



AGL Macquarie Pty Limited

Liddell Power Station - Proposed Borrow Area Preliminary Geotechnical and Contamination Report

July 2021

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Appendices

- Appendix A – Figures
- Appendix B – General notes and standard sheets
- Appendix C – Engineering logs
- Appendix D – Laboratory test reports
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Glossary

Term/ acronym	Definition
°C	Degrees celsius
ABC	Ambient background concentration
ACL	Added contaminant limits
AGLM	AGL Macquarie
BPS	Bayswater Power Station
BTEXN	Benzene, toluene, ethylbenzene, p-xylene and naphthalene
CoC	Chain of Custody
COPC	Contaminants of potential concern
ECN	Emerson Class Number
EIL	Ecological Investigation Level
ESL	Ecological Screening Level
FMC	Field Moisture Content
HIL	Health Investigation Level
HSL	Health Screening Level
HVO	Hunter Valley Operations
JSEA	Job safety and environmental assessment
km	Kilometres
km ²	Square kilometres
LAD	Liddell Ash Dam
LL	Liquid Limit
LNAPL	Light non-aqueous phase liquid
LOR	Limit of reporting
LPS	Liddell Power Station
m	metres
MDD	maximum dry density
mm	millimetres
MSC	Muswellbrook Shire Council
NATA	National Association of Testing Authorities
NEPM	<i>National Environment Protection (Assessment of Site Contamination) Amended Measure</i>
NSW	New South Wales
OMC	Optimum moisture content
PAH	Poly aromatic hydrocarbon
PI	Plasticity Index
PL	Plastic Limit
PSD	Particle size distribution
RL	Reduced level
SMP	Safety management plan
t	tonne
t/m ³	tonnes per cubic metre
TOC	Total organic carbon

Term/ acronym	Definition
TP	Test Pit
TRH	Total recoverable hydrocarbons

1. Introduction

1.1 Background

A borrow pit area is required for supply of suitable materials for capping/ rehabilitation of the Liddell Ash Dam (**LAD**) and for other uses in areas such as the proposed Hazmat landfill, Liddell Power Station (**LPS**) site areas and Bayswater Power Station (**BPS**) for civil projects and rehabilitation works.

The ash disposal process for LPS requires ash to be deposited in terraces in the LAD, with ash progressively capped with inert material. The material used for the construction of terraces and capping material is currently sourced from material stockpiled within the LAD by the adjacent former Drayton Coal Mine. However, it is projected that material available within these stockpiles will not be sufficient to complete the approved LAD Extension works if required, progressive rehabilitation works and rehabilitation works post closure of LPS .

To enable continued progressive capping and wall construction for the Liddell Ash Dam (**LAD**), additional spoil material is urgently required. The additional material is proposed to be sourced from an area immediately north of the LAD and constitutes existing material emplaced on AGL Macquarie Pty Ltd (**AGLM**) land approximately 30 years ago by the former Drayton coal mine operations (now Malabar Coal) under DA 9/90 granted by Muswellbrook Shire Council (**MSC**).

This material is likely to have similar attributes as the material currently being used, as they are both from the same source. However, Hunter Valley materials are sometimes known to be highly reactive, exhibit poor durability and breakdown upon handling and compaction. Notwithstanding, material from coal mining can contain high concentrations of carbonaceous material, making it susceptible to spontaneous combustion.

A preliminary geotechnical and contamination assessment was required to characterise the material within the proposed borrow pit and confirm its suitability for use as ash dam terrace, embankment and capping material.

1.2 Purpose of this report

This report presents the factual results of the geotechnical and contamination investigation, and provides discussion and recommendations relating to:

- Characterisation of the material and compare to published data on Hunter Valley material properties
- Suitability of the borrow material to be used for ash dam embankment, capping and terrace material, with relation to the relevant material specification
- Suitable management (short term and long term) of material /unsuitable material with regard to limiting issues such as risk of spontaneous combustion, erosion and other site management requirements
- Maximum temporary and permanent landform batter slopes
- Other potential uses identified during the investigation

This report should be read in conjunction with the attached General Notes in Appendix B.

1.3 Assumptions and limitations

This report has been prepared by GHD for AGLM and may only be used and relied on by AGLM for the purpose agreed between GHD and AGLM as set out in this report.

GHD otherwise disclaims responsibility to any person other than AGLM arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by AGLM and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

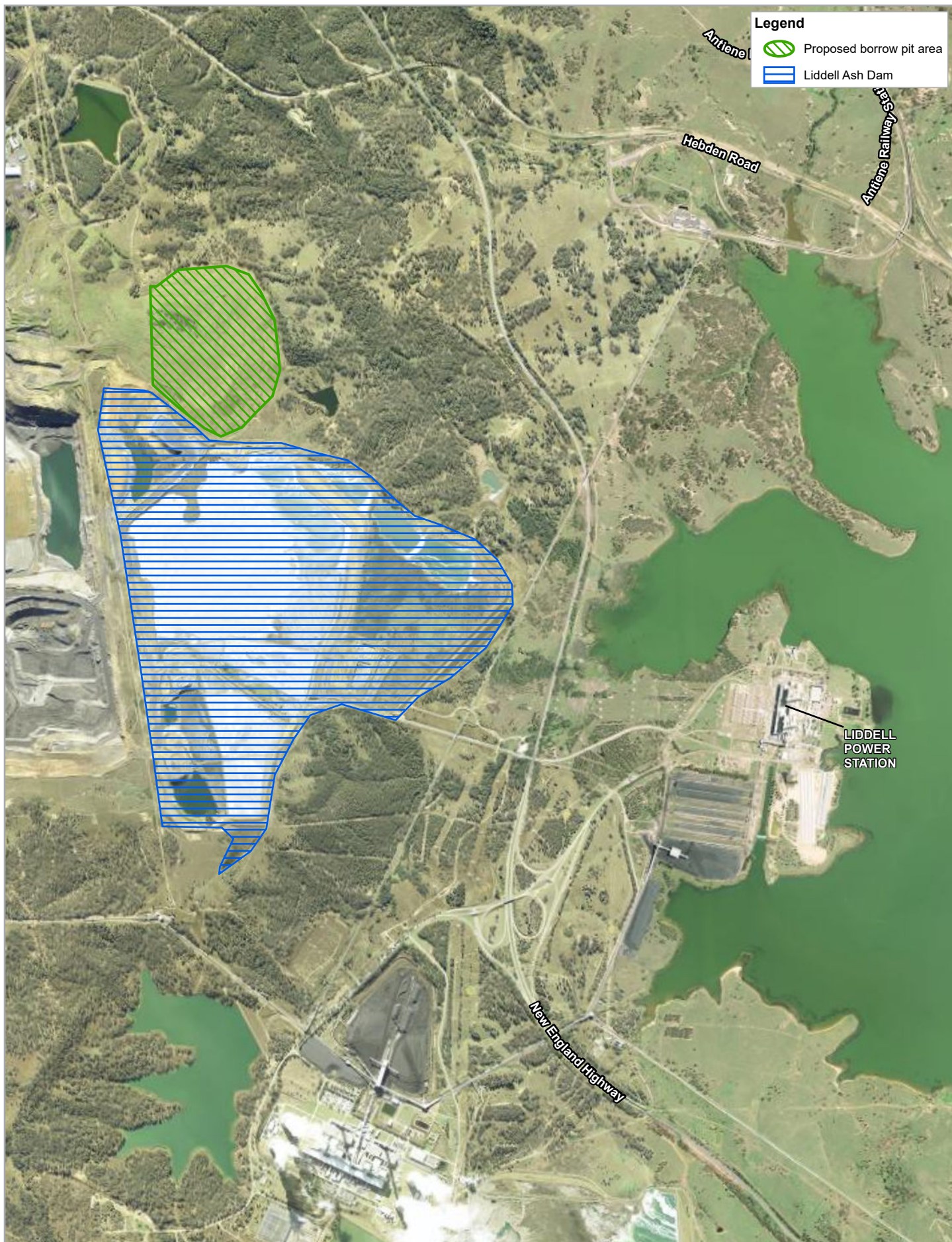
2. Site description

2.1 Surface conditions

The **LPS** is located approximately 14 kilometres (**km**) south east of Muswellbrook, in the Hunter Valley, New South Wales (**NSW**). The western boundary of the site adjoins the former Drayton Coal Mine.

