Tallawarra Lands Concept Plan
Approval Modification

APPENDIX

I

GEOTECHNICAL REPORT

Cardno
Shaping the Future

Geotechnical Considerations

Tallawarra Concept Approval Modification

8201714202

Prepared for
Bridgehill (Tallawarra) Pty Ltd

7 August 2017

Cardno
Shaping the Future

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Table of Contents

Appendices

Tables

Figures

1 Introduction

A review of the geotechnical constraints associated with the Tallawarra Lands 75W modification has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposed modification to the Tallawarra Concept Plan (MP 09_0131 MOD 1).

A Geotechnical, Contamination and Ground Water Investigation Report for the Tallawarra Lands, Yallah, NSW was prepared by Coffey Environments and Coffey Geotechnics dated 22 December 2010. This report addressed the Northern, Central and Lakeside (Southern) precincts.

Previous studies were summarised in the Coffey reports; however, these reports were not available. A geotechnical investigation report was prepared by Douglas Partners in 2006-2007 and a number of environmental investigations were conducted by different parties. The investigations undertaken in this current study consisted of a review of the Coffey investigations and subsequent intrusive investigations.

This assessment concerns the modification areas and land surrounding the modification area where deemed necessary.

2 Agency Environmental Assessment Requirements Review

A review of the SEARs and the associated response is provided in the Table below.

Table 2-1 Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements	Precinct	Comments
Impacts of potential earthworks however detailed assessment would be undertaken as part of future detailed DA	Central	There is a risk of erosion and disturbance of the soils during earthworks. Additional investigation / laboratory tests of erodibility of the soils is required for further stages of development. This area poses moderate risks, however, these can be managed by appropriate engineering design, to be determined by further intrusive investigation and assessment. It is anticipated that expanding area poses limited slope instability risk for residential development following appropriate engineering design
	Northern	There is a risk of erosion and disturbance of the soils during earthworks. Additional investigation / laboratory tests of erodibility of the soils is required for further stages of development. The expanded areas of the Northern Precinct are not expected to have major constraints.

3 Previous Studies

The previous studies are briefly summarised below:

3.1 Douglas Partners (2006-2007)

A copy of the geotechnical investigation Report of Douglas Partners was not provided. A summary of the report was available and it is understood that the Douglas Partners Report consisted of Ash Pond Areas 1 to 3 which are outside of the modification areas.

3.2 Coffey (2010)

The objective of this report was to collect and collocate information on contamination. Geotechnical, groundwater and acid sulfate soil (ASS) concerns. With this purpose, a site walk over to identify areas of environmental and chemical concern and geotechnical constraints were undertaken. The following site investigations were conducted:

> Geotechnical investigation consisted of 86 test pits, 7 boreholes, 9 groundwater monitoring wells and 24 piezocones. Depth of investigation changed between 0.5m to 24m.

> 24 Cone penetration tests and pore pressure dissipation tests were carried out.

> Shrink swell test, particle size distribution including hydrometer and Atterberg Limits test with linear shrinkage test were conducted on selected samples.

The Central Precinct was divided into two parts, the site adjacent to the proposed expansion was Zone 2(D). The proposed modification site was located in Zone 4(B) (D).

The Northern Precinct was located in Zone 1(B) and was adjacent to Zone 4 (B) (D).

Where B denoted undulating slopes and D steep slopes.

Summaries of the zones in question are presented below.

3.3 Central Precinct:

3.3.1 Acid Sulfate Soils

According to ASS Mapping presented in the report, this zone was in No Known occurrence zone.

3.3.2 Site Observations

Zone 2(D)

> Sandstone outcrops were identified at several locations.

> Disturbed and eroded soils were noted on the western and eastern sides of the zone.

> Steep slopes were detected on the eastern side of the zone.

> Unauthorised placement was observed at the central part of the site.

> A pond of water was observed at the centre of the site.

Zone 4(B)(D)

> Several dams were located.

> Two water tanks were located in the central region, cuts and fills were observed associated with the tanks.

> In the eastern portion an area of excavation/erosion was noted.

> Overhead power lines extended through the zone.

3.3.3 Laboratory Test Results

Test results concerning the modification area are presented below:

Test Pit No:	Sample Depth	Geological unit	Moisture Content (%)	Shrink Swell Index (Iss, %)
CTP 36	0.00-010	Sandy Clay	32.9	5.9
CTP 33	0.8-1.0	Clay	30.4	6.6

3.3.4 Groundwater

It was noted that no groundwater level was observed within the depth of investigation in Zone 1 (B).

