

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



P2108165JR05V04
December 2024

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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	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). A survey map showing the topography of the site is presented in (Attachment C).
Expected Geology and Soils	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. 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.

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 of 530 m² 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 (2024) *Site Plan - Proposed Horse Arena and Facilities and New Dwelling. Lot 6 DP749791. 113 Orchard St., Warriewood*.

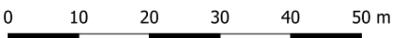
5 Attachment A: Mapset and Figures

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



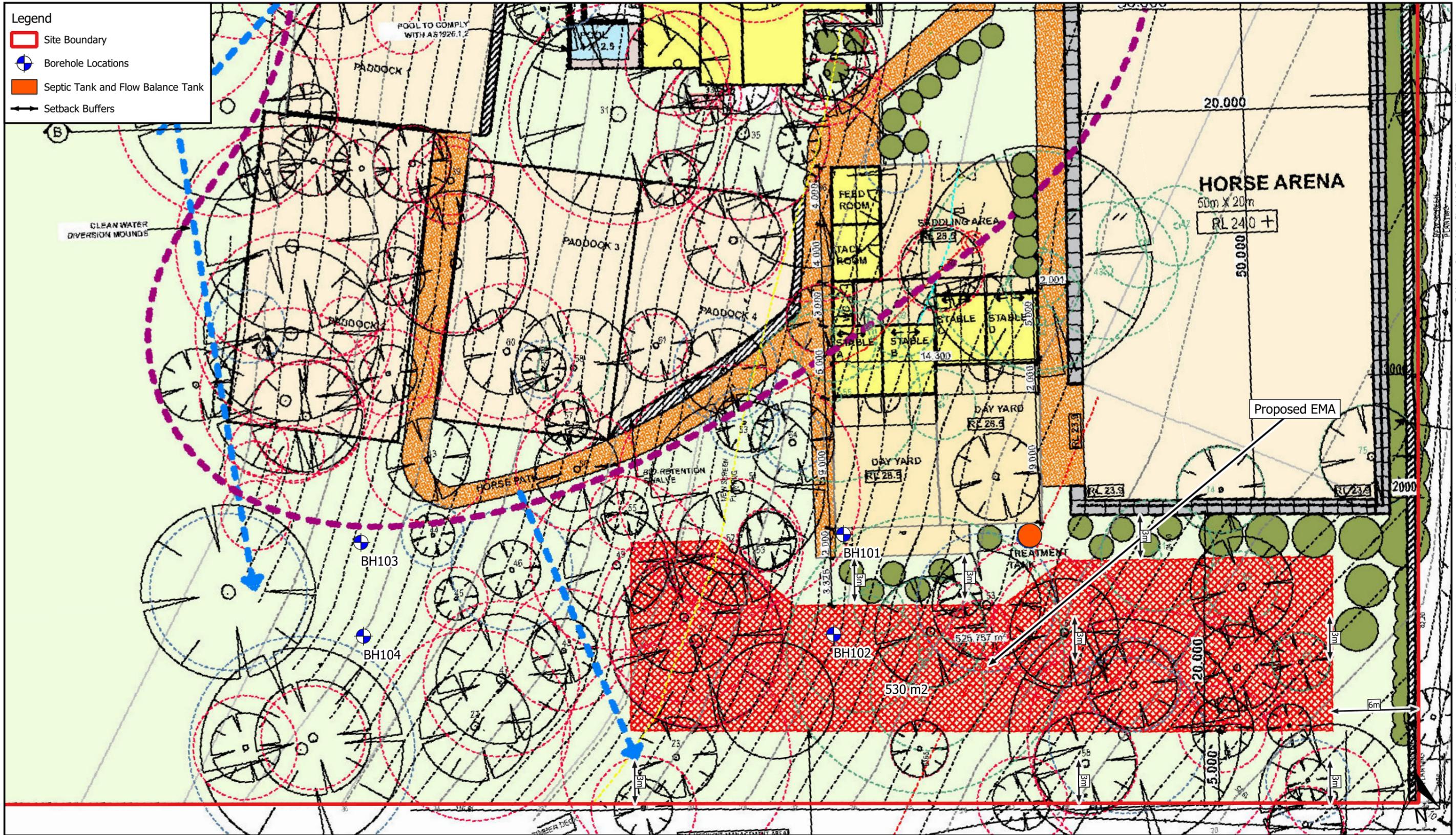
0 10 20 30 40 50 m

1:1000 @ A3
 Viewport
 Source of contour lines: ELVIS Lidar.
 Source of Aerial Photo: Nearmap.

