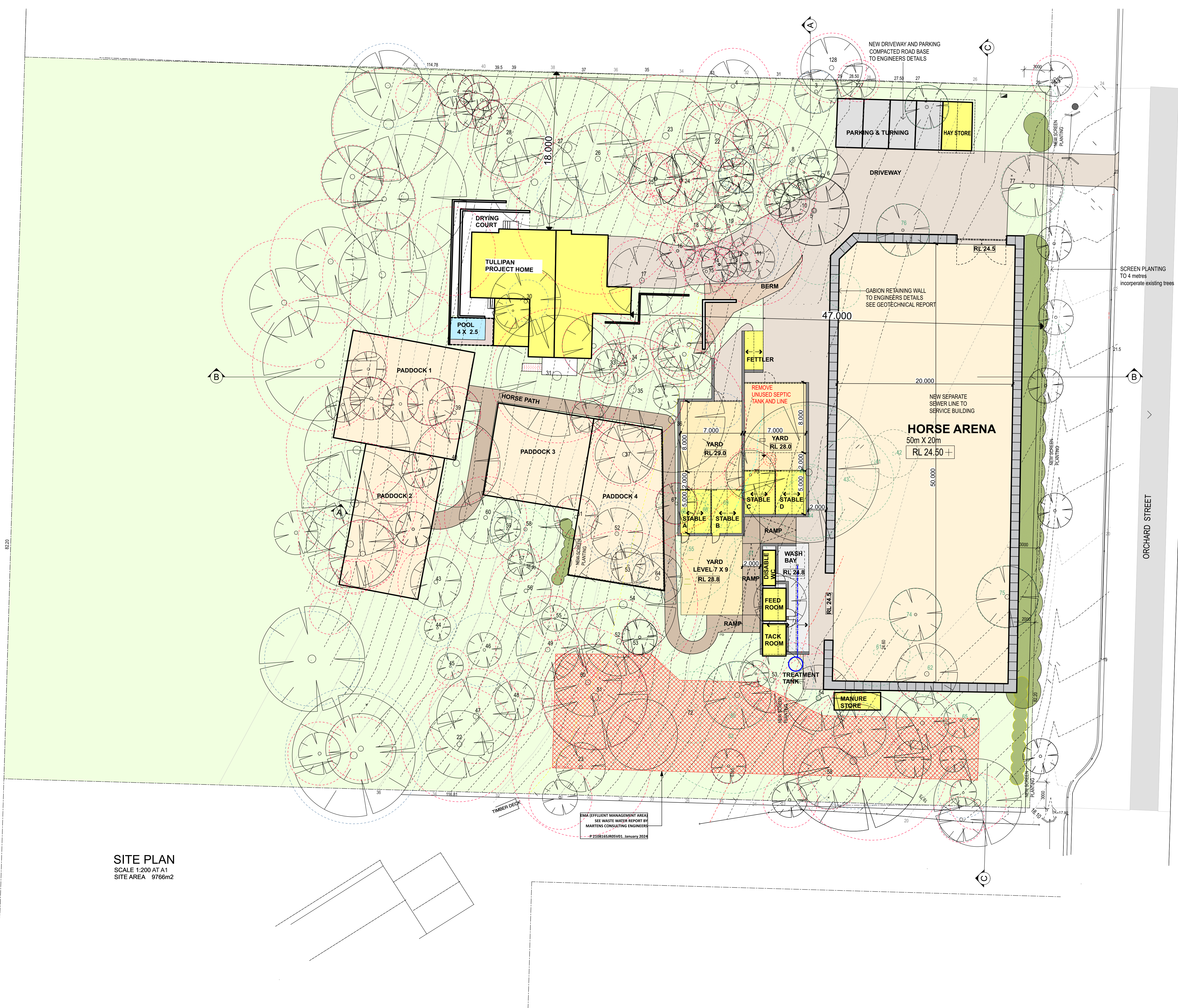
1:250 @ A3

Viewport

Source: Tony McIn (2021) Proposed Horse Arena and Facilities and Additions to Existing Dwelling. Lot 6 DP749791.

