TERRA INSIGHT

Lot 106 DP755923 Inyadda Dr, Manyana NSW

Report on Geotechnical Investigation

Prepared for:

HEIR ASQUITH

Our Ref: TERRA19271.Rep1.Rev1

Prepared for:
HEIR ASQUITH
C/ Egis Consulting Pty Ltd

9 August 2023

Attention: Mr T Nahra

RE: Lot 106 DP755923 Inyadda Dr, Manyana NSW
Report on Geotechnical Investigation

Dear Tony,

Please find enclosed our geotechnical investigation report in relation to the acid sulphate soil assessments conducted on the above Site. This report should be read in conjunction with the attached document 'About Your Report' in Appendix A. The results of these assessments are documented herein and indicate the following:

- The Site has a very low potential for acid sulfate soil (ASS) to be present on the eastern part of the Site which is not proposed for development and will be used for environmental conservation;
- The Site proposed for residential development is underlain, in parts, by alluvial soils. ASS mapping, the elevation of these alluvial soils, and laboratory testing indicates these alluvial soils are not comprised of ASS;
- The Site, in parts, is underlain by residual soils derived from acid rock of the Wandrawandian Siltstone. The residual soils are classed as acidic soils which contain sulfur but not in the form of pyrite or Reducible Inorganic Sulfur (RIS). Their potential acidity and retained acidity are below the limits of detection. Consequently, these soils are unlikely to produce acidic conditions by oxidation alone without some additional form of chemical oxidising re-agent.
- No formal acid sulfate soil management plan is deemed required for the Site.
- The residual soils are endemic to the area and therefore can be reused on Site as general fill. However, the acidic soils do contain sulfuric ores and therefore do not met the definition of virgin excavated material (VENM). Consequently, they cannot be reused off-Site and must be treated with lime at a rate of 10kg/t prior to disposal to landfill.

Should you have any questions please contact the undersigned.

For and on behalf of Terra Insight

Karen Gates
Principal Engineer/ Director
CPEng MIEaust BEng MEngSc(Geot) MEnvMgt MBA CEnvP

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1 Introduction

At the request of HEIR ASQUITH (the client), Terra Insight Pty Ltd (Terra) has carried out an acid sulphate soil (ASS) assessment of Lot 106 DP755923 Inyadda Dr, Manyana NSW, hereafter referred to as the Site. It is understood that the Site is proposed for residential sub-division. Drawings showing the proposed residential development are provided in Appendix B. The objective of the geotechnical ASS investigation was to determine whether acid sulphate soils are present on the Site and if present, their net acidity and liming rate and the requirement for an Acid Management Plan (if applicable). This assessment was done in conjunction with a Preliminary (Contamination) Site Investigation which included limited sampling of the near-surface soils (< 0.5m depth). The findings of the PSI have been reported separately (refer TERRA22-165 Rep 1 Rev2).

2 Scope of work

The scope of work for this assessment included the following:

- A review of geological maps and aerial photography covering the Site;
- A review of acid sulphate mapping covering the Site;
- A visit to the Site to make observations of site surface conditions by a Geotechnical Engineer;
- A subsurface investigation comprising:
  - Twenty-four (24) boreholes (named BH1 to BH24) to 1.0m depth or shallow refusal in weathered material.
  - Sampling of the subsurface soils at 0.5m intervals for acid sulfate soil testing; and
  - Logging of the materials encountered by a geotechnical engineer;
- Laboratory testing including ASS field screen testing of all samples collected from the Site and an ASS Chromium suite test on a representative sample of the material encountered on the Site; and
- Provision of report providing the findings of the ASS assessment and recommendations in accordance with the objectives outlined above.

3 Investigation Findings

3.1 Site details and Topography

Lot 106 DP755923 Inyadda Dr, Manyana NSW, is located approximately 2.4km north east of Cunjurong Point. The Site has a surficial area of approximately 76ha with around 14ha proposed for residential development as shown on Figure 1. This development is focused mainly on the western and middle parts of the Site. The eastern part of the Site and area adjacent to existing creeks have been set aside for riparian and conservation areas.

The Site is bounded by Inyadda Drive on the western boundary and underdeveloped land on all other boundaries. Two small drainage depression cross the Site from the north-eastern corner (Creek 1) and south-western corner (Creek 2) of the Site. These flow eastwards, joining together within the eastern part of the Site (into Creek 3) and then flow into a small lake which overflows onto Inyadda Beach.

The Site has elevations varying from 5m on the eastern boundary of the Site adjacent to the creek, increasing to approximately 30m AHD on the western boundary of the Site between the two drainage depressions. Typically, the surface elevations of the areas proposed for development on the western and middle part of the Site are above 8m AHD.

3.2 Geology

The 1:250,000 geology sheet for Ulladulla indicates the Site is underlain by 'Undifferentiated Tertiary' aged sediments, consisting of gravel, sand, clay, quartzite, sandstone and conglomerate. It also shows 'Quaternary' aged alluvial sediments located around Creek 2, and around the small lake and Creek 3 located within the middle and eastern parts of the Site respectively (refer Figure 1). The area of alluvial soils around the lake and Creek 3 is remote from the areas proposed for residential development. The area of alluvial soils located within the middle of the Site and Creek 2, are located between the two portions of the Site proposed for residential development as shown on Figure 1. No alluvial sediments are mapped in association with Creek 1.

The NSW geology mobile app shows the entire Site is underlain by Cainozoic era (deposited 0 to 65 million years ago) alluvial sediments with Permian aged Snapper Point Formation and Wandrawandian Siltstone of the Shoalhaven group located to the west and north of the Site respectively (refer Figure 2).

3.3 Historical Aerial Imagery

Historical aerial photography of the Site (refer Figure 3) indicates that the Site has remained relatively unchanged since 2004. The Site is undeveloped. The creeks within the Site are visible as shallow drainage depression with adjacent low-lying areas.

Within the middle of the Site are two areas partly cleared of vegetation hereafter referred to as Area 1 and Area 2. Several dirt tracks are visible within and around these areas. Area 1 is located just to the north of Creek 2 and the alluvial sediments mapped within the middle of the Site as shown on Figure 1. Area 2 is located just to the west of the Creek 3 and the lake and the alluvial sediments mapped on the eastern part of the Site.

Area 1 has an elevation ranging from 17 to 24m AHD and Area 2 has an elevation ranging from 7 to 14m AHD with the elevations falling to the south east.

3.4 ASS risk mapping

Acid sulfate soils (ASS) are naturally occurring soils and sediments containing iron sulfides, most commonly pyrite. When pyrite in ASS is exposed to air, the iron sulfides in the soil react with oxygen and water to produce a variety of iron compounds and sulfuric acid.

Although some ASS were formed millions of years ago and occur in ancient marine rocks, those of most concern which can produce acid runoff, were formed after the last major sea level rise (within the Holocene era - ie in the past 10,000 years) and are referred to as acid sulfate soils.

ASS commonly occur in coastal wetlands as layers of marine muds and sands which are deposited in protected, low-energy environments such as barrier estuaries and coastal lakes. In similar environments, they are still being formed. Although typically encountered at elevations below 5m AHD, they can be encountered at elevations up to about 20m AHD associated with historical flooding events and former seashores.

Mapping of potential areas of ASS are documented within three potential on-line resources; viz, the NSW EPA E- Spade website, the Department of Land and Water 1:50,000 scale maps and on the online mapping services within Shoalhaven City Council.

The Shoalhaven online mapping resources show the entire Site is mapped as Class 5 ASS. Class 5 ASS means the Site is located within 500m of known areas of ASS. This means there is a very low risk of ASS being present on the Site or that there is the potential for proposed works on the Site to impact on nearby ASS if these works are not managed appropriately.

The acid sulphate soil risk map accessed online via eSPADE v2.0 (see Figure 4) and the Department of Land and Water Conservation map, which covers the Milton-Cunjurong Point area, indicates the portions of the Site proposed for residential development are not within areas with known occurrence of ASS except for the following:

- Area 2 is within proximity of a potential area of ASS occurrence. This potential area of ASS borders the eastern part of the area and is associated with Creek 3 and the lake to the east of Area 2. The ASS is mapped as Ep1. This is defined as an estuarine plain with ASS at elevations between 1 and 2 m AHD.

3.5 Site Observations

Observations of the Site were made at the time of the site inspection. Photographs taken of the general Site conditions are provided in Appendix C. The inspection of the Site was constrained to those part of the Site that were accessible by foot or car. This included, in particular, Area 1 and Area 2. The observations made within each area were as follows:

Area 1

- The area is predominantly flat with a slight fall to the south east with an RL of between 24 to 17m AHD. The surface of the Site is undulated with dirt roads and washouts within them,
- The surface of the area is scattered with foreign material including but not limited to glass bottles, building waste, rubbish, plastic, old fridges, paint containers, bricks, car bodies, and more,
- In the middle of Area 1, the Site it is predominantly grassed and surrounded by thick bush. There are several dirt vehicle tracks in and around the grassed area,

Area 2

- Area 2 has is slightly sloping south eastward with an approximate RL of 14 to 8m AHD,
- Like Area 1, Area 2 is predominantly grassed in the middle and has a few car bodies scatted throughout the open area,
- There is a dirt vehicle track around the perimeter of the grassed central part of the Area. This dirt road continues northwards towards the adjacent lot to the north of the Site,
- The vegetation on the eastern side of the area was a lot denser than the bush encountered in Area 1, especially along the drainage depression on the site.
- Along the eastern part of the Site a shallow depression as observed, which was inferred to be the creek. No water was observed flowing in the creek.

3.6 Subsurface conditions

The Site's geology mapping indicates the potential for alluvial soils along the southern part of Area 1 and along the eastern part of area 2. The ASS mapping indicates ASS is most likely to be found in the alluvial soils along the eastern part of Area 2 with no known occurrence of ASS along Creek 2.

Consequently, the investigation focused on testing for ASS along the southern and eastern parts of Area 1 and 2 respectively, which were accessible. This included testing within the two cleared areas (Area 1 and Area 2) and from adjacent nearby tracks.

The subsurface investigation was undertaken on the 5th of August and comprised the auguring of twenty-four test sites (named BH01 to BH24) to a depth of 1.0m below the existing ground surface level or refusal in weathered material where shallower.

Test locations BH01 to BH012 were located within and around Area 2 whilst test locations BH13 to BH24 were located within and around Area 1. The location of each test site within and around Area 1 and Area 2 are shown on Figure 5 and 6 respectively. The subsurface conditions encountered in the boreholes are summarised on Table 3.1 and 3.2 respectively. Engineering logs are provided in Appendix D. A groundwater table was not encountered during the investigation.

Table 3-1: Summary of subsurface investigation Area 2

Subsurface conditions *(Soil name, plasticity or particle characteristics, colour, secondary components and minor components)*	Structure and other comments	Depth encountered in test site/exposure (m)											
		BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH10	BH11	BH12
CLAY/Sandy CLAY: low to high plasticity, dark brown, brown, trace of fine gravel	Topsoil	0.0-0.4	0.0-0.5	0.0-0.3	0.0-0.3	0.0-0.2	0.0-0.3	0.0-0.3	0.0-0.2	0.0-0.2	0.0-0.2	0.0-0.2	0.0-0.2
Sandy CLAY medium to high plasticity, brown, with fine to medium angular gravel	Fill	NE	NE	NE	NE	NE	NE	NE	0.2-0.7	NE	NE	NE	NE
GRAVEL: fine to coarse angular gravel, grey brown		NE	NE	NE	NE	NE	NE	NE	0.7-0.8	NE	NE	NE	NE
CLAY: medium to high plasticity, grey brown, brown. Sandy CLAY for BH07. Possibly fill for BH11 and BH12.	Alluvial	0.4-0.8	0.5-1.0	NE	0.3-0.6	NE	NE	0.3-0.7	NE	NE	NE	0.2-0.7	0.2-0.7
Sandy CLAY to CLAY: medium to high plasticity, dark grey brown, brown with fine to medium sand, trace of fine angular gravel	Alluvial transition into Residual	NE	NE	0.3-0.7	NE	0.2-0.45	0.3-0.8	NE	NE	0.2-0.6	NE	NE	NE
Sandy CLAY to CLAY: low to medium plasticity, yellow brown, light brown, brown fine to medium sand.	Residual	0.8-0.9	1.0-1.2	NE	NE	NE	NE	0.7-0.9	NE	NE	0.2-0.4r	NE	0.7-1.1r
Sandy GRAVEL: with clay, grey brown (possibly fill)		NE	NE	NE	NE	NE	NE	NE	0.8-1.2r	NE		0.7-0.8	
Extremely Weathered Sandstone: recovered as SAND, Silty SAND and Sandy CLAY: fine to coarse sand, yellow brown, low plasticity fines	Extremely Weathered Material	0.9-1.0r	1.2-1.3r	0.7-0.9r	0.6-0.8r	0.45-0.5r	0.8-1.0r	0.9-1.3r		0.6-0.7r		0.8-1.0r	

Notes to table * - End of hole at target depth; ^{r} - Early refusal, NE – not encountered

Table 3-2: Summary of subsurface investigation Area 1

Subsurface conditions *(Soil name, plasticity or particle characteristics, colour, secondary components and minor components)*	Structure and other comments	Depth encountered in test site/exposure (m)											
		BH13	BH14	BH15	BH16	BH17	BH18	BH19	BH20	BH21	BH22	BH23	BH24
Sandy CLAY: low to medium plasticity, red brown, brown, trace of fine gravel, foreign items in parts	Topsoil	0.0-0.2	NE	0.0-0.2	0.0-0.1	0.0-0.4	0.0-0.1	0.0-0.2	0.0-0.2	0.0-0.1	0.0-0.3	0.0-0.2	0.0-0.2
Sandy CLAY: medium to high plasticity, brown.	Alluvial	NE	0.0-0.9	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Sandy CLAY: low to medium plasticity, reddish brown, dark brown, trace of fine to medium sub angular gravel	Alluvial transitioning into Residual	NE	NE	NE	0.1-0.8	NE	NE	NE	NE	NE	0.3-0.7	NE	NE
Sandy CLAY: low to medium plasticity, red brown, fine sand, possibly residual	Colluvial	NE	NE	NE	NE	NE	0.1-0.6	NE	NE	NE	NE	NE	NE
Sandy CLAY: medium to high plasticity, reddish brown, with medium to coarse sand, with fine to medium gravel	Residual	NE	NE	NE	NE	NE	NE	NE	0.2-0.7	NE	NE	NE	NE
Sandy CLAY: medium plasticity, brown, dark brown, yellow brown, fine sand to coarse sand, with or trace of gravels		0.2-0.4	0.9-1.0r	0.2-0.6r	NE	NE	0.6-1.0r	0.2-0.4	NE	0.1-0.4r	0.7-0.9r	0.2-0.4	0.2-0.4
Extremely Weathered Material: recovered as clayey SAND to SAND: yellow brown, yellow, light brown with low plasticity fines	Extremely Weathered Material	0.4-0.5r			0.8-0.9r	0.4-0.5r		0.4-0.5r	0.7-0.8r			0.4-0.5r	0.4-0.5r

Notes to table: * - End of hole at target depth; ʳ - Early refusal, NE – not encountered

3.7 Laboratory Analysis

Acid sulfate soils (ASS) are grouped into two types, viz:

- **Actual (Active) Acid Sulfate Soils (AASS)** where the soils are oxidising, and acid is already being produced. These soils are typically identified because the pH of the soil when mixed with water is low (e.g. pHf < 4);
- **Potential (Passive) Acid Sulfate Soils (PASS)** where there is the potential for acid to be generated but the soil is not yet exposed to oxidizing conditions. In this case, a low pH is produced when the soil is mixed with an oxidizing solution resulting in a low pH (e.g. pH_{fox} < 3). Other indicators of PASS soils are a notable reaction when the oxidizing solution is applied and a pH_{fox} at least one unit lower than pH_f.

A summary of the results of acid sulfate soils field screening tests undertaken on samples of soil retrieved from each of the test sites as summarised in **Table 3-3** on the following page and provided in Appendix F.

The ASS field screening indicated the following:

- Almost all samples showed a drop in pH greater than 1 with a moderate reaction during the testing. This is indicative of a weak acidic reaction which can be associated with organic (humic) material within near surface topsoils.
- There was a variance in the Field Screen test results between samples taken from Area 1 and Area 2 as follows:
  - Western Part of the Site (Area 1): the pH_f ranged from 4.5 to 8.7 but was typically above 4 which is not indicative of the presence of AASS. The pH_{fox} was typically just above 4 which is an inconclusive result for PASS. The exceptions to this were BH13, BH20 to BH22, and BH24 where the pH_{fox} was below 4. This is considered a borderline result for the potential presence of PASS.
  - Eastern Part of the Site (Area 2), the pH_f was typically above 6 which is not indicative of the presence of AASS. The pH_{fox} was typically just above 5 which not indicative of the presence of PASS.

It is noted that samples with a borderline result for PASS, were located on the south-western part of Area 1, close to Creek 2. The lowest pH_{fox} result in this area was 3.6, found in both samples BH13 S2 (1.0m) and BH21 S1 (0.5m). Both these samples had a moderate reaction and ΔpH greater than 1 and were logged as comprised of residual soil with refusal on weathered material occurring within 1m depth. The soils were also observed to be located at relatively high elevation (>21m AHD) and west of any known mapped areas with the potential areas for ASS occurrence.

Further chromium suite testing was undertaken on a sample of soil taken from BH20 at 0.5m to assess the cause of acid generation. This result is documented in Table 3.5 and indicates the following:

- Ph KCl 4.1
- Actual acidity 0.2 % S
- Potential acidity <0.005 % S pyrite
- Retained acidity <0.02 % S pyrite
- Net acidity 0.21 %S
- Limiting rate 10 kg CaCO3/t

Given the elevation of the Site, the shallow depth to rock across the Site, and the level of acidity being below limits of reporting for potential and retained acidity, the acidity detected in the field screen results for the south-western part of Area 1 is deemed to be associated with residual soils derived from an underlying acidic rock. It is known that Wandrawandian Siltstone is located to the north of the Site and this rock formation is known to contain some acidic rock. It is expected that the soils on higher parts of the Site are associated with weathered materials associated with this rock formation.

Table 3-3: Summary of ASS field screening laboratory results

Test Hole Number	Sample Depth (m)	$pH_{(f)}$	$pH_{(fox)}$	Reaction (1 slight, 2 moderate, 3 strong, to 4 extreme)	ΔpH $pH_{(f)}$ - $pH_{(Fox)}$	AASS indicator ($pH_f < 4$)[A]	PASS indicators			Potential for ASS[D] based on fast field screen test
							pHfox[C]<3	ΔpH[B] (>1)	Strong or very strong reaction	
Area 1										
BH13	S1 0.5	5.2	4.0	2	1.2	✗	✗	✓	✗	LOW
	S2 1.0	4.7	3.6	2	1.1	✗	✗	✓	✗	MODERATE
BH14	S1 0.5	7.4	6.0	3	1.4	✗	✗	✓	✓	HUMIC
	S2 1.0	8.5	5.8	2	2.7	✗	✗	✓	✗	NA
BH15	S1 0.5	5.4	4.2	3	1.2	✗	✗	✓	✓	LOW - HUMIC
BH16	S1 0.5	6.1	4.0	3	2.1	✗	✗	✓	✓	LOW-- HUMIC
	S2 1.0	5.6	3.9	2	1.7	✗	✗	✓	✗	-MODERATE
BH17	S1 0.5	7.4	5.4	3	2	✗	✗	✓	✓	NA
BH18	S1 0.5	6.4	4.4	3	2	✗	✗	✓	✓	LOW
	S2 1.0	5.6	4.1	3	1.5	✗	✗	✓	✓	LOW
BH19	S1 0.5	5.7	4.1	3	1.6	✗	✗	✓	✓	LOW
BH20	S1 0.5	5.1	3.7	3	1.4	✗	✗	✓	✓	MODERATE
BH21	S1 0.5	5.1	3.6	2	1.5	✗	✗	✓	✗	MODERATE
BH22	S1 0.5	5.2	3.7	2	1.5	✗	✗	✓	✗	MODERATE
	S2 1.0	5.0	4.0	3	1	✗	✗	✗	✓	LOW
BH23	S1 0.5	5.4	4.2	2	1.2	✗	✗	✓	✗	LOW
BH24	S1 0.5	5.3	3.9	2	1.4	✗	✗	✓	✗	MODERATE
Area 2										
BH01	S1 0.5	6.9	5.1	3	1.8	✗	✗	✓	✓	HUMIC
	S2 1.0	7.6	5.7	2	1.9	✗	✗	✓	✗	NA
BH02	S1 0.5	6.8	4.9	3	1.9	✗	✗	✓	✓	LOW - HUMIC
	S2 1.0	7.6	5.7	2	1.9	✗	✗	✓	✗	NA
	S3 1.5	6.4	4.9	3	1.5	✗	✗	✓	✓	NA
BH03	S1 0.5	6.2	5.1	3	1.1	✗	✗	✓	✓	NA
	S2 1.0	6.7	5.4	3	1.3	✗	✗	✓	✓	NA

Test Hole Number	Sample Depth (m)	$pH_{(f)}$	$pH_{(fox)}$	Reaction (1 slight, 2 moderate, 3 strong, to 4 extreme)	ΔpH $pH_{(f)}$ - $pH_{(Fox)}$	AASS indicator ($pH_f < 4$)[A]	PASS indicators $pHfox^C<3$	Potential for ASS[D] based on fast field screen test ΔpH[B] < 1	Test Hole Number	Sample Depth (m)
Area 2 Cont.										
BH04	S1 0.5	7.3	6.0	2	1.3	✗	✗	✓	✗	NA
	S2 1.0	8.2	6.3	4	1.9	✗	✗	✓	✓	NA
BH05	S1 0.5	6.1	5.1	2	1	✗	✗	✗	✗	NA
BH06	S1 0.5	6.9	5.8	3	1.1	✗	✗	✓	✓	NA
	S2 1.0	8.8	6.3	4	2.5	✗	✗	✓	✓	NA
BH07	S1 0.5	7.0	5.2	3	1.8	✗	✗	✓	✓	NA
	S2 1.0	8.8	6.3	4	2.5	✗	✗	✓	✓	NA
BH08	S1 0.5	7.7	6.0	3	1.7	✗	✗	✓	✓	NA
	S2 1.0	8.0	7.2	4	0.8	✗	✗	✗	✓	NA
BH09	S1 0.5	7.3	5.6	3	1.7	✗	✗	✓	✓	NA
	S2 1.0	8.6	6.5	4	2.1	✗	✗	✓	✓	NA
BH10	S1 0.5	6.0	4.2	2	1.8	✗	✗	✓	✗	HUMIC
BH11	S1 0.5	7.6	6.1	4	1.5	✗	✗	✓	✓	NA
	S2 1.0	8.6	7.6	4	1	✗	✗	✗	✓	NA
BH12	S1 0.5	7.6	7.1	4	0.5	✗	✗	✗	✓	NA
	S2 1.0	7.9	7.7	4	0.2	✗	✗	✗	✓	NA

Notes to table: *A) This indicator is not used on its own as soils with high organic content can contain humic acid or manganese oxides which also produce a reaction;*

B) As the ΔpH increases, there is an increased probability that PASS is present.

C) The lower the pHfox the greater the potential for PASS to be present. Where pHfox < 3 and there is a strong reaction and high ΔpH, there is a high probability that PASS is present. Where the pHfox < 4 the result is less positive and further laboratory testing is required to determine the source of acid generation. Where pHfox < 5 the test is inconclusive, sulfides may be present either in small quantities or may be poorly reactive under quick field test conditions or the sample may contain carbonate which neutralises some or all acid production by oxidation. Equally the low value may be due to weak organic acids and there may be no sulfides present. Further testing to identify the cause of acid generation is recommended.

D) Samples which meet all the QASSIT indicators for PASS are assigned a high potential. Samples which meet some of the indicators for PASS are assigned a moderate potential. Samples which show an inconclusive result are assigned a low potential. It is noted that it is possible for some 'non-ASS soils' to generate acid and have all or some of the indicators of ASS. Further testing is required to assess the nature of acid generation.

Table 3-4: Summary of Chromium Suite laboratory test results

Test Location	Soil Type	Depth (m)	pH KCL	Actual Acidity [A] % S-TAA	Potential Acidity (% Sr)	Retained Acidity [C] (% S-S_{nas})	- Acid Neutralising Capacity ANCB (% S)[B]	Net Acidity (%S)	Fineness Factor	Liming Rate excluding ANC (kg/t)
LOR			*0.1*	*0.02*	*0.005*	*0.02*	*0.02*	*0.02*	*0.5*	*1*
BH20 S1	Clayey Silt	0.5	4.1	0.2	<0.005	<0.02	NA	0.21	1.5	10

Notes to table: LOR – level of reporting. NA – not applicable. A) only required where pH_{kci} is < 5.5, B) only required where pH_{kci} is >6.5 C) only required where pH_{kcl}<4

4 Engineering Assessment

4.1 Acid Sulfate Soils

The desk study identified that ASS may potentially exist in alluvial soils located to the east of the proposed areas for residential development (eg around Creek 3 and the lake) at elevations below 2m AHD. The ASS mapping indicates that these areas of ASS are likely to be comprised of sporadic and/or weak ASS which are unlikely to impact on the site unless dewatering of the site occurs to depths below 2m AHD.

The geotechnical investigations has confirmed that the areas proposed for residential development are underlain by alluvial soils in parts. These alluvial soils are underlain by residual soils which grade into weathered siltstone rock at shallow depth (typically < 1m). The results of the field investigation and the laboratory testing indicate the following:

- the alluvial soils encountered on the western and middle parts of the Site, within the areas proposed for development, are typically at elevations above 8m AHD and are not comprised of AASS or PASS. They are typically neutral to slightly alkaline. The potential for ASS to be present within the alluvial soils on the western and middle part of the Site in areas proposed for residential development is therefore assessed as very low.
- The residual soils underlying the Site, are in part, derived from an underlying acid rock associated with the Wandrawandian Siltstone. However, the acidity within these materials is not associated with pyrite (or reduced inorganic sulfur - RIS) and is unlikely to produce acidity by oxidation alone.

Naturally-occurring acidic soils, such as the residual soils which underlie the Site, are not considered an environmental hazard. They may form part of an acidophilic ecosystem whose health depends on maintaining an acidic environment. As an example, many soil materials in naturally acidic landscapes, such as acidic peatlands and coastal heaths, often have low pH values and high acidities. It has been demonstrated that the majority of the acidity associated with the acidic soil on the Site is not derived from the oxidation of RIS. Consequently, these materials should not be treated like ASS materials. Treating these soils as ASS may result in the liming of a naturally acidic ecosystems, leading to an unnaturally alkaline environment, resulting in severe ecological damage to the acidophilic organisms that rely on the acidic nature of such an ecosystem. Based on the above, a formal management plan for the Site is therefore deemed not required.

4.2 Waste Classification

The acidic soils underlying the site contain sulfidic ores and could potential generate acidity when exposed to certain oxidising chemical reagents. Consequently, the soils do not meet the definition of Virgin Excavated Natural Material (V/ENM) and must be treated prior to disposal to landfill. The laboratory testing indicates a liming rate of 10kg/t for material requiring off-Site disposal to landfill.

As the acidic soil is endemic to the area and is unlikely to be exposed to oxidising chemical agents as part of the residential development of the Site, the soil can be re-used on-Site without treatment.