3.3.5 Conclusion

In conclusion, rock depths were determined to be at 1.0m – 3.0m depth. An area of fill was identified in the north western portion of the site with an inferred depth of 1.0m - 2.0m. The site was identified as:

Zone 2 (D) and Zone 4 (B) (D):

> *"Upper steep slopes of hillside areas generally with slopes greater than about 10°, either colluvial and/or residual soils present in the areas. Soil cover generally less than 2m in most areas with some deeper areas near gullies overlying Budgong Sandstone."*

> "*Moderate Risk (with some high risk) of landslide in these areas. Further detailed geotechnical assessment works would be necessary to further refine areas suitable for development. Some of this land may be excluded from future development."*

3.4 Northern Precinct:

3.4.1 Acid Sulfate Soils

According to ASS Mapping presented in the report, this zone was in a No Known Occurrence zone.

3.4.2 Site Observations

Zone 1(B)

> Undulating slopes with 3 to 15º degrees of slope angles were observed.

> Sandstone outcrops were observed at several locations.

> Base of the valley was boggy with minor ponding.

> Several dams were located on the site.

> Areas of fill were noted.

Zone 4(B)(D)

> Several dams were located.

> Two water tanks were located at the central region, cuts and fills were observed associated with the tanks.

> In the eastern portion an area of excavation/erosion was noted.

> Overhead power lines extended through the zone.

3.4.3 Laboratory Test Results

Test results concerning the modification area are presented below:

Test Pit No:	Sample Depth	Geological unit	Passing 2.36mm Sieve %	Passing 75mm Sieve %	Plasticity Index	Liquid Limit	Llinear Shrinkage (%)
CTP 70	0.00-010	Sandy Clay	100	45	18	42	12
CTP 69	0.8-1.0	Sandy Clay	97	50	20	43	11

3.4.4 Groundwater

It was noted that no groundwater level was observed within the depth of investigation in Zone 2(D).

3.4.5 Conclusion

In conclusion, rock depths were determined to be at 1.0m – 2.0m depth. An area of fill was identified in the north eastern portion of the site with an inferred depth of 1.0m - 2.0m. The site was identified as:

Zone 1 (B):

> *"Lower undulating footslopes of hillside areas, generally with slopes less than or equal to about 10°, either colluvial and/or residual soils present in the areas. Soil cover generally less than 2m in most areas with some deeper areas near gullies overlying Budgong Sandstone."*

> *"Generally no significant geotechnical constraints to urban development within these areas. Further geotechnical assessment works required during planning and detailed design stages for future development"*

Zone 4 (B) (D):

> *"Upper steep slopes of hillside areas generally with slopes greater than about 10°, either colluvial and/or residual soils present in the areas. Soil cover generally less than 2m in most areas with some deeper areas near gullies overlying Budgong Sandstone."*

> "*Moderate Risk (with some high risk) of landslide in these areas. Further detailed geotechnical assessment works would be necessary to further refine areas suitable for development. Some of this land may be excluded from future development."*