Proposed Effluent Management Area (EMA)

6 Attachment B: Development Plans



- KEY**
- EXISTING VEGETATION - UNBUILT ON AREA WITHIN BOUNDARIES
 - NEW SCREEN PLANTING
 - ARENA, DAY YARDS, TOP PADDOCKS
 - ACCESS DRIVE
 - HORSE PATH
 - NEW STRUCTURES
 - CHECK TREE POSITIONS NEAR TO FACILITIES REPORT ANY DISCREPANCIES TO ARCHITECT BEFORE COMMENCING CONSTRUCTION
 - EXISTING TREE CANOPY
 - TREE PROTECTION ZONE IMPORTANT TREES
 - TREE PROTECTION ZONE LESS IMPORTANT TREES
 - TREE TO BE REMOVED
 - NEW LEVEL
 - CUT BERM MAXIMUM 30° SLOPE
 - GABION RETAINING WALL
 - 1800 HIGH TIMBER FENCE
 - RETAINING WALL

Revision	Date	Remarks
K	04.06.24	REMOVE UNUSED SEPTIC TANK AND LINE
J	31.01.24	EMA SHOWN
	11.5.23	FOR DA

Revision Date Remarks

Project

PROPOSED HORSE ARENA AND FACILITIES AND ADDITIONS TO EXISTING DWELLING

LOT 6 DP749791

Address

113 Orchard St, Warriewood

Title

SITE PLAN

DA

Tony McLain Architect (Reg. No. 4291)