Figures

Ulladulla 1:250,000 geological map

Site Geology

Symbol	Group	Sub-group	Unit	Lithology
Qal	-	-	-	Alluvium, gravel, swamp deposits and sand dunes
T	-	-	Undifferentiated Sediments	Gravel, sand, clay, quartzite, sandstone, conglomerate

Site Location

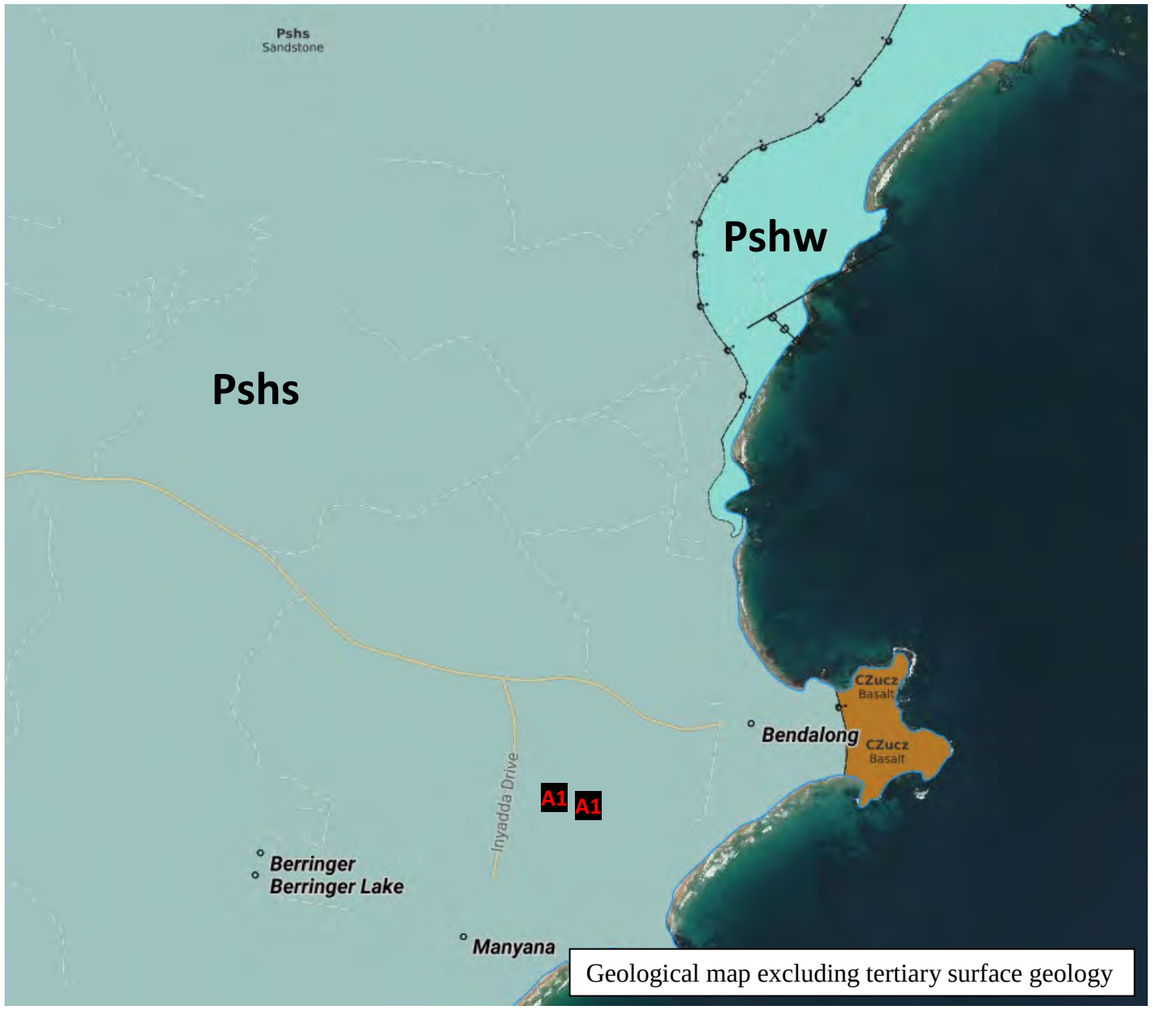
revision	description	drawn	approved	date
	Site location	HJP	KEG	10/08/2023

TERRA INSIGHT

scale	NTS
original size	**A3**

client:	**JWD Projects Pty Ltd**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
title:	**Site Location**
project no: **TERRA19271**	figure no: **FIGURE 1**

Geological map including tertiary surface geology



Geological map excluding tertiary surface geology

Site Geology

Symbol	Group	Sub-group	Unit	Lithology
CZ_a	-	-	Alluvium/Conglomerate	Unconsolidated alluvial clay, silt and gravel deposits. Dominant lithology is conglomerate
CZucz	-	-	Central province Volcanics	Basalt flows, minor basaltic volcaniclastics; basaltic vent, breccia including alkali dolerite; basaltic diatreme breccia; minor gabbro, dolerite, and diatomite
Pshw	Shoalhaven Group	-	Wandrawandian Formation	Mid-grey to blue-grey fine-grained quartz-lithic silty sandstone, mudstone, siltstone (fine specs mica present: matrix supported polymictic pebbles within sequence. Commonly bioturbated, fossils include brachiopods, corals and crinoid stems
Pshs		-	Snapper Point Formation	Fine to medium grained sandstone, pebbly sandstone, and poly mictic pebble conglomerate (down sequence), medium to coarse grained sandstone with lithic pebbles and fragments, minor siltstone (up sequences): brachiopod, bivalve and bryozoan fossils common

revision	description	drawn	approved	date
	Site Geology	HJP	KEG	27/08/2019
	NSW Government – Planning and Environment MinView online Seamless Geological Mapping			

TERRA INSIGHT

scale	NTS
original size	**A3**

client: **HEIR ASQUITH**

project: **Geotechnical Investigation**
Lot 106 DP755923
Inyadda Drive, Manyana NSW

title: **NSW Geology Mobile App Mapping**

project no: **TERRA19271** figure no: **FIGURE 2**

Historical Imagery

description	drawn	approved	date
Aerial images	HJP	KEG	7/08/2019

TERRA INSIGHT

client:	**HEIR ASQUITH**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
title:	**Historical Imagery**
scale	NTS
original size	**A3**
project no: **TERRA19271**	figure no: **FIGURE 3**

N

Legend

- Hm: High probability, bottom sediments
- H0: High probability at/near ground surface
- H1: High probability <1 m below ground surface
- H2: High probability 1 - 3 m below ground surface
- H4: High probability >3 m below ground surface
- Lm: Low probability, bottom sediments
- L0: Low probability, at/near ground surface
- L1: Low probability, <1 m below ground surface
- L2: Low probability, 1 - 3 m below ground surface
- L4: Low probability, >3 m below ground surface
- N: No known occurrence
- NB: No known occurrence, beach
- X2: Disturbed terrain
- X4: Disturbed terrain

Landform Process Class		Landform Element			Elevation*	
W	Aeolian	b	Backplain	t Levee toe	0	0-1 m
A	Alluvium	k	Backswamp	o Ox-bow	1	1-2 m
B	Beach	m	Bottom sediments	p Plain	2	2-4 m
E	Estuarine	n	Channel	a Sandplain	4	>4 m
L	Lacustrine	d	Dune	s Swamp	Additional Descriptive Codes	
S	Swamp	r	Interbarrier swamp	y Splay	(p)	Pleistocene
		i	Intertidal flat	u Supratidal flat	(s)	Acidic scald
		g	Lagoon	w Swale		
X	Disturbed Terrain*	l	Levee	c Tidal creek		

*Elevation levels given on the map refer to the elevation of the ground surface at the time of mapping. Depending on the nature of the disturbance, these elevation levels may or may not represent the original ground surface elevation.

*Approximate AHD

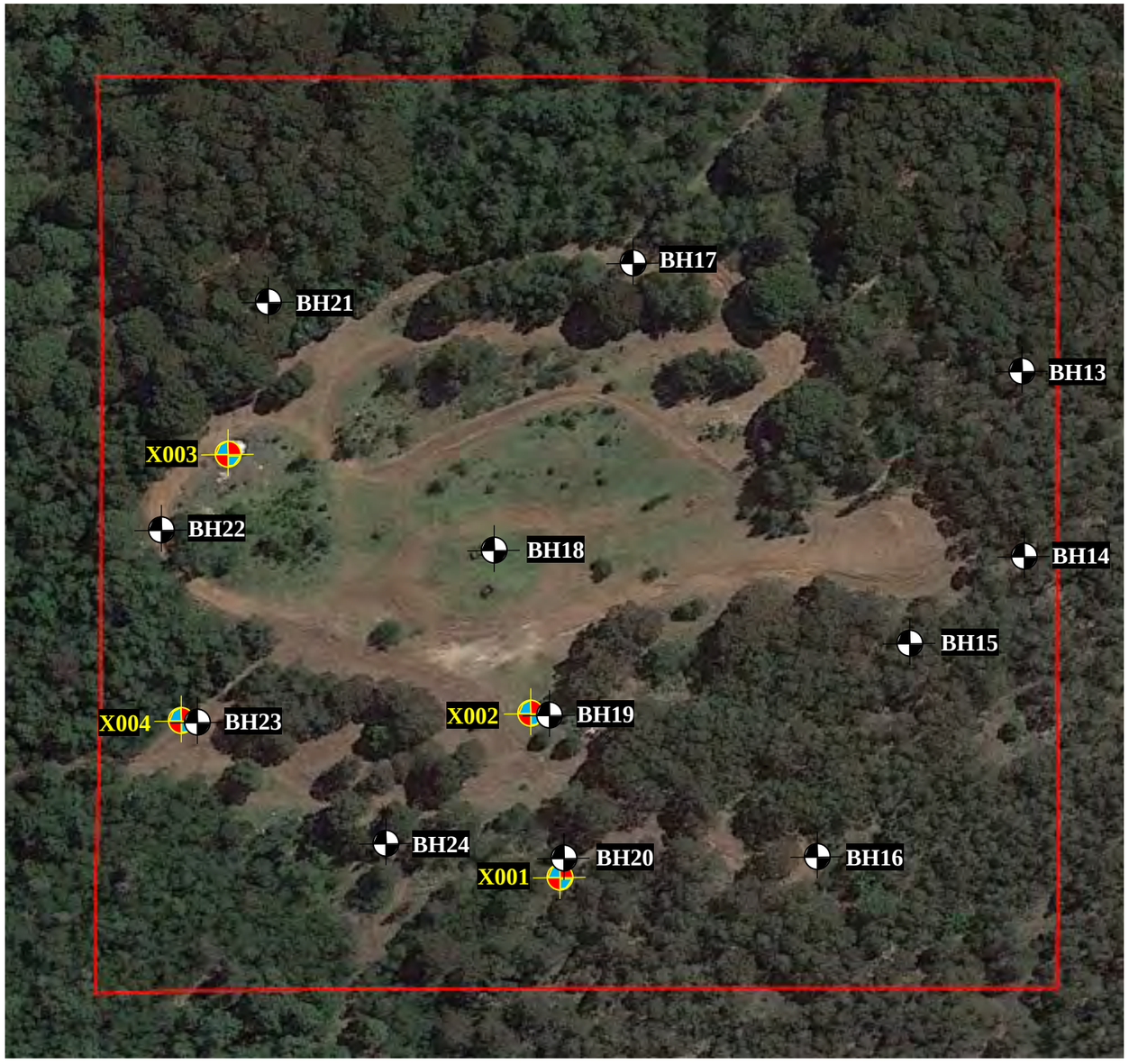
ASS Mapping (eSPADE v2.0)

revision	description	drawn	approved	date
	Aerial images	XJ	KEG	22/08/2019

TERRA INSIGHT

client:	**HEIR ASQUITH**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
title:	**ASS Mapping Excerpt**
scale	NTS
original size	**A3**
project no:	**TERRA19271**
figure no:	**FIGURE 4**

N



Legend

Test site

Potential “asbestos” containing material sampled

Test Site Locations – Area 1

revision	description	drawn	approved	date
	Aerial images	HJP	KEG	7/08/2019

TERRA INSIGHT

scale	NTS
original size	A3

client:	**HEIR ASQUITH**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
title:	**Test Site Locations - Area 1**
project no: **TERRA19271**	figure no: **FIGURE 5**

N

Legend

Test site

Test Site Locations – Area 2

revision	description	drawn	approved	date
	Aerial images	HJP	KEG	7/08/2019

TERRA INSIGHT

scale	NTS
original size	A3

client: **HEIR ASQUITH**

project: **Geotechnical Investigation for ASS**
Lot 106 DP755923
Inyadda Drive, Manyana NSW

title: **Test Site Locations - Area 2**

project no: **TERRA19271**

figure no: **FIGURE 6**

Appendix A: Your Report

TERRA INSIGHT

Your Report

These notes have been prepared to help you understand the advice provided in Your Report and its limitations.

Your Report is based on what you tell us

Your Report has been developed based on the information you have provided such as the scope and size of your project. It applies only to the site investigated. If there are changes to the proposed works, then the advice provided within Your Report may need to be reviewed

Your Report is written with your needs in mind

The advice provided within Your Report is also not relevant to another purpose other than that originally specified at the time the report was issued. Please seek advice from Terra Insight before you share Your Report with another third party – except for the purpose for which the report was written.

Terra Insight assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in Your Report.

Your Report is based on what we observed

The advice provided within Your Report assumes that the site conditions, revealed through selective point sampling (undertaken in accordance with normal practices and standards) at a particular point in time, are indicative of the actual conditions on your site. However, the nature of the materials underlying your site is affected by natural processes and the activity of man. Under no circumstances can it be considered that these findings represent the actual state at all points. The subsurface conditions may vary significantly on the other parts of the site, particularly where no nearby sampling and testing work has been carried out.

As a result conditions on your site can change with time; they can also vary spatially. As a result, the actual conditions encountered may differ from those detailed within Your Report. Although nothing can be done to change the actual site conditions which exist, steps can be taken to gain a better understanding of the subsurface conditions underlying your site and reduce the potential for unexpected conditions to be encountered

The advice within Your Report also relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it. Only Terra Insight is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If the details of your project have changed, the site conditions have changed or a significant amount of time as elapsed since our report was written, the advice provided within Your Report may need to be reviewed.

Your Report has been written by a Professional

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

Your Report is better when it is kept together

Your Report presents all the findings of the site assessment and should not be copied in part or altered in any way. Keeping Your Report intact reduces the potential for yourself or other design professionals to misinterpret the report.

Your Geo-Environmental Report

If Your Report is for geotechnical purposes only, it will not relate any findings, conclusions, or recommendations about the potential for hazardous materials to exist at the site unless you have specifically asked us to do so. If your report is written for Geo-Environmental purposes the following should be noted in addition to the above:

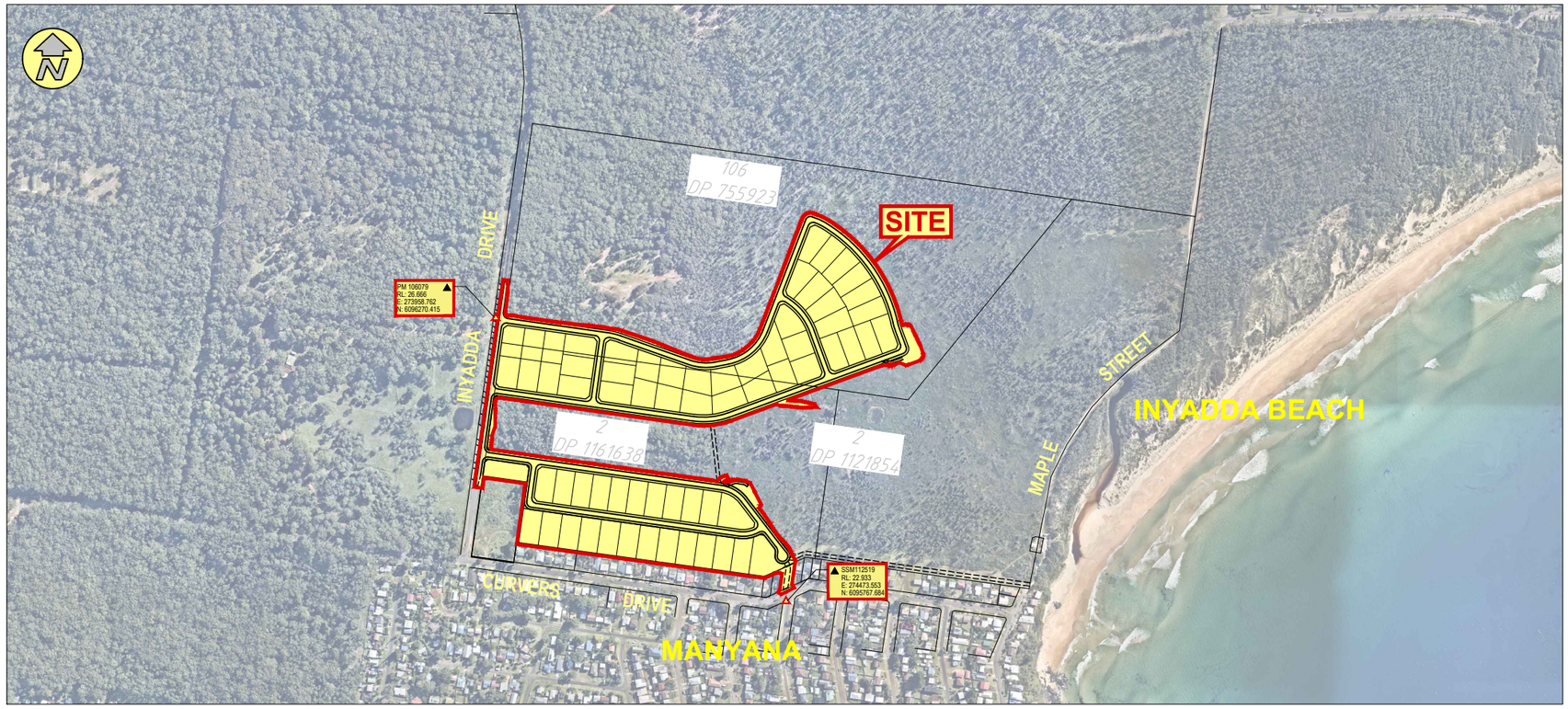
- Advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in Your Report should be verified if you propose to use this report more than 6 months after its date of issue;
- Your Report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. The assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, which includes budget and timing;
- The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice. Any interpretation in Your Report is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment.
- We may have relied on data and other information provided by you and other qualified individuals in preparing Your Report. We have not verified the accuracy or completeness of such data or information except as otherwise stated in Your Report. For these reasons Your Report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.
- For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination posed in the context of the agreed purpose. If the proposed use of the site changes, the assessment may no longer be valid and will need to be reviewed.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.

Appendix B: Proposed site development

INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

ISSUED FOR DEVELOPMENT APPLICATION



LOCALITY PLAN
N.T.S.

DRAWING LIST

NO.	Sheet Title
GENERAL	
000	COVER SHEET
001	GENERAL ARRANGEMENT PLAN
002	SHEET LAYOUT PLAN
003	GENERAL NOTES & LEGEND
004	DEMOLITION PLAN
SEDIMENT & EROSION CONTROL	
101	SEDIMENT BASIN CATCHMENT PLAN
102	SOIL & WATER MANAGEMENT PLAN - SHEET 01 OF 02
103	SOIL & WATER MANAGEMENT PLAN - SHEET 02 OF 02
SITE REGRADING	
201	SITE REGRADING PLAN - SHEET 01 OF 02
202	SITE REGRADING PLAN - SHEET 02 OF 02
203	SITE SECTIONS - SHEET 01 OF 02
204	SITE SECTIONS - SHEET 02 OF 02
ENGINEERING PLANS	
301	ENGINEERING PLAN - 01 OF 05
302	ENGINEERING PLAN - 02 OF 05
303	ENGINEERING PLAN - 03 OF 05
304	ENGINEERING PLAN - 04 OF 05
305	ENGINEERING PLAN - 05 OF 05
351	LANDSCAPE PLAN
ROAD LONGITUDINAL SECTIONS	
401	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.01
402	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.01 (CONT.)
403	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.01 (CONT.)
404	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.02 & 03
405	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.06
406	LONGITUDINAL & TYPICAL SECTIONS - ROAD No.07
WATER QUALITY DETAILS	
850	BASIN No.01 PLAN & DETAILS
851	BASIN No.02 PLAN & DETAILS
852	CATCHMENT PLAN
853	SANDSTONE LOGWALL, BLOCKWALL & GRASSED ROADSIDE SWALE DETAILS

CLIENT:
HEIR ASQUITH

LGA SHOALHAVEN CITY COUNCIL

LOT 1 D.P.1161638
LOT 2 D.P.1121854
LOT 106 D.P.755923

INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

PROJECT No.:	STAGE:	MILESTONE:	REVISION DATE:	DRAWING No.:	REVISION:
21-000403	-	DA	30/06/2023	000	2

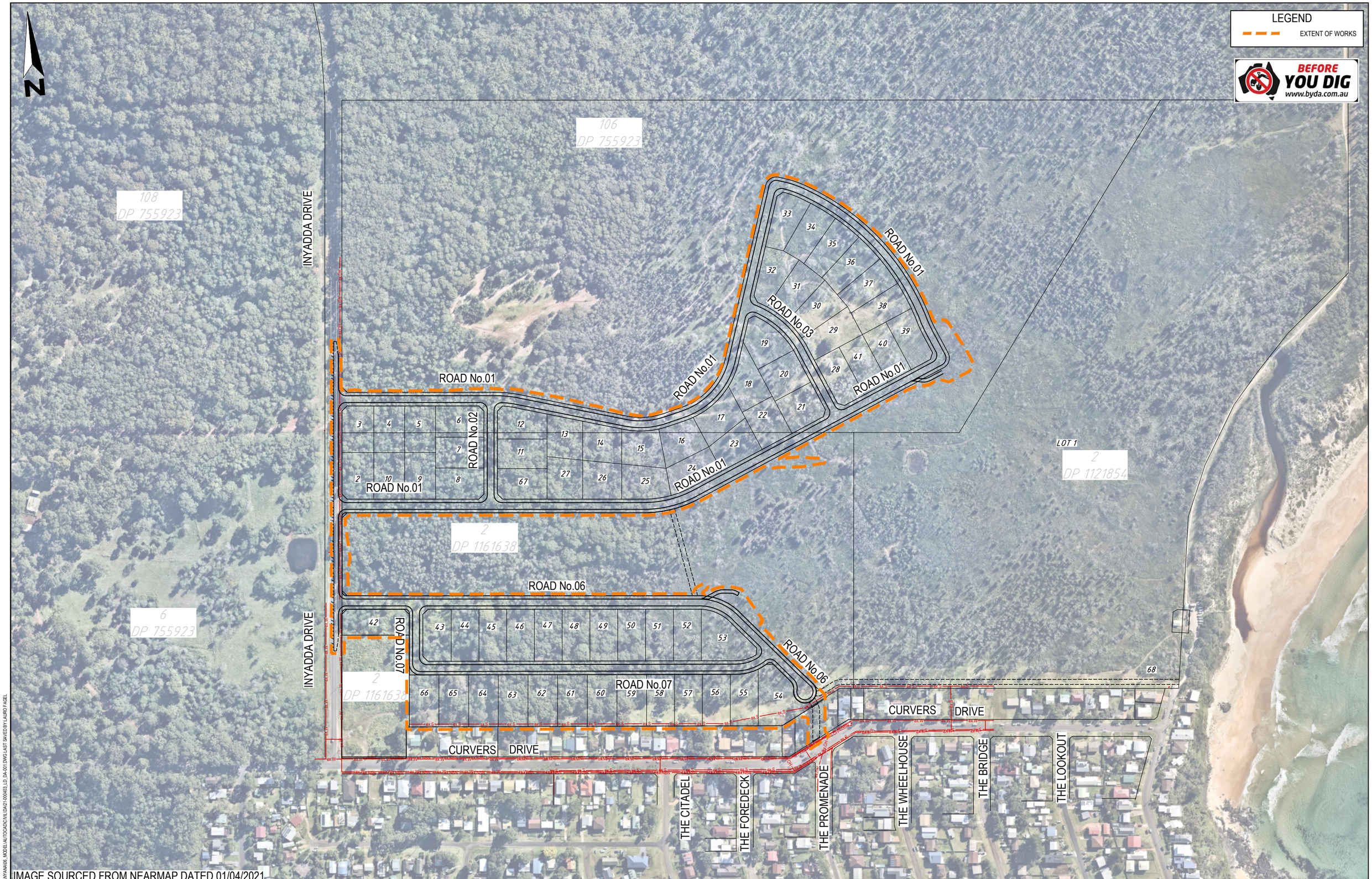


IMAGE SOURCED FROM NEARMAP DATED 01/04/2021

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
	FIRST ISSUE	AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN: 30/06/2023
MEng (Civil) MIEAust CPEng NER
DATE:

SCALE: 0 20 40 60 80 100 120 140 160
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

CLIENT: HEIR ASQUITH

egis
www.egis-group.com

PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

DRAWING TITLE: GENERAL ARRANGEMENT PLAN

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	001	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\05_MODEL\AUTOCAD\CIVIL\DA\21-000403_LO_DA-001.DWG LAST SAVED BY LAURO FAGEL

IMAGE SOURCED FROM NEARMAP DATED 01/04/2021

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
AMENDMENTS 1	AW	JS	SA	EF	14/12/2021	
1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN:
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 25 50 75 100 125 150 175 200
SCALE 1:2500 (A1) SCALE 1:5000 (A3)

CLIENT: HEIR ASQUITH

egis
www.egis-group.com

PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

DRAWING TITLE: SHEET LAYOUT PLAN

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	002	DA	2

F:\E.H\21-000403 - INYADDA DRIVE, MANYANA\05_MODEL\AUTOCAD\CIVIL\DA21-000403_LD_DA-002.DWG LAST SAVED BY JED SWEENEY

GENERAL NOTES

GENERAL

G1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH SHOALHAVEN COUNCIL DESIGN GUIDELINES AND SHOALHAVEN COUNCIL ENGINEERING CONSTRUCTION SPECIFICATIONS AND TO THE REQUIREMENTS OF THE CERTIFYING AUTHORITY.

G2. INSPECTIONS BY CERTIFYING AUTHORITY ARE REQUIRED AT THE FOLLOWING STAGES AND THE WORKS APPROVED PRIOR TO CONTINUANCE OF ANY FUTURE WORK:

(A) FOLLOWING INSTALLATION OF EROSION AND SEDIMENT CONTROL STRUCTURES/MEASURES.

(B) PRIOR TO BACKFILLING PIPELINES, SUBSOIL DRAINS AND DAMS.

(C) PRIOR TO CASTING OF PITS AND OTHER CONCRETE STRUCTURES, INCLUDING KERB AND GUTTER BUT FOLLOWING PLACEMENT OF FOOTINGS, FORMWORK, AND REINFORCEMENT.

(D) PRIOR TO PLACEMENT OF SUB BASE AND ALL SUBSEQUENT PAVEMENT LAYERS, A PROOF ROLLER TEST OF EACH PAVEMENT LAYER IS REQUIRED.

(E) FORMWORKS PRIOR TO POURING CONCRETE IN PARKING AREA FOR FOOTPATH CROSSING AND OTHER ASSOCIATED WORK.

(F) PRIOR TO BACKFILLING PUBLIC UTILITY CROSSINGS IN ROAD RESERVES.

(G) FINAL INSPECTIONS AFTER ALL WORKS ARE COMPLETED AND 'WORKS AS EXECUTED' PLANS HAVE BEEN SUBMITTED TO COUNCIL.

G3. NO TREES ARE TO BE REMOVED UNLESS APPROVAL IS GRANTED BY COUNCIL'S LANDSCAPE COMPLIANCE OFFICER OR AS AUTHORISED BY DEVELOPMENT CONSENT.

G4. MAKE SMOOTH JUNCTIONS WITH EXISTING WORKS.

G5. NO WORK IS TO BE CARRIED OUT ON COUNCIL PROPERTY OR ADJOINING PROPERTIES WITHOUT THE WRITTEN PERMISSION FROM THE OWNER/S.

G6. VEHICULAR ACCESS AND ALL UTILITIES/SERVICES ARE TO BE MAINTAINED AT ALL TIMES TO ADJOINING PROPERTIES AFFECTED BY CONSTRUCTION.