4 Existing Environment: Geology & Soils

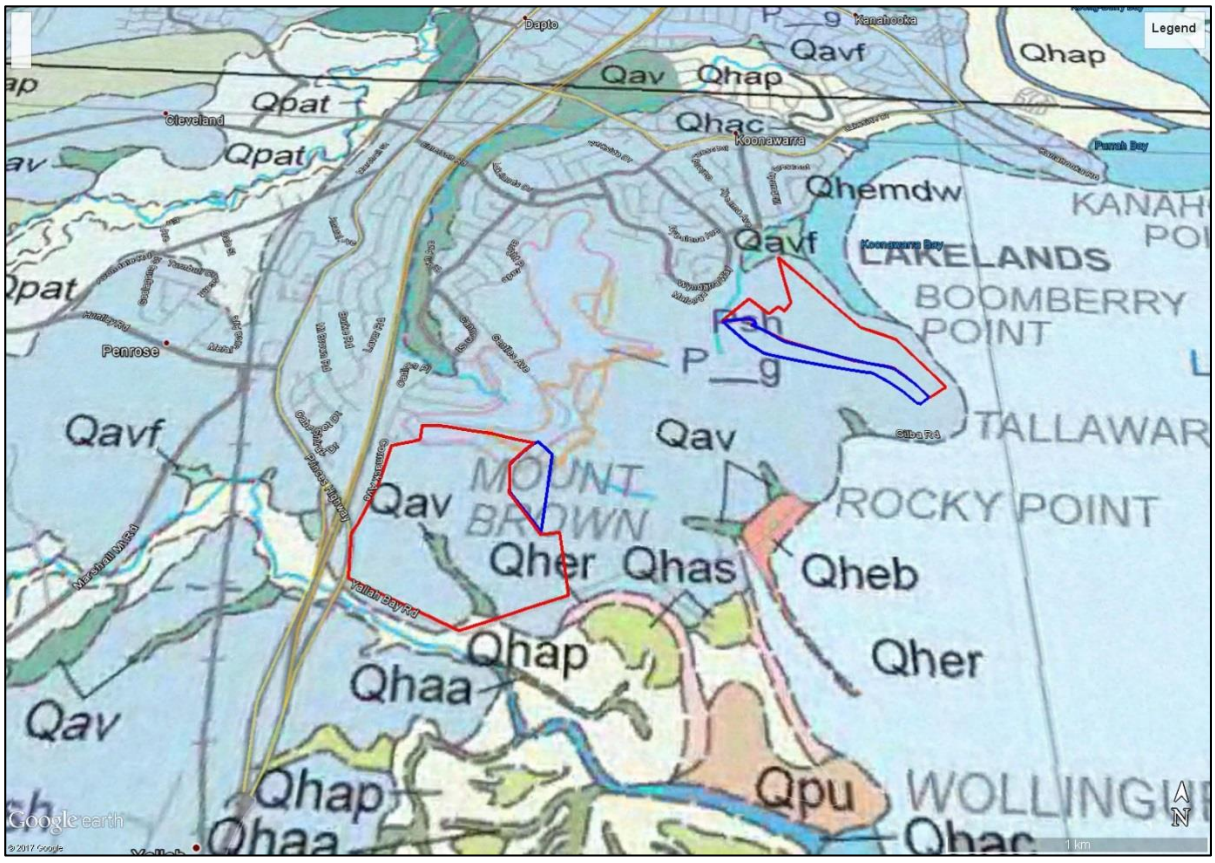
Reference to the Wollongong Area Coastal Quaternary Geology Map 2016 (1:100,000) indicates the site is located within Shoalhaven group (Psh) with minor localised areas of Gerringong Volcanics.

Shoalhaven Group consists of, polymictic pebble paraconglomerate, fine-grained muddy lithic sandstone. Sandy micaceous siltstone, minor shale, sporadic minor carbonate and evaporite,: Sandstone sporadically bioturbated, abundant fossil shell fragments, dropstones.

Gerringong Volcanics consist of; Latite, trachytic tuff with pebbly bands, sandstone, minor siltstone and conglomerate.

In the figure below, the approximate locations of the sites and underlying geology is presented.

Figure 4-1 Geological Map – Approximate site locations



5 Modification Area:

A site walkover and site investigation was conducted for the modification areas. Site observations and a site investigation summary are provided in the sections below.

5.1 Central Precinct

During site walkover, steep slopes were observed on site. Although no dams were located within the expanded areas, several dams were located on site suggesting high ground water levels. It was observed that the site was adjacent to existing structures (i.e. Telecommunication towers).

Site investigation consisted of six (6) hand augured test pits. Test pits CHA 101. CHA 102, CHA 103, CHA 104, CHA 105 and CHA 106 were excavated using hand excavation tools – shovel. Encountered subsurface stratum and rock levels are presented in the table below.

Table 5-1 Site Investigations for the Central Precinct

Test Pit No:	Soil Type	Soil Layer thickness (m)	Rock Type	Rock Depth (mbg)
CHA101	Sandy Silt Clayey Sandy Silt	0.4m 0.5m	Sandstone	0.9m
CHA102	Sandy Silt Silty Clay	0.4m 0.6m	Sandstone	1.0m
CHA103	Sandy Silt Silty Sand	0.6m 0.2m	Sandstone	0.8m
CHA104	Sandy Silt EW Sandstone	0.2m 0.2m	Sandstone	0.4m
CHA105	Sandy Silt EW Sandstone	0.3m 0.2m	Sandstone	0.5m
CHA106	Sandy Silt EW Sandstone	0.4m 0.4m	Sandstone	0.8m

The depth of sandstone levels are consistent with the subsoil investigation Coffey has conducted. The geology is consistent with Wollongong Area Coastal Quaternary Geology Map.