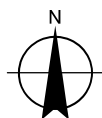
The ash produced by the coal fired LPS is emplaced in the LAD, located approximately 2 km to the west of the LPS. The LAD has been progressively developed over time and currently covers an area of 2.7 square kilometres (**km²**). The location of the LAD is shown below in Figure 2.1.

The LAD is nearing capacity for ash emplacement. An increase in height of the Stage 3 east dam wall is currently approved by MSC under the LAD Extension consent (DA 1/2011) to manage ongoing ash storage to the end of station life which is scheduled for April 2023 when the final units at LPS are switched off. To facilitate the wall raise and final capping, it is proposed to source material for the construction from the proposed borrow area located to the north of the LAD.



Paper Size ISO A4
0 0.25 0.5 0.75 1
Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



AGL Macquarie Pty Limited
Liddell Power Station - Proposed Borrow
Preliminary Geotechnical and Contamination Report

Project No. 12532502
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**Liddell Ash Dam and
Borrow Area location**

FIGURE 2-1

The borrow area covers an area of approximately 0.65 **km²** and comprises a grass mound with multiple terraced levels, ranging from Reduced Level (**RL**)190 to RL 255. The western portion of the proposed borrow area lies within the former Drayton Coal Mine, and was not included as part of this investigation.



Photograph 1 View looking south towards borrow area

2.2 Geological setting

Reference to the 1:250,000 scale Singleton geological, sheet 56-1, indicates the the borrow area is situated over Permian aged Maitland Group of the Sydney Basin, comprising siltstone, claystone, fine- to coarse-grained sandstone and conglomerate.

The former Drayton Mine is located within the Branxton Formation and Greta coal measures and comprise coal, siltstone, sandstone, claystone and chert.

3. Methodology

3.1 Preliminaries

Prior to the subsurface investigation, a qualified services locator was engaged to scan test locations for locatable buried service and an excavation permit issued by AGLM. A safety management plan (**SMP**) and job safety and environmental assessment (**JSEA**) were prepared for the site work. All site staff were inducted on to the SMP and briefed on the requirements set out in the JSEA, prior to commencing fieldwork.

3.2 Subsurface investigation

The subsurface investigation was undertaken between 29 October and 1 November 2019. The investigations included excavating 34 test pits ranging from 3.3 metres (**m**) to 5.5 m total depth. The test pits were excavated using a 29 tonne (**t**) tracked excavator.

The subsurface investigation included logging the encountered strata and collecting representative samples for laboratory testing. The logging was generally carried out in accordance with Australian Standard, AS 1726-2017.

Bulk samples were collected from each of the test pits. Generally >75 millimetres (**mm**) material was excluded from the sample to ensure sufficient representative material was recovered for laboratory testing. Samples were selected for subsequent laboratory testing based on visual analysis during the field investigation.

The locations of the test pits are shown in Figure 6, Appendix A. Coordinates were recorded using hand held GPS and are noted on the test pit logs. Upon completion, the test pits were backfilled with the excavated spoil.

3.3 Laboratory testing

Samples recovered from the test pit investigation were transported to GHD's National Association of Testing Authorities (**NATA**) accredited laboratory for materials testing. Selected laboratory tests (e.g. contamination testing) were outsourced to specialist NATA registered analytical laboratories.

Table 3-1 outlines the laboratory testing that was undertaken:

Table 3-1 Summary of laboratory testing

Laboratory Test	Number
Moisture Content (AS 1289.2.1.1)	15
Atterberg Limits (AS 1289.3.1.1, 3.2.1 & 3.3.3)	10
Sieve Analysis (AS1289.3.6.1)	15
Emerson Class (AS 1289.3.8.1)	10
Standard Compaction (AS 1289.5.1.1)	5
Electrical Conductivity (EC)	15
Total Organic Carbon (TOC), heavy metals (13), poly aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRH)/ benzene, toluene, ethylbenzene, p-xylene and naphthalene (BTEXN) and total sulphur	10
Auto Ignition	10

The laboratory report sheets are contained in Appendix D.

4. Geotechnical investigation findings

4.1 Subsurface conditions

Reference to the test pit logs should be made for detailed descriptions of the subsurface conditions encountered. Test procedures, classification methods and descriptive terms are described in the Standard Sheets held in Appendix B.

The material encountered comprised mainly of sand, gravel, gravel comprising siltstone, sandstone, cobbles, occasional boulders. There was also some carbonaceous siltstone, coal and smaller areas of clay towards the extremities of the proposed borrow area. Natural ground profile was not encountered during the subsurface investigation. The maximum particle size recorded was 1 m diameter boulders in TP12.

The carbonaceous content of the fill material varied across the borrow area. In general terms, the highest carbonaceous content was encountered in the south western portion of the borrow area. At the highest point of the proposed borrow area between RL 250 to 255, the carbonaceous content was relatively low to negligible.

No groundwater was encountered within the limit of the investigation. Groundwater conditions surrounding the area have been summarised from monitoring information provided by AGLM in a separate groundwater assessment letter (GHD, 2019).

4.2 Laboratory test results

The laboratory test results are summarised in Table 4-1 to Table 4-3. Laboratory test reports are held in Appendix D.

Table 4-1 Moisture content and Atterberg limits test results

Sample Location	Sample Depth (m)	Material description	FMC (%)	ECN	Atterberg Limits		
					LL (%)	PL (%)	PI (%)
TP01	4.0	FILL-Clayey GRAVEL	-	3	34	18	16
TP02	2.5	FILL-Clayey SAND	8.3	-	-	-	-
TP04	2.1	FILL-Clayey SAND	-	2	36	19	17
TP04	4.9	FILL-Clayey SAND	13.1	-	-	-	-
TP05	5.0	FILL-Clayey GRAVEL	20.3	-	-	-	-
TP08	2.5	FILL-Clayey GRAVEL	8.2	-	-	-	-
TP09	2.8	FILL-Clayey GRAVEL	-	2	39	23	16
TP12	3.7	FILL- GRAVEL	-	2	34	19	15
TP13	1.5	FILL-Clayey SAND	10.3	-	-	-	-
TP15	1.5	FILL-Sandy GRAVEL	-	2	44	22	22
TP16	2.0	FILL-Gravelly Sandy CLAY	11.9	-	-	-	-
TP17	3.4	FILL-Clayey GRAVEL	13.5	-	-	-	-
TP18	1.8	FILL-Clayey Gravelly SAND	11.7	-	-	-	-
TP18	4.9	FILL-Sandy GRAVEL	-	2	36	19	17
TP23	4.0	FILL-Sandy GRAVEL	-	2	41	20	21
TP24	1.7	FILL-Sandy CLAY	13.4	-	-	-	-
TP26	4.5	FILL-Clayey SAND	12.5	-	-	-	-
TP27	2.1	FILL-Clayey GRAVEL	-	2	41	20	21
TP28	2.3	FILL-Clayey SAND	11.4	-	-	-	-
TP29	4.7	FILL-Sandy GRAVEL	-	2	37	20	17
TP30	4.0	FILL- Clayey Gravelly SAND	16.9	-	-	-	-
TP32	2.2	FILL-Clayey GRAVEL	12.7	-	-	-	-
TP33	2.0	FILL- Sandy CLAY	-	2	43	25	18
Where: FMC = Field Moisture Content ECN = Emerson Class Number LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index							

The classification test results (Table 4-1) confirm the logging of the clay fill material for all samples as low to medium plasticity. Tested field moisture contents were dry of the plastic limit.