G7. ALL RUBBISH, BUILDINGS, SHEDS AND FENCES TO BE REMOVED TO SATISFACTION OF COUNCIL'S ENGINEER.

G8. COUNCIL ENGINEERS HAVE DISCRETION TO VARY, AS CONSIDERED NECESSARY, THE ENGINEERING REQUIREMENTS IN RESPECT OF A PARTICULAR SUBDIVISION OR DEVELOPMENT HAVING REGARD TO THE SITE CONTEXT.

EARTHWORKS

E1. EARTHWORKS ARE TO BE CARRIED OUT TO THE SATISFACTION OF THE COUNCIL. UNSUITABLE MATERIALS ARE TO BE REMOVED FROM ROADS AND LOTS PRIOR TO FILLING. THE CONTRACTOR IS TO ARRANGE AND MAKE AVAILABLE COMPACTION TESTING RESULTS FOR ALL AREAS THAT CONTAIN FILL IN EXCESS OF 200mm.

E2. COMPACTION OF EARTHWORKS SHALL CONTINUE UNTIL A DRY DENSITY RATIO OF 95% FOR SITE FILLING AND 100% FOR ROAD PAVEMENT SUBGRADES HAS BEEN ACHIEVED IN ACCORDANCE WITH TEST METHOD AS1289.5.3.1 OR AS.1289.5.1.1. THE CONTROL TESTING OF EARTHWORKS SHALL BE IN ACCORDANCE WITH THE GUIDELINES IN AS3798 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'. WHERE IT IS PROPOSED TO USE TEST METHOD AS1289.5.8.1 TO DETERMINE THE FIELD DENSITY, A SAND REPLACEMENT METHOD SHALL BE USED TO CONFIRM THE RESULTS.

E3. THE SUITABLE QUALIFIED GEOTECHNICAL ENGINEER, SHALL HAVE A LEVEL 1 RESPONSIBILITY FOR ALL FILLING AS DEFINED IN APPENDIX B AS3798 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS', AND AT THE END OF THE WORKS SHALL CONFIRM THE EARTHWORKS COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION AND DRAWINGS BY WRITTEN NOTIFICATION.

E4. IN AREAS TO BE FILLED WHERE THE SLOPE OF THE NATURAL SURFACE EXCEEDS 1(V):4(H), BENCHES ARE TO BE CUT TO PREVENT SLIPPING OF THE PLACED FILL MATERIAL AS REQUIRED BY THE COUNCIL.

E5. ALL BATTERS ARE TO BE SCARIFIED TO A DEPTH OF 50mm TO ASSIST WITH ADHESION OF TOP SOIL TO BATTER FACE.

E6. PROVIDE MINIMUM 150mm AND MAXIMUM 300mm TOPSOIL ON FOOTPATHS, FILLED AREAS AND ALL OTHER AREAS DISTURBED DURING CONSTRUCTION. TOPSOILED AREAS TO BE STABILISED WITH APPROVED VEGETATION A MAXIMUM OF 14 DAYS AFTER TOPSOILING AND ARE TO BE WATERED TO ENSURE GERMINATION.

E7. THE CONTRACTOR SHALL CONTROL SEDIMENTATION, EROSION AND POLLUTION DURING CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITION OF 'MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION' PRODUCED BY LANDCOM.

E8. A MINIMUM 1m WIDE, CONTINUOUS STRIP OF COUCH GRASS SHALL BE PLACED BEHIND THE BACK OF ALL KERBS & OTHER CONCRETE STRUCTURES IMMEDIATELY AFTER THE COMPLETION OF THE FOOTPATH GRADING OR OTHER ELEMENTS AS APPLICABLE, AND SHALL BE MAINTAINED AND REPLACED AS REQUIRED DURING THE CONSTRUCTION MAINTENANCE PERIOD.

EGIS GENERAL

EC1. SURVEY SOURCED FROM:
-SURVEYOR: EGIS
-D.T.M.: 211029 Detail Survey 1.dwg DATED 11/10/2021
-ALL FILES ARE ON MGA56 GDA 2020 CO-ORDINATE SYSTEM

EC2. CONTRACTOR IS TO ENSURE THAT ALL WORKS ASSOCIATED WITH PROPERTY BOUNDARIES ARE TO BE SET OUT OR VERIFIED BY A REGISTERED SURVEYOR

EC3. PIPES UP TO 750Ø SHALL BE CONSTRUCTED WITH SPIGOT AND SOCKET RUBBER RING JOINTS AND BE OF FIBRE REINFORCED CONCRETE WHICH SHALL CONFORM RESPECTIVELY TO THE REQUIREMENTS OF AS 4139 AND AS 4058. WHERE FIBRE REINFORCED CONCRETE PIPES ARE TO BE USED, A PROPRIETARY COLLAR IS TO BE APPLIED OVER THE PIPE JOINTS.

EC4. PIPES GREATER THAN 750Ø ARE TO BE CONSTRUCTED FROM SULPHATE RESISTANT CEMENT.

ROADWORKS

R1. SUBGRADES AND SUB BASES ARE TO BE COMPACTED IN ACCORDANCE WITH COUNCIL'S CONSTRUCTION SPECIFICATION.

R2. SUBSOIL DRAINS TO BE PROVIDED ON BOTH SIDES OF ROADS (EXCEPT WHERE THERE IS STORMWATER DRAINAGE).

R3. 150 x 50 H.D. GALVANISED STEEL KERB OUTLETS TO BE PLACED IN ALL KERB TYPES ON LOW SIDE OF LOTS. PROVIDE SUITABLE ADAPTOR TO ALLOW CONNECTION OF 90mm DIAMETER STORMWATER PIPE.

R4. LIPLESS PERAMBULATOR CROSSINGS ARE TO BE PROVIDED IN ALL KERB RETURNS AND WHERE REQUIRED BY COUNCIL.

R5. SERVICE CONDUITS TO BE PLACED AS DIRECTED BY ALL PUBLIC UTILITY AUTHORITIES INCLUDING ENDEVOUR ENERGY, NBN AND SYDNEY WATER

R6. PROPOSED UTILITIES AND SERVICES CROSSING EXISTING ROADS SHALL BE PROVIDED FOR USING A TRENCHLESS TECHNIQUE SO AS NOT TO DAMAGE THE EXISTING SURFACE. ALL SERVICE CONDUITS UNDER ROADS MUST BE LAID TO A MINIMUM DEPTH OF 750mm.

R7. CONCRETE FOOTPATH CONSTRUCTION MAY BE BONDED WITH COUNCIL PENDING COMPLETION OF UTILITY/SERVICES AND SURROUNDING DWELLINGS.

R8. ALL TEMPORARY ROADS MUST BE TEMPORARILY SEALED WITH A SINGLE COAT FLUSH SEAL.

R9. ALL PERMANENT ROADS MUST BE SEALED WITH A SINGLE COAT FLUSH SEAL AND 50mm OF AC TO BE APPLIED IN TWO 25mm THICK LAYERS. THE FINAL AC LAYER IS TO BE AC 10 AND MAY BE BONDED WITH COUNCIL AND PLACED FOLLOWING APPROVAL FROM COUNCIL.

R10. SIGNPOSTING AND LINE MARKING SHALL CONFORM TO AS1742.2 'TRAFFIC CONTROL DEVICES FOR GENERAL USE'. RAISED RETRO-REFLECTIVE PAVEMENT MARKERS TO CONFORM TO AS1906 'RETRO-REFLECTIVE MATERIALS AND DEVICES FOR ROAD TRAFFIC CONTROL PURPOSES'. ALL APRONS AND KERB FACE ON CENTRAL ISLANDS OF ROUNDABOUTS AND ALL OTHER ISLANDS TO BE DELINEATED BY REFLECTIVE WHITE MARKING. INSTALLATION SHALL OCCUR IN ACCORDANCE WITH THE PLAN APPROVED BY THE LOCAL TRAFFIC COMMITTEE.

R11. ALL LOT AND HOUSE NUMBERS MUST BE STENCILLED ON KERB FACE.

R12. STREET SIGNS TO COUNCIL STANDARD MUST BE INSTALLED BY THE CONTRACTOR.

STORMWATER

S1. ALL PIPES TO BE SPIGOT AND SOCKET, RUBBER RING JOINTED.

S2. ALL LONGITUDINAL PIPELINES IN ROADS MUST BE LOCATED UNDER KERB AND GUTTER AND BE BACKFILLED WITH APPROVED GRANULAR MATERIAL UNLESS OTHERWISE APPROVED BY THE COUNCIL ENGINEER.

S3. DRAINAGE LINES MUST BE BACKFILLED WITH APPROVED GRANULAR MATERIAL IN TRAFFICABLE AREAS. THREE (3) METRES OF SUBSOIL DRAINAGE WRAPPED IN GEOTEXTILE STOCKING MUST BE PROVIDED TO ALL DOWNSTREAM PITS.

S4. ALL GULLY PITS TO COUNCIL'S STANDARD AND LINTELS CENTRALLY PLACED AT SAG PITS.

S5. ALL PITS MUST BE BENCHED AND STREAMLINED. PROVIDE SL72 REINFORCEMENT AND GALVANISED STEP IRONS IN ALL PITS OVER 1.2-METRES DEEP AS MEASURED FROM THE TOP OF GRATE TO THE INVERT OF THE PIT.

S6. CONCRETE IS TO HAVE MINIMUM COMPRESSIVE STRENGTH OF 32MPA AT 28-DAYS UNLESS OTHERWISE APPROVED BY THE COUNCIL ENGINEER.

S7. ALL INTER-ALLOTMENT DRAINAGE MUST HAVE A MINIMUM PIPE DIAMETER OF 150mm AND A MINIMUM GRADE OF 1% UNLESS OTHERWISE APPROVED BY THE COUNCIL ENGINEER.

S8. ALL INTER-ALLOTMENT DRAINAGE LINES MUST BE LAID CENTRALLY WITHIN DRAINAGE EASEMENTS. INSPECTION PITS MUST BE PROVIDED AT ALL CHANGES OF GRADE AND DIRECTION.

S9. INTER-ALLOTMENT DRAINAGE LINES MUST BE INSTALLED AFTER SYDNEY WATER SEWERAGE LINES HAVE BEEN INSTALLED WHERE SEWER IS PROPOSED ADJACENT TO INTER-ALLOTMENT DRAINAGE LINES.

S10. 1% AEP OVERLAND FLOW PATHS MUST BE FORMED AND SHOWN ON 'WORKS AS EXECUTED' DRAWINGS.

S11. ALL PLANS (BOTH DESIGN AND WAE) ARE TO CLEARLY DELINEATE THE EXTENT/LOCATION OF FLOOD LINES INCLUDING THE 5% AEP, 1% AEP AND PMF.

S12. ADEQUATE PROVISION IS TO BE MADE TO PREVENT SCOURING AND SEDIMENTATION FOR ALL DRAINAGE WORKS IN ACCORDANCE WITH COUNCIL'S REQUIREMENTS.

S13. PIT LINTELS ARE TO BE STENCILLED WITH APPLICABLE DISTINCTION STENCIL AVAILABLE FROM COUNCIL.

S14. CATCH DRAINS MUST BE CONSTRUCTED AS REQUIRED BY THE APPROVED PLANS OR THE PRINCIPAL CERTIFYING AUTHORITY.

S15. SOIL AND WATER MANAGEMENT PLANS ARE TO BE PREPARED FOR ALL DISTURBED SITES AND ADHERED TO AT ALL TIMES DURING THE CONSTRUCTION AND MAINTENANCE PERIODS.

DIGITAL MODELS CREATED BY EGIS UNDER THIS COMMISSION ARE CREATED FOR THE PURPOSE OF THE PREPARATION OF DRAWINGS AND ESTIMATES OF QUANTITIES. INFORMATION CONTAINED IN THE DRAWINGS TAKES PRECEDENCE OVER THE DIGITAL MODEL UPON WHICH IT WAS BASED. USE OF DIGITAL MODELS, CREATED BY EGIS, BY OTHER PARTIES TO SET OUT WORKS OR FOR OTHER REASONS IS DONE ENTIRELY AT THE RISK OF THE PARTY SO USING THE DIGITAL MODEL

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LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
SITE BOUNDARY			
STORMWATER PIPELINE	375Ø		
STORMWATER DRAINAGE PITS			
DRAINAGE LINE No. 3 DRAINAGE PIT No. 10	3/10	3/10	3/10
CONCRETE HEADWALL			
CULVERT CROSSING			
SUBSOIL DRAIN	SS	SS	
150mm KERB AND GUTTER	K&G	EXIST. K&G	FUT. K&G
ROLL KERB AND GUTTER	RK	EXIST. RK	FUT. RK
KERB ONLY	KO	EXIST. KO	FUT. KO
EDGE STRIP	ES	EXIST. ES	FUT. ES
MOUNTABLE KERB	MK	EXIST. MK	FUT. MK
DISH CROSSING	DC	EXIST. DC	FUT. DC
VEHICULAR CROSSING	VC	EXIST. VC	FUT. VC
PEDESTRIAN RAMP	PR		
EDGE OF BITUMEN	EOB	EXIST. EOB	FUT. EOB
BATTERS			
CONCRETE PATHWAY			
CONTOURS	99.5 99.0	99.5 99.0	99.5 99.0
SITE REGRADING AREA	CUT FILL		
SERVICE LINES SEWER, GAS, WATER, ELECTRICITY, RECYCLED WATER	S G W E RW	ex.S ex.G ex.W ex.E ex.RW	fut.S fut.G fut.W fut.E fut.RW
COMMUNICATION LINES TELSTRA, FIBRE OPTIC, NBN	T OF NBN	ex.T ex.OF ex.NBN	fut.T fut.OF fut.NBN
OVER HEAD LINES AND POLES	OH	ex.OH	fut.OH
LIMIT OF CONSTRUCTION			
FENCE POST AND RAIL FENCE SECURITY FENCE			
LOT NUMBERS	2586		
RETAINING WALL			
SANDSTONE LOG WALL			
ROCK WALL			
ROOF WATER OUTLET TO KERB			
ROOF WATER OUTLET TO BACK OF PIT			

EXISTING TREES

EXISTING TREES	EXISTING TREES TO BE RETAINED	EXISTING TREES TO BE REMOVED

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
A	AW	JS	SA	EF	14/12/2021	
1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN:
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

DRAWING TITLE: GENERAL NOTES & LEGEND

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	003	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-003.DWG LAST SAVED BY:PAMA SENDURAN

IMAGE SOURCED FROM NEARMAP DATED 01/04/2021

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
A 1	AW	JS	SA	EF	14/12/2021	ISSUED FOR DEVELOPMENT APPLICATION
M 2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS
E						
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D						
M						
E						
N						
T						
S						

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
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MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 20 40 60 80 100 120 140 160
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: DEMOLITION PLAN

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	004	DA	2

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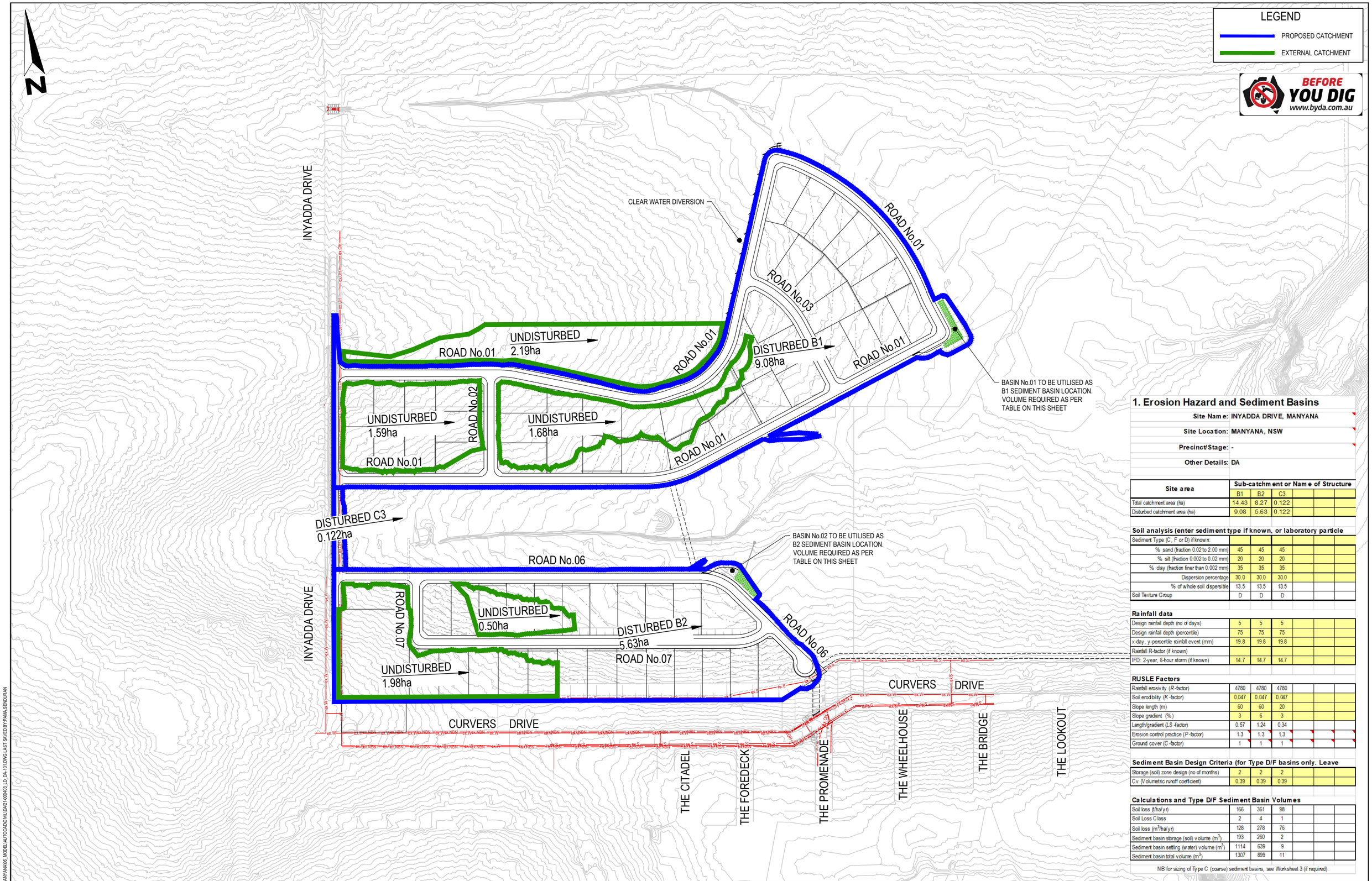

1. Erosion Hazard and Sediment Basins

Site Name:	INYADDA DRIVE, MANYANA
Site Location:	MANYANA, NSW
Precinct/Stage:	-
Other Details:	DA

Site area	Sub-catchment or Name of Structure					
	B1	B2	C3			
Total catchment area (ha)	14.43	8.27	0.122			
Disturbed catchment area (ha)	9.08	5.63	0.122			

Soil analysis (enter sediment type if known, or laboratory particle

Sediment Type (C , F or D) if known:						
% sand (fraction 0.02 to 2.00 mm)	45	45	45			
% silt (fraction 0.002 to 0.02 mm)	20	20	20			
% clay (fraction finer than 0.002 mm)	35	35	35			
Dispersion percentage	30.0	30.0	30.0			
% of whole soil dispersible	13.5	13.5	13.5			
Soil Texture Group	D	D	D			

Rainfall data

Design rainfall depth (no of days)	5	5	5			
Design rainfall depth (percentile)	75	75	75			
x-day , y-percentile rainfall event (mm)	19.8	19.8	19.8			
Rainfall R-factor (if known)						
IFD: 2-year, 6-hour storm (if known)	14.7	14.7	14.7			

RUSLE Factors

Rainfall erosivity (*R*-factor)	4780	4780	4780			
Soil erodibility (*K*-factor)	0.047	0.047	0.047			
Slope length (m)	60	60	20			
Slope gradient (%)	3	6	3			
Length/gradient (*LS* -factor)	0.57	1.24	0.34			
Erosion control practice (*P*-factor)	1.3	1.3	1.3			
Ground cover (*C*-factor)	1	1	1			

Sediment Basin Design Criteria (for Type D/F basins only. Leave

Storage (soil) zone design (no of months)	2	2	2			
Cv (Volumetric runoff coefficient)	0.39	0.39	0.39			

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	166	361	98			
Soil Loss Class	2	4	1			
Soil loss (m^3/ha/yr)	128	278	76			
Sediment basin storage (soil) volume (m^3)	193	260	2			
Sediment basin settling (water) volume (m^3)	1114	639	9			
Sediment basin total volume (m^3)	1307	899	11			

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

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AMENDMENTS

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PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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DRAWING TITLE: SEDIMENT BASIN CATCHMENT PLAN

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	101	DA	2

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N

INYADDA DRIVE

LEGEND

- SEDIMENT FENCE (SD 6-8)
- BARRIER FENCE
- CATCH DRAIN/ DIVERSION BANK (SD 5-5)
- STABILISED ACCESS POINT
- GEOTEXTILE INLET FILTER (SD 6-12) DURING CONSTRUCTION OF THE ROAD. MESH & GRAVEL INLET FILTER (SD 6-11) AFTER CONSTRUCTION OF LINTEL. FILTER TO BE REMOVED AFTER COMPLETION OF ALL WORKS AND PRIOR TO SUBDIVISION CERTIFICATE
- STRAW BALE FILTER (SD 6-7)
- LEVEL SPREADER (SD 5-6)
- EXISTING CONTOUR (ORIGINAL NATURAL SURFACE)
- PROPOSED CONTOUR
- CUT AREA
- FILL AREA
- HOLLOW BEARING TREE (TO BE KEPT)
- HOLLOW BEARING TREE (TO BE REMOVED)
- 100YR FLOOD LINES

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ALL FENCES TO BE INSIDE OF SITE BOUNDARY. FENCES HAVE BEEN SHOWN OUTSIDE FOR CLARITY

PROVIDE CLEAN WATER DIVERSION

CATCH DRAIN TO BE CONSTRUCTED ALONG DOWNSTREAM SIDE OF SITE UNTIL ROAD BOXING IS COMPLETELY FORMED

POSSIBLE STOCKPILE SITE

ROAD No.01

ROAD No.02

ROAD No.03

POSSIBLE STABILISED SITE ACCESS WITH LOCKABLE GATE.

BASIN No.01

BASIN TO BE UTILISED AS SEDIMENT BASIN DURING CONSTRUCTION. REFER TO DWG. No.101

FOR CONTINUATION REFER TO DWG No.103

CATCH DRAIN TO BE CONSTRUCTED ALONG DOWNSTREAM SIDE OF SITE UNTIL ROAD BOXING IS COMPLETELY FORMED

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SIGN: Sina Arbabzadeh
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0 10 20 30 40 50 60 70 80
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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DRAWING TITLE: SOIL & WATER MANAGEMENT PLAN - SHEET 01 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	102	DA	2

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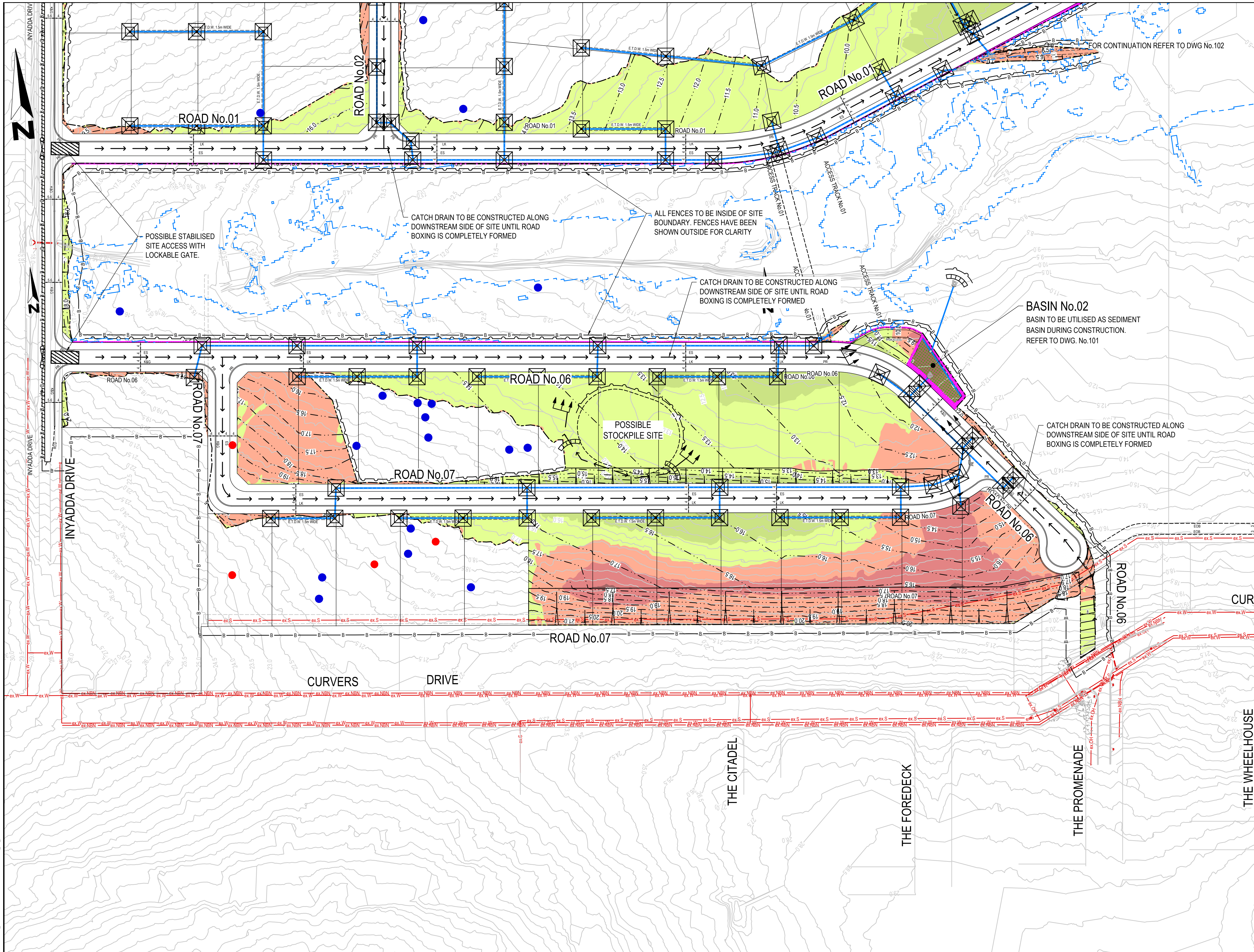

LEGEND

- SEDIMENT FENCE (SD 6-8)
- BARRIER FENCE
- CATCH DRAIN/ DIVERSION BANK (SD 5-5)
- STABILISED ACCESS POINT
- GEOTEXTILE INLET FILTER (SD 6-12) DURING CONSTRUCTION OF THE ROAD. MESH & GRAVEL INLET FILTER (SD 6-11) AFTER CONSTRUCTION OF LINTEL. FILTER TO BE REMOVED AFTER COMPLETION OF ALL WORKS AND PRIOR TO SUBDIVISION CERTIFICATE
- STRAW BALE FILTER (SD 6-7)
- LEVEL SPREADER (SD 5-6)
- EXISTING CONTOUR (ORIGINAL NATURAL SURFACE)
- PROPOSED CONTOUR
- CUT AREA
- FILL AREA
- HOLLOW BEARING TREE (TO BE KEPT)
- HOLLOW BEARING TREE (TO BE REMOVED)
- 1% AEP FLOOD EXTENT

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CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: SOIL & WATER MANAGEMENT PLAN - SHEET 02 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	103	DA	2

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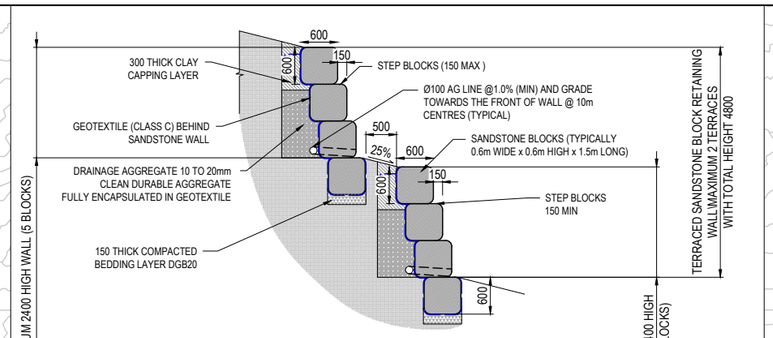

INDICATIVE RETAINING WALL DETAIL
TERRACED SANDSTONE BLOCK WALL TYPICAL SECTION

SCALE 1:50

NOTES:

1. ALL SERVICES SHOWN ARE INDICATIVE ONLY. THE CONTRACTOR SHALL LOCATE, POTHOLE AND LEVEL ALL SERVICES WHERE NECESSARY, PRIOR TO COMMENCEMENT OF WORKS.
2. CONTRACTOR IS RESPONSIBLE FOR ALL SERVICES INVESTIGATION AND PROTECTION ON SITE.