5.2 Northern Precinct

During site walkover, undulating slopes were observed on site. Several dams were located in northern precinct. Additional site investigation consisted ten (10) hand augured or excavated test pits. Test pits CTP 100, CTP101, CTP102, CTP103, CTP 104 and CTP 106 are excavated with a 5 tonne excavator and the remaining of the test pits, CHA100, CHA105, CHA107 and CHA108 were excavated using hand augers. DCP test was undertaken on following test pits: CHA100, CTP100, CTP101, CTP102, CTP103 and CTP104. Test pit logs are attached. Encountered subsurface stratum and rock levels are presented in the table below.

Table 5-2 Site Investigations for Northern Precinct

Test Pit No:	Soil Type	Soil Layer thickness (m)	Rock Type	Rock Depth (mbg)
CHA100	Topsoil – Silty Clay Silty Sand	0.3m 0.6m	Sandstone	0.9m
CHA107	Sandy Silt Silty Clay	0.4m 0.4m	-	-
CHA108	Sandy Silt Silty Clay	0.4m 0.3m	-	-
CTP100	Topsoil – Silty Clay Sandy Silty Clay Gravelly Clay (EW Sandstone)	0.4m 0.4m 0.2m	Sandstone	1.0m
CTP101	Topsoil – Silty Clay Sandy Silty Clay Gravelly Clay (EW Sandstone)	0.2m 0.6m 0.3m	Sandstone	1.1m
CTP102	Topsoil – Silty Clay Sandy Silty Clay Clay Gravelly Clay (EW Sandstone)	0.2m 0.3m 0.2m 0.2m	Sandstone	0.9m
CTP103	Topsoil - Silty Clay Sandy Silty Clay Silty Sand	0.4m 0.4m 0.1m	Sandstone	0.9m
CTP104	Topsoil - Silty Clay Sandy Clay (EW Sandstone) Sandstone (EW to DW))	0.7m 0.25m 0.15m	Sandstone	1.1m
CTP105	Sandy Silt -Silty Clay EW Sandstone	1.8m 0.2m	Sandstone	2.0m
CTP106	Sandy Gravelly Silt Silty Clay EW Sandstone	0.4 0.2 0.4	Sandstone	1.0m

The depth of sandstone levels is consistent with the subsoil investigation Coffey has conducted. The geology is consistent with Wollongong Area Coastal Quaternary Geology Map.

6 Conclusion and Recommendations

The following conclusions and recommendations are made:

> Data obtained from the Coffey geotechnical report is consistent with the findings from the additional test pits and hand augered boreholes drilled by Cardno. According to the data obtained at these locations shallow Sandstone is expected to be encountered. Extremely weathered sandstone depth is anticipated to be around 1.0 – 3.0m depths.

> The geotechnical profile is consistent with Wollongong Area Coastal Quaternary Geology Map 2016 (1:100,000).

> During the site walkover of the Central Precinct some potential/previous slope instability was observed. Further intrusive investigation is recommended to confirm the extent of any instability. The central precinct (expanding area) poses moderate risks, however, these can be managed by appropriate engineering design, to be determined by further intrusive investigation and assessment. It is anticipated that expanding area poses limited slope instability risk for residential development following appropriate engineering design. There is the potential that discrete areas may require remediation prior to dwelling construction, again, to be areas determined by further intrusive investigation.

> The expanded areas of the Northern Precinct are not expected to have major geotechnical constraints. The existing data provides sufficient geotechnical information at this stage to understand the geotechnical constraints. Consequently, the proposed expansion does not present further geotechnical constraint.

> There is a risk of erosion and disturbance of the soils during Earthworks. Additional investigation and associated laboratory tests of soil erodibility is required for further stages of development. These investigations should be undertaken prior to construction.

> Areas of boggy ground suggest the existence of localised high groundwater levels, dewatering and ground improvement may be necessary for these areas. Additionally, these areas can have soft soil layers. Further assessment of soil compressibility / swell characteristics should be undertaken prior to construction.