Map Title / Figure:
Borehole Location Map

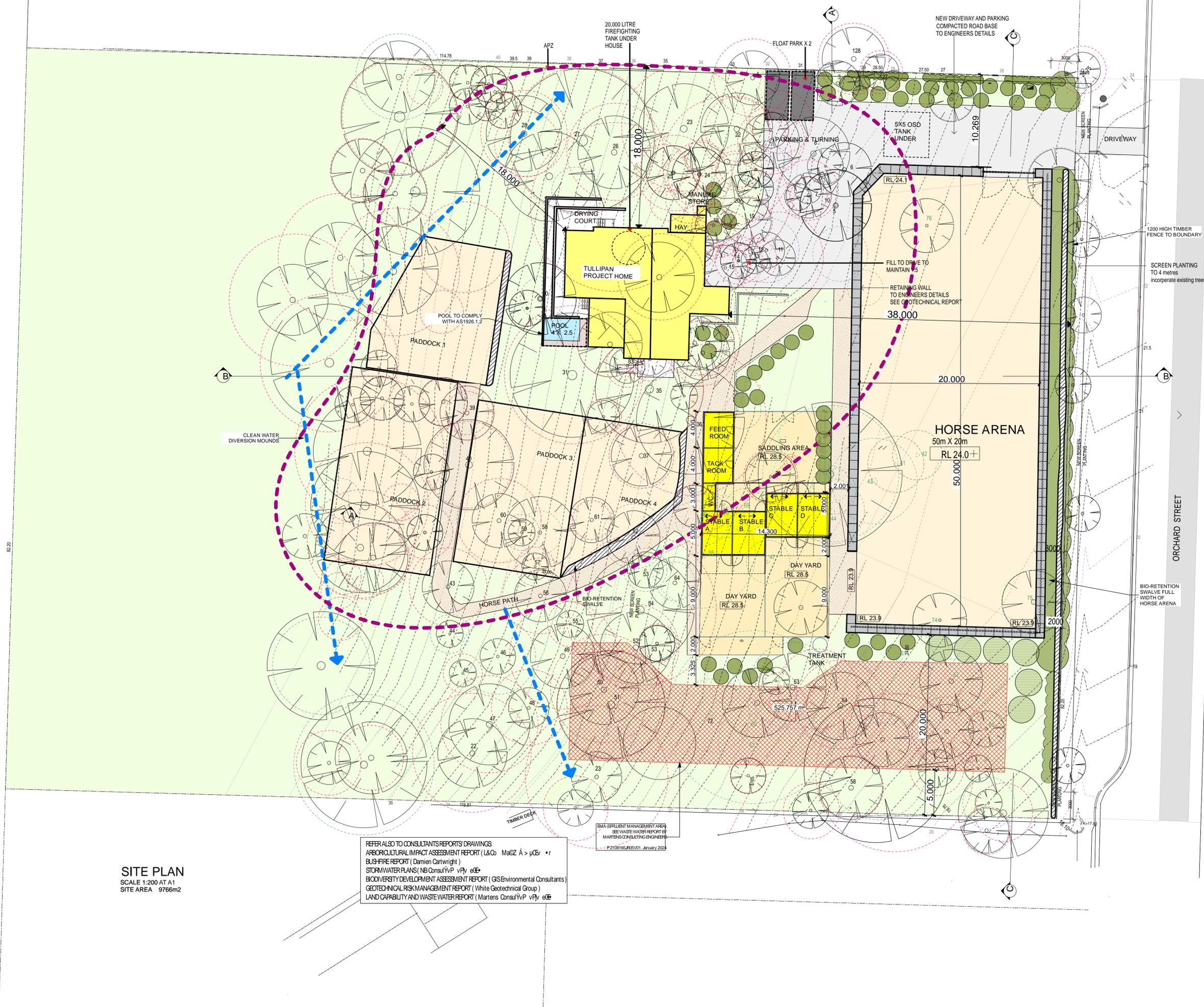
Map 02	Map
113 Orchard Street, Warriewood, NSW.	Site
Proposed Dwelling and Stables	Project
Wastewater Assessment	Sub-Project
Tony Mclain Architects	Client
16/12/2024	Date

Project No: P2108165 Map Set: M502-R04 EPSG: 28356
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1:250 @ A3
 Viewport
 Source: Tony Mclain (2021) Proposed Horse Arena and Facilities and Additions to Existing Dwelling, Lot 6 DP749791.