Further commentary of the 'impacts' of plasticity in terms of the material is provided in the sections below. For background on the classification of soils including Atterberg limits test please refer to Appendix B.

The Emerson class number test results indicate the majority of tested fill materials to be dispersive (Emerson Class 2) in fresh water. One clayey gravel sample from TP01 gave an Emerson Class value of 3, indicating slightly dispersive properties.

Table 4-2 Particle size distribution test results

Sample Location	Sample Depth (m)	Material description	Particle size distribution		
			Fines (%)	Sand (%)	Gravel (%)
TP02	2.5	FILL-Clayey SAND	30	46	24
TP04	4.9	FILL-Clayey SAND	32	42	27
TP05	5.0	FILL-Clayey GRAVEL	19	28	53
TP08	2.5	FILL-Clayey GRAVEL	16	29	55
TP13	1.5	FILL-Clayey SAND	28	54	18
TP16	2.0	FILL-Gravelly Sandy CLAY	37	32	31
TP17	3.4	FILL-Clayey GRAVEL	19	15	66
TP18	1.8	FILL-Clayey Gravelly SAND	30	37	33
TP22	2.1	FILL-Sandy CLAY	41	44	15
TP24	1.7	FILL-Sandy CLAY	41	36	24
TP26	4.5	FILL-Clayey SAND	33	40	28
TP28	2.3	FILL-Clayey SAND	33	37	30
TP30	4.0	FILL- Clayey Gravelly SAND	30	36	34
TP32	2.2	FILL- Sandy CLAY	36	34	30

Table 4-3 Standard compaction test results

Sample Location	Sample Depth (m)	Material description	OMC (%)	MDD t/m ³
TP01	4.1	FILL-Clayey GRAVEL	16.6	1.78
TP04	1.7	FILL-Clayey SAND	14.9	1.83
TP13	5.0	FILL-Clayey GRAVEL	16.3	1.77
TP18	4.7	FILL-Sandy GRAVEL	15.1	1.82
TP25	4.5	FILL-Clayey Sandy GRAVEL	17.8	1.68
Where: MDD = Standard Maximum Dry Density OMC = Standard Optimum Moisture Content				

The standard compaction test results indicate the field moisture contents were generally dry of the standard optimum moisture content for the tested fill material.