Tallawarra Concept Approval Modification

APPENDIX A

TESTPIT LOCATIONS

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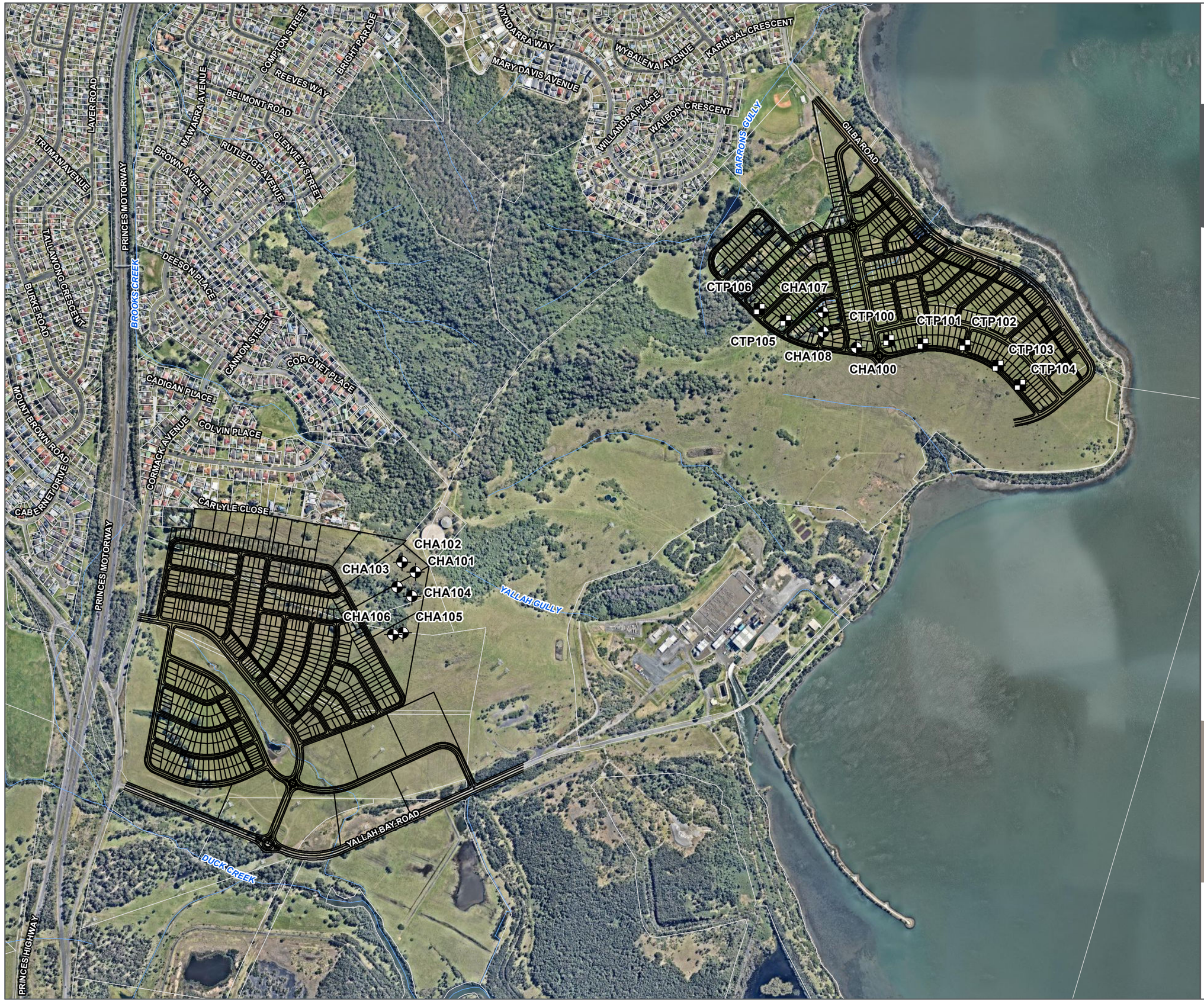
Site Plan

TALLAWARRA LANDS



Legend

- Approximate Hand Auger Location
- Approximate Test Pit Location
- Proposed Lot Layout
- Watercourses (LPI)
- Cadastre (DFSI-SS, 2017)

1:10,000 Scale at A3

Metres

0 100 200 300 400

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2017-07-18 | Project: 8201714202
Coordinate System: GDA 1994 MGA Zone 56
Map: 8201714202-GS-001-SitePlan.mxd 01
Aerial imagery supplied by nearmap (October, 2016)