Tel 98108631

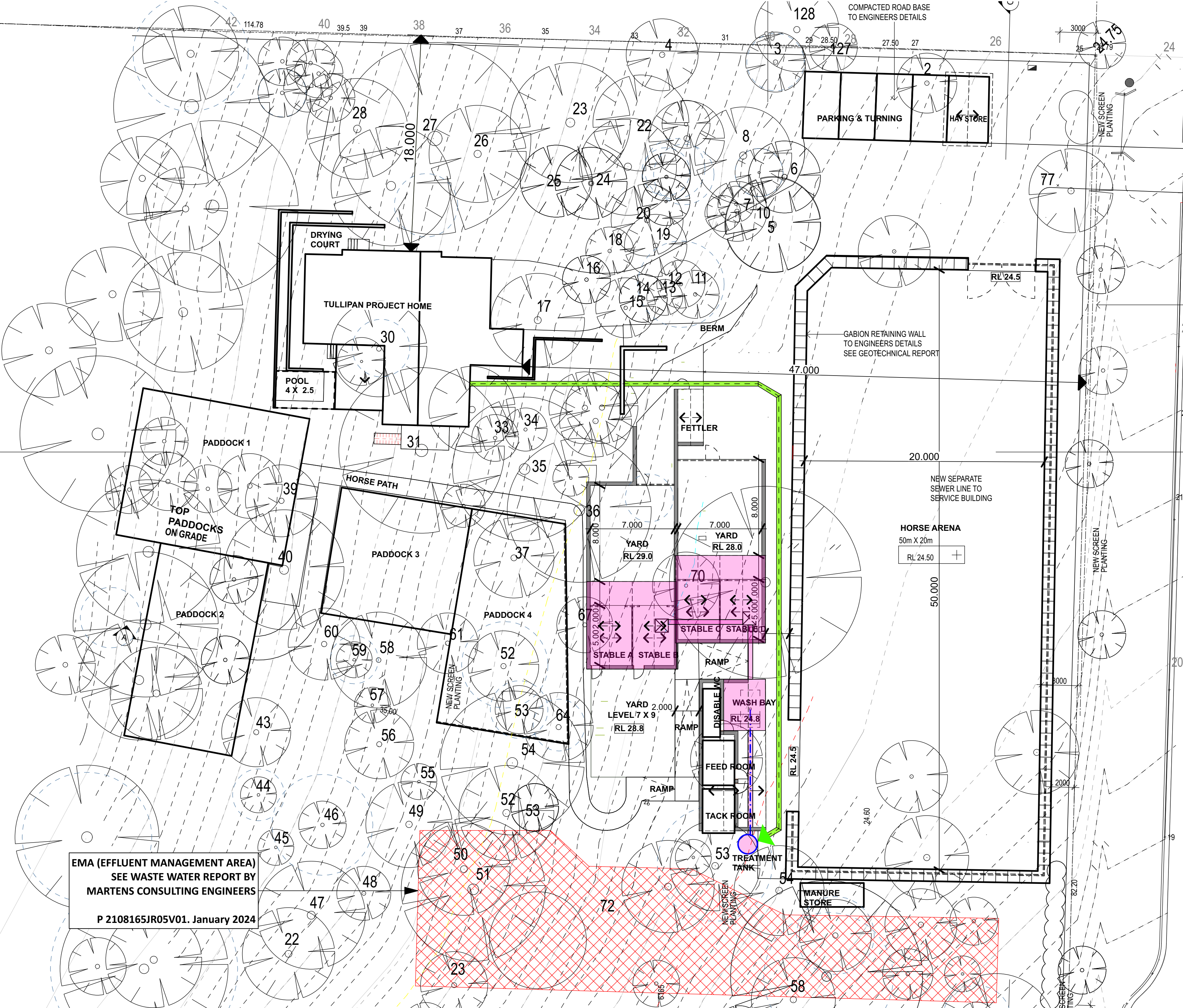
Mob 0402223665

mclaintony@gmail.com

Scale 1:200 @ A1 Date JUN 2024

Project No. Drawing No. Rev.

1826 01 K



EMA (EFFLUENT MANAGEMENT AREA)
SEE WASTE WATER REPORT BY
MARTENS CONSULTING ENGINEERS

P 2108165JR05V01. January 2024

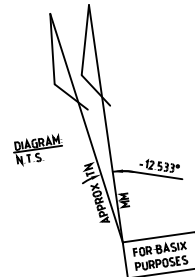
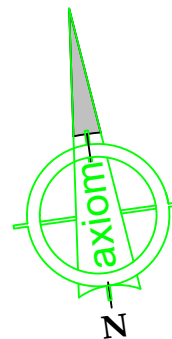
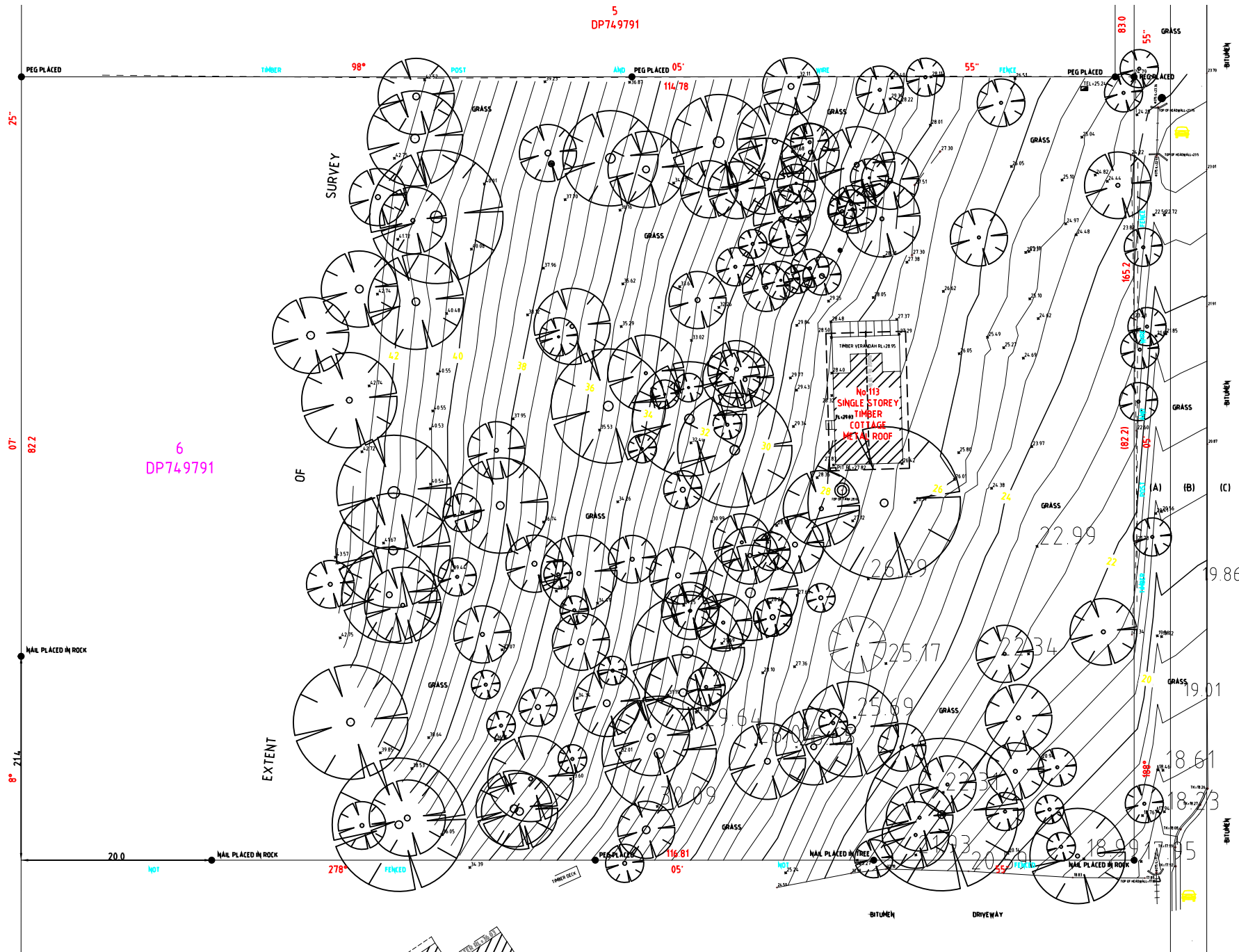
SCREEN PLANTING
TO 4 metres
incorporate existing trees