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LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
- RETAINING WALL ALONG BIO
- HOLLOW BEARING TREE (TO BE KEPT)
- HOLLOW BEARING TREE (TO BE REMOVED)
- 1% AEP FLOOD EXTENT
- CUT -2m TO -100m
- CUT -1.5m TO -2m
- CUT -1m TO -1.5m
- CUT -0.5m TO -1m
- CUT 0m TO -0.5m
- FILL 0m TO 0.5m
- FILL 0.5m TO 1m
- FILL 1m TO 1.5m
- FILL 1.5m TO 2m
- FILL 2m TO 2.5m
- FILL 2.5m TO 3m
- FILL 3m TO 100m

CUT & FILL VOLUMES

CUT = 20,130 m³
FILL = 135,965 m³
BALANCE = 115,835 m³ IMPORT

NOTE:

VOLUMES PROVIDED ARE FROM THE NATURAL SURFACE LEVEL TO THE FINISHED PROPOSED LEVEL. VOLUMES DO NOT TAKE INTO ACCOUNT BOXING OF ROADS, SERVICES TRENCHING OR STRIPPING OF TOPSOIL.

INYADDA DRIVE

ROAD No.01

ROAD No.02

ROAD No.03

BASIN No.01

REFER TO INDICATIVE WALL DETAIL FOR INFORMATION. WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE

PROVIDE UPSTREAM DIVERSION SWALE

DIVERSION SWALE TO BE PROVIDED AT BOTTOM OF RETAINING WALL

OVERHEAD POWERLINE TO BE RELOCATED AS PER AUTHORITIES REQUIREMENT

SLOPE 1:4

SLOPE 1:6

MAX. 2m RW

MAX. 3m RW

MAX. 4m RW

FOR CONTINUATION REFER TO DWG No.202

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SCALE 1:50 (A1) SCALE 1:100 (A3)
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

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PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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DRAWING TITLE: SITE REGRADING PLAN - SHEET 01 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	201	DA	2

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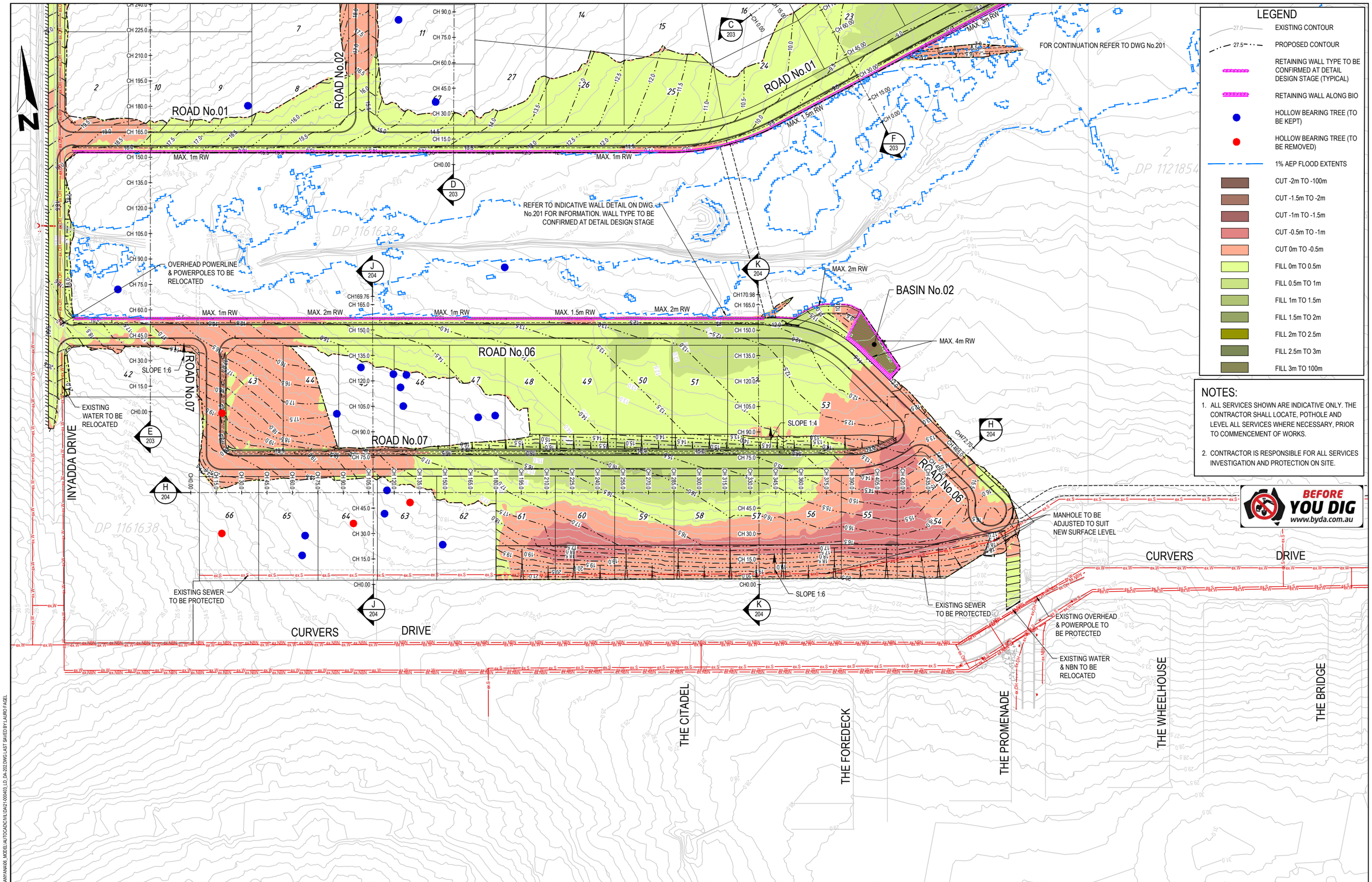

LEGEND

- EXISTING CONTOUR
- PROPOSED CONTOUR
- RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
- RETAINING WALL ALONG BIO
- HOLLOW BEARING TREE (TO BE KEPT)
- HOLLOW BEARING TREE (TO BE REMOVED)
- 1% AEP FLOOD EXTENTS
- CUT -2m TO -100m
- CUT -1.5m TO -2m
- CUT -1m TO -1.5m
- CUT -0.5m TO -1m
- CUT 0m TO -0.5m
- FILL 0m TO 0.5m
- FILL 0.5m TO 1m
- FILL 1m TO 1.5m
- FILL 1.5m TO 2m
- FILL 2m TO 2.5m
- FILL 2.5m TO 3m
- FILL 3m TO 100m

NOTES:

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: SITE REGRADING PLAN - SHEET 02 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	202	DA	2

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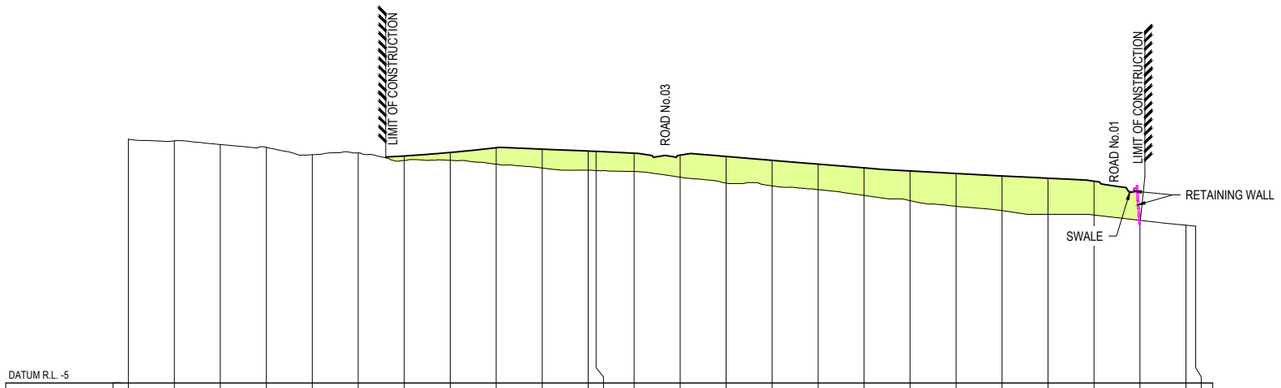

NOTE:
FOR EXISTING SURFACE INFORMATION, REFER TO EGIS CONSULTING GENERAL NOTE 1 ON DWG.No.003.

LEGEND

—	EXISTING LEVEL
—	DESIGN LEVEL
🟥	CUT AREA
🟩	FILL AREA
❘	RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
▮	APPROXIMATE LOCATION OF EXISTING SEWER
—	1% AEP WATER LEVEL

DATUM R.L. -5

W.A.E. LEVEL																										
DESIGN LEVEL							9.8	10.03	10.34	10.25	10.13	10.1	9.98	9.86	9.77	9.52	9.27	9.03	8.83	8.66	8.5	8.35	8.16	5.67		
EXISTING LEVEL	10.9	10.79	10.55	10.36	9.89	10	9.51	9.51	9.27	9.02	8.88	8.85	8.79	8.42	8.03	7.85	7.6	7.23	6.89	6.52	6.24	6	5.96	5.61	5.29	5.22
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	152.563	165	180	195	210	225	240	255	270	285	300	315	330	345	348.158

SECTION C/201 C/202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

DATUM R.L. 2

W.A.E. LEVEL														
DESIGN LEVEL		14.07	14.5							17.95				
EXISTING LEVEL	12.71	13.53	14.41	15.38	15.78	16.17	17	17.56	18.21	18.96	19.29	19.63	20	20.04
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	180	191.595

SECTION D/201 D/202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

DATUM R.L. 5

W.A.E. LEVEL																								
DESIGN LEVEL				17.19								18.14								24.35				
EXISTING LEVEL	20.35	19.32	18.07	17.21	16.7	15.88	15.76	15.75	15.8	16.25	17.13	18.1	19.07	20	20.63	21.34	22.41	23	23.79	24.05	24.78	25	25	24.82
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	338.027

SECTION E/201 E/202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

DATUM R.L. -3

W.A.E. LEVEL													
DESIGN LEVEL			8.61	9.41	9.56	9.71			11.81				
EXISTING LEVEL	7.67	7.9	8.24	8.44	8.77	9.32	10.02	10.74	11.3	12	12.56	13.16	13.27
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	169.441

SECTION F/201 F/202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
FIRST ISSUE		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS
FOR
DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN: Sina Arbabzadeh
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0
SCALE 1:200 (A1) SCALE 1:400 (A3)
0 10 20 30 40 50 60 70 80
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

CLIENT
HEIR ASQUITH

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PROJECT
INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

DISCLAIMER
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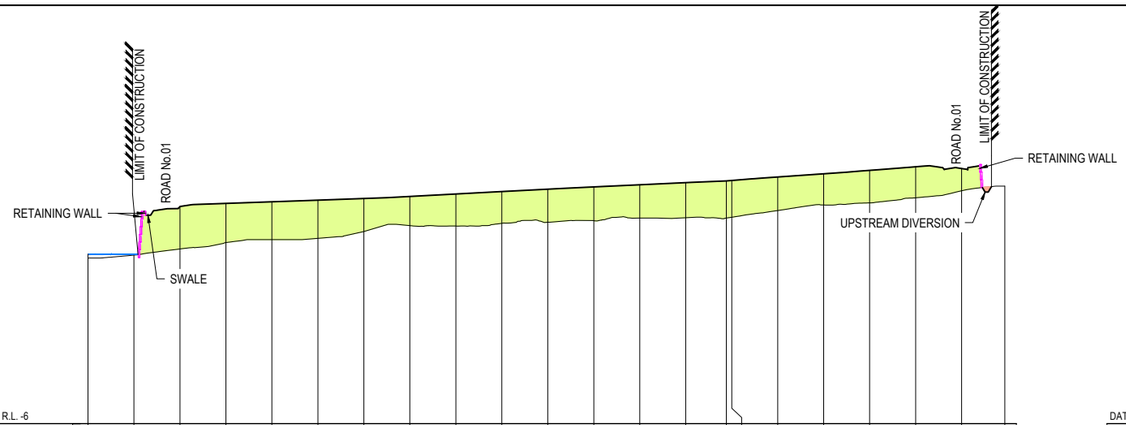
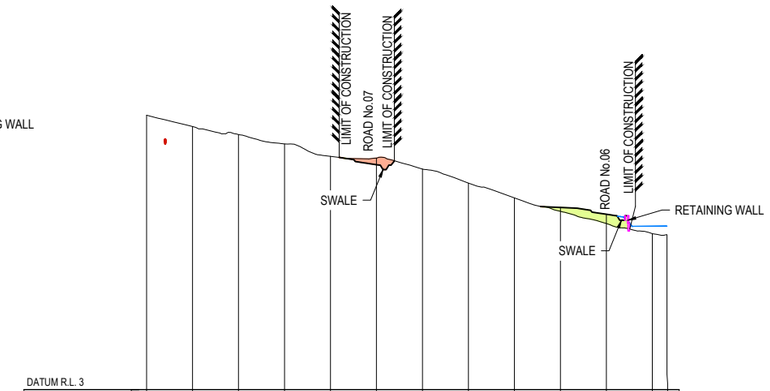
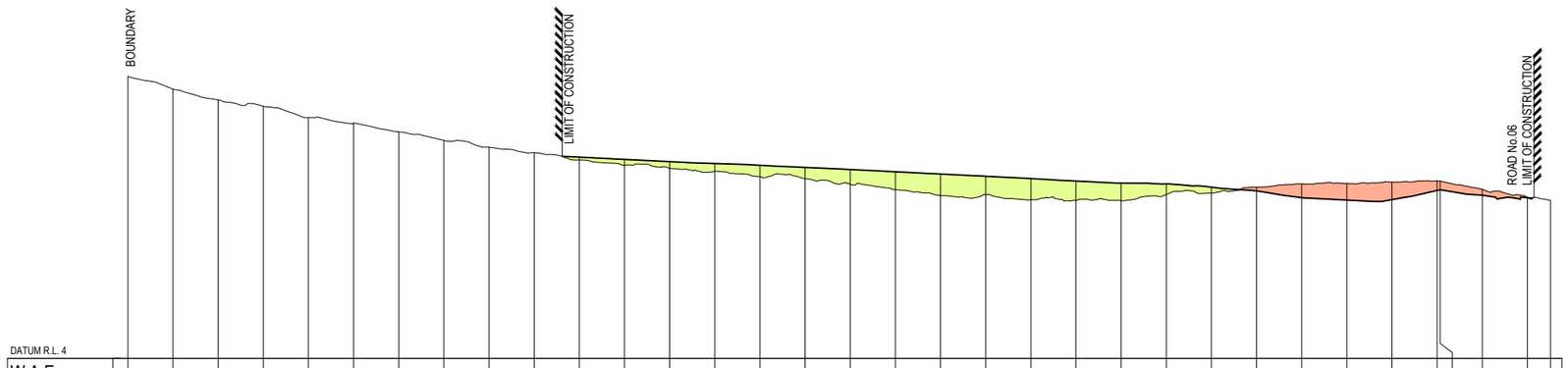
DRAWING TITLE
SITE SECTIONS - SHEET 01 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	203	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-203.DWG LAST SAVED BY:LAURO FAGEL







DATUM R.L. -6

W.A.E. LEVEL																						
DESIGN LEVEL		5.02	8.15	8.36	8.47	8.57	8.68	8.81	8.97	9.13	9.29	9.44	9.57	9.71	9.82	9.85	10.09	10.29	10.52	10.75	10.63	
EXISTING LEVEL	4.79	4.99	5.39	5.81	6	6.08	6.53	6.91	6.88	7.06	7.13	7.23	7.4	7.43	7.41	7.46	7.9	8.26	8.4	8.73	9.18	9.49
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	180	195	208.255	210	225	240	255	270	285	299.093

SECTION G / 201
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

DATUM R.L. 3

W.A.E. LEVEL													
DESIGN LEVEL						17.67				14.88	14.43		
EXISTING LEVEL	20.89	20.16	19.63	19.02	18.21	18.1	17.39	16.46	15.5	14.63	13.83	13.17	13.1
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	169.761

SECTION J / 202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

NOTE:
FOR EXISTING SURFACE INFORMATION, REFER TO EGIS CONSULTING GENERAL NOTE 1 ON DWG.No.003.

LEGEND

─	EXISTING LEVEL
━	DESIGN LEVEL
🟧	CUT AREA
🟩	FILL AREA
▯	RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
●	APPROXIMATE LOCATION OF EXISTING SEWER
─	1% AEP WATER LEVEL

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DATUM R.L. 4

W.A.E. LEVEL																	
DESIGN LEVEL											17.38	17.23	17.07	16.95	16.84	16.69	16.55
EXISTING LEVEL	22.73	21.89	21.18	20.76	20	19.65	19.05	18.49	18.04	17.67	17.18	16.83	16.63	16.43	16.07	15.95	15.59
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240

W.A.E. LEVEL																	
DESIGN LEVEL	16.4	16.25	16.1	15.95	15.79	15.65	15.59	15.38	15.13	14.68	14.52	14.55	15.16	15.21	14.84	14.67	
EXISTING LEVEL	15.22	14.83	14.9	14.54	14.5	14.49	14.89	14.99	15.38	15.59	15.62	15.72	15.8	15.79	15.23	14.7	14.5
CHAINAGE	255	270	285	300	315	330	345	360	375	390	405	420	435	435.98	450	465	472.698

SECTION H / 202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

DATUM R.L. 0

W.A.E. LEVEL													
DESIGN LEVEL		18.04	16.26	15.88	15.5	14.99	13.12	12.9	12.76	12.61	12.16		
EXISTING LEVEL	20.73	18.77	17.08	15.57	14.05	13.65	13.12	12.59	12.1	11.44	10.89	10.29	10
CHAINAGE	0	15	30	45	60	75	90	105	120	135	150	165	170.983

SECTION K / 202
SCALE: 1:1000 (H)
SCALE: 1:200 (V)

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-204.DWG LAST SAVED BY:LAURO FAGEL

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
FIRST ISSUE		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS
FOR
DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN: Sina Arbabzadeh
DATE: 30/06/2023

SCALE
0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0
SCALE 1:200 (A1) SCALE 1:400 (A3)
0 10 20 30 40 50 60 70 80
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

CLIENT
HEIR ASQUITH

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PROJECT
INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

DISCLAIMER
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DRAWING TITLE
SITE SECTIONS - SHEET 02 OF 02

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	204	DA	2

LEGEND

1% AEP FLOOD EXTENTS

OVERHEAD POWERLINE TO BE RELOCATED

ROAD No.01

ROAD No.02

TRANSITION FROM K&G TO LK AT KTP OVER 2m

PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD

E.T.D.W. 1.5m WIDE

TRANSITION FROM K&G TO ES AT KTP OVER 2m

PIPE CROSSING & HW TO BE ADJUSTED TO SUIT PROPOSED ROADWORKS

SURCHAGE PIT TO BIO-RETENTION SWALE

BIO-SWALE No.01

INSTALL "W-BEAM" OR APPROVED EQUIVALENT ALONG LENGTH OF RETAINING WALL.

FOR CONTINUATION REFER TO DWG No.302

FOR CONTINUATION REFER TO DWG No.304

INYADDA DRIVE

DP 1161638

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FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
AMENDMENTS 1	AW	AW	SA	EF	14/12/2021	
2	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1)
SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: ENGINEERING PLAN - 01 OF 05

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	301	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\05_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-301.DWG LAST SAVED BY LAURO.FAGEL

PIPE CROSSING & HW TO BE ADJUSTED TO SUIT PROPOSED ROADWORKS

OUTLET HW WITH RIPRAP

OVERHEAD POWERLINE & POWERPOLES TO BE RELOCATED

FOR CONTINUATION REFER TO DWG No.301

BIO-SWALE No.03

BIO-SWALE No.04

BIO-SWALE No.05

SURCHAGE PIT TO BIO-RETENTION SWALE

INSTALL "W-BEAM" OR APPROVED EQUIVALENT ALONG LENGTH OF RETAINING WALL.

ROAD No.06

ROAD No.07

TRANSITION FROM K&G TO ES AT KTP OVER 2m

TRANSITION FROM LK TO ES AT KTP OVER 2m

TRANSITION FROM K&G TO LK AT KTP OVER 2m

PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD

E.T.D.W. 1.5m WIDE

EXISTING WATER TO BE LOCATED PRIOR TO ANY WORKS. EXISTING WATER DEPTH TO BE FOUND & SUPERINTENDENT TO NOTIFY ASSET OWNER IF WATER MAIN REQUIRED TO BE LOWERED DUE TO PIPE COVER & TRAFFIC LOADS.EXISTING WATER BACKFILL TO BE TESTED TO COMPLY WITH COUNCIL STANDARDS FOR ALL TRAFFICABLE AREAS. SUPERINTENDENCY TO PROVIDE DIRECTION ONCE COMPACTION TEST RESULTS ARE COMPLETED.

EXISTING RESIDENTS TO BE PROTECTED ALONG ENTIRE LENGTH OF ROAD No.07. NO WORKS TO CROSS BOUNDARY

EXISTING SEWER TO BE PROTECTED

FOR CONTINUATION REFER TO DWG No.305

INYADDA DRIVE

CURVERS DRIVE

DP 1161638

LEGEND

1% AEP FLOOD EXTENTS

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FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
	AW	JS	SA	EF	14/12/2021	
1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
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AMENDMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE: 0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

DISCLAIMER
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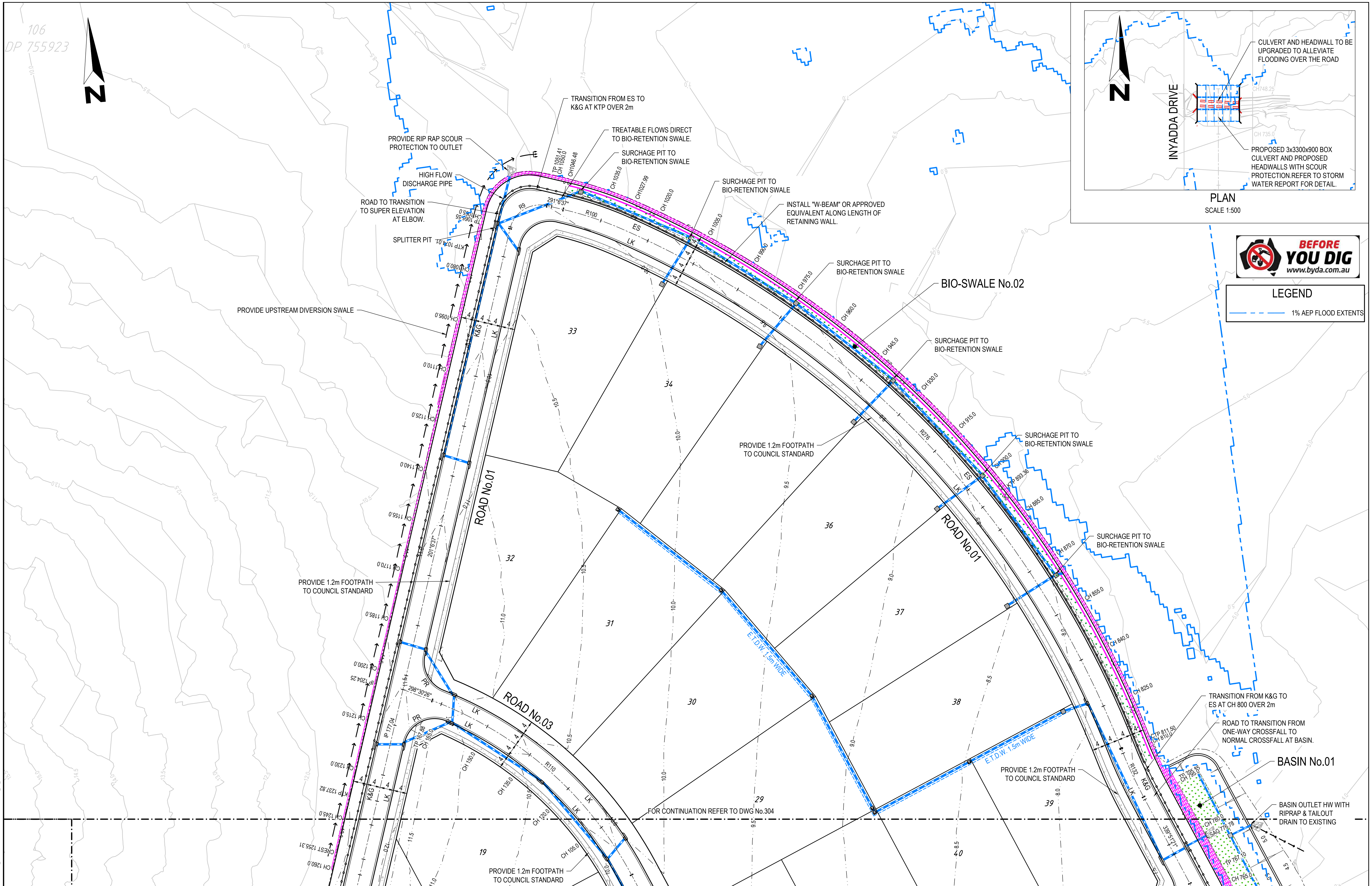
DRAWING TITLE: ENGINEERING PLAN - 02 OF 05

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	302	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DWG\21-000403_LD_DA-302.DWG LAST SAVED BY LAURO FAGEL


106
DP 755923
N
TRANSITION FROM ES TO K&G AT KTP OVER 2m
TREATABLE FLOWS DIRECT TO BIO-RETENTION SWALE.
SURCHAGE PIT TO BIO-RETENTION SWALE
PROVIDE RIP RAP SCOUR PROTECTION TO OUTLET
HIGH FLOW DISCHARGE PIPE
ROAD TO TRANSITION TO SUPER ELEVATION AT ELBOW.
SPLITTER PIT
SURCHAGE PIT TO BIO-RETENTION SWALE
INSTALL "W-BEAM" OR APPROVED EQUIVALENT ALONG LENGTH OF RETAINING WALL.
SURCHAGE PIT TO BIO-RETENTION SWALE
BIO-SWALE No.02
SURCHAGE PIT TO BIO-RETENTION SWALE
PROVIDE UPSTREAM DIVERSION SWALE
PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD
SURCHAGE PIT TO BIO-RETENTION SWALE
SURCHAGE PIT TO BIO-RETENTION SWALE
ROAD No.01
ROAD No.01
ROAD No.03
PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD
E.T.D.W. 1.5m WIDE
E.T.D.W. 1.5m WIDE
TRANSITION FROM K&G TO ES AT CH 800 OVER 2m
ROAD TO TRANSITION FROM ONE-WAY CROSSFALL TO NORMAL CROSSFALL AT BASIN.
BASIN No.01
PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD
BASIN OUTLET HW WITH RIPRAP & TAILOUT DRAIN TO EXISTING
FOR CONTINUATION REFER TO DWG No.304
PROVIDE 1.2m FOOTPATH TO COUNCIL STANDARD
19
30
31
32
33
34
36
37
38
39
40
INYADDA DRIVE
CULVERT AND HEADWALL TO BE UPGRADED TO ALLEVIATE FLOODING OVER THE ROAD
PROPOSED 3x3300x900 BOX CULVERT AND PROPOSED HEADWALLS WITH SCOUR PROTECTION.REFER TO STORM WATER REPORT FOR DETAIL.
PLAN
SCALE 1:500
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LEGEND
1% AEP FLOOD EXTENTS

FIRST ISSUE		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
A	1	AW	JS	SA	EF	14/12/2021	
	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
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STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN: DATE: 30/06/2023

SCALE: 0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: ENGINEERING PLAN - 03 OF 05

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	303	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-303.DWG LAST SAVED BY LAURO FAGEL

FOR CONTINUATION REFER TO DWG No.303

FOR CONTINUATION REFER TO DWG No.302

FOR CONTINUATION REFER TO DWG No.305

N

ROAD No.01

ROAD No.03

ACCESS TRACK No.01

900x900 G.S.I.P. DRAIN
EXISTING LOW POINT

TRUNK DRAINAGE TO BE
MIDDLE OF EASEMENT

E.T.D.W. 1.5m WIDE

E.T.D.W. 6.0m WIDE

PROVIDE 1.2m FOOTPATH
TO COUNCIL STANDARD

CONSTRUCT SPLITTER PIT TO
DISTRIBUTE ALL FLOWS EVENLY

SPLITTER PIT

TREATABLE FLOWS
DIRECTED TOWARDS
BASIN

PROVIDE RIP RAP SCOUR
PROTECTION TO OUTLET

HIGH FLOW OUTLET
HW WITH RIPRAP

PROVIDE TAILOUT
AT 1% TO EXISTING

SURCHAGE PIT TO
BIO-RETENTION SWALE

INSTALL "W-BEAM" OR APPROVED
EQUIVALENT ALONG LENGTH OF
RETAINING WALL.