Tallawarra Concept
Approval Modification

APPENDIX B

TESTPIT LOGS

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ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA101
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.1PPM, r = 0A 0.20m	0.0			Sandy SILT: low plasticity, brown, fine to medium grained sand	M		rootlets present
	0.50m PID = 0.0PPM, r = 0A 0.60m	0.5			0.40m Clayey Sandy SILT: low to medium plasticity, orange to brown some sandstone gravel from 0.7 m 0.90m	D / M		extremely weathered sandstone
		1.0			Test hole CHA101 terminated at 0.90 m EOH at 0.9 m - refusal on sandstone			
		1.5						
		2.0						

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— - Water seepage/inflow
▼ - Water level

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

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ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA102
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.2PPM, r = 0A 0.20m	0.0			Sandy SILT: low plasticity, brown, fine to medium grained sand	M		rootlets present
	0.50m PID = 0.1PPM, r = 0A 0.60m	0.5			0.40m Silty CLAY: medium plasticity, brown, with trace sand	D / M		
	0.90m PID = 0.1PPM, r = 0A 1.00m	1.0			1.00m Test hole CHA102 terminated at 1.00 m EOH at 1.0 m - refusal on sandstone rock			
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
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- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

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CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA103
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.1PPM, r = 0A 0.20m	0.0			Sandy SILT, low plasticity, brown, fine to medium grained sand, with some sandstone gravel and cobbles < 80 mm diameter	M		rootlets present
	0.60m PID = 0.1PPM, r = 0A 0.80m	0.5			0.60m Silty SAND: fine to medium grained sand, orange-brown 0.80m	D		
		1.0			Test hole CHA103 terminated at 0.80 m EOH at 0.8 m - refusal on weathered sandstone			
		1.5						
		2.0						

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
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DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

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CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA104
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.1PPM, r = 0A 0.20m	0.0			Sandy SILT: low plasticity, brown, fine grained sand, with some sandstone gravel and cobbles < 80 mm diameter 0.20m	M		rootlets present
	0.30m PID = 0.1PPM, r = 0A 0.40m				SANDSTONE: coarse, brown, extremely weathered 0.40m	D		
		0.5			Test hole CHA104 terminated at 0.40 m EOH at 0.4 m - refusal on sandstone rock			
		1.0						
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
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See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA105
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.1PPM, r = 0A 0.20m	0.0			Sandy SILT: low plasticity, brown, fine to medium grained sand, with some sandstone gravel and boulders up to 70 mm diameter	M		rootlets present
	0.40m PID = 0.0PPM, r = 0A 0.50m	0.5			0.30m SANDSTONE: coarse, orange-brown, extremely weathered 0.50m Test hole CHA105 terminated at 0.50 m EOH at 0.5 m - refusal on sandstone	XW		
		1.0						
		1.5						
		2.0						

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— - Water seepage/inflow
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SAMPLES & FIELD TESTS
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D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA106
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 22/5/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Central Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.2PPM, r = 0A 0.20m	0.0			Sandy SILT: low plasticity, brown, fine to medium grained sand, with some gravel and boulders up to 60 mm diameter	M		rootlets and earthworms present to 200 mm
					0.40m SANDSTONE: coarse, orange-brown, extremely weathered			
	0.60m PID = 0.1PPM, r = 0A 0.70m	0.5			0.80m	D		
					Test hole CHA106 terminated at 0.80 m EOH at 0.8 m refusal on sandstone			
		1.0						
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA107
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 12/7/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Northern Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.3PPM, r = 0A 0.30m	0.0			Sandy SILT: low plasticity, drak brown 0.40m	D		rootlets present
	0.50m PID = 0.2PPM, r = 0A 0.70m	0.5			Silty CLAY: medium to high plasticity, orange-brown, with trace sand 0.80m	D / M		
		1.0			Test hole CHA107 terminated at 0.80 m EOH at 0.8 m - target depth			
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL BORE HOLE LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CHA108
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel

DATE EXCAVATED : 12/7/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Northern Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	PID = 0.4PPM, r = 0A	0.0			Sandy SILT: low plasticity, dark brown	D		rootlets present
	0.20m							
					0.30m Sandy SILT: low plasticity, light brown	D		
					0.40m Silty CLAY: medium plasticity, orange-brown			
	0.50m PID = 0.2PPM, r = 0A	0.5				D		
	0.70m				0.70m Test hole CHA108 terminated at 0.70 m EOH at 0.7 m - target depth			
		1.0						
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL TEST PIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CTP105
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : 5 Tonne Excavator | METHOD : Machine Excavation