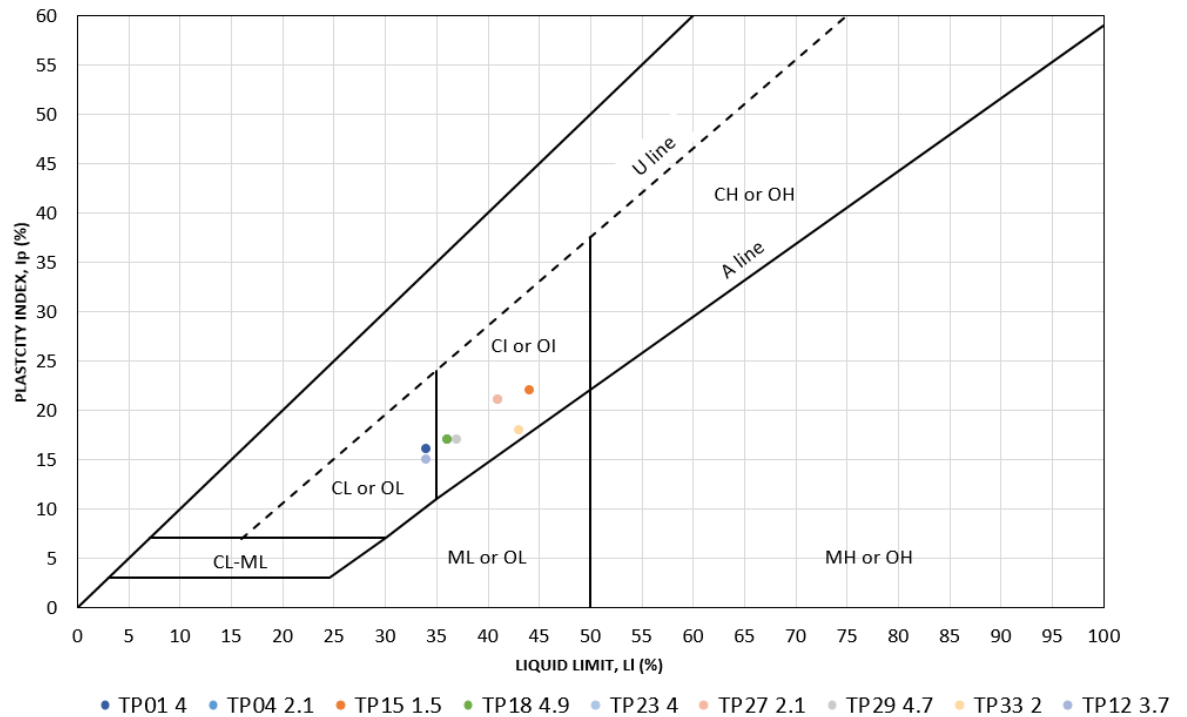


Figure 4.1 Plasticity chart

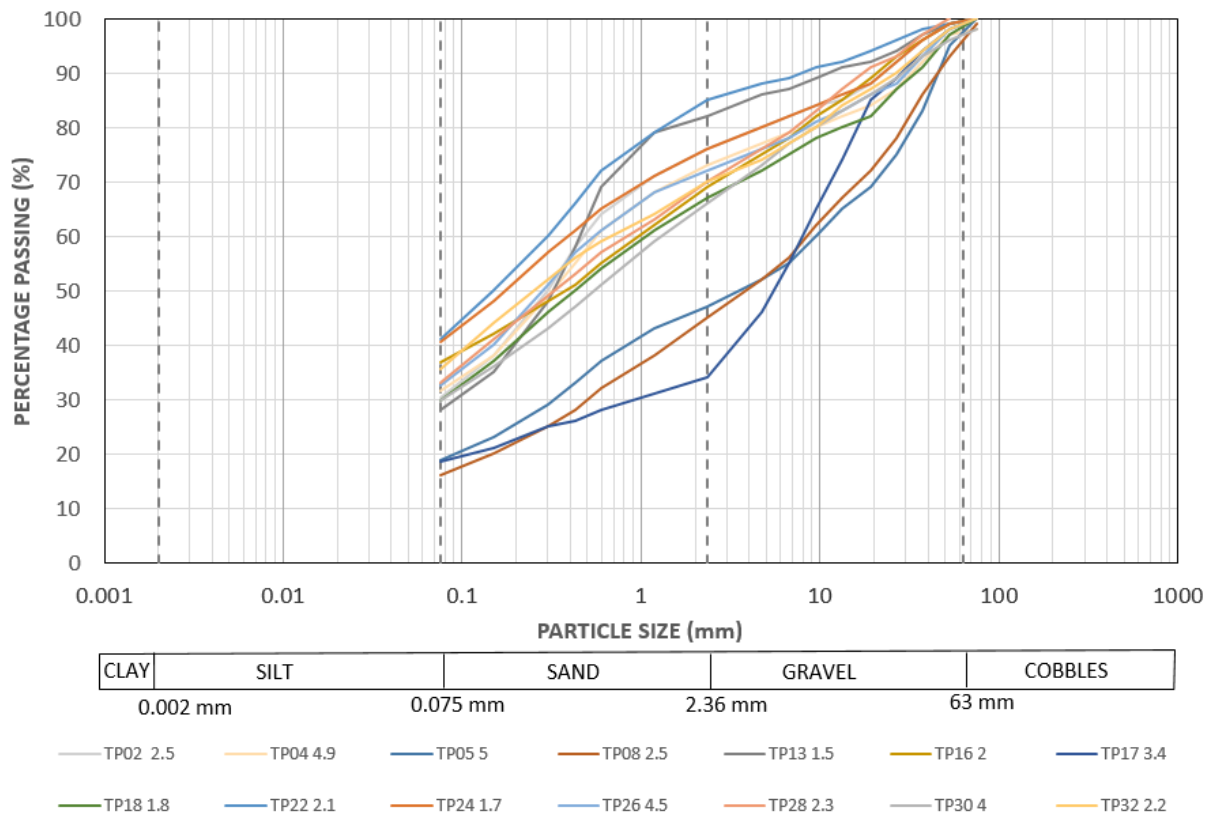


Figure 4.2 Particle size distribution curves

The particle size distribution tests indicate the fill material to be generally well graded, with a varying component of sand. The majority of the tested samples can be classified as Clayey Gravelly SAND.

The tested fill material plotted above the specification for select earth fill provided by AGLM.

4.3 Spontaneous combustion assessment

Auto ignition temperature testing was conducted on ten samples. The results are summarised in Table 4-4.

Table 4-4 Summary of auto ignition test results

Sample Location	Sample Depth (m)	Auto Ignition Temperature (°C)
TP05	0.5	>500
TP06	1.7	>500
TP08	1.1	>500
TP09	2.8	>500
TP10	0.3	>500
TP12	0.5	>500
TP16	3.5	>500
TP19	2.2	>500
TP30	0.7	>500
TP34	4.8	>500

4.4 Permeability

Triaxial permeability testing was undertaken on three samples using 99.5% to 100% of the Standard Optimum Moisture Content at 100 % Standard compaction effort. The results are summarised in Table 4-5.

Table 4-5 Summary of permeability test results

Sample Location	Sample Depth (m)	Material description	Standard Maximum Dry Density (t/m ³)	Standard Optimum Moisture Content (%)	Permeability (m/sec)
TP04	4.9	FILL-Clayey SAND	1.75	17.5	5 x 10 ⁻¹⁰
TP08	2.5	FILL-Clayey GRAVEL	1.64	14.5	3 x 10 ⁻¹⁰
TP22	2.1	FILL-Sandy CLAY	1.76	16.0	1 x 10 ⁻¹⁰

5. Geotechnical discussion and recommendations

This section provide discussion and recommendations relating to the following geotechnical aspects:

- Characterisation of the material and comparison to published data
- Suitability of material for reuse
- Batter slopes
- Management of unsuitable material.

Laboratory testing was undertaken on discrete samples that were selected based on visual and tactile assessment during the field investigation and therefore should be considered a preliminary assessment.

5.1 AGLM material specification

Table 5-1 below presents the material specification provided by AGLM for the Ravensworth Void 3 Detention Basin and was originally proposed to be used as the material specification for the LAD extension embankments and capping. It should be noted that the specification for required construction materials will be confirmed during the development of the closure plan and ash dam capping design (currently in preparation).

The specified material is plotted against Particle Size Distribution (**PSD**) laboratory test results in Figure 5.1.

Table 5-1 Specification for select earth fill particle size distribution

Sieve size (mm)	Percentage passing (not less than)
200	80
75	50
2.36	20
0.075	10

The maximum particle size (prior to compaction) shall be 300 mm.

Select fill to be compacted to achieve 98% maximum dry density (**MDD**) (Min) at optimum moisture content (**OMC**) to – 2% OMC. Uncompacted layers are to be placed in layers no thicker than 400 mm prior to compaction.

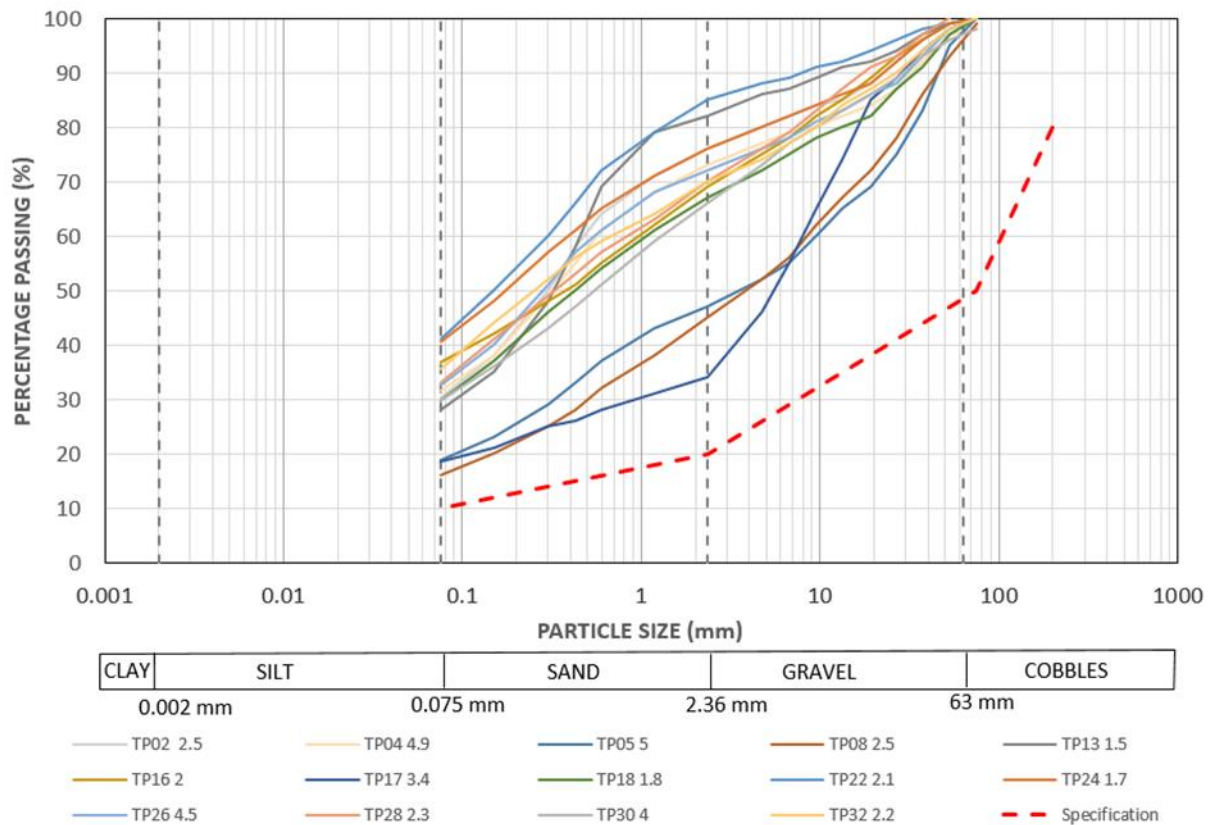


Figure 5.1 Comparison of particle size distribution against specification

5.2 Comparison to published data

The characteristics of the material were compared to published data for Hunter Valley material properties similar in nature from Mt Owen, Mt Arthur, and Hunter Valley Operations (HVO).