ORCHARD STREET

K-04-6-24	REMOVE UNUSED SEPTIC TANK AND LINE	
J31-1-24	EMA SHOWN	
J 11-5-23	FOR DA	
G 21-7-22	REVISED HOUSE LOCATION	
F 11-4-22	REVISED HOUSE LOCATION	
E 11-6-20	FOR DA SUBMISSION	
D 7-7-19	GENERAL, TREE PROTECTION ZONES SHOWN	
C 10-6-19	GENERAL	
A 30-10-18	ABSORPTION BED ADDED, DIMENSIONS TO BOUNDARIES	
Revision	Date	Remarks
Project		
PROPOSED HORSE ARENA AND		
AND FACILITIES AND ADDITIONS TO		
EXISTING DWELLING		
LOT 6 DP749791		
Address		
113 Orchard St , Warriewood		
Title		
WASTE WATER		
Tony McLain Architect (Reg. No. 4291)		
Tel 98108631		
Mob 0402223665		
mclaintony@gmail.com		
Scale 1:200 @ A1	Date JUN 2024	Rev.
Project No.	Drawing No.	
1826	15	K

7 Attachment C: Survey Plan

L.G.A. : NORTHERN BEACHES
PARISH : NARRABEEN
COUNTY : CUMBERLAND



AREA LOT 6
VIDE DP 749791: 9766 m²
BY CALC: 9765 m²

ORIGIN OF LEVELS:
PM 55214 RL=25.74 (AHD) FOUND NEAR THE
END OF ORCHARD STREET AND LOT 702

ACCURACY OF ORIGIN: ± 0.001m

LEGEND

● POWER POLE	☐ WATER MAIN
⬢ ELECTRICAL PILLAR	☐ TELSTRA PIT
⬢ POWER LIGHT POLE	☐ SEWER LAMPHOLE
⬢ LIGHT POLE	☐ STORMWATER GRATE
⬢ HYDRANT	☐ SURFACE INLET PIT
⬢ WATER METER	☐ LINTEL-KERB INLET PIT
⬢ STOP VALVE	☐ CLOTHES LINE
⬢ GAS METER	☐ TREE: Ø DIAMETER
⬢ GAS DIRECTION MARKER	☐ S SPREAD
⬢ SEWER MANHOLE	
⬢ STREET SIGN	
⬢ PRAM CROSSING	
⬢ VEHICLE CROSSING	
— E — OVERHEAD ELECTRICITY LINE	
— T — OVERHEAD TELECOM LINE	
— S — SEWER LINE	