6 Attachment B: Development Plans



- KEY**
- EXISTING VEGETATION - UNBUILT ON AREA WITHIN BOUNDARIES
 - NEW SCREEN PLANTING
 - ARENA, DAY YARDS, TOP PADDOCKS
 - ACCESS DRIVE COMPACTED ROAD BASE
 - HORSE PATH NATURAL GRADE
 - 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
 - APZ
 - NEW LEVEL
 - CLEAN WATER DIVERSION MOUND
 - BIO-RETENTION SWALE
 - EFFLUENT MANAGEMENT AREA
 - RETAINING WALL
 - 1200 HIGH TIMBER FENCE
 - RETAINING WALL

Revision	Date	Remarks
N	6.12.24	APPEAL APPLICATION S8.7
M	01.10.24	REVISED SITE PLAN
L	10.09.24	REMOVE HORSE WASH BAY, ARENA REPOSITIONED
K	04.06.24	REMOVE UNUSED SEPTIC TANK AND LINE
J	31.01.24	EMA SHOWN
	11.5.23	FOR DA

Revision	Date	Remarks

SITE PLAN
SCALE 1:200 AT A1
SITE AREA 9766m²

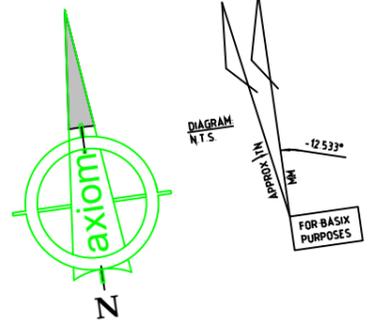
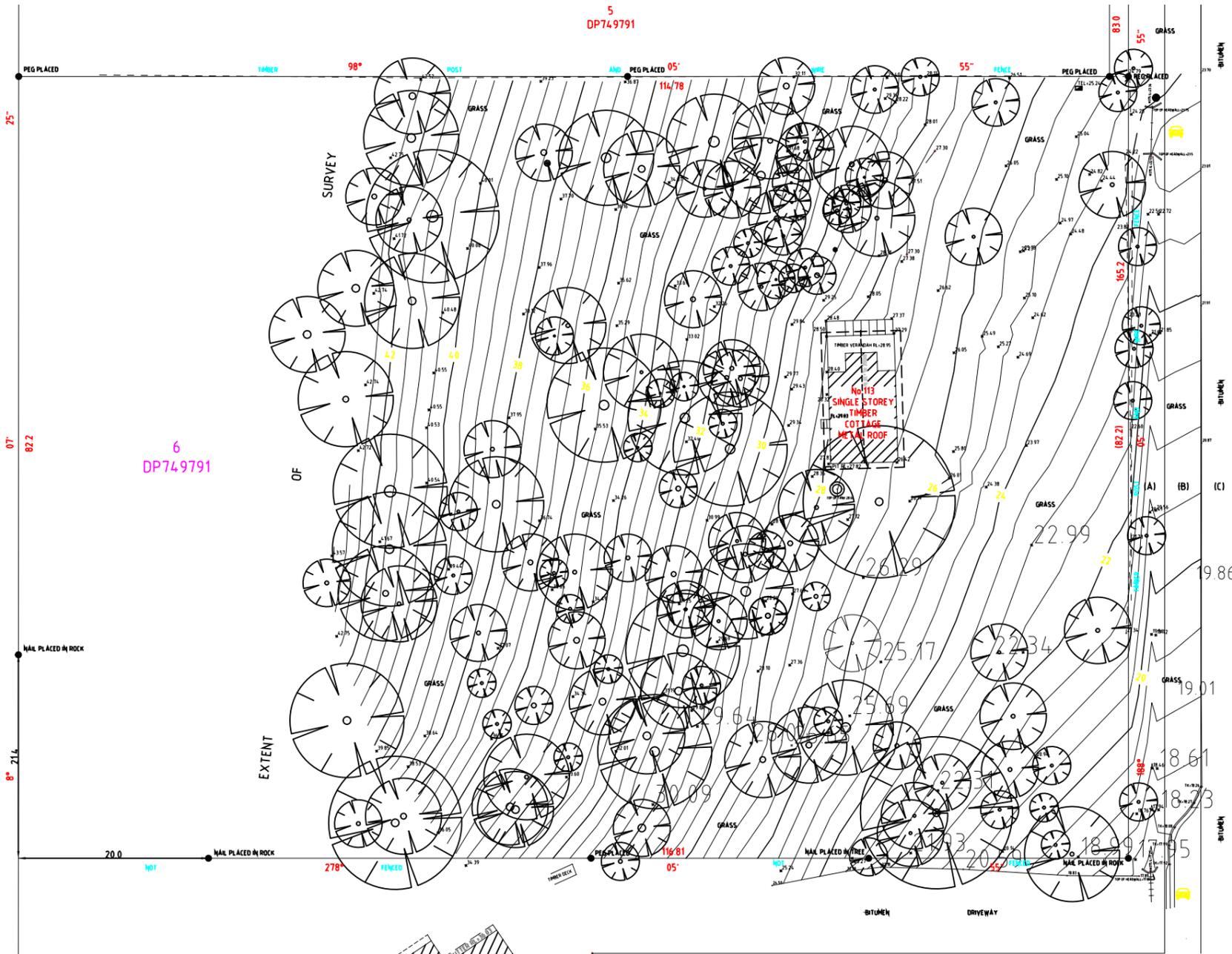
REFER ALSO TO CONSULTANTS REPORTS/DRAWINGS
ARBOCULTURAL IMPACT ASSESSMENT REPORT (L&Co Ma@Z A > µ@v • r
BUSH-FIRE REPORT (Damien Cartwright)
STORMWATER PLANS (NB Consul VvP vFv e@e
BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (GSEnvironmental Consultants)
GEOTECHNICAL RISK MANAGEMENT REPORT (White Geotechnical Group)
LAND CAPABILITY AND WASTE WATER REPORT (Martens Consul VvP vFv e@e