The plasticity of the tested material samples from Mt Owen, Mt Arthur and HVO generally classify as low to medium plasticity, similar to the material encountered at the proposed borrow area (Figure 5.2).

Emerson class testing of selected material samples from Mt Owen, Mt Arthur and HVO indicated high erosion potential for all tested samples (Emerson Class values of 2), similar to that encountered at the proposed borrow area.

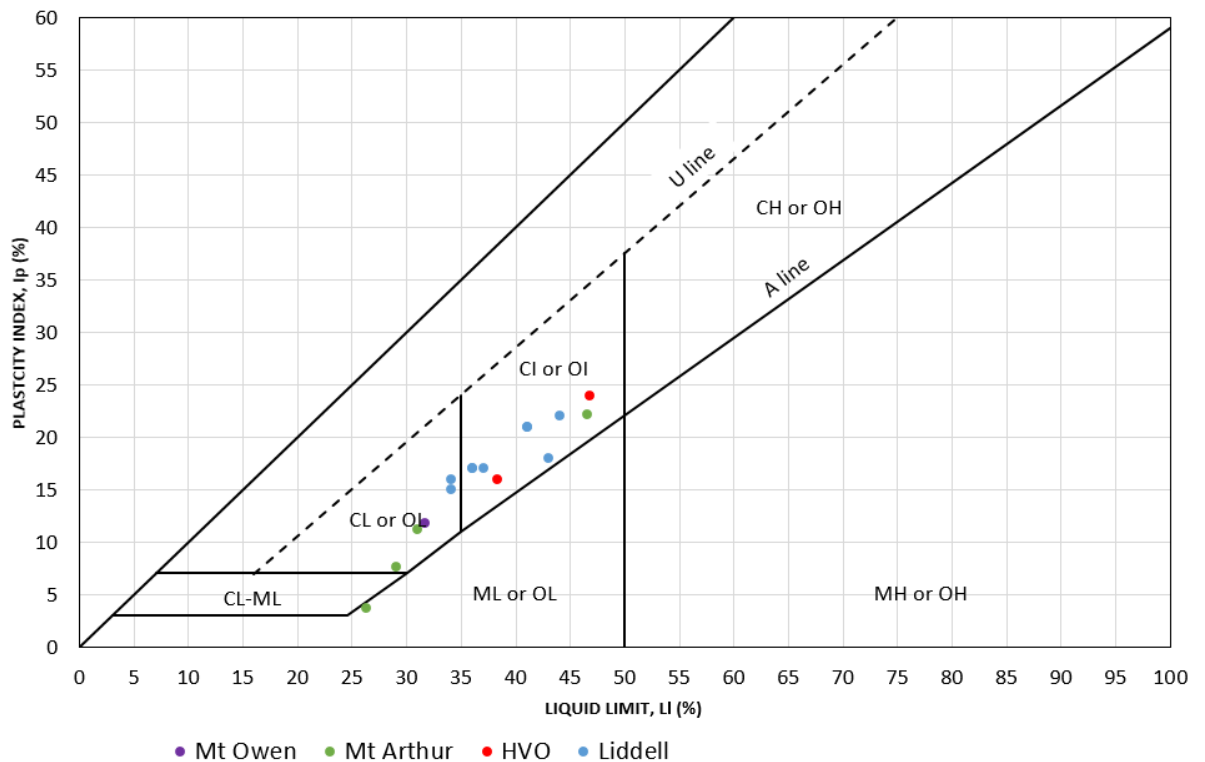


Figure 5.2 Comparison of particle size distribution curves

Comparison of PSD data from Mt Owen, Mt Arthur and HVO with Liddell (LAD) shows the proposed borrow pit material to have a larger component of fine material. The Mt Owen, Mt Arthur and HVO samples plotted as Clayey GRAVEL with Sand, compared to the majority of the proposed borrow pit samples which plotted as Clayey Gravelly SAND. The larger fines component may be a result of the I material breaking down with time. Similar observations were made on material from Mt Arthur.

The results of the standard compaction testing of samples from the proposed borrow pit gave maximum dry density values of between 1.68 to 1.83 tonnes per cubic metre (t/m^3). These are within the range of maximum dry density values encountered at Mt Owen, Mt Arthur and HVO which ranged from 1.70 to 1.98 t/m^3 .

5.3 Gypsum stabilisation

Emerson class test results indicated the fill material to be dispersive (Emerson Class 2). The material is not considered suitable for use as embankment or terrace construction material unless the material is treated or stabilised with fine grained gypsum to address the dispersive nature of the soil.

Gypsum stabilisation should be provided preferentially as a 'shell' zone, which is a protective layer that surrounds the internal layer. Alternatively a homogeneous mix may be used if a 'shell' is not practical.

If an exposed shell zone is utilised, the gypsum stabilised layer should be a minimum thickness of 200 mm thickness and should be covered by a minimum 300 mm of non-dispersive material (typically well graded ripped or crushed rock/gravel) in order to protect the stabilised layer from physical erosion such as from plant traffic, and from drying out producing shrinkage cracking. Selected lab samples of material should undergo Emerson Crumb testing before and after mixing of gypsum. To ensure the minimum Emerson Class of 4 or greater is achieved construction using a suitable earthworks specification and inspection and testing programme is

recommended during construction. A minimum gypsum dosing rate of 3% is suggested irrespective of laboratory testing to assist with overall construction quality control.

5.4 Management of spontaneous combustion

Spontaneous combustion can occur in waste carbonaceous material present in stockpiles.

The results of the auto ignition temperature testing indicated that none of the tested samples would spontaneously combust at temperatures below 500 degrees celsius (°C).

However, visual monitoring for spontaneous combustion should still be undertaken during excavation of the borrow material. Visual monitoring should involve:

- Noting any areas of material with a high carbonaceous/coal content and blending with non carbonaceous material to avoid concentration of combustible materials
- Looking for visible signs of heat haze, steam/vapour, smoke emissions, flames or an odour of visual combustion.

If an area of spontaneous combustion is encountered during excavation the following response process should be actioned:

- Where possible, isolate the zone of spontaneous combustible material
- If practicable and safe to do so, excavate out the affected area and move to a safe area where the material can be spread out to cool or be saturated with water.

5.5 Suitability for re use

Based on this preliminary geotechnical assessment, the material has been characterised generally as sand and gravel, with silt and cobbles of waste rock with some areas of clay.

Based on the encountered subsurface conditions and the particle size grading results, it is considered that the material meets the material specification provided by AGLM for use as capping material. Screening or on site sorting of the material should exclude oversize (>300 mm particle size) material that does not break down under the roller.

Due to the potential dispersive nature of the material encountered, it is not considered suitable for re-use as embankment or terrace construction material unless treated/stabilised with gypsum.

Fill material used in embankment construction should be moisture conditioned to within 2% of the OMC and compacted to a minimum of 98% of the MDD achieved in the Standard Compaction test. Uncompacted layers are to be placed in layers no thicker than 400 mm prior to compaction.