TRANSITION FROM
ES TO K&G AT VC

ROAD TO TRANSITION FROM
ONE-WAY CROSSFALL TO
NORMAL CROSSFALL AT BASIN

BASIN No.01

BIO-SWALE No.01

LEGEND

1% AEP FLOOD EXTENTS

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	FIRST ISSUE:	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
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AUTHORISED FOR ISSUE:
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MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE: SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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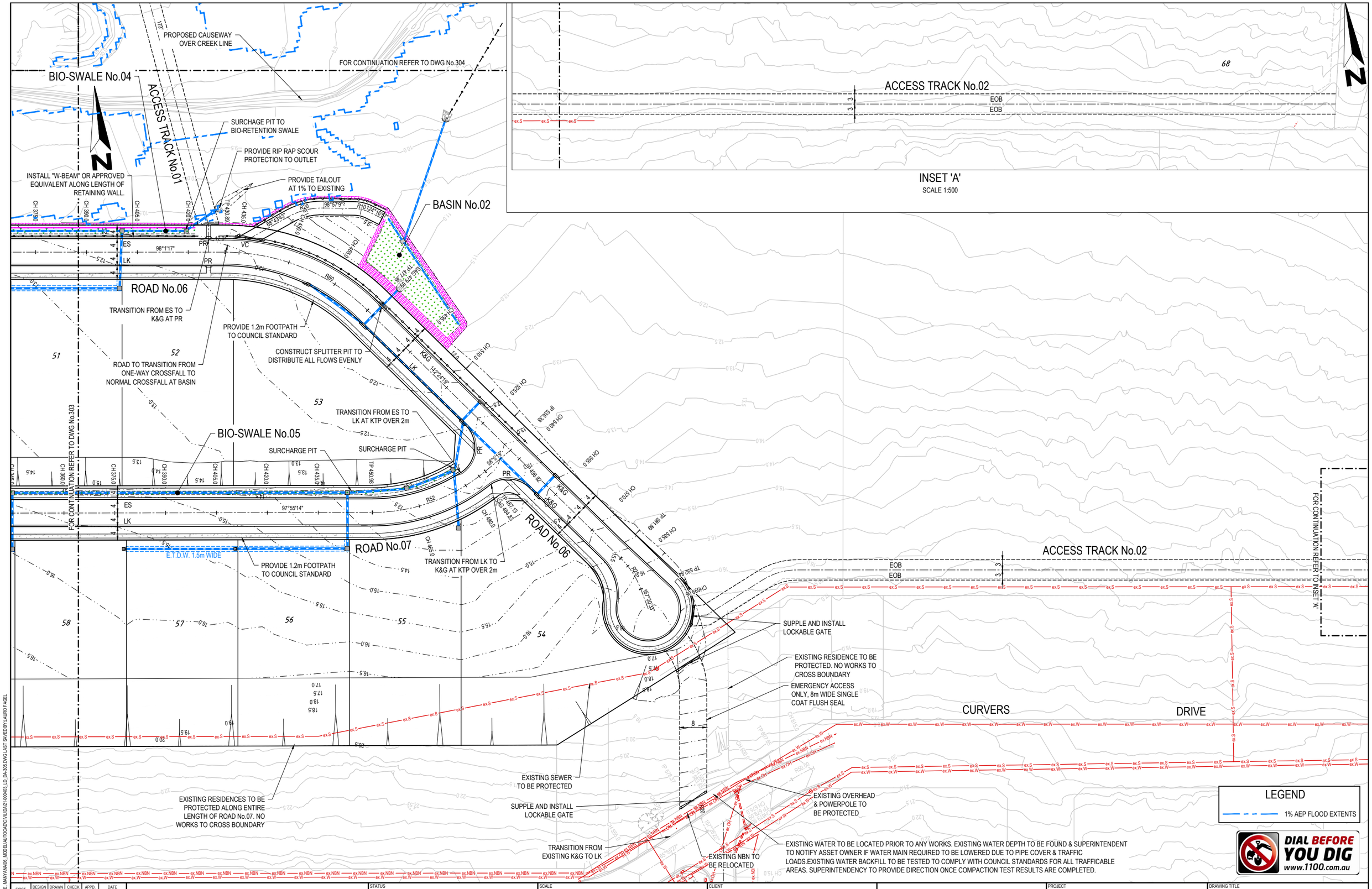
DRAWING TITLE: ENGINEERING PLAN - 04 OF 05

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	304	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\05_MODEL\AUTOCAD\CIVIL\DA21-000403_LO_DA-304.DWG LAST SAVED BY: LAURO FADEL



INSET 'A'
SCALE 1:500

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
1	AW	AW	SA	EF	14/12/2021	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE: 0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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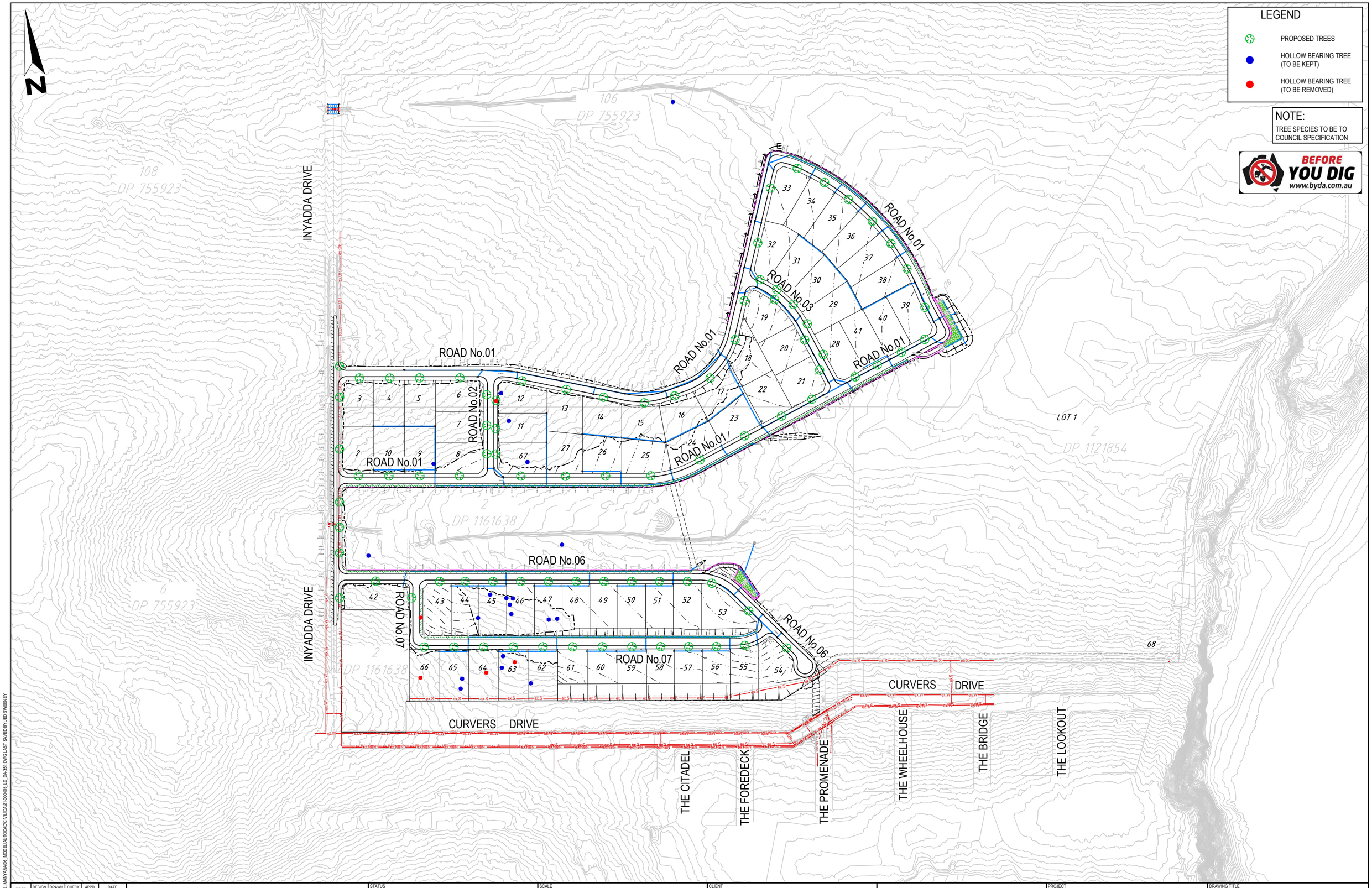
DRAWING TITLE: ENGINEERING PLAN - 05 OF 05

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	305	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODELIA\TOCAD\CIVIL\DA21-000403_LD_DA-305.DWG LAST SAVED BY LAURO FABEL



FIRST ISSUE		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
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STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN:
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE: 0 20 40 60 80 100 120 140 160
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

DISCLAIMER
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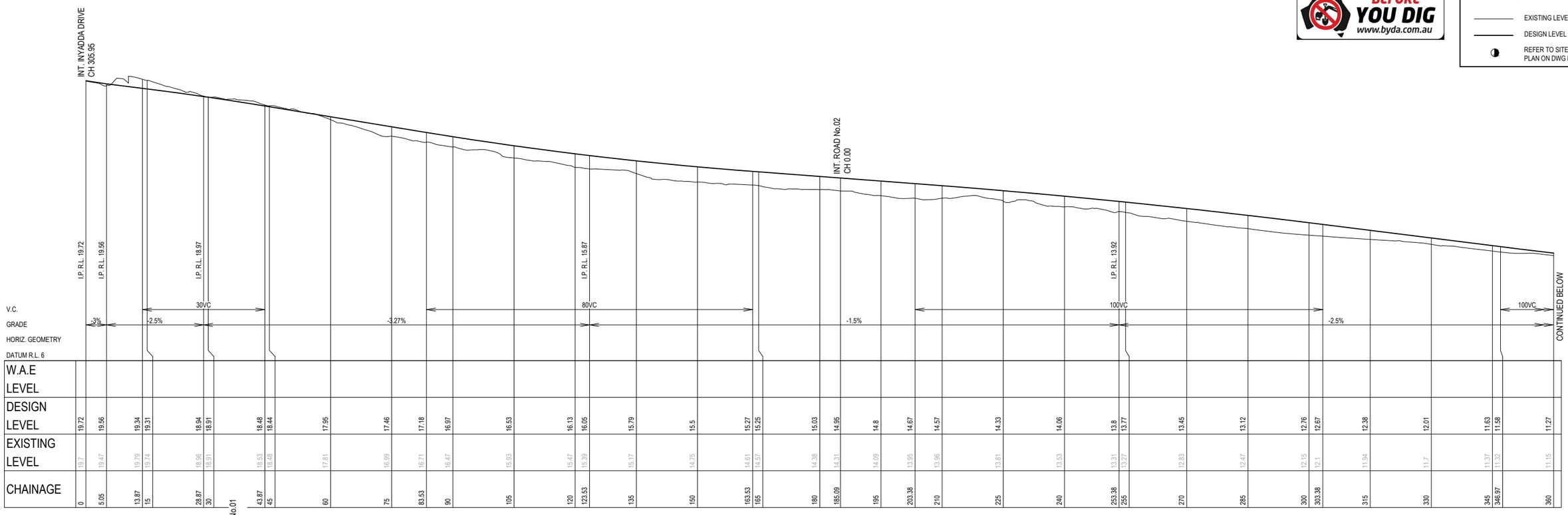
DRAWING TITLE: LANDSCAPE PLAN

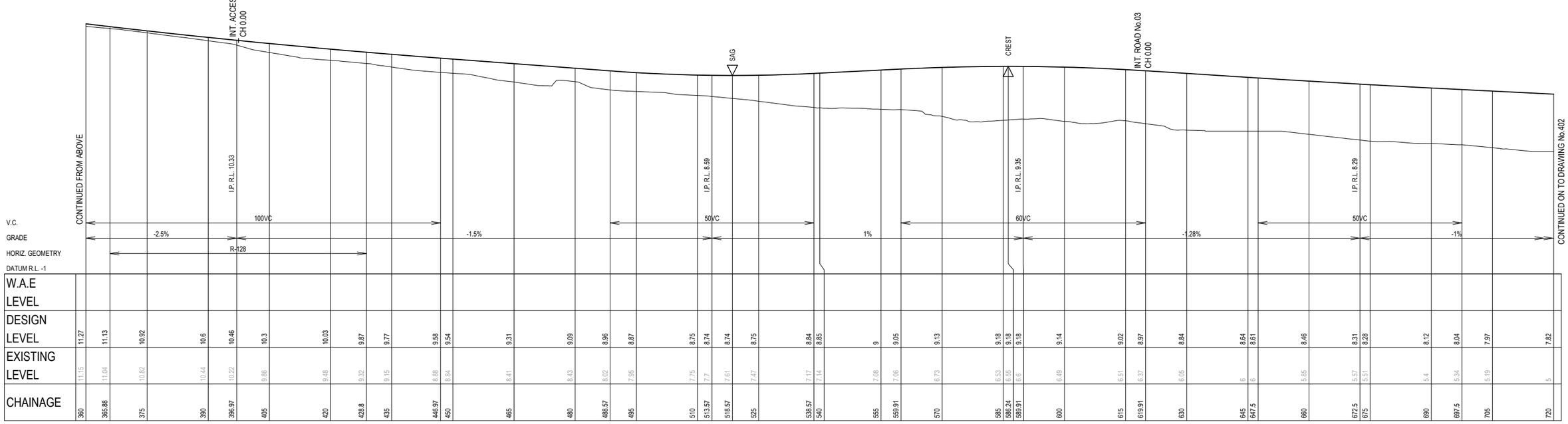
PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	351	DA	2

FILE: H:\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-351.DWG LAST SAVED BY: JED SWEENEY



LONGITUDINAL SECTION CENTRELINE - ROAD No.01

SCALE 1:500 (H)
SCALE 1:100 (V)



LONGITUDINAL SECTION CENTRELINE - ROAD No.01

SCALE 1:500 (H)
SCALE 1:100 (V)

LEGEND

- EXISTING LEVEL
- DESIGN LEVEL
- REFER TO SITE REGRADING PLAN ON DWG No.201-202

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FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
A 1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
M 2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS
E						
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STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN: Sina Arbabzadeh
DATE: 30/06/2023

SCALE
0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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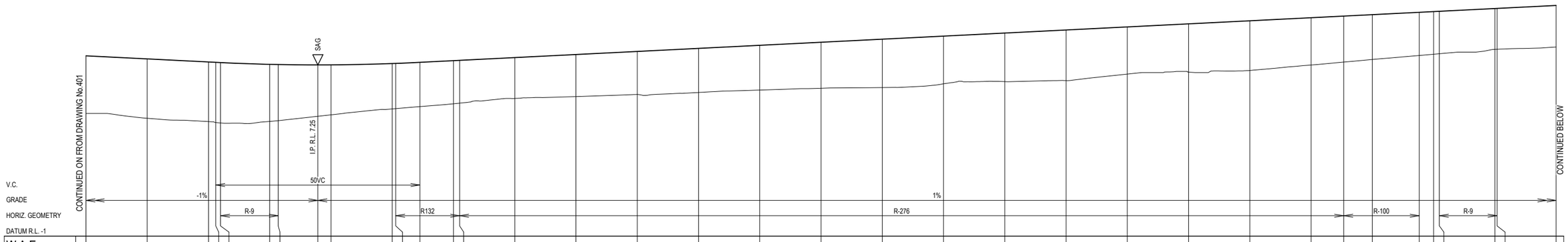
PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

DISCLAIMER
ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE. NOT FOR CONSTRUCTION UNLESS STAMPED BY CERTIFYING AUTHORITY

DRAWING TITLE: LONGITUDINAL & TYPICAL SECTIONS - ROAD No.01

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	401	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\05_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-401.DWG LAST SAVED BY JED SWEENEY



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LEGEND

─	EXISTING LEVEL
━	DESIGN LEVEL
◑	REFER TO SITE REGRADING PLAN ON DWG No.201-202

W.A.E LEVEL	DESIGN LEVEL	EXISTING LEVEL	CHAINAGE
	7.82	5	720
	7.67	4.76	735
	7.52	4.6	750
	7.5	4.56	751.79
	7.49	4.53	752.96
	7.4	4.61	765
	7.39	4.65	767.1
	7.38	4.86	776.78
	7.38	4.93	780
	7.44	5.22	795
	7.45	5.24	795.85
	7.5	5.34	801.79
	7.58	5.47	810
	7.6	5.5	811.5
	7.73	5.73	825
	7.88	5.83	840
	8.03	5.93	855
	8.18	6.03	870
	8.33	6.14	885
	8.48	6.23	900
	8.63	6.26	915
	8.78	6.45	930
	8.93	6.56	945
	9.08	6.61	960
	9.23	6.92	975
	9.38	7.02	990
	9.53	7.1	1005
	9.68	7.37	1020
	9.76	7.51	1027.99
	9.83	7.64	1035
	9.95	7.84	1046.48
	9.98	7.9	1050
	10	7.92	1051.41
	10.13	8.14	1065
	10.14	8.14	1065.55
	10.28	8.25	1080

LONGITUDINAL SECTION CENTRELINE - ROAD No.01

SCALE 1:500 (H)
SCALE 1:100 (V)

W.A.E LEVEL	DESIGN LEVEL	EXISTING LEVEL	CHAINAGE
	10.28	8.25	1080
	10.43	8.4	1095
	10.58	8.88	1110
	10.73	9.11	1125
	10.88	9.65	1140
	11.03	10.13	1155
	11.18	10.57	1170
	11.33	10.79	1185
	11.48	11	1200
	11.52	11	1204.25
	11.63	11.24	1215
	11.78	11.26	1230
	11.89	11.44	1240.31
	11.93	11.4	1245
	11.96	11.36	1255.31
	11.95	11.37	1260
	11.89	11.33	1270.31
	11.88	11.32	1271.41
	11.84	11.26	1275
	11.71	11.24	1287.91
	11.69	11.25	1290
	11.64	11.4	1302.91
	11.64	11.39	1305
	11.71	11.61	1317.91
	11.73	11.54	1320
	11.88	11.52	1335
	12.03	11.67	1350
	12.14	11.92	1360.7
	12.18	11.98	1365
	12.23	12	1370.09
	12.36	12.33	1380
	12.41	12.42	1383.33
	12.66	12.62	1395
	12.66	12.63	1395.09
	13.09	13.25	1410
	13.44	13.6	1420.09
	13.63	13.72	1425
	13.85	13.81	1430.59
	14.21	14.29	1440

LONGITUDINAL SECTION CENTRELINE - ROAD No.01

SCALE 1:500 (H)
SCALE 1:100 (V)

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-402.DWG LAST SAVED BY:LAURO FAGEL

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
FIRST ISSUE		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS
FOR
DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN: Sina Arbabzadeh
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT
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PROJECT
INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

DISCLAIMER
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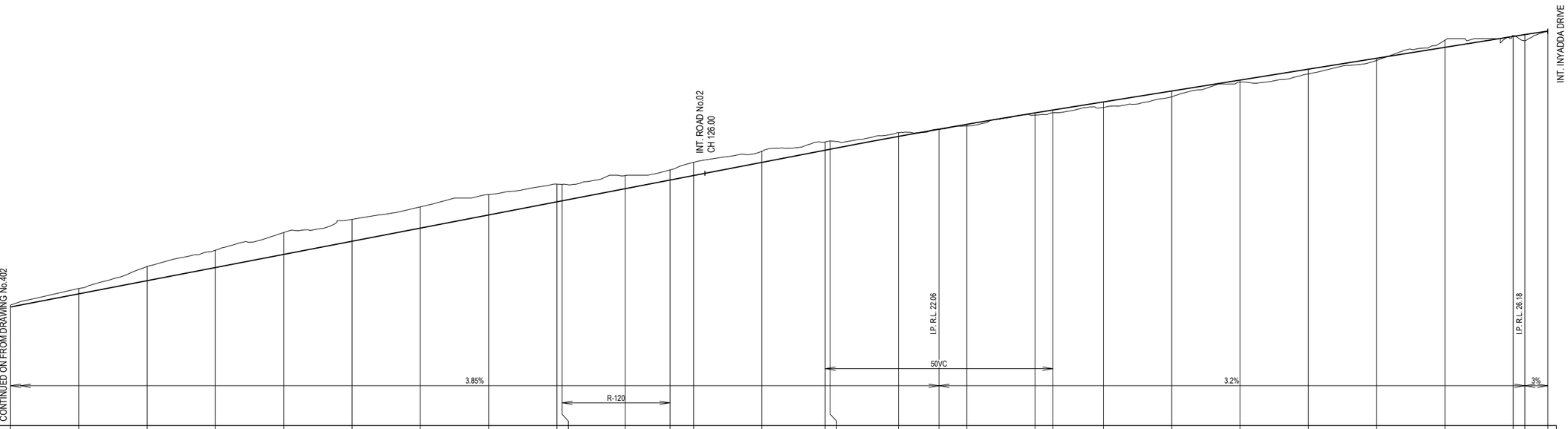
DRAWING TITLE
LONGITUDINAL & TYPICAL
SECTIONS - ROAD No.01 (CONT.)

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	402	DA	2



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LEGEND

─	EXISTING LEVEL
━	DESIGN LEVEL
◑	REFER TO SITE REGRADING PLAN ON DWG No.201-202

W.A.E LEVEL															
DESIGN LEVEL	14.21	14.79	15.37	15.94	16.52	17.1	17.68	18.25	18.83	18.87	19.41	19.79	19.99	20.56	21.1
EXISTING LEVEL	14.29	15.02	15.99	16.7	17.48	18.06	18.61	19.15	19.61	19.6	19.99	20.23	20.56	21.05	21.46
CHAINAGE	1440	1455	1470	1485	1500	1515	1530	1545	1560	1561.13	1575	1584.82	1590	1605	1618.91

W.A.E LEVEL															
DESIGN LEVEL	21.14	21.7	22.02	22.23	22.74	22.86	23.22	23.7	24.18	24.66	25.14	25.62	26.1	26.18	26.33
EXISTING LEVEL	21.5	21.86	22.02	22.16	22.64	22.74	22.98	23.45	24.09	24.45	25.04	25.93	26.13	25.91	26.33
CHAINAGE	1620	1635	1643.91	1650	1665	1668.91	1680	1695	1710	1725	1740	1755	1770	1772.54	1777.59

LONGITUDINAL SECTION CENTRELINE - ROAD No.01

SCALE 1:500 (H)
SCALE 1:100 (V)

RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL). REFER INDICATIVE DETAIL ON DWG. No.201

DESIGN LEVEL	0.37	0.35	0.2	0.11	0.11	0	-0.1	-0.12	-0.12	-0.42	-0.42	-0.18	VAR.
OFFSET	-8.5	-8	-4	-3.68	-3.45	0	3.55	4	4.5	5.4	7.1	8	9.1

TYPICAL CROSS SECTION - ROAD No.01

CH 0 - CH 710 & CH 805 - CH 1046
SCALE 1:100 (H) 1:100 (V)

RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL). REFER INDICATIVE DETAIL ON DWG. No.201

DESIGN LEVEL	0.13	0.11	-0.04	-0.13	-0.1	0	0.07	0.03	0.18	0.29	VAR.
OFFSET	-8.5	-8	-4	-3.68	-3.45	0	3.55	4	4.03	8.03	9.1

TYPICAL CROSS SECTION - ROAD No.01

CH 1046 - CH 1065
SCALE 1:100 (H) 1:100 (V)

RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL). REFER INDICATIVE DETAIL ON DWG. No.201

DESIGN LEVEL	0.13	0.11	-0.05	-0.13	-0.1	0	-0.11	-0.15	0	0.12	VAR.
OFFSET	-8.5	-8	-4	-3.68	-3.45	0	3.55	4	4.03	8.03	9.19

TYPICAL CROSS SECTION - ROAD No.01

CH 740 - CH 790, CH 1065 - END
SCALE 1:100 (H) 1:100 (V)

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
FIRST ISSUE		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS
FOR
DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN: Sina Arbabzadeh
DATE: 30/06/2023

SCALE
0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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PROJECT
INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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DRAWING TITLE
LONGITUDINAL & TYPICAL
SECTIONS - ROAD No.01 (CONT.)