EMA EFFLUENT MANAGEMENT AREA
SEE WASTE WATER REPORT BY
MARTENS CONSULTING ENGINEERS
P 2109165.F002/01 January 2023

PROPOSED HORSE ARENA AND FACILITIES AND NEW DWELLING
LOT 6 DP749791
Address
113 Orchard St, Warriewood
Title
SITE PLAN DA
Tony McLain Architect (Reg. No. 4291)
Tel 98108631
Mob 040223665
mclainTony@gmail.com

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

- (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

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- 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

LEGEND

	POWER POLE		WATER MAIN
	ELECTRICAL PILLAR		TELSTRA PIT
	POWER LIGHT POLE		SEWER LAMP HOLE
	LIGHT POLE		STORMWATER GRATE
	HYDRANT		SURFACE INLET PIT
	WATER METER		LINTEL-KERB INLET PIT WITH GRATE
	STOP VALVE		CLOTHES LINE
	GAS METER		SEWER MANHOLE
	GAS DIRECTION MARKER		TREE
	STREET SIGN		Ø DIAMETER
	PRISM CROSSING		S SPREAD
	VEHICLE CROSSING		E OVERHEAD ELECTRICITY LINE
			T OVERHEAD TELECOM LINE
			S SEWER LINE

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c/- PO Box 106, 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: 2967	YOUR REF:	Rev.	Amendments	Date
DRAWING No: 2967CO	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

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)	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	█			CL	Light CLAY; pale brown; moderate structure.					
			0.8-0.9/S/1 D 0.80-0.90 m	█					Trace sandstone / ironstone gravels.				
			0.90 27.20										
			1.00					Hole Terminated at 1.00 m				1.00: Hand push tube refusal on extremely low strength sandstone.	

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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					CL	Sandy CLAY LOAM; brown / grey; moderate structure.				
			0.30					CL	Light CLAY; pale brown; moderate structure.				
			0.90	0.5-0.6/S/1 D 0.50-0.60 m									
									Hole Terminated at 0.90 m (Target depth reached)				

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165HH101-10AV01.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



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 mail@martens.com.au WEB: http://www.martens.com.au

**Engineering Log -
BOREHOLE**

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.				
			0.80						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

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P2108165HH101-104V01.GPJ <<DrawingFile>> 09/02/2022 15:25 10/02/2004 D:\ggl\Lab and In Situ\Tool - DGD\ Lib: Martens 2.00 2016-11-13 Proj: Martens 2.00 2016-11-13



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**Engineering Log -
BOREHOLE**