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- VISIBLE SERVICES ONLY HAVE BEEN SHOWN WHICH WERE VISIBLE AT THE TIME OF SURVEY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED TO LOCATE ANY POTENTIAL UNDERGROUND SERVICES WHICH MAY BE PRESENT.
- THE CONTOUR INTERVAL IS 0.5 m.
- THE RIDGE HEIGHTS, ROOF LINE, WINDOWS AND GUTTER HEIGHTS HAVE BEEN LOCATED BY INDIRECT MEANS AND ARE APPROXIMATE ONLY.
- PRIOR TO ANY CONSTRUCTION WORK AN ACCURATE BOUNDARY SURVEY SHOULD BE CONDUCTED AND MARKS PLACED TO DEFINE THE POSITION OF ANY NEW CONSTRUCTION.
- THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN WHICH ARE NOT TO BE REMOVED.

- (A) RIGHT OF CARRIAGEWAY, EASEMENT FOR SERVICES & EASEMENT TO DRAIN WATER 3.805 WIDE & 10 WIDE
(B) RIGHT OF CARRIAGEWAY, EASEMENT FOR SERVICES & EASEMENT TO DRAIN WATER 3.81 WIDE
(C) EXISTING RIGHT OF CARRIAGEWAY 3.81 WIDE VIDE AD794085, EXISTING RIGHT OF CARRIAGEWAY 3.81 WIDE VIDE AD794084 & EASEMENT FOR ACCESS 3.81 WIDE


AXIOM
ABN 20 683 949 027
c/- PO Box 166, SUTHERLAND NSW 1499
MOB 0420 333 275
Email: day@axiomsurveying.com.au

PLAN SHOWING DETAIL & LEVELS
OVER LOT 6 IN DP749791
BEING No 113 ORCHARD STREET
WARRIEWOOD, FOR DESIGN
PURPOSES AND TO SUPPORT A
DEVELOPMENT APPLICATION


JOB No:	2987	YOUR REF:		Rev.	Amendments	Date
DRAWING No:	2987CO	CLIENT:	JILL HUNTER			
SCALE:	1:250 (A1)	SURVEYED K.D.				
DATUM:	AHD	DATE:	16.02.2018	DRAWN K.D.		
SHEET:	1 OF 1	DATE:	22.02.2018			

8 **Attachment D: Borehole Logs**


MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165BH101-104V01.GPJ <<DrawingFile>> 06/02/2022 15:25 10/02/2004 D:\git\Lab and In Situ Tool - DGD [Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13]

CLIENT	Tony Mclain Architects			COMMENCED	24/11/2021	COMPLETED	24/11/2021	REF BH101						
PROJECT	Wastewater Assessment			LOGGED	RM	CHECKED	GT	Sheet 1 OF 1						
SITE	113 Orchard Street, Warriewood, NSW.			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Grass	PROJECT NO. P2108165						
EQUIPMENT	Hydraulic push tube			LONGITUDE		RL SURFACE	28.1 m	DATUM	AHD					
EXCAVATION DIMENSIONS	ø100 mm x 1.00 m depth			LATITUDE		ASPECT	East	SLOPE	20 - 30%					
Drilling			Sampling		Field Material Description									
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
PT		Not Encountered	28.10	0.0-0.1/S/1 D 0.00-0.10 m			SP	Sand LOAM; dark grey / brown.					RESIDUAL SOIL	
			0.20	27.90			CL	Sandy CLAY LOAM; brown / grey; moderate structure.						
			0.3-0.4/S/1 D 0.30-0.40 m											
			0.4											
			0.60	27.50			CL	Light CLAY; pale brown; moderate structure.						
			0.8	0.8-0.9/S/1 D 0.80-0.90 m										
			0.90	27.20					Trace sandstone / ironstone gravels.					
			1.00						Hole Terminated at 1.00 m				1.00: Hand push tube refusal on extremely low strength sandstone.	
			1.2											
			1.4											
EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS														
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MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165BH101-104V01.GPJ <<DrawingFile>> 06/02/2022 15:25 10/02/2004 D:\git\Lab and In Situ\Tool - DGD\ [Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13]