DATE EXCAVATED : 12/7/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Northern Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
		0.0			Sandy Gravelly SILT: low plasticity, dark brown with some sandstone gravel	D		rootlets present
	0.10m PID = 0.2PPM, r = 0A 0.20m							
					0.30m Silty CLAY: medium plasticity, orange-brown, with trace sand and sandstone gravel (<30 mm)	D / M		
	0.50m PID = 0.2PPM, r = 0A 0.60m	0.5						
					0.70m Silty CLAY: medium to high plasticity, orange-brown, with trace sand and sandstone gravel (<30 mm)	D / M		
	1.00m PID = 0.2PPM, r = 0A 1.10m	1.0						
		1.5			1.80m SANDSTONE: fine to medium grained, light brown, extremely weathered sandstone, with trace mottled green clay	D / M		
	1.90m PID = 0.1PPM, r = 0A 2.00m	2.0			2.00m Test hole CTP105 terminated at 2.00 m EOH at 2 m, target depth			

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

ENVIRONMENTAL TEST PIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands

HOLE NO : CTP106
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : 5 Tonne Excavator | METHOD : Machine Excavation

DATE EXCAVATED : 12/7/17 | LOGGED BY : MB | CHECKED BY : JMG

LOCATION : Northern Precinct (see drawing for precise location)

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	STRUCTURE & Other Observations
	0.10m PID = 0.3PPM, r = 0A 0.20m	0.0			Sandy Gravelly SILT: low plasticity, dark brown, with some sandstone gravel	D		rootletes present
					0.40m Silty CLAY: medium plasticity, orange-brown, with trace sand			
	0.50m PID = 0.2PPM, r = 0A 0.60m	0.5			0.60m SANDSTONE: fine to medium grained sandstone, light brown, weathered	D / M		
	0.90m PID = 0.2PPM, r = 0A 1.00m	1.0			1.00m Test hole CTP106 terminated at 1.00 m EOH at 1.0 m - refusal on sandstone	D		rock becoming fresh, sandstone boulders <400 mm
		1.5						
		2.0						

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CHA100
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger | METHOD : Hand Excavation/Shovel
DATE EXCAVATED : 17/5/17 | LOGGED BY : DA | CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, medium to high plastic, dark brown, trace subangular to angular sandstone gravel			4		TOPSOIL
					Same as above, with angular to subangular sandstone gravel and cobble (<110mm)			4		
								5		
					0.30m Silty SAND, fine to coarse grained, brown, black and orange-red patches, angular to subangular sand, medium dense to dense			6		EW SANDSTONE
		0.5		SM		MC < PL	St	5		
								13		
					0.90m Testpit CHA100 terminated at 0.90 m			20/RB		
		1.0			Refusal on SANDSTONE					
		1.5								
		2.0								

HAND PENETRO-METER (kPa) scale: 100, 200, 300, 400

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— - Water seepage/inflow
▼ - Water level

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CTP100
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Kobelco SK55SRX 5.5t
METHOD : Machine Excavation 600mm toothed
DATE EXCAVATED : 17/5/17
LOGGED BY : DA
CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, moderate to high plasticity, dark brown, trace subangular to angular sandstone gravel			6 6 6 6	HP In-situ = 330 - 370 kPa	TOPSOIL with root fibres and earthworms
		0.40m		CL-CH	Sandy Silty CLAY, moderate to high plasticity, orange-brown mottled pale grey, fine to coarse grained sand, subangular to angular, with some sandstone gravel	MC > PL	St to H	14 34/RB	HP In-situ = 350 - 370 kPa HP In-situ = 250 kPa	RESIDUAL
		0.80m		CL	Gravelly CLAY, Low plasticity, pale grey,brown mottled black sandstone gravel, hard	MC < PL	H			EW SANDSTONE
		1.00m			Testpit CTP100 terminated at 1.00 m Refusal on SANDSTONE				HP In-situ > 600 kPa	
		1.0								
		1.5								
		2.0								

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— - Water seepage/inflow
▼ - Water level