Silt material should not be used as a construction material due to difficulty with compaction and poor performance characteristics, including dispersive potential and low strength.

Spontaneous combustible material or potentially spontaneous combustible material, should it be encountered, is not considered suitable for use as embankment, capping or terrace construction material.

5.6 Batter slopes/excavation condition

For construction of the dam terrace walls and dam embankment, short term unsupported batter slopes within the fill material above the water table may be constructed to be 2H:1V or flatter.

The fill material has been classified as Emerson class 2, indicating that it has the capacity for slaking and some dispersion. Stabilisation as per Section 5.3 should be implemented for the fill material used in construction of terrace walls and dam embankments.

5.7 Further work

Geotechnical inspection of all founding strata is recommended prior to placing fill. Further laboratory testing may also be required to physically and chemically characterise the material.

For treatment of embankment and terrace construction material, Emerson Crumb testing is advised before and after mixing gypsum to ensure a homogenous mix is achieved.

6. Contamination assessment findings

6.1 Sampling methodology

Sampling and laboratory testing for preliminary assessment of soil contamination was undertaken in conjunction with the test pit subsurface investigations to assist with preliminary characterisation of the proposed borrow material. Soil samples were collected at nominal intervals and selected for analysis for contaminants of potential concern (**COPC**). COPC were considered to consist of heavy metals, polycyclic aromatic hydrocarbons (**PAHs**), total recoverable hydrocarbons (**TRH**), benzene, toluene, ethyl-benzene, xylene and naphthalene (**BTEXN**) and total sulphur.

Contamination samples were placed in unpreserved laboratory supplied glass sample jars, sealed with Teflon lined lids. Contamination jar and bag samples were stored in an ice filled cooler for preservation prior to and during shipment to the testing laboratory. All samples were transported under signed Chain of Custody (**CoC**) documentation to ALS Environmental and Eurofins, independent and NATA accredited laboratories for the analysis requested (as per Table 3-1).

6.2 Soil assessment criteria

The assessment of risk to human health and ecological receptors was undertaken in accordance with 2013 *National Environment Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater* (NEPC 2013).

The proposed end land use of the capped surface is likely to be pasture/grassland containing shallow roots (i.e. no deep rooted trees/woodland). Public open space land use criteria were selected as the most appropriate criteria for initial Tier 1 assessment of contamination risks to human health and ecological receptors. Other potential future receptors, such as cattle using the site for pasture grazing, were excluded from this assessment. There is no specific generic criteria for assessment of agricultural land use and NEPC (2013) only provides guidance on potential risks with respect to human health or ecological receptors.

The following criteria were adopted for this investigation:

- NEPC (2013) Health Investigation Level (**HIL**) C – recreational/public open space
- NEPC (2013) Health Screening Level (**HSL**) C - recreational/public open space
- NEPC (2013) Ecological Investigation Level (**EIL**) – urban residential and public open space
- NEPC (2013) Ecological Screening Level (**ESL**) – urban residential and public open space.

NEPC(2013) also requires consideration of management limits for petroleum hydrocarbon compounds in relation to consideration of formation of light non-aqueous phase liquid (**LNAPL**), fire and explosive hazards and effects on buried infrastructure. Management limits have not been considered applicable for this investigation as they are considered less relevant at operating industrial sites (including mine sites) and the proposed use is considered to be a similar type activity related to mine sites. Potential fire and explosive hazards have also been assessed in Section 5.4.

HSL guidelines take into account the sub-surface material and have different guidelines for sand, silt and clay at varying depths. PSD results indicated that there is a range of materials present. Conservatively, HSLs for sand have been adopted for this site given the end use as capping materials and uncertainty in segregation of materials.

Soil specific analysis such as pH and cation exchange capacity (CEC) were not undertaken given the preliminary nature of the assessment. As such default conservative added contaminant limits (**ACL**) have been used for **EIL** calculations in conjunction with the ambient background concentration (**ABC**) of the material (represented as the average of results obtained).

6.3 Contamination results

6.3.1 Field observations

The general description of soils encountered during the investigation is provided in Section 4.1.

No other signs of contamination such as odours and staining were observed during the investigation works. Coal material was observed, however this is not considered to be a contaminating source given the nature of the material at the proposed borrow area .

6.3.2 Laboratory results

The soil sampling laboratory results are summarised in Table 6-1, Appendix E and laboratory certificates of analysis are presented in Appendix D. Sampling locations are shown in Figure 6, Appendix A.

Concentrations of COPC were below the nominated assessment criteria (as listed in Section 6.2) or below the laboratory limit of reporting (**LOR**) with the exception of those listed in Table 6-1, which were exceedances of EIL/ESL criteria.

Table 6-1 Soil assessment criteria exceedances

Assessment Criteria	Analyte (EIL) (mg/kg)	Location	Concentration (mg/kg)
NEPC EIL (urban residential and public open space)	Nickel (178)	TP14_2.1	180
		TP24_1.0	230
		TP30_3.3	370
		TP33_1.4	210
NEPC ESL (urban residential and public open space)	TRH C ₁₀ -C ₁₆ (120)	TP08_3.4	190
	TRH F3 (300)	TP08_3.4	960
		TP11_3.5	370

6.4 Soil contamination discussion and recommendations

Concentrations of COPC were generally below the nominated assessment criteria with the exception of ecological assessment criteria exceedances of nickel and TRH. There were no exceedances of the human health assessment criteria in any of the soil samples analysed indicating that potential risks from the presence of naturally occurring chemicals are limited to ecological risks.

The TRH concentrations at TP08 2.2 and TP11 3.5 are likely associated with the coal present in the samples, and not from anthropogenic sources such as petroleum hydrocarbons. The heavy metal ecological exceedances at the four locations listed in Table 6-1 (nickel) were generally consistent within the material indicating that this is reflective of the naturally occurring metals sources from its origin. While manganese does not have a screening criteria, the manganese concentrations appear to be similarly reflective of the naturally occurring materials.

As the ecological criteria is a conservative screening level, exceedances of this criteria do not necessarily mean this is a potential direct contact (uptake) risk to vegetation. Further assessment and refinement of ecological assessment criteria may be required in the future, specific to which plants/species are proposed for vegetation on top of the capping, noting that most surrounding areas are highly disturbed due to mining activities and use of this material for rehabilitation activities is common. Also the proposed cap is likely to consist of a 150 mm layer of spoil mixed with compost material/biosolids (or similar) overlying the capping material. As such the shallow rooted plants are unlikely to extend to great depths into the cap and therefore adverse effects from heavy metals are considered unlikely.

As part of the ash dam closure plan (currently in preparation) there are requirements for vegetation monitoring post capping. Potential risks to ecological receptors are recommended to be managed (with suggested mitigation measures) as recommended in the proposed closure plan monitoring.

7. Conclusion

The material encountered during the subsurface investigation shows similarities in material properties (plasticity and Emerson class) common in the Hunter Valley. The material encountered at Liddell is finer grained, likely due to the age of the material and the material breaking down over time.

PSD results indicate the material meets the material specification provided by AGLM. It is noted that the material specification is being further refined as part of the ash dam closure plan and further testing, such as classification, density and moisture testing will be required to verify capping material properties as part of quality assurance during construction. Screening or on site sorting of the material may be required to exclude oversize (>300 mm particle size) material.

Gypsum stabilisation is recommended to address the dispersive nature of the material if it is to be used as embankment or terrace construction material. Further Emerson class testing before and after mixing of gypsum may be required to ensure a suitable Emerson class number is achieved.