CLIENT	Tony Mclain Architects			COMMENCED	24/11/2021	COMPLETED	24/11/2021	REF BH102						
PROJECT	Wastewater Assessment			LOGGED	RM	CHECKED	GT	Sheet 1 OF 1						
SITE	113 Orchard Street, Warriewood, NSW.			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Grass	PROJECT NO. P2108165						
EQUIPMENT	Hydraulic push tube			LONGITUDE		RL SURFACE	28 m	DATUM	AHD					
EXCAVATION DIMENSIONS	ø100 mm x 1.00 m depth			LATITUDE		ASPECT	East	SLOPE	20 - 30%					
Drilling			Sampling		Field Material Description									
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
PT	Not Encountered		28.00					SP	Sand LOAM; dark grey / brown.				RESIDUAL SOIL	
			0.15											
			27.85						CL	Sandy CLAY LOAM; brown / grey; moderate structure.				
			0.2											
			0.4											
			0.40						CL	Light CLAY; pale brown; moderate structure.				
			27.60											
			0.6											
			0.8											
			1.0											
			1.00						Hole Terminated at 1.00 m (Target depth reached)					
			1.2											
			1.4											
EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS														
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MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165BH101-104V01.GPJ <<DrawingFile>> 06/02/2022 15:25 10/02/2004 D:\git\Lab and In Situ Tool - DGD [Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13]

CLIENT	Tony Mclain Architects			COMMENCED	24/11/2021	COMPLETED	24/11/2021	REF BH103						
PROJECT	Wastewater Assessment			LOGGED	RM	CHECKED	GT	Sheet 1 OF 1						
SITE	113 Orchard Street, Warriewood, NSW.			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Grass	PROJECT NO. P2108165						
EQUIPMENT	Hydraulic push tube			LONGITUDE		RL SURFACE	39.4 m	DATUM	AHD					
EXCAVATION DIMENSIONS	ø100 mm x 0.90 m depth			LATITUDE		ASPECT	East	SLOPE	20 - 30%					
Drilling		Sampling		Field Material Description										
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
PT		Not Encountered	39.40	0.0-0.1/S/1 D 0.00-0.10 m			SP	Sand LOAM; dark grey / brown.					RESIDUAL SOIL	
			0.20											
			39.20					CL	Sandy CLAY LOAM; brown / grey; moderate structure.					
			0.30											
			39.10					CL	Light CLAY; pale brown; moderate structure.					
			0.4											
			0.6		0.5-0.6/S/1 D 0.50-0.60 m									
			0.8											
			0.90											
			1.0						Hole Terminated at 0.90 m (Target depth reached)					
			1.2											
			1.4											
EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS														
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MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165BH101-104V01.GPJ <<DrawingFile>> 06/02/2022 15:25 10/02/2004 D:\git\Lab and In Situ Tool - DGD [Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13]

CLIENT	Tony Mclain Architects			COMMENCED	24/11/2021	COMPLETED	24/11/2021	REF BH104						
PROJECT	Wastewater Assessment			LOGGED	RM	CHECKED	GT	Sheet 1 OF 1						
SITE	113 Orchard Street, Warriewood, NSW.			GEOLOGY	Hawkesbury Sandstone	VEGETATION	Grass	PROJECT NO. P2108165						
EQUIPMENT	Hydraulic push tube			LONGITUDE		RL SURFACE	39 m	DATUM	AHD					
EXCAVATION DIMENSIONS	ø100 mm x 0.80 m depth			LATITUDE		ASPECT	East	SLOPE	20 - 30%					
Drilling			Sampling		Field Material Description									
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
PT		Not Encountered	39.00					SP	Sand LOAM; dark grey / brown.				RESIDUAL SOIL	
			0.20											
			38.80						CL	Sandy CLAY LOAM; brown / grey; moderate structure.				
			0.30											
			38.70					CL	Light CLAY; pale brown; moderate structure.					
			0.4											
			0.6											
			0.8	0.80					Hole Terminated at 0.80 m (Target depth reached)					
			1.0											
			1.2											
			1.4											
EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS														
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