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CTP101
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Kobelco SK55SRX 5.5t
METHOD : Machine Excavation 600mm toothed
DATE EXCAVATED : 17/5/17
LOGGED BY : DA
CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETRO-METER (kPa)	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, moderate to high plasticity, dark brown, trace subangular to angular sandstone gravel			5 6		TOPSOIL with root fibres and earthworms
					0.20m Sandy Silty CLAY, moderate to high plasticity, orange-brown mottled pale grey, fine to coarse grained sand, subangular to angular, with some sandstone gravel			11 17 >30		RESIDUAL
		0.5		CL-CH		MC > PL	St to H	6/RB		
					0.80m Gravelly CLAY, Low plasticity, pale grey,brown mottled black sandstone gravel, hard					EW SANDSTONE
		1.0		CL		MC < PL	H			
					1.10m Testpit CTP101 terminated at 1.10 m Refusal on SANDSTONE					
		1.5								
		2.0								

HAND PENETROMETER (kPa) scale: 100, 200, 300, 400

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CTP102
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Kobelco SK55SRX 5.5t
METHOD : Machine Excavation 600mm toothed
DATE EXCAVATED : 17/5/17
LOGGED BY : DA
CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, moderate to high plasticity, dark brown, trace subangular to angular sandstone gravel			6 6		TOPSOIL with root fibres and earthworms
					0.20m Sandy Silty CLAY, moderate to high plasticity, orange-brown mottled pale grey, fine to coarse grained sand, subangular to angular, with some sandstone gravel			5		RESIDUAL
				CL-CH		MC > PL	St	3 4		
		0.5			0.50m CLAY: high plasticity, pale grey, mottled orange - brown, with fine to medium grained sandstone gravel			26		root fibres and decomposing wood matter observed
				CH		W	St	20/RB		
					0.70m Gravelly CLAY, low plasticity, pale grey,brown mottled black sandstone gravel, hard					EW SANDSTONE
				CL		MC < PL	St to H			
					0.90m Testpit CTP102 terminated at 0.90 m					
		1.0			Refusal on SANDSTONE					
		1.5								
		2.0								

HAND PENETROMETER (kPa) scale: 100, 200, 300, 400

MOISTURE & GROUNDWATER
- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▶— - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH
- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING
- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CTP103
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Kobelco SK55SRX 5.5t
METHOD : Machine Excavation 600mm toothed
DATE EXCAVATED : 17/5/17
LOGGED BY : DA
CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETROMETER (kPa) 100 200 300 400	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, moderate to high plasticity, dark brown, trace subangular to angular sandstone gravel			7 8 9 9		TOPSOIL with root fibres and earthworms
					0.40m Sandy Silty CLAY, moderate to high plasticity, orange-brown mottled pale grey, fine to coarse grained sand, subangular to angular, with some sandstone gravel			26 28/RB		RESIDUAL
		0.5		CL-CH		MC > PL	VSt			
					0.80m Silty SAND, fine to coarse grained, brown, black and orange-red patches, subangular to angular sand		D to VD			EW SANDSTONE
				SM	0.90m Testpit CTP103 terminated at 0.90 m					
		1.0			Refusal on SANDSTONE					
		1.5								
		2.0								

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▶— - Water seepage/inflow
▼ - Water level

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTPIT LOG

CLIENT : Bridgehill
PROJECT : Tallawarra Lands
LOCATION : Tallawarra lands, Northern and Central Precinct

HOLE NO : CTP104
PROJECT REF : 8201714202
SHEET : 1 OF 1

EQUIPMENT TYPE : Kobelco SK55SRX 5.5t
METHOD : Machine Excavation 600mm toothed
DATE EXCAVATED : 17/5/17
LOGGED BY : DA
CHECKED BY : MB
LOCATION : Northern Precinct (see drawing for precise location)

GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DCP (BLOW COUNT)	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
Not Observed		0.0			TOPSOIL, Silty CLAY, moderate to high plasticity, dark brown, trace subangular to angular sandstone gravel			6 6 5 10 26 20/RB	100 200 300 400	TOPSOIL with root fibres and earthworms
		0.70m		CL-CH	Sandy CLAY: medium to high plasticity, mottled brown and orange brown clay, fine to medium grained angular sand, with sandstone gravel and cobble (<180mm) Rock structure observed frequently	M > PL	VSt to H			EW SANDSTONE
		0.95m			SANDSTONE, extremely to distinctly weathered, indistinctly bedded, brown, mottled black and orange-brown, with boulders(<250mm)					EW to DW SANDSTONE
		1.10m			Testpit CTP104 terminated at 1.10 m Refusal on SANDSTONE					

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