Preliminary contamination assessment of the material indicates that unacceptable risks to human health or ecological receptors are considered unlikely and the spoil material would be suitable for use from a contamination perspective. On-going vegetation monitoring is recommended to manage potential risks to vegetation post capping, which will be outlined in the ash dam closure plan currently being prepared.

8. References

Bulking and Subsequent Self-Weight and Saturation Settlements, and Geotechnical Stability, of Deep Coal Mine Spoil Piles, ACARP PROJECT C19022, D.J Williams, March 2015.

Spontaneous combustion in open cut coal mining spoil piles: progress toward treatment of this challenging legacy, A.R. Levanthal and J.N. Carras, 2001

ANZECC (2000), *National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)¹.

Australian Standard AS 1289, Methods of Testing Soils for Engineering Purposes.

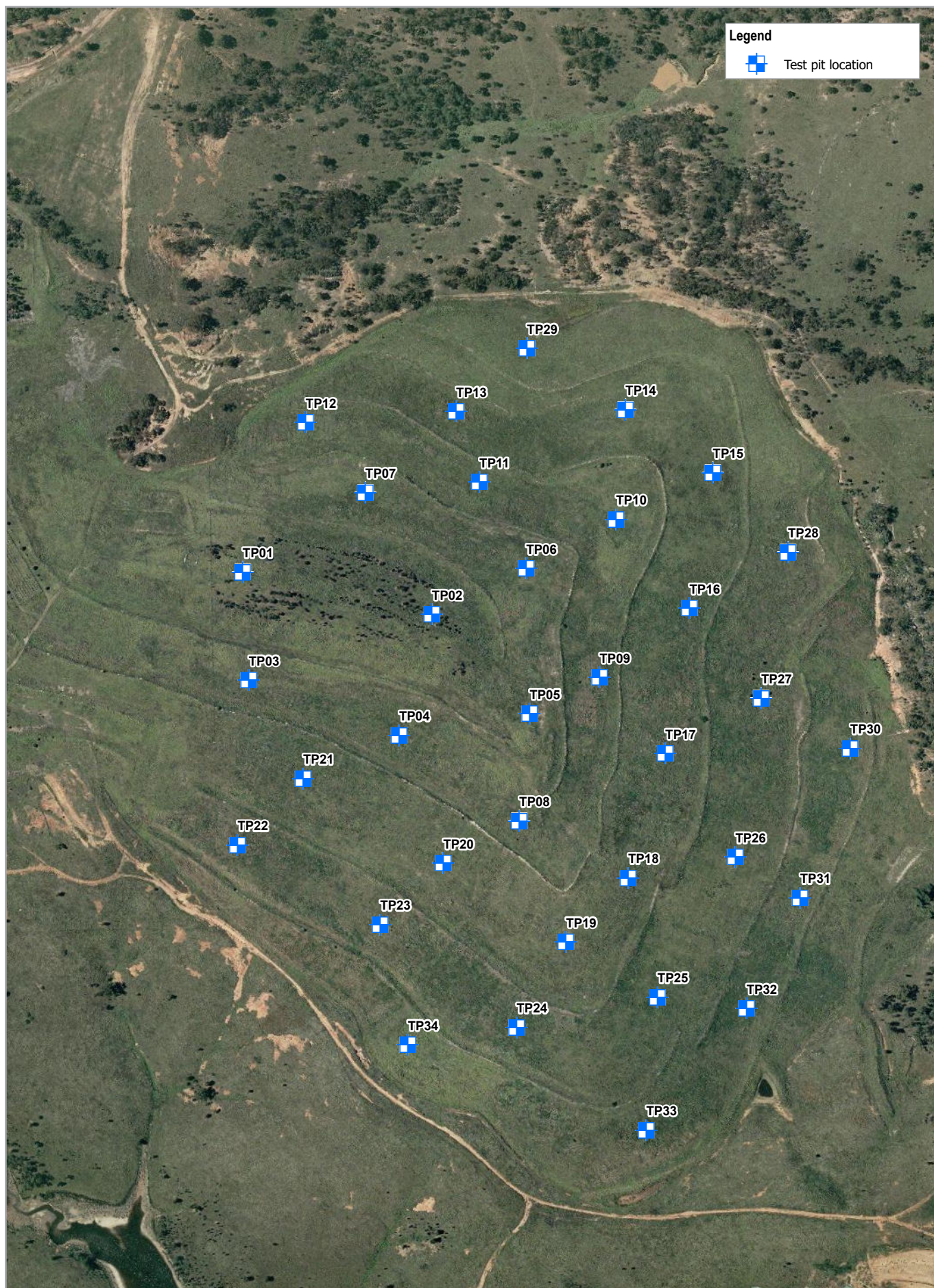
Australian Standard AS 1726-2017, Geotechnical Site Investigations

GHD (2019), Proposed Borrow Area-Mine Spoil Dump, Groundwater Assessment, Letter, dated 10 February 2020, Ref: 1509717-LET-Groundwater Assessment.

NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater* (NEPC 2013).

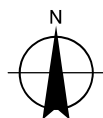
Appendices

Appendix A – Figures



Paper Size ISO A4
0 40 80 120 160
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



AGL Macquarie Pty Limited
Liddell Power Station - Proposed Borrow
Preliminary Geotechnical and Contamination Report

Project No. 12532502
Revision No. 0
Date 05/07/2021

Test pit location plan

FIGURE A-1

Appendix B – General notes and standard sheets

GENERAL NOTES



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The report contains the results of a geotechnical investigation or study conducted for a specific purpose and client. The results may not be used or relied on by other parties, or used for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the report are excluded unless they are expressly stated to apply in the report.

TEST HOLE LOGGING

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Moreover, the location of test holes should be considered approximate, unless noted otherwise (refer report). Reference should also be made to the relevant standard sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

GROUNDWATER

Unless otherwise indicated, the water depths presented on the test hole logs are the depths of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater depth may differ from this recorded depth depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this depth could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities such as a change in ground surface level. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate surveys, instrumentation techniques and monitoring programmes.

INTERPRETATION OF RESULTS

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data, often with only approximate locations (e.g. GPS). Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in ground conditions do occur in the natural environment, particularly between discrete test hole locations or available observation sites. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural processes.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to GHD for appropriate assessment and comment.

GEOTECHNICAL VERIFICATION

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system and/or to conduct monitoring as a result of this natural variability. Allowance for verification by appropriate geotechnical personnel must be recognised and programmed for construction.

FOUNDATIONS

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions must include at least all of the relevant test hole and test data, together with the appropriate Standard Description sheets and remarks made in the written report of a factual or descriptive nature.

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LABORATORY TESTING



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GENERAL

Samples extracted during the fieldwork stage of a site investigation may be “disturbed” or “undisturbed” (as generally indicated on the test hole logs) depending upon the nature and purpose of the sample as well as the method of extraction, transportation, extrusion and testing. This aspect should be taken into account when assessing test results, which must of necessity, reflect the effects of such disturbance.

All soil properties (as measured by laboratory testing) exhibit inherent variability and thus a certain statistical number of tests is required in order to predict an average property with any degree of confidence. The site variability of soil strata, future changes in moisture and other conditions and the discrete sampling positions must also be considered when assessing the representative nature of the laboratory programme.

Certain laboratory test results provide interpreted soil properties as derived by conventional mathematical procedures. The applicability of such properties to engineering design must be assessed with due regard to the site, sample condition, procedure and project in hand.