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	403	DA	2

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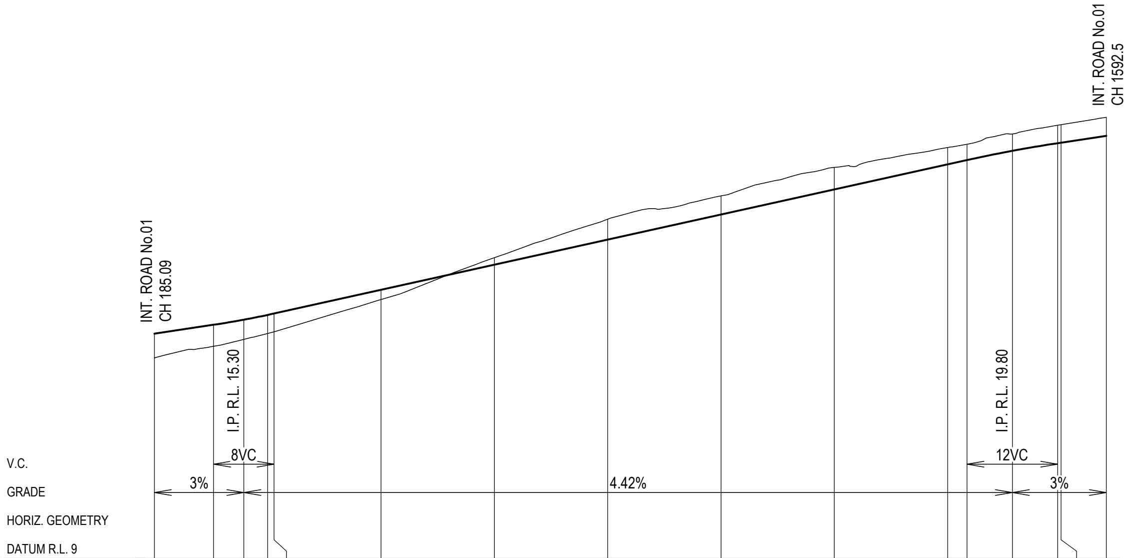
LEGEND

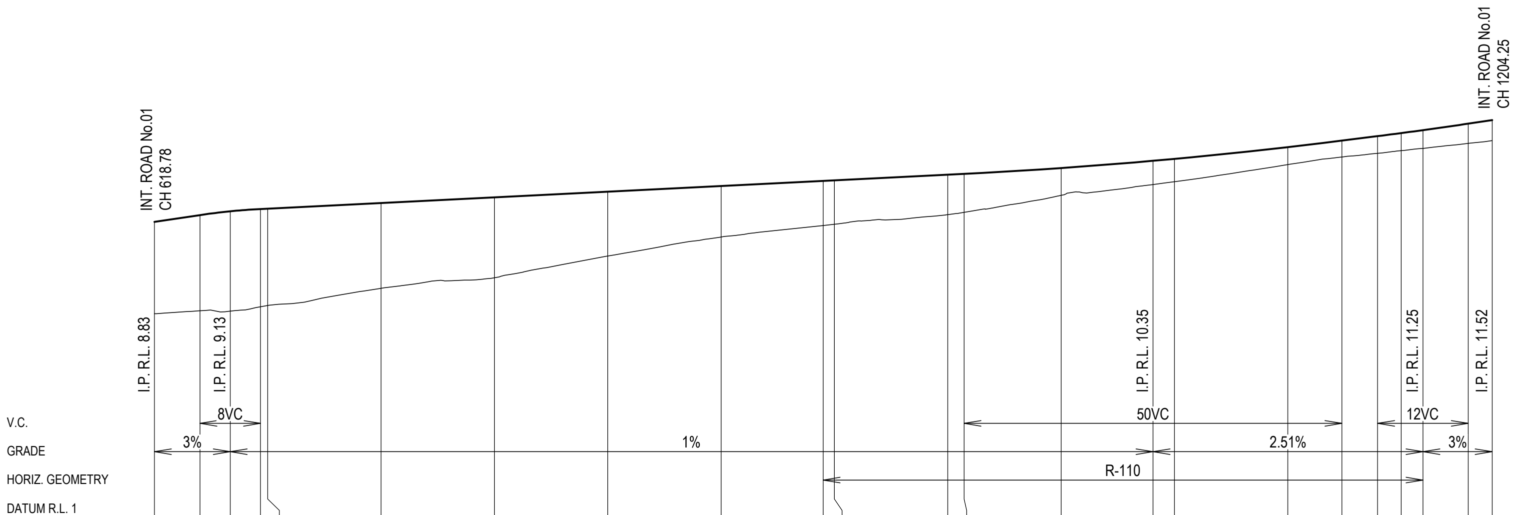
- EXISTING LEVEL
- DESIGN LEVEL
- ◑ REFER TO SITE REGRADING PLAN ON DWG No.201-202



W.A.E LEVEL																			
DESIGN LEVEL	14.95	15.18	15.32	15.44	15.48	16.11	16.77	17.43	18.1	18.76	19.43	19.54	19.78	19.98	20	20.18			
EXISTING LEVEL	14.31	14.62	14.8	14.95	15	15.85	16.96	17.98	18.59	19.35	19.87	19.95	20.23	20.46	20.47	20.67			
CHAINAGE	0	7.85	11.85	15	15.85	30	45	60	75	90	105	107.56	113.56	119.56	120	126			

LONGITUDINAL SECTION CENTRELINE - ROAD No.02

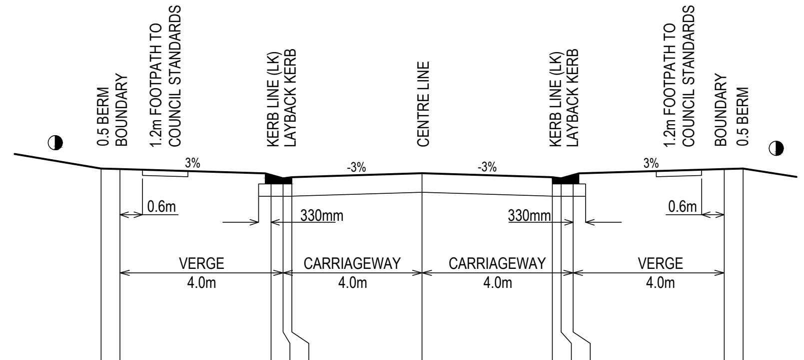
SCALE 1:500 (H)
SCALE 1:100 (V)



W.A.E LEVEL																							
DESIGN LEVEL	8.83	9.01	9.11	9.17	9.18	9.33	9.48	9.63	9.78	9.92	9.93	10.08	10.1	10.26	10.45	10.5	10.81	10.98	11.1	11.18	11.26	11.43	11.52
EXISTING LEVEL	6.4	6.48	6.47	6.59	6.62	7.07	7.35	7.93	8.43	8.73	8.77	9.02	9.08	9.53	9.82	9.89	10.35	10.55	10.64	10.71	10.78	10.91	10.98
CHAINAGE	0	6.04	10.04	14.04	15	30	45	60	75	88.5	90	105	107.16	120	132.16	135	150	157.16	161.88	165	167.88	173.88	177.04

LONGITUDINAL SECTION CENTRELINE - ROAD No.03

SCALE 1:500 (H)
SCALE 1:100 (V)



DESIGN LEVEL	0.13	0.11	-0.04	-0.13	-0.1	0	-0.1	-0.13	-0.04	0.11	0.13	0.06
OFFSET	-8.5	-8	-4	-3.68	-3.45	0	3.45	3.68	4	8	8.5	8.91

TYPICAL CROSS SECTION - ROADS No.02 & 03

SCALE 1:100 (H) 1:100 (V)

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-404.DWG LAST SAVED BY:JED SWEENEY

		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
FIRST ISSUE		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN: Sina Arbabzadeh
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE:
0 1 2 3 4 5 6 7 8 — SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40 — SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

DISCLAIMER
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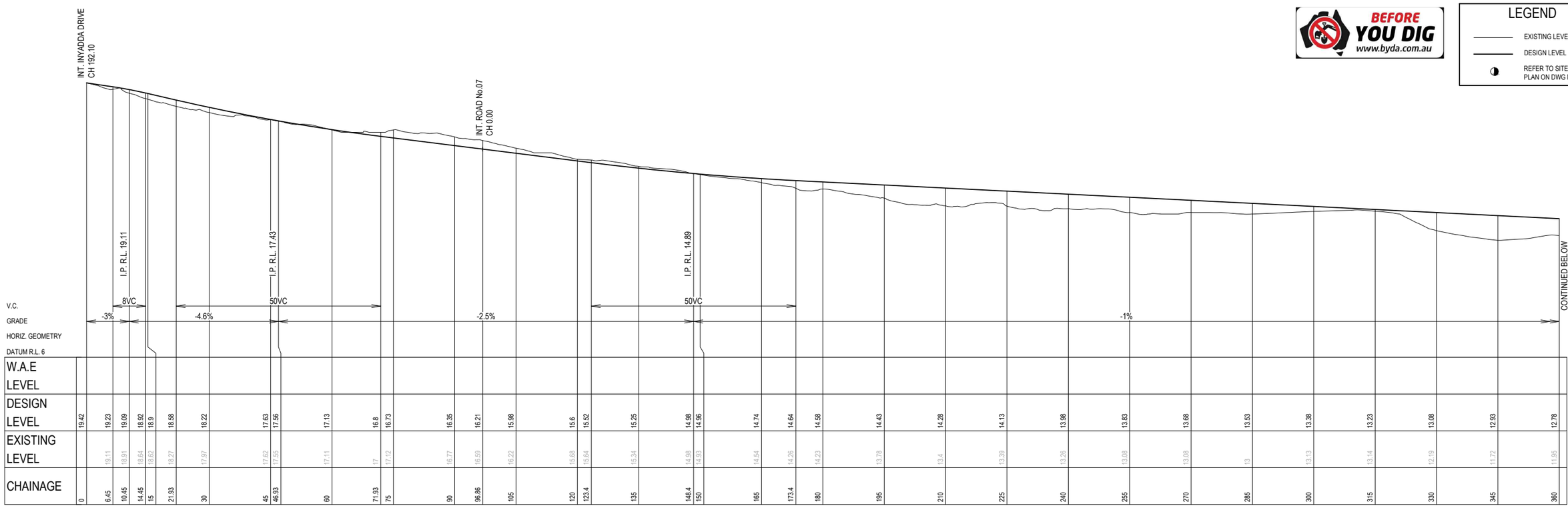
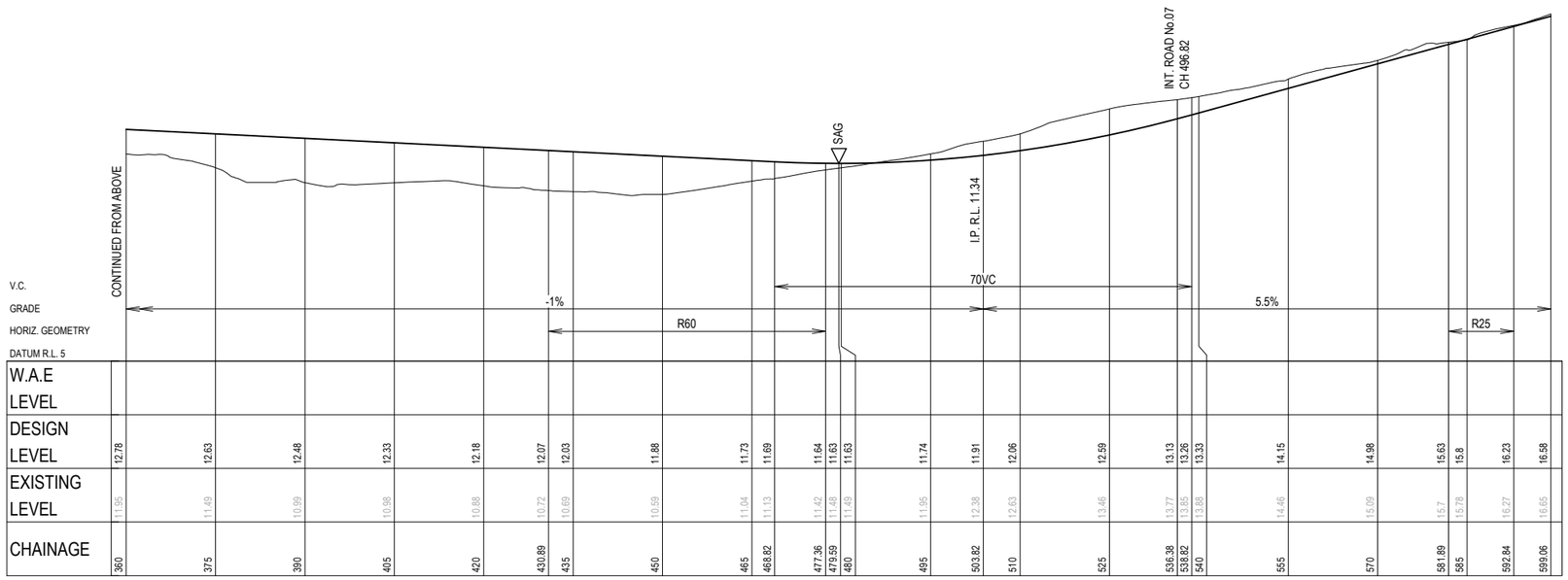
DRAWING TITLE: LONGITUDINAL & TYPICAL SECTIONS - ROAD No.02 & 03

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	404	DA	2



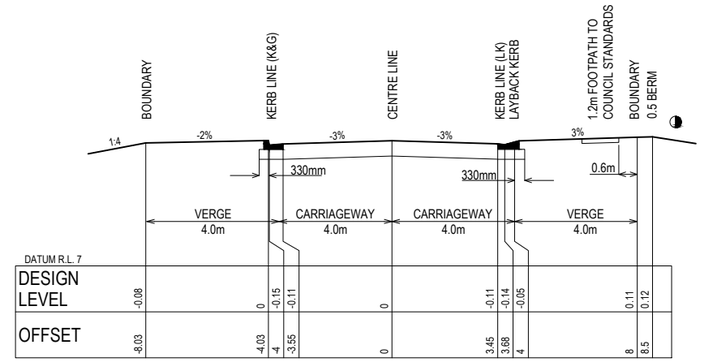
LONGITUDINAL SECTION CENTRELINE - ROAD No.06

SCALE 1:500 (H)
SCALE 1:100 (V)



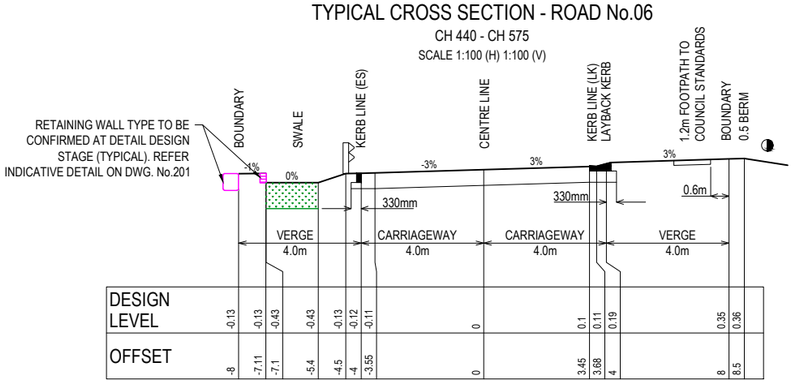
LONGITUDINAL SECTION CENTRELINE - ROAD No.06

SCALE 1:500 (H)
SCALE 1:100 (V)



TYPICAL CROSS SECTION - ROAD No.06

CH 440 - CH 575
SCALE 1:100 (H) 1:100 (V)



TYPICAL CROSS SECTION - ROAD No.06

CH 0 - CH 420
SCALE 1:100 (H) 1:100 (V)

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
AMENDMENTS 1	AW	JS	SA	EF	14/12/2021	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE
0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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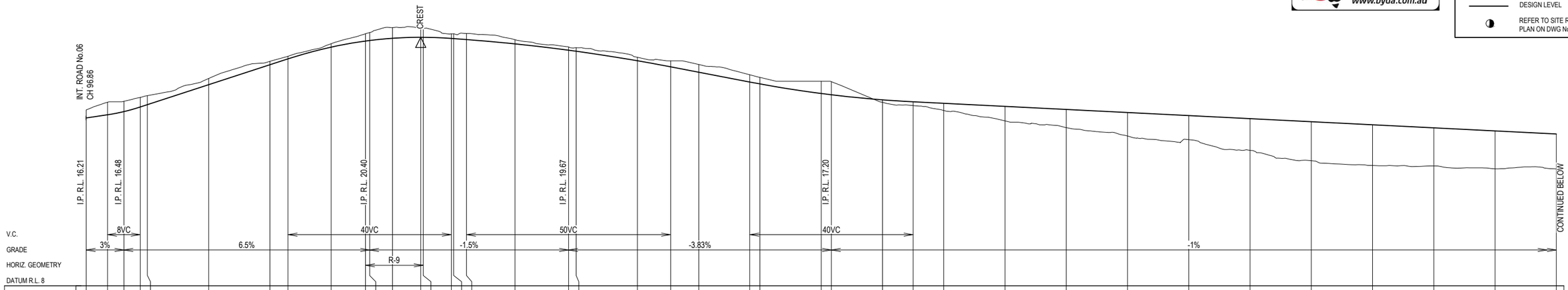
DRAWING TITLE: LONGITUDINAL & TYPICAL SECTIONS - ROAD No.06

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	405	DA	2

F:\E:\H\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA21-000403_LD_DA-405.DWG LAST SAVED BY:JED SWEENEY



LEGEND

─── (thin)	EXISTING LEVEL
─── (thick)	DESIGN LEVEL
◑	REFER TO SITE REGRADING PLAN ON DWG No.201-202

CHAINAGE	W.A.E LEVEL	DESIGN LEVEL	EXISTING LEVEL
0		16.21	16.6
5.25		16.36	16.98
9.25		16.52	17.02
13.25		16.74	17.21
15		16.86	17.3
30		17.83	18.14
45		18.81	18.98
49.43		19.1	19.23
60		19.67	19.84
68.4		19.97	20.32
69.43		20	20.39
75		20.1	20.63
81.93		20.15	20.6
82.55		20.15	20.59
89.43		20.1	20.32
90		20.09	20.32
93.13		20.04	20.34
105		19.83	20.03
118.13		19.52	19.68
120		19.47	19.64
135		19	19.17
143.13		18.71	19
150		18.44	18.82
162.5		17.97	18.32
165		17.87	18.19
180		17.4	18
182.5		17.34	17.98
195		17.09	16.97
202.5		17	16.81
210		16.92	16.57
225		16.77	16.06
240		16.62	15.74
255		16.47	15.32
270		16.32	15.15
285		16.17	14.62
300		16.02	14.12
315		15.87	13.88
330		15.72	13.86
345		15.57	13.72
360		15.42	13.72

LONGITUDINAL SECTION CENTRELINE - ROAD No.07
SCALE 1:500 (H)
SCALE 1:100 (V)

CHAINAGE	W.A.E LEVEL	DESIGN LEVEL	EXISTING LEVEL
360		15.42	13.72
375		15.27	13.64
390		15.12	13.65
399.27		15.03	13.76
405		14.96	13.76
414.27		14.81	13.6
420		14.68	13.69
429.27		14.43	13.88
435		14.26	14.04
450		13.81	14.31
450.98		13.78	14.34
465		13.36	14.29
478.4		12.96	14.2
480		12.92	14.17
484.4		12.86	13.98
484.83		12.86	13.98
487.13		12.87	13.92
490.4		12.93	13.86
493.35		13.01	13.82
495		13.07	13.83
496.82		13.13	13.77

LONGITUDINAL SECTION CENTRELINE - ROAD No.07
SCALE 1:500 (H)
SCALE 1:100 (V)

DESIGN LEVEL	-0.13	-0.12	-0.42	-0.42	-0.12	-0.12	-0.1	0	0.11	0.11	0.2	0.35	0.37
OFFSET	-8	-7.3	-6.4	-5.4	-4.5	-4	-3.55	0	3.45	3.68	4	8	8.5

TYPICAL CROSS SECTION - ROAD No.07
SCALE 1:100 (H) 1:100 (V)

FIRST ISSUE		DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
		AW	JS	SA	EF	14/12/2021	
AMENDMENTS	1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
	2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS
FOR
DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH SIGN: Sina Arbabzadeh
MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)
0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

CLIENT
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PROJECT
INYADDA DRIVE, MANYANA
ROAD & DRAINAGE DESIGN

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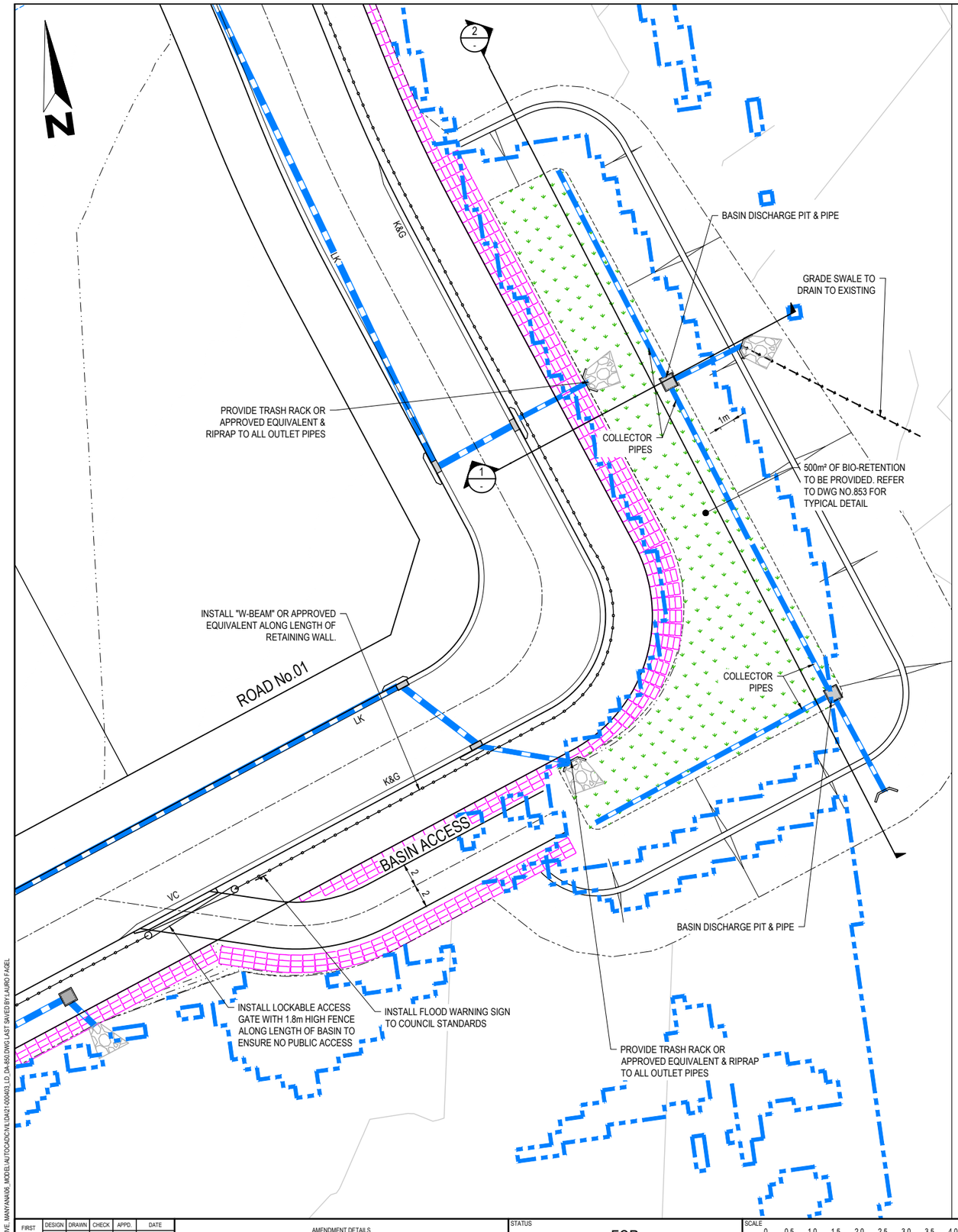
DRAWING TITLE
LONGITUDINAL & TYPICAL SECTIONS - ROAD No.07

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	406	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-406.DWG LAST SAVED BY:JED SWEENEY



LEGEND

- EXISTING LEVEL
- DESIGN LEVEL
- RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
- 100YR FLOOD LINES

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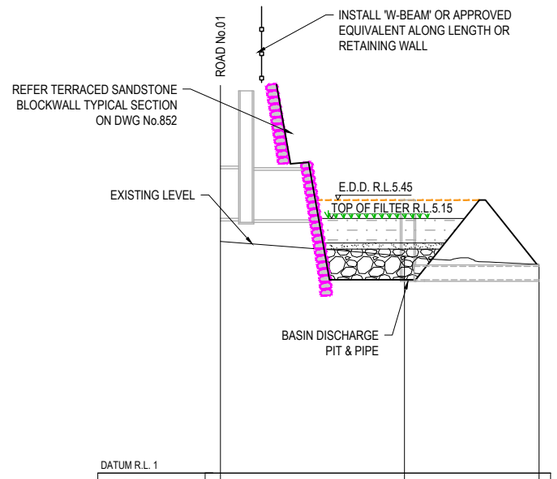
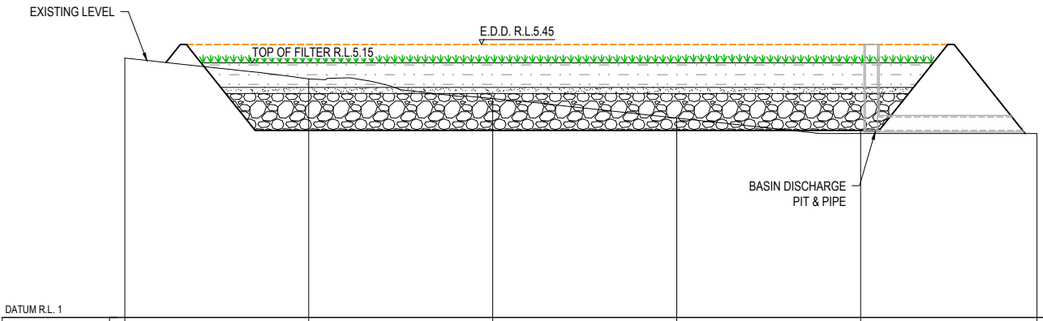


DATUM R.L. 1

W.A.E LEVEL				
DESIGN LEVEL	7.32	4.15		
EXISTING LEVEL	4.78	4.54	4.4	
CHAINAGE	0	15	25.979	

SECTION 1/850
SCALE: 1:250 (H)
SCALE: 1:50 (V)



DATUM R.L. 1

W.A.E LEVEL						
DESIGN LEVEL		4.15	4.15	4.15	4.15	
EXISTING LEVEL	5.23	4.89	4.57	4.25	4	4
CHAINAGE	0	15	30	45	60	74.378

SECTION 2/850
SCALE: 1:250 (H)
SCALE: 1:50 (V)

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
	AW	JS	SA	EF	14/12/2021	
1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
BY: SINA ARBABZADEH
MEng (Civil) MIEAust CPEng NER
SIGN:
DATE: 30/06/2023

SCALE
SCALE 1:50 (A1) SCALE 1:100 (A3)
SCALE 1:200 (A1) SCALE 1:400 (A3)
SCALE 1:250 (A1) SCALE 1:500 (A3)

CLIENT: HEIR ASQUITH

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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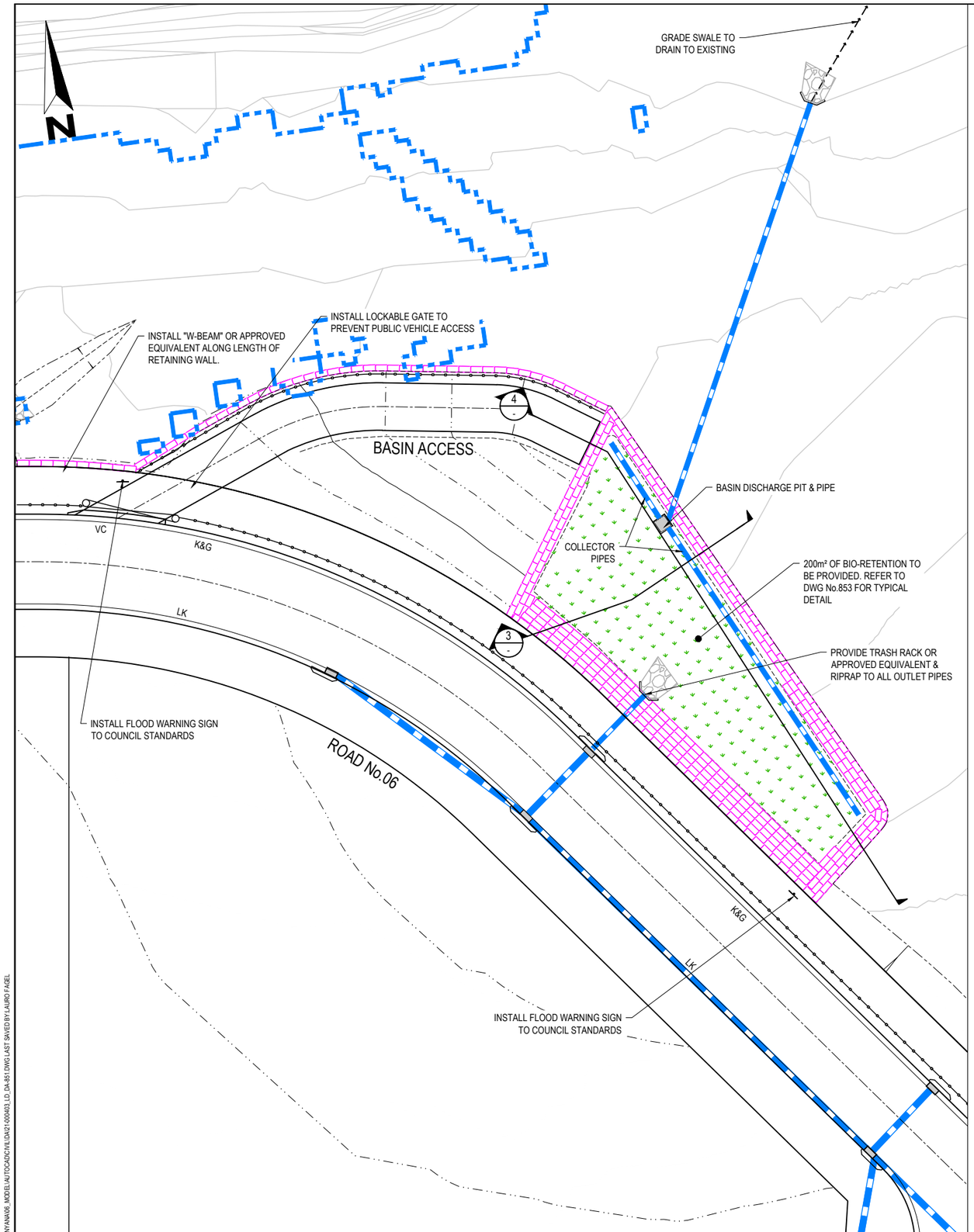
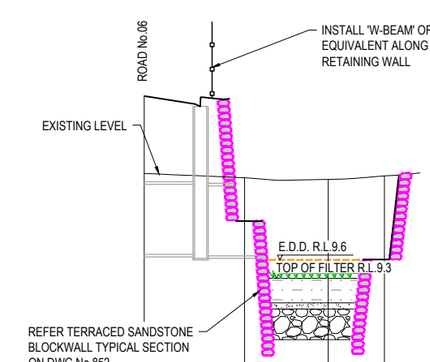
DRAWING TITLE: BASIN No.01 PLAN & DETAILS

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	850	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DA\21-000403_LD_DA-850.DWG LAST SAVED BY LAURO FADEL





DATUM R.L. 5

W.A.E LEVEL					
DESIGN LEVEL	12.27	9	8.91		
EXISTING LEVEL	11.01	10.94	10.91	10.97	
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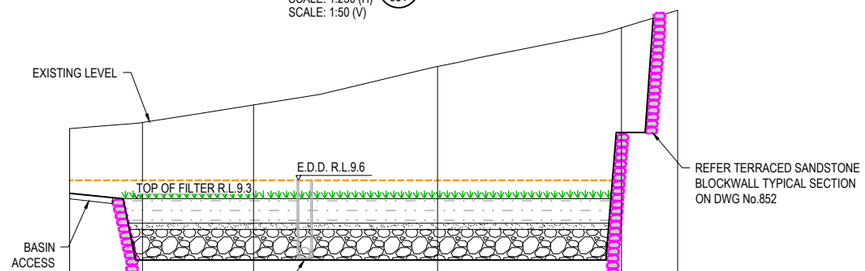
SECTION 3 / 851
SCALE: 1:250 (H)
SCALE: 1:50 (V)



DATUM R.L. 5

W.A.E LEVEL							
DESIGN LEVEL	9.39	8.3	8.3	8.3	11.45		
EXISTING LEVEL	10.44	10.54	10.83	11.46	12.09	12.37	
CHAINAGE	0	5.909	15	30	45	49.573	

SECTION 4 / 851
SCALE: 1:250 (H)
SCALE: 1:50 (V)

LEGEND
- EXISTING LEVEL
- DESIGN LEVEL
- RETAINING WALL TYPE TO BE CONFIRMED AT DETAIL DESIGN STAGE (TYPICAL)
- 100YR FLOOD LINES

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FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
	AW	JS	SA	EF	14/12/2021	
AMENDMENTS 1	AW	AW	SA	EF	12/01/2022	ISSUED FOR DEVELOPMENT APPLICATION
AMENDMENTS 2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

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SCALE
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
SCALE 1:50 (A1) SCALE 1:100 (A3)
0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0
SCALE 1:200 (A1) SCALE 1:400 (A3)
0 2.5 5 7.5 10 12.5 15 17.5 20
SCALE 1:250 (A1) SCALE 1:500 (A3)

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PROJECT: INYADDA DRIVE, MANYANA ROAD & DRAINAGE DESIGN

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DRAWING TITLE: BASIN No.02 PLAN & DETAILS

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	851	DA	2

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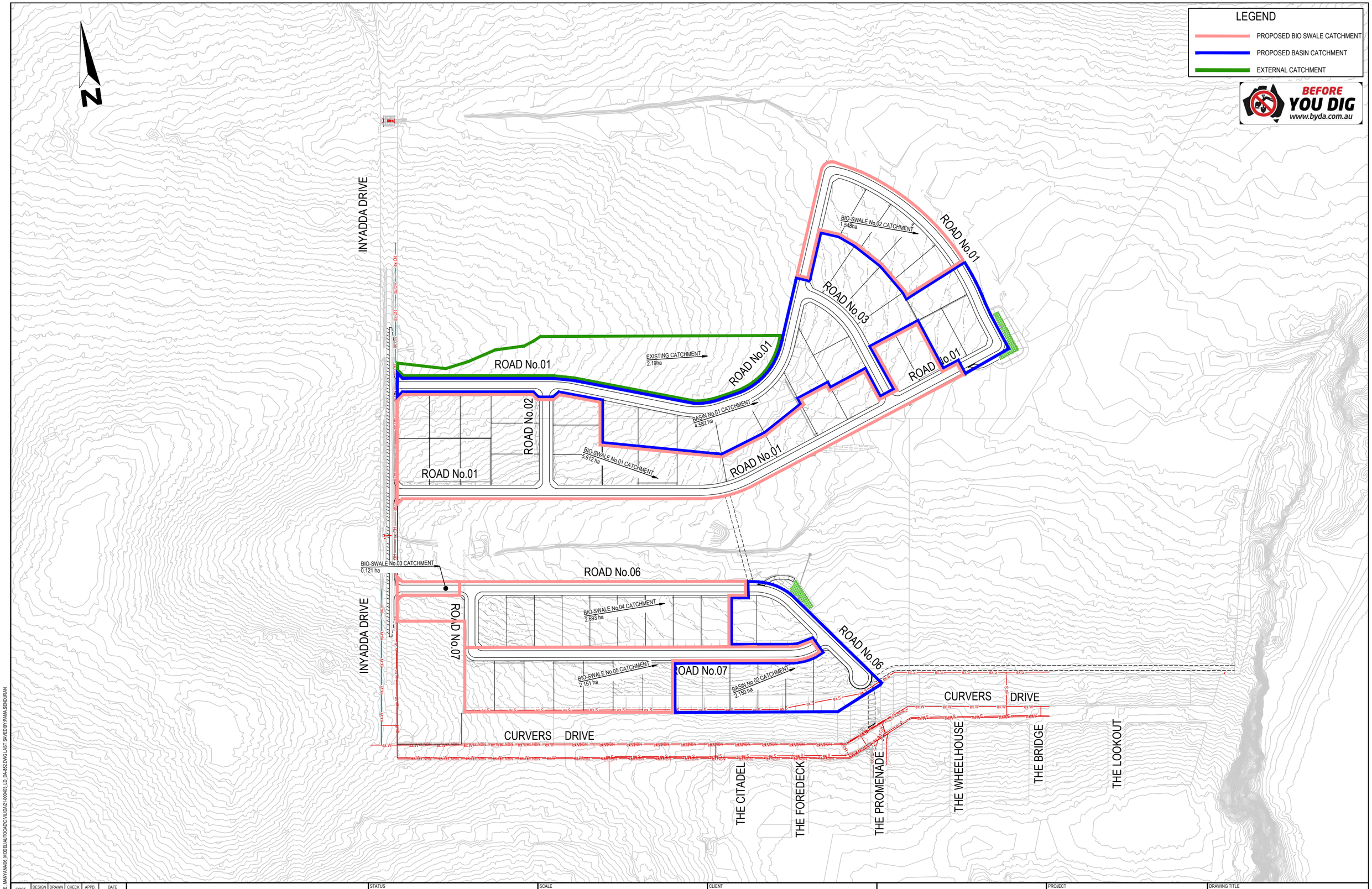

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
1	AW	AW	SA	EF	14/12/2021	ISSUED FOR DEVELOPMENT APPLICATION
2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

AMENDMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
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DATE: 30/06/2023

SCALE
0 20 40 60 80 100 120 140 160
SCALE 1:2000 (A1) SCALE 1:4000 (A3)

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DRAWING TITLE: CATCHMENT PLAN

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	852	DA	2

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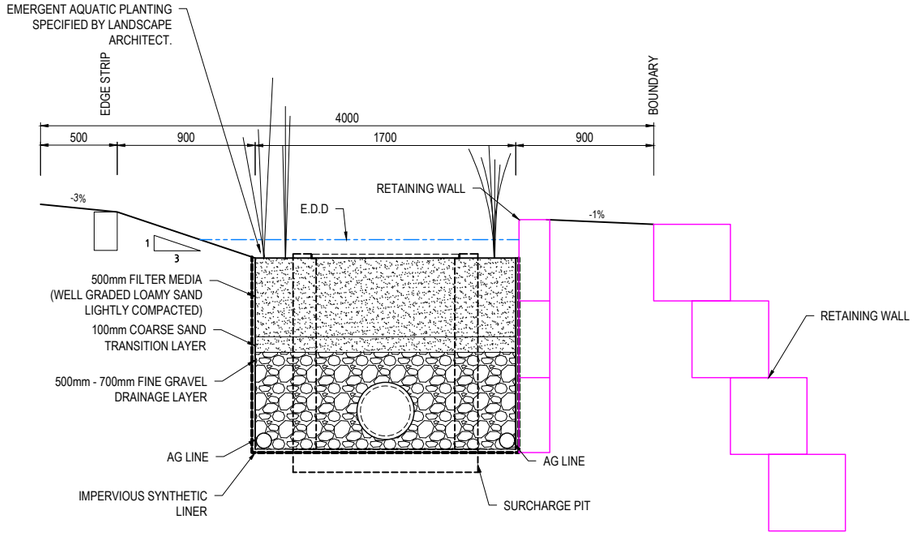
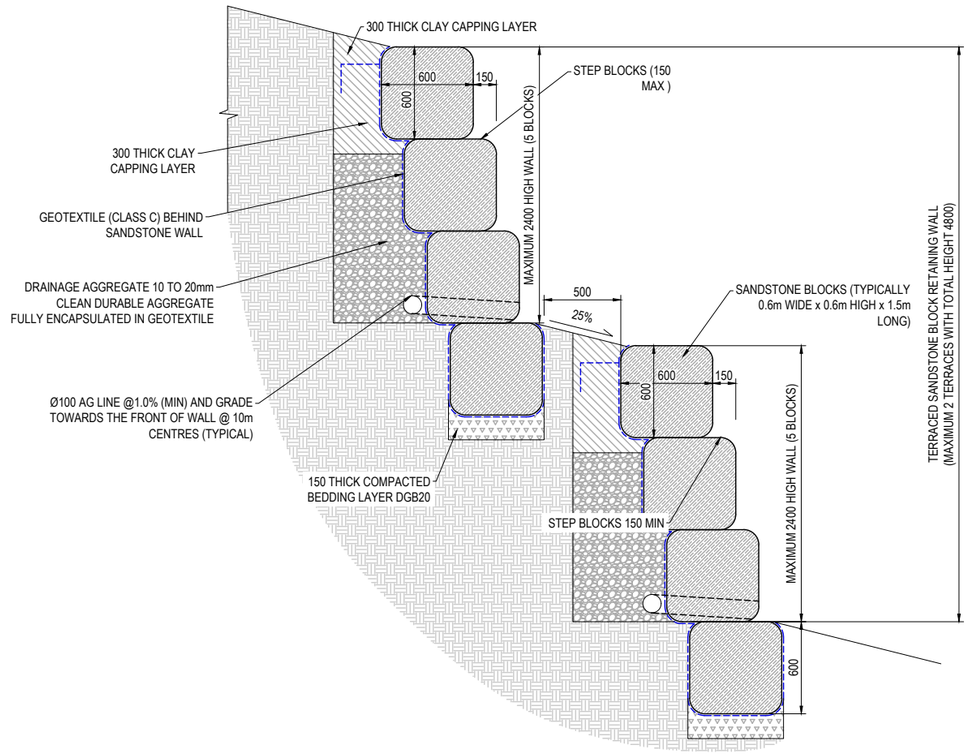


TYPICAL DETAIL ALONG BIO SWALE & BIO BASIN

SCALE 1:20



TERRACED SANDSTONE BLOCK WALL
TYPICAL SECTION

SCALE 1:10

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPD.	DATE	AMENDMENT DETAILS
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2	LF	PS	SA	SA	30/06/2023	ISSUED TO SUIT COUNCIL COMMENTS

AMENDMENTS

STATUS: FOR DEVELOPMENT APPLICATION

AUTHORISED FOR ISSUE:
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MEng (Civil) MIEAust CPEng NER
DATE: 30/06/2023

SCALE
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
SCALE 1:10 (A1) SCALE 1:20 (A3)
0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6
SCALE 1:20 (A1) SCALE 1:40 (A3)

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DRAWING TITLE: SANDSTONE LOGWALL, BLOCKWALL & GRASSED ROADSIDE SWALE DETAILS

PROJECT No.	DRAWING No.	STAGE	REVISION
21-000403	853	DA	2

FILE: H:\21\21-000403 - INYADDA DRIVE, MANYANA\06_MODEL\AUTOCAD\CIVIL\DWG\21-000403_LD_DA-853.DWG LAST SAVED BY LAURO FADEL

Appendix C: Site Images

Photograph 1: View of Area 1 looking east from near borehole BH22

Photograph 2: View of Area 1 looking north east from near BH24

Photograph 3: View of Area 1 looking north from near BH18

Photograph 4: View of Area 1 looking north from BH19

revision	description	drawn	approved	date
	Plate1	HJP	KEG	27/08/2019

TERRA INSIGHT

client:	**HEIR ASQUITH**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
scale	NTS
Title	**Images of the site**
original size	**A3**
project no:	**TERRA19271**
Plate no:	**1**

Photograph 5: view of Area 1 looking south west from BH13

Photograph 6: view of area 1 looking east from near BH17

Photograph 7: view looking east from near the eastern boundary of Area1

Photograph 8: view of Area 2 looking east from the western side of the area

revision	description	drawn	approved	date
	Plate2	HJP	KEG	27/08/2019

TERRA INSIGHT

client:	**HEIR ASQUITH**
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**
scale	NTS
Title	**Images of the site**
original size	**A3**
project no:	**TERRA19271**
Plate no:	**2**

Photograph 9: view of Area 2 looking south from the eastern side of the area

Photograph 10: view of area 2 looking west from BH06

Photograph 11: view of Area 2 looking south east from BH12

Photograph 12: view of Area 2 looking east from near BH11

revision	description	drawn	approved	date
	Plate4	HJP	KEG	27/08/2019

TERRA INSIGHT

client:	**HEIR ASQUITH**		
project:	**Geotechnical Investigation for ASS Lot 106 DP755923 Inyadda Drive, Manyana NSW**		
scale	NTS	Title	**Images of the site**
original size	**A3**	project no: **TERRA19271**	Plate no:**3**

Appendix D: Engineering logs

TERRA INSIGHT

How to interpret the engineering logs in Your Report

FIELD DECRIPTIONS OF SOILS

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)				USC	PRIMARY NAME
COARSE GRAINED SOILS More than 65% of materials less than 63 mm is larger than 0.075 mm	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	GRAVEL
			Predominantly one size or a range of sizes with more intermediate sizes missing.	GP	GRAVEL
		GRAVELS WITH FINES Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	GM	SILTY GRAVEL
			Plastic fines (for identification procedures see CL below)	GC	CLAYEY GRAVEL
	SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes	SW	SAND
			Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	SAND
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	SM	SILTY SAND
			Plastic fines (for identification procedures see CL below).	SC	CLAYEY SAND

FINE GRAINED SOILS More than 35% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm (Note a 75Um particle is about the smallest particle that is visible to the naked eye.)				
		DRY STRENGTH	DILATANCY	TOUGHNESS	USC	PRIMARY NAME
	SILTS & CLAYS Liquid limit less than 50	None to Low	Quick to slow	None	ML	SILT
		Medium to High	None	Medium	CL	CLAY
		Low to medium	Slow to very slow	Low	CL	ORGANIC SILT
	SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low to medium	MH	SILT
		High	None	High	CH	CLAY
		Medium to High	None	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC	Readily identified by colour, odour, spongy feel and frequently by fibrous texture by fibrous texture.				PT	PEAT

● Low plasticity – Liquid Limit w_L less than 35%. ● Medium plasticity – w_L between 35% and 50%. ● High plasticity – w_L greater than 50%.

Particle size descriptive terms

NAME	SUBDIVISION	SIZE
Boulders Cobbles		>200 mm 63 mm to 200 mm
Gravel	coarse medium fine	20 mm to 63 mm 6 mm to 20 mm 2.36 mm to 6 mm
Sand	coarse medium fine	600 µm to 2.36 mm 200 µm to 600 µm 75 µm to 200 µm

Minor components

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

TERRA INSIGHT

How to interpret the engineering logs in Your Report

Moisture condition

TERM	DEFINITION
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
Moist	Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist but with free water forming on hands when handled.

Soil structure

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

Consistency of cohesive soils

TERM	UNDRAINED STRENGTH s_u (kPa)	VISUAL OBSERVATION IN FIELD
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 – 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 – 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 – 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 – 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

Density of granular soils

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 – 35
Medium Dense	35 – 65
Dense	65 – 85
Very Dense	Greater than 85

Geological origin

TRANSPORTED SOILS

Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope by gravity).
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible.
Residual soil	Structure and fabric of parent rock not visible.

TERRA INSIGHT

How to interpret the engineering logs in Your Report

FIELD DESCRIPTIONS OF ROCK

The descriptive terms used by Terra Insight are given below. They are broadly consistent with Australian Standard AS1726-1993.

Rock Substance — In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.

Defect — Discontinuity or break in the continuity of a substance or substances.

Mass — Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

Classification of weathering products

Term	Abbreviation	Definition
Residual Soil	RS	Soil derived from the weatherinç rock; the mass structure and substance fabric are no longer evident; there is a large change volume but the soil has not beer significantly transported.
Extremely Weathered Material	XW	Material is weathered to such ar extent that it has soil properties, it either disintegrates or can be remoulded in water. Original roc fabric still visible.
Highly Weathered Rock	HW	Rock strength is changed by weathering. The whole of the rc substance is discoloured, usuall iron staining or bleaching to the extent that the colour of the orig rock is not recognisable. Some minerals are decomposed to cla minerals. Porosity may be increa by leaching or may be decrease due to the deposition of mineral pores.
Moderately Weathered Rock	MW	The whole of the rock substance discoloured, usually by iron stair or bleaching , to the extent that colour of the fresh rock is no lon recognisable.
Slightly Weathered Rock	SW	Rock substance affected by weathering to the extent that pa staining or partial discolouration the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rc is recognisable; strength proper are essentially those of the fresh rock substance.
Fresh Rock	FR	Rock substance unaffected by weathering.

Notes on Weathering:

AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction. DW may be used with the definition given in AS1726.

Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

Rock substance strength terms

Term	Abbreviation	UCS (MPa)	Point Load Index, $I_{s(50)}$ (MPa)	Field Guide
Very Low	VL	<2	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30mm thick can be broken by finger pressure.
Low	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	6 to 20	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	60 to 200	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
Extremely High	EH	>200	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

Notes on Rock Substance Strength:

In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy. The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms. The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index Is(50). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

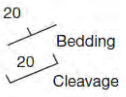
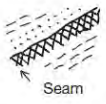
SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME	Simple rock names are used rather than precise geological classification.
PARTICLE SIZE	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
FABRIC	Terms for layering of penetrative fabric (eg. bedding, cleavage etc.) are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on properties.
Distinct	Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

TERRA INSIGHT

How to interpret the engineering logs in Your Report

Common defects observed in rock

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.			 (Note 2)
Joint	A surface or crack across which the rock has little or no tensile strength. but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.			 (Note 2)
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.			
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties			
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.			
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in place.			

Notes on Defects:

1. Usually borehole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.

Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

ROUGHNESS TERMS

Slickensided	Grooved or striated surface, usually polished
Polished	Shiny smooth surface
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.

COATING TERMS

Clean	No visible coating
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Veneer	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.

TERRA INSIGHT

Borehole No.
BH01
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274652.0 m E 6096268.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	8.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.40 m		7.8	0.2		CI-CH	CLAY: medium to high plasticity, dark brown, with fine angular gravel	M			TOPSOIL
				S1 D 0.45-0.50 m		7.6	0.4		CI-CH	CLAY: medium to high plasticity, grey brown	M			ALLUVIAL SOIL
						7.4	0.6							
						7.2	0.8		CL-CI	Sandy CLAY: low to medium plasticity, yellow brown, medium sand	D - M			RESIDUAL SOIL
				S2 D 0.95-1.00 m		7.0	1.0		SM	Extremely Weathered Sandstone: recovered as Silty SAND: fine to medium sand, yellow brown, low plasticity fines	D			EXTREMELY WEATHERED MATERIAL
										Hole Terminated at 1.00 m Refusal				
						6.8	1.2							
						6.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH02
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274641.0 m E 6096257.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	9.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		8.8	0.2		CI	Sandy CLAY: meidum plasticity, dark brown	M			TOPSOIL
				S1 D 0.45-0.50 m		8.6	0.4		CI	Sandy CLAY: medium plasticity, dark brown and black, fine to medium sand, with fine to medium gravel	M			ALLUVIAL SOIL
						8.4	0.6		CI-CH	CLAY: medium to high plasticity, grey brown and yellow brown mottled, with rootlets	M			
				S2 D 0.95-1.00 m		8.2	0.8							
						8.0	1.0		CI	CLAY: medium plasticity, yellow brown, with fine to medium sand	M			RESIDUAL SOIL
				S3 D 1.25-1.30 m		7.8	1.2		CL-CI	Extremeley Weathered Sandstone: recovered as Sandy CLAY, low to medium plasticity, yellow, fine to medium sand	D - M			
						7.6	1.4			Hole Terminated at 1.30 m Refusal				

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH03
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274633.0 m E 6096236.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	8.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information					*Soil Description*						*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		7.8	0.2		CI	Sandy CLAY: medium plasticity, dark brown	M			TOPSOIL
				S1 D 0.45-0.50 m		7.6	0.4		CI-CH	CLAY: medium to high plasticity, dark grey brown, with fine to medium sand, trace of fine angular gravel	M			ALLUVIAL SOIL / RESIDUAL SOIL
				S2 D 0.85-0.90 m		7.4	0.6							
						7.2	0.8		SP	Extremely Weathered Sandstone: recovered as SAND, medium to coarse sand, yellow brown, with fine angular gravel	D			
						7.0	1.0			Hole Terminated at 0.90 m Refusal				
						6.8	1.2							
						6.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH04
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274574.0 m E 6096214.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	9.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		8.8	0.2		CI	Sandy CLAY: medium plasticity, dark brown, fine to medium sand, trace of fine gravel	D - M			TOPSOIL
				S1 D 0.45-0.50 m		8.6	0.4		CI-CH	CLAY: medium to high plasticity, grey brown to brown	D - M			ALLUVIAL SOIL
				S2 D 0.75-0.80 m		8.4	0.6		SP	Extremely weathered Sandstone: recovered as SAND with clay fines, fine to coarse sand, yellow brown	D			EXTREMELY WEATHERED MATERIAL
						8.2	0.8			Hole Terminated at 0.80 m Refusal				
						8.0	1.0							
						7.8	1.2							
						7.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH05
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274600.0 m E 6096299.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	9.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		8.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, fine to medium sand, trace of fine gravel	D			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, fine to medium sand	D - M			ALLUVIAL SOIL / RESIDUAL SOIL
				S1 D 0.45-0.50 m		8.6	0.4		SP	Extremely Weathered Sandstone: recovered as SAND, fine grained, brown	D			EXTREMELY WEATHERED MATERIAL
										Hole Terminated at 0.50 m Refusal				
						8.4	0.6							
						8.2	0.8							
						8.0	1.0							
						7.8	1.2							
						7.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH06
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274572.0 m E 6096265.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	7.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		6.8	0.2		CI	Sandy CLAY: medium plasticity, dark brown to brown, with rootlets, trace fine gravel	D - M			TOPSOIL
				S1 D 0.45-0.50 m		6.6	0.4		CI-CH	Sandy CLAY: medium to high plasticity, grey brown and brown mottled, with rootlets, trace of fine gravel	M			ALLUVIAL SOIL / RESIDUAL SOIL
						6.4	0.6							
				S2 D 0.95-1.00 m		6.2	0.8		SC	Clayey SAND: brown to yellow brown, with fine to medium sub-angular gravel	D - M			RESIDUAL SOIL becoming EXTREMELY WEATHERED MATERIAL
						6.0	1.0			Hole Terminated at 1.00 m Refusal				
						5.8	1.2							
						5.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH07
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274544.0 m E 6096237.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	9.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		8.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, trace fine to medium gravel	D			TOPSOIL
									CI	Sandy CLAY: medium plasticity, brown, with rootlets, trace fine gravel	D - M			ALLUVIAL SOIL
				S1 D 0.45-0.50 m		8.6	0.4							
						8.4	0.6							
						8.2	0.8		CL	Sandy CLAY: low plasticity, light brown, fine sand	D			RESIDUAL SOIL
				S2 D 0.95-1.00 m		8.0	1.0		CL	Silty CLAY: low plasticity, light yellow brown, fine sand	D			EXTREMELY WEATHERED MATERIAL
						7.8	1.2							
						7.6	1.4			Hole Terminated at 1.30 m Virtual refusal				

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH08
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274528.0 m E 6096216.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	9.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		8.8	0.2		CL-CI	Sandy CLAY: low to mediu plasticity, dark brown to brown	D - M			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, with fine to medium angular gravel				FILL
				S1 D 0.45-0.50 m		8.6	0.4				D - M			
						8.4	0.6							
									GP	GRAVEL: fine to coarse angular gravel, grey brown	D			
						8.2	0.8		GP	Sandy GRAVEL: with clay, grey brown				FILL or RESIDUAL SOIL
				S2 D 0.95-1.00 m		8.0	1.0				D			
						7.8	1.2			Hole Terminated at 1.20 m Refusal				
						7.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH09
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274521.0 m E 6096329.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	11.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		10.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, fine to medium sand, with fine to medium angular gravel	D			TOPSOIL
									CI-CH	Sandy CLAY: medium to high platicity, brown, fine to coarse sand, with fine to medium semi-rounded and angular gravel	D - M			ALLUVIAL SOIL / RESIDUAL SOIL
				S1 D 0.45-0.50 m		10.6	0.4							
						10.4	0.6		SP	SAND: fine to medium sand with clay, yellow brown to yellow	D			EXTREMELY WEATHERED MATERIAL
				S2 D 0.65-0.70 m										
										Hole Terminated at 0.70 m Refusal				
						10.2	0.8							
						10.0	1.0							
						9.8	1.2							
						9.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH10
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274525.0 m E 6096281.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	10.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		9.8	0.2		CI	Sandy CLAY: medium pasticity, brown, with silt, with fine rounded gravel	D - M			TOPSOIL
				S1 D 0.45-0.50 m		9.6	0.4		CI-CH	Sandy CLAY: medium to high plasticity, brown, with fine to medium gravel	D - M			RESIDUAL SOIL
						9.4	0.6			Hole Terminated at 0.50 m Refusal				
						9.2	0.8							
						9.0	1.0							
						8.8	1.2							
						8.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH11
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274519.0 m E 6096257.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	10.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		9.8	0.2		CI	Sandy CLAY: medium plasticity, brown, fine to coarse sand, with fine gravel	D			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, with fine to medium sub-angular gravel	D - M			FILL or ALLUVIAL SOIL
				S1 D 0.45-0.50 m		9.6	0.4							
						9.4	0.6							
									GP	GRAVEL: fine to coarse sub-angular gravel, grey and brown	D			FILL or RESIDUAL SOIL
						9.2	0.8		SC	Sandy CLAY / Clayey SAND: fine to medium sand, yellow brown, medium plasticity clay fines	D			EXTREMELY WEATHERED MATERIAL
				S2 D 0.95-1.00 m		9.0	1.0			Hole Terminated at 1.00 m Refusal				
						8.8	1.2							
						8.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH12
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274518.0 m E 6096237.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	12.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		11.8	0.2		CI	Sandy CLAY: medium plasticity, brown, fine to medium sand, with fine gravel	D			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, with fine to medium semi-rounded gravel				FILL or ALLUVIAL SOIL
				S1 D 0.45-0.50 m		11.6	0.4				D - M			
						11.4	0.6							
						11.2	0.8		CL-CL	Sandy CLAY: low to medium plasticity, light yellow brown, fine to medium sand, trace sub-angular coarse gravel				RESIDUAL SOIL
				S2 D 0.95-1.00 m		11.0	1.0				D - M			
						10.8	1.2			Hole Terminated at 1.10 m Refusal				
						10.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH13
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274313.0 m E 6096380.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	19.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.30 m		18.8	0.2		CL-CI	Silty Sandy CLAY: low to medium plasticity, brown, fine sand, with fine to medium rounded gravel, with rootlets	D			TOPSOIL
				S1 D 0.45-0.50 m		18.6	0.4		CI-CH	Sandy CLAY: medium to high plasticity, brown, fine to medium sand, with fine sub-angular gravel, with rootlets	D			ALLUVIAL SOIL
				S2 D 0.75-0.80 m		18.4	0.6							
						18.2	0.8			Hole Terminated at 0.80 m Refusal				
						18.0	1.0							
						17.8	1.2							
						17.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH14
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274316.0 m E 6096337.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	18.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		17.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, fine to medium sand, with fine to coarse rounded and sub-angular gravel	D			ALLUVIAL SOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, with rootlets	D - M			
				S1 D 0.45-0.50 m		17.6	0.4							
						17.4	0.6							
									CL	Sandy CLAY: low plasticity, yellow brown, fine sand	D			RESIDUAL SOIL
				S2 D 0.95-1.00 m		17.2	0.8							
						17.0	1.0			Hole Terminated at 1.00 m Refusal				
						16.8	1.2							
						16.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH15
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274280.0 m E 6096323.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	19.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	**DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		18.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, fine to medium sand, with tree litter (leaves and twigs)	D			TOPSOIL
				S1 D 0.45-0.50 m		18.6	0.4		CI	Sandy CLAY: medium plasticity, brown, with fone to medium sub-angular gravels	D			RESIDUAL SOIL
						18.4	0.6			Hole Terminated at 0.60 m Refusal				
						18.2	0.8							
						18.0	1.0							
						17.8	1.2							
						17.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH16
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274266.0 m E 6096274.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	20.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		19.8	0.2		CL	Sandy CLAY: low plasticity, brown, with tree litter (leaves and twigs)	D			TOPSOIL
									CL-CI	Sandy CLAY: low to medium plasticity, reddish brown, trace rootlets, trace of fine to medium sub-angular gravel				ALLUVIAL SOIL / RESIDUAL SOIL
				S1 D 0.45-0.50 m		19.6	0.4				D			
						19.4	0.6							
						19.2	0.8		SC	Clayey SAND: yellow, with medium to coarse gravel	D			EXTREMELY WEATHERED MATERIAL
				S2 D 0.85-0.90 m										
						19.0	1.0			Hole Terminated at 0.90 m Refusal				
						18.8	1.2							
						18.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH17
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274224.0 m E 6096403.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	19.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	**Material Description** Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density / **DCP** NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		18.8	0.2		CI	Sandy CLAY: medium plasticity, brown, fine to coarse sand, with fine to medium angular and sub-angular gravel	D - M		TOPSOIL / ALLUVIAL SOIL
				S1 D 0.45-0.50 m		18.6	0.4		SC	Extremely Weathered Sandstone: recovered as SAND with clay, yellow brown	D		EXTREMELY WEATHERED MATERIAL
						18.4	0.6			Hole Terminated at 0.50 m Refusal			
						18.2	0.8						
						18.0	1.0						
						17.8	1.2						
						17.6	1.4						

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH18
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274191.0 m E 6096333.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	20.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m G2 D 0.00-0.20 m		19.8	0.2		CL	Sandy CLAY: low plasticity, red brown, with ash and rubbish (metal, bottles, cannisters, plastic, glass)	D			TOPSOIL
									CL-CI	Sandy CLAY: low to medium plasticity, red brown, fine sand	D - M			COLLUVIAL SOIL / RESIDUAL SOIL
				S1 D 0.45-0.50 m		19.6	0.4							
						19.4	0.6		CI-CH	Sandy CLAY: medium to high plasticity, brown, medium to coarse sand, with rootlets				RESIDUAL SOIL
				S2 D 0.95-1.00 m		19.2	0.8				D - M			
						19.0	1.0			Hole Terminated at 1.00 m Target				
						18.8	1.2							
						18.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH19
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274216.0 m E 6096305.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	21.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		20.8	0.2		CL-CI	Sandy CLAY: low to medium plasticity, brown, trace rubbish on the surface	D			TOPSOIL
									CI	Sandy CLAY: medium plasticity, brown, with rootlets	D - M			RESIDUAL SOIL
				S1 D 0.45-0.50 m		20.6	0.4			Extremely Weathered Sandstone: recovered as SAND with clay, low plasticity fines, light brown	D			EXTREMELY WEATHERED MATERIAL
						20.4	0.6			Hole Terminated at 0.50 m Refusal				
						20.2	0.8							
						20.0	1.0							
						19.8	1.2							
						19.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH20
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274213.0 m E 6096272.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	22.00 m
Hole Diameter:		Bearing:		Datum: AHD	Operator: GF

Drilling Information									Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m						Building rubble (bricks, concrete, glass and wood) on surface				
									CL-CI	Sandy CLAY: low to medium plasticity, brown, fine to medium sand, with gravel	D			TOPSOIL
						21.8	0.2		CI-CH	Sandy CLAY: medium to high plasticity, reddidh brown, with medium to coarse sand, with fine to medium gravel				RESIDUAL SOIL
				S1 D 0.45-0.50 m		21.6	0.4				D - M			
						21.4	0.6							
									CL	Sandy CLAY: low plasticity, yellow brown, fine to medium sand				EXTREMELY WEATHERED MATERIAL
				S2 D 0.85-0.90 m		21.2	0.8				D - M			
										Hole Terminated at 0.90 m Refusal				
						21.0	1.0							
						20.8	1.2							
						20.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH21
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274143.0 m E 6096396.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	24.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		23.8	0.2		CI	Sandy CLAY: medium plasticity, dark brown, with tree litter (leaves and twigs)	D - M			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, with fine to coarse sand, with fine to medium sub-angular gravel	D - M			RESIDUAL SOIL
				S1 D 0.35-0.40 m		23.6	0.4			Hole Terminated at 0.40 m Refusal				
						23.4	0.6							
						23.2	0.8							
						23.0	1.0							
						22.8	1.2							
						22.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH22
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274116.0 m E 6096349.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	25.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		24.8	0.2		CL-Cl	Sandy CLAY: low to medium plasticity, red brown, fine to coarse sand, with fine to coarse angular gravel	D			TOPSOIL
				S1 D 0.45-0.50 m		24.6	0.4		CL-Cl	Sandy CLAY: low to medium plasticity, dark brown, with fine to medium gravel	D - M			ALLUVIAL SOIL / RESIDUAL SOIL
				S2 D 0.85-0.90 m		24.4	0.6		Cl	Sandy CLAY: medium plasticity, dark brown, fine to coarse sand, with fine to medium angular gravel	D - M			RESIDUAL SOIL
						24.2	0.8							
						24.0	1.0			Hole Terminated at 0.90 m Refusal				
						23.8	1.2							
						23.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH23
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274130.0 m E 6096304.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	24.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		23.8	0.2		CL-CI	Sandy CLAY: ow to medium plasticity, dark brown, trace coarse gravel	D - M			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, brown, medium to coarse sand, trace gravels	D - M			RESIDUAL SOIL
				S1 D 0.45-0.50 m		23.6	0.4		CL-CI	Sandy CLAY: low to medium plasticity, yellow brown, fine to coarse sand, with fine to medium sub-angular gravel	D - M			EXTREMELY WEATHERED MATERIAL
						23.4	0.6			Hole Terminated at 0.50 m Refusal				
						23.2	0.8							
						23.0	1.0							
						22.8	1.2							
						22.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

TERRA INSIGHT

Borehole No.
BH24
Page 1 of 1

Engineering Log - Borehole

Project No.: TERRA19271

Client:	HEIR ASQUITH	Commenced:	05/08/2019
Project Name:	Geotechinal Investigation	Completed:	05/08/2019
Hole Location:	Lot 106 DP 755923, Inyadda Dr Manyana NSW	Logged By:	HP
Hole Position:	274166.0 m E 6096267.0 m N MGA94 Zone 56	Checked By:	KG

Drill Model and Mounting:	1.8t excavator	Inclination:	-90°	RL Surface:	23.00 m		
Hole Diameter:		Bearing:		Datum:	AHD	Operator:	GF

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Group Symbol	Material Description Soil name, plasticity/grainsize characteristics, colour, description of secondary component. Minor components, i.e., some/trace . . . other soil substance observations	Moisture Condition	Consistency Relative Density	DCP NO OF BLOWS PER 100 mm	Structure and Additional Observations
				G1 D 0.00-0.20 m		22.8	0.2		CI	Sandy CLAY: medium plasticity, dark brown, fine to medium sand	D - M			TOPSOIL
									CI-CH	Sandy CLAY: medium to high plasticity, grey brown and brown, with fine to medium gravel	M			RESIDUAL SOIL
				S1 D 0.45-0.50 m		22.6	0.4		SC	Sandy CLAY / Clayey SAND: yellow brown	D - M			EXTREMELY WEATHERED MATERIAL
						22.4	0.6			Hole Terminated at 0.50 m Refusal				
						22.2	0.8							
						22.0	1.0							
						21.8	1.2							
						21.6	1.4							

Method
AS - Auger Screwing
RR - Rock Roller
WB - Washbore

Penetration
No resistance ranging to refusal

Water
Level (Date)
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very Soft
S - Soft
F - Firm
VSt - Very Stiff
H - Hard
Fr - Friable
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Support
C - Casing

Graphic Log/Core Loss
Core recovered (hatching indicates material)
Core loss

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Plastic Limit
< PL
= PL
< PL

Appendix E: ASS Laboratory Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922089**	Page	: 1 of 3
Client	: **TERRA INSIGHT**	Laboratory	: Environmental Division Brisbane
Contact	: MS KAREN GATES	Contact	: Aneta Prosaroski
Address	: PO BOX 414 UNANDERRA NSW 2526	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: TERRA 19271	Date Samples Received	: 19-Aug-2019 13:42
Order number	:	Date Analysis Commenced	: 26-Aug-2019
C-O-C number	: ----	Issue Date	: 26-Aug-2019 13:26
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0-0.5	----	----	----	----
			Client sampling date / time	05-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922089-001	--------	--------	--------	--------
				Result	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.1**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**125**	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.20**	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.02**	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.04**	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	**0.21**	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	**132**	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	**10**	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.21**	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**132**	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	**10**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1903386**	Page	: 1 of 21
Client	: **TERRA INSIGHT**	Laboratory	: Environmental Division NSW South Coast
Contact	: MS KAREN GATES	Contact	: Aneta Prosaroski
Address	: PO BOX 414 UNANDERRA NSW 2526	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: TERRA 19271	Date Samples Received	: 06-Aug-2019 11:31
Order number	: ----	Date Analysis Commenced	: 07-Aug-2019
C-O-C number	: ----	Issue Date	: 16-Aug-2019 16:47
Sampler	: ----		
Site	: MANAYANA LOT 106		
Quote number	: EN/222		
No. of samples received	: 69		
No. of samples analysed	: 69		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Evie Sidarta	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- **EA200 Legend**
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.
- EA200: N/A - Not Applicable

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01 0-0.5	BH01 0.5-1.0	BH02 0-0.5	BH02 0.5-1.0	BH02 1.0-1.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-001	EW1903386-002	EW1903386-003	EW1903386-004	EW1903386-005
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**6.9**	**7.6**	**6.8**	**7.6**	**6.4**
ø **pH (Fox)**	----	0.1	pH Unit	**5.1**	**5.7**	**4.9**	**5.7**	**4.9**
ø **Reaction Rate**	----	1	-	**3**	**2**	**3**	**2**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH03 0-0.5	BH03 0.5-1.0	BH04 0-0.5	BH04 0.5-1.0	BH1
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-006	EW1903386-007	EW1903386-008	EW1903386-009	EW1903386-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	6.2	6.7	7.3	8.2	----
ø pH (Fox)	----	0.1	pH Unit	5.1	5.4	6.0	6.3	----
ø Reaction Rate	----	1	-	3	3	2	4	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	----	28.7
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	----	<5
Cadmium	7440-43-9	1	mg/kg	----	----	----	----	<1
Chromium	7440-47-3	2	mg/kg	----	----	----	----	83
Copper	7440-50-8	5	mg/kg	----	----	----	----	10
Lead	7439-92-1	5	mg/kg	----	----	----	----	7
Nickel	7440-02-0	2	mg/kg	----	----	----	----	53
Zinc	7440-66-6	5	mg/kg	----	----	----	----	17
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	----	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH2	BH3	BH4	BH9	BH10
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-011	EW1903386-012	EW1903386-013	EW1903386-014	EW1903386-015
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		22.3	36.8	24.5	8.2	14.7
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		95	97	211	89	92
Copper	7440-50-8	5	mg/kg		10	16	30	6	15
Lead	7439-92-1	5	mg/kg		6	<5	<5	10	9
Nickel	7440-02-0	2	mg/kg		47	90	141	18	33
Zinc	7440-66-6	5	mg/kg		15	20	32	9	21
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH11	BH12	BH13	BH14	BH15
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-016	EW1903386-017	EW1903386-018	EW1903386-019	EW1903386-020
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**20.2**	**14.1**	**13.2**	**11.3**	**14.1**
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**152**	**134**	**129**	**154**	**138**
Copper	7440-50-8	5	mg/kg		**18**	**13**	**10**	**14**	**22**
Lead	7439-92-1	5	mg/kg		**8**	**8**	**8**	**8**	**5**
Nickel	7440-02-0	2	mg/kg		**48**	**44**	**16**	**26**	**26**
Zinc	7440-66-6	5	mg/kg		**18**	**15**	**23**	**31**	**36**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH16	BH21	BH22	BH23	BH24
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-021	EW1903386-022	EW1903386-023	EW1903386-024	EW1903386-025
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		12.2	23.2	7.4	19.0	17.3
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		135	184	97	156	134
Copper	7440-50-8	5	mg/kg		18	12	22	14	16
Lead	7439-92-1	5	mg/kg		10	11	20	6	6
Nickel	7440-02-0	2	mg/kg		28	17	17	22	26
Zinc	7440-66-6	5	mg/kg		44	29	34	19	28
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	25.3	13.8	16.5	20.9	15.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	6	5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	135	105	74	165	186
Copper	7440-50-8	5	mg/kg	14	38	49	30	18
Lead	7439-92-1	5	mg/kg	6	23	<5	6	8
Nickel	7440-02-0	2	mg/kg	36	41	194	146	36
Zinc	7440-66-6	5	mg/kg	14	165	76	49	39
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**90.7**	**85.3**	**89.2**	**86.6**	**87.7**
2-Chlorophenol-D4	93951-73-6	0.5	%		**98.0**	**90.4**	**94.5**	**90.6**	**91.5**
2.4.6-Tribromophenol	118-79-6	0.5	%		**65.4**	**68.3**	**64.2**	**61.3**	**63.8**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**101**	**93.9**	**95.9**	**94.3**	**92.3**
Anthracene-d10	1719-06-8	0.5	%		**105**	**97.4**	**102**	**102**	**101**
4-Terphenyl-d14	1718-51-0	0.5	%		**114**	**104**	**107**	**105**	**108**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**95.8**	**88.6**	**94.7**	**86.1**	**94.6**
Toluene-D8	2037-26-5	0.2	%		**89.0**	**77.1**	**86.9**	**76.3**	**87.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH03 0-0.5	BH03 0.5-1.0	BH04 0-0.5	BH04 0.5-1.0	BH1
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-006	EW1903386-007	EW1903386-008	EW1903386-009	EW1903386-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	6.2	6.7	7.3	8.2	----
ø pH (Fox)	----	0.1	pH Unit	5.1	5.4	6.0	6.3	----
ø Reaction Rate	----	1	-	3	3	2	4	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	----	28.7
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	----	<5
Cadmium	7440-43-9	1	mg/kg	----	----	----	----	<1
Chromium	7440-47-3	2	mg/kg	----	----	----	----	83
Copper	7440-50-8	5	mg/kg	----	----	----	----	10
Lead	7439-92-1	5	mg/kg	----	----	----	----	7
Nickel	7440-02-0	2	mg/kg	----	----	----	----	53
Zinc	7440-66-6	5	mg/kg	----	----	----	----	17
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	----	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH2	BH3	BH4	BH9	BH10
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-011	EW1903386-012	EW1903386-013	EW1903386-014	EW1903386-015
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		22.3	36.8	24.5	8.2	14.7
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		95	97	211	89	92
Copper	7440-50-8	5	mg/kg		10	16	30	6	15
Lead	7439-92-1	5	mg/kg		6	<5	<5	10	9
Nickel	7440-02-0	2	mg/kg		47	90	141	18	33
Zinc	7440-66-6	5	mg/kg		15	20	32	9	21
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH11	BH12	BH13	BH14	BH15
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-016	EW1903386-017	EW1903386-018	EW1903386-019	EW1903386-020
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**20.2**	**14.1**	**13.2**	**11.3**	**14.1**
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**152**	**134**	**129**	**154**	**138**
Copper	7440-50-8	5	mg/kg		**18**	**13**	**10**	**14**	**22**
Lead	7439-92-1	5	mg/kg		**8**	**8**	**8**	**8**	**5**
Nickel	7440-02-0	2	mg/kg		**48**	**44**	**16**	**26**	**26**
Zinc	7440-66-6	5	mg/kg		**18**	**15**	**23**	**31**	**36**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH16	BH21	BH22	BH23	BH24
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-021	EW1903386-022	EW1903386-023	EW1903386-024	EW1903386-025
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**12.2**	**23.2**	**7.4**	**19.0**	**17.3**
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**135**	**184**	**97**	**156**	**134**
Copper	7440-50-8	5	mg/kg		**18**	**12**	**22**	**14**	**16**
Lead	7439-92-1	5	mg/kg		**10**	**11**	**20**	**6**	**6**
Nickel	7440-02-0	2	mg/kg		**28**	**17**	**17**	**22**	**26**
Zinc	7440-66-6	5	mg/kg		**44**	**29**	**34**	**19**	**28**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	25.3	13.8	16.5	20.9	15.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	6	5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	135	105	74	165	186
Copper	7440-50-8	5	mg/kg	14	38	49	30	18
Lead	7439-92-1	5	mg/kg	6	23	<5	6	8
Nickel	7440-02-0	2	mg/kg	36	41	194	146	36
Zinc	7440-66-6	5	mg/kg	14	165	76	49	39
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**90.7**	**85.3**	**89.2**	**86.6**	**87.7**
2-Chlorophenol-D4	93951-73-6	0.5	%		**98.0**	**90.4**	**94.5**	**90.6**	**91.5**
2.4.6-Tribromophenol	118-79-6	0.5	%		**65.4**	**68.3**	**64.2**	**61.3**	**63.8**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**101**	**93.9**	**95.9**	**94.3**	**92.3**
Anthracene-d10	1719-06-8	0.5	%		**105**	**97.4**	**102**	**102**	**101**
4-Terphenyl-d14	1718-51-0	0.5	%		**114**	**104**	**107**	**105**	**108**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**95.8**	**88.6**	**94.7**	**86.1**	**94.6**
Toluene-D8	2037-26-5	0.2	%		**89.0**	**77.1**	**86.9**	**76.3**	**87.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		**88.6**	**85.7**	**85.4**	**79.7**	**89.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH5 0-0.5	BH6 0-0.5	BH7 0-0.5	BH8 0-0.5	BH17 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-030	EW1903386-031	EW1903386-032	EW1903386-033	EW1903386-034
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		**88.6**	**85.7**	**85.4**	**79.7**	**89.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH18 0-0.5	BH19 0-0.5	BH20 0-0.5	BH18D 0.0-0.5	BH5 0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-035	EW1903386-036	EW1903386-037	EW1903386-038	EW1903386-039
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	----	----	----	----	6.1
ø pH (Fox)	----	0.1	pH Unit	----	----	----	----	5.1
ø Reaction Rate	----	1	-	----	----	----	----	2
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	7.9	15.3	8.7	10.6	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	----
Cadmium	7440-43-9	1	mg/kg	3	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	103	152	68	145	----
Copper	7440-50-8	5	mg/kg	617	23	18	268	----
Lead	7439-92-1	5	mg/kg	506	<5	9	103	----
Nickel	7440-02-0	2	mg/kg	82	34	15	39	----
Zinc	7440-66-6	5	mg/kg	2030	64	61	558	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH18 0-0.5	BH19 0-0.5	BH20 0-0.5	BH18D 0.0-0.5	BH5 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-035	EW1903386-036	EW1903386-037	EW1903386-038	EW1903386-039
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	**80**	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	**100**	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	**100**	**80**	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	**60**	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	**140**	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	**140**	**60**	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	**60**	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**86.6**	**90.3**	**88.7**	**83.6**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**90.2**	**95.5**	**92.0**	**88.4**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**88.9**	**79.2**	**79.8**	**66.2**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**92.1**	**96.5**	**93.6**	**95.0**	----
Anthracene-d10	1719-06-8	0.5	%		**94.2**	**103**	**102**	**98.4**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH18 0-0.5	BH19 0-0.5	BH20 0-0.5	BH18D 0.0-0.5	BH5 0-0.5
				Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EW1903386-035	EW1903386-036	EW1903386-037	EW1903386-038	EW1903386-039
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		**102**	**111**	**105**	**112**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**95.3**	**87.0**	**88.1**	**90.3**	**----**
Toluene-D8	2037-26-5	0.2	%		**85.4**	**76.2**	**80.3**	**78.9**	**----**
4-Bromofluorobenzene	460-00-4	0.2	%		**83.9**	**77.6**	**80.1**	**80.2**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH6 0.0-0.5	BH6 0.5-1.0	BH7 0.0-0.5	BH7 0.5-1	BH8 0.-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-040	EW1903386-041	EW1903386-042	EW1903386-043	EW1903386-044
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	6.9	8.8	7.0	8.8	7.7
ø pH (Fox)	----	0.1	pH Unit	5.8	6.3	5.2	6.3	6.0
ø Reaction Rate	----	1	-	3	4	3	4	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH8 0.5-1.0	BH9 0.0-0.5	BH9 0.5-1.0	BH10 0.0-0.5	BH11 0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-045	EW1903386-046	EW1903386-047	EW1903386-048	EW1903386-049
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	**8.0**	**7.3**	**8.6**	**6.0**	**7.6**
ø pH (Fox)	----	0.1	pH Unit	**7.2**	**5.6**	**6.5**	**4.2**	**6.1**
ø Reaction Rate	----	1	-	**4**	**3**	**4**	**2**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH11 0.5-1.0	BH12 0.0-0.5	BH12 0.5-1.0	BH13 0.0-0.5	BH13 0.5-1.0
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-050	EW1903386-051	EW1903386-052	EW1903386-053	EW1903386-054
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	**8.6**	**7.6**	**7.9**	**5.2**	**4.7**
ø pH (Fox)	----	0.1	pH Unit	**7.6**	**7.1**	**7.7**	**4.0**	**3.6**
ø Reaction Rate	----	1	-	**4**	**4**	**4**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH14 0-0.5	BH14 0.5-1.0	BH15 0-0.5	BH16 0-0.5	BH16 0.5-1.0
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-055	EW1903386-056	EW1903386-057	EW1903386-058	EW1903386-059
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	**7.4**	**8.5**	**5.4**	**6.1**	**5.6**
ø pH (Fox)	----	0.1	pH Unit	**6.0**	**5.8**	**4.2**	**4.0**	**3.9**
ø Reaction Rate	----	1	-	**3**	**2**	**3**	**3**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 0-0.5	BH18 0-0.5	BH18 0.5-1.0	BH19 0-0.5	BH20 0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-060	EW1903386-061	EW1903386-062	EW1903386-063	EW1903386-064
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	7.4	6.4	5.6	5.7	5.1
ø pH (Fox)	----	0.1	pH Unit	5.4	4.4	4.1	4.1	3.7
ø Reaction Rate	----	1	-	3	3	3	3	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH21 0-0.5	BH22 0-0.5	BH22 0.5-1.0	BH23 0-0.5	BH24 0.0-0.5
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EW1903386-065	EW1903386-066	EW1903386-067	EW1903386-068	EW1903386-069
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	**5.1**	**5.2**	**5.0**	**5.4**	**5.3**
ø pH (Fox)	----	0.1	pH Unit	**3.6**	**3.7**	**4.0**	**4.2**	**3.9**
ø Reaction Rate	----	1	-	**2**	**2**	**3**	**2**	**2**

Analytical Results

Sub-Matrix: SOLID (Matrix: SOLID)			Client sample ID	X001	X002	X003	X004	----
			Client sampling date / time	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	05-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit	EW1903386-026	EW1903386-027	EW1903386-028	EW1903386-029	--------
				Result	Result	Result	Result	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**Yes**	**No**	**Yes**	**----**
Asbestos Type	1332-21-4	-	--	**-**	**Ch + Am**	**-**	**Ch**	**----**
Asbestos (Trace)	1332-21-4	5	Fibres	**N/A**	**N/A**	**N/A**	**N/A**	**----**
Sample weight (dry)	----	0.01	g	**75.6**	**52.3**	**106**	**54.2**	**----**
APPROVED IDENTIFIER:	----	-	--	**A. RISTOSKI**	**A. RISTOSKI**	**A. RISTOSKI**	**A. RISTOSKI**	**----**
Synthetic Mineral Fibre	----	0.1	g/kg	**No**	**No**	**No**	**No**	**----**
Organic Fibre	----	0.1	g/kg	**Yes**	**No**	**Yes**	**No**	**----**

Analytical Results

Descriptive Results

Sub-Matrix: **SOLID**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	X001 - 05-Aug-2019 00:00	Several pieces of cement sheeting.
EA200: Description	X002 - 05-Aug-2019 00:00	One piece of asbestos cement sheeting approximately 120x100x5mm.
EA200: Description	X003 - 05-Aug-2019 00:00	Two pieces of cement sheeting.
EA200: Description	X004 - 05-Aug-2019 00:00	Two pieces of asbestos cement sheeting approximately 70x65x5mm.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130