TESTING

Laboratory testing is normally carried out in accordance with Australian Standard AS 1289 as amended, or in NSW, Roads and Maritime Services (RMS) standards when specified. The routine Australian Standard tests are as follows:

Moisture Content	AS1289 2.1.1	collectively known as Atterberg Limits
Liquid Limit	AS1289 3.1.1	
Plastic Limit	AS1289 3.2.1	
Plasticity Index	AS1289 3.3.1	
Linear Shrinkage	AS1289 3.4.1	
Particle Density	AS1289 3.5.1	collectively, Dispersive Classification
Particle Size Distribution	AS1289 3.6.1, 3.6.2 and 3.6.3	
Emerson Class Number	AS1289 3.8.1	
Percent Dispersion	AS1289 3.8.2	
Pinhole Dispersion Classification	AS1289 3.8.3	
Hole Erosion (HE)	GHD Method	
No Erosion Filter (NEF)	GHD Method	
Organic Matter	AS1289 4.1.1	
Sulphate Content	AS1289 4.2.1	
pH Value	AS1289 4.3.1	
Resistivity	AS1289 4.4.1	
Standard Compaction	AS1289 5.1.1	
Modified Compaction	AS1289 5.2.1	
Dry Density Ratio	AS1289 5.4.1	
Minimum Density	AS1289 5.5.1	
Density Index	AS1289 5.6.1	
California Bearing Ratio	AS1289 6.1.1 and 6.1.2	
Shear Box	AS1289 6.2.2	
Undrained Triaxial Shear	AS1289 6.4.1 and 6.4.2	
One Dimensional Consolidation	AS1289 6.6.1	
Permeability Testing	AS1289 6.7.1, 6.7.2 and 6.7.3	

Where tests are used which are not covered by appropriate standard procedures, details are given in the report.

LABORATORIES

Our Australian laboratories are NATA accredited to AS ISO / IEC17025 for the listed tests.

The oedometer, triaxial and shear box equipment are fully automated for continuous operation using computer controlled data acquisition, processing and plotting systems.

SOIL DESCRIPTION AND CLASSIFICATION



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Soil is described in general accordance with Australian Standard AS 1726-2017 (Geotechnical Site Investigations) in terms of visual and tactile properties, with potential refinement by laboratory testing. AS 1726 defines soil as particulate materials that occur in the ground and can be disaggregated or remoulded by hand in air or water without prior soaking. Classification of the soil is undertaken following description.

SOIL DESCRIPTION

The soil description includes a) Composition, b) Condition, c) Structure, d) Origin and e) Additional observations. 'FILL', 'TOPSOIL' or a 'MIXTURE OF SOIL AND COBBLES / BOULDERS' (with dominant fraction first) is denoted at the start of a soil description where applicable.

a) Soil Composition (soil name, colour, plasticity or particle characteristics, secondary and then minor components)

Soil Name: A soil is termed a *coarse grained soil* where the dry mass of sand and gravel particles exceeds 65% of the total. Soils with more than 35% fines (silt or clay particles) are termed *fine grained soils*. The soil name is made up of the primary soil component (in BLOCK letters), prefixed by applicable secondary component qualifiers. Minor components are applied as a qualifiers to the soil name (using the words 'with' or 'trace').

Particles are differentiated on the basis of size. 'Boulders' and 'cobbles' are outside the soil particle range, though their presence (and proportions) is noted. While individual particles may be designated as silt or clay based on grain size, fine grained soils are characterised as silt or clay based on tactile behaviour or Atterberg Limits, and not the relative composition of silt or clay sized particles.

Colour: The prominent colour is noted, followed by (spotted, mottled, streaked etc.) then secondary colours as applicable. Roughly equally proportioned colours are prefixed by (spotted, mottled, streaked etc.). Colour is described in its moist condition, though both wet and dry colours may also be provided if appropriate.

Plasticity: Fine grained soils are designated within standard ranges of plasticity based on tactile assessment or laboratory assessment of the Liquid Limit.

Particle Characteristics: The particle shape, particle distribution and particle size range within a coarse grained soil is described using standard terms. Particle composition may be described using rock or mineral names, with specific terms for carbonate soils.

Secondary and Minor Components: The primary soil is described and modified by secondary and minor components, with assessed ranges as tabulated.

Carbonate Soils: Carbonate content can be assessed by use of dilute '10%' HCl solution. Resulting clear sustained effervescence is interpreted as a *Carbonate soil* (approximately >50% carbonate), while weak or sporadic effervescence indicates *Calcareous soil* (< 50% carbonate). No effervescence is interpreted as a non-calcareous soil.

Organic and Peat Soils: Where identified, organic content is noted. *Organic soil* (2% to 25% organic matter) is usually identified by colour (usually dark grey/black) and odour (i.e. 'mouldy' or hydrogen sulphide odour). *Peat* (>25% organic matter) is identified by a spongy feel and fibrous texture. Peat soils' decomposition may be described as '*fibrous*' (little / no decomposition), '*pseudo-fibrous*' (moderate decomposition) or '*amorphous*' (full decomposition).

Fraction	Components		Particle Size (mm)
Oversize	BOULDERS		> 200
	COBBLES		63 - 200
Coarse grained soil particles	GRAVEL	Coarse	19 - 63
		Medium	6.7 -19
		Fine	2.36 - 6.7
	SAND	Coarse	0.6 - 2.36
		Medium	0.21 - 0.6
		Fine	0.075 - 0.21
Fine grained soil particles	SILT		0.002 - 0.075
	CLAY		< 0.002

Plasticity Terms (Fine Grained Soils)		Laboratory Liquid Limit Range
Silt	Clay	
N/A	N/A	(Non Plastic)
Low Plasticity	Low Plasticity	≤ 35%
	Medium Plasticity	> 35% and ≤ 50%
High Plasticity	High Plasticity	> 50%

Particle Distribution Terms (Coarse Grained Soils)	
Well graded	good representation of all particle sizes
Poorly graded	one or more intermediate sizes poorly represented
Gap graded	one or more intermediate sizes absent
Uniform	essentially of one size

Particle Shape Terms (Coarse Grained Soils)		
Rounded	Sub-angular	Flaky or Platy
Sub-rounded	Angular	Elongated

Secondary and Minor Components for Coarse Grained Soils			
Fines (%)	Modifier (as applicable)	Accessory coarse (%)	Modifier (as applicable)
≤ 5	'trace silt / clay'	≤ 15	'trace sand / gravel'
> 5, ≤ 12	'with clay / silt'	> 15, ≤ 30	'with sand / gravel'
> 12	prefix 'silty / clayey'	> 30	prefix 'gravelly / sandy'

Secondary and Minor Components for Fine Grained Soils	
% Coarse	Modifier (as applicable)
≤ 15	add "trace sand / gravel"
> 15, ≤ 30	add "with sand / gravel"
> 30	prefix soil "sandy / gravelly"

SOIL DESCRIPTION AND CLASSIFICATION



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b) Soil Condition (moisture, relative density or consistency)

Moisture: Fine grained soils are described relative to plastic or liquid limits, while coarse grained soils are assessed based on appearance and feel. The observation of seepage or free water is noted on the test hole logs.

Moisture - Coarse Grained Soils			Moisture - Fine Grained Soils		
Term		Tactile Properties	Term		Tactile Properties
Dry	('D')	Non-cohesive, free running	Moist, dry of plastic limit	('w < PL')	Hard and friable or powdery
Moist	('M')	Feels cool, darkened colour, tends to stick together	Moist, near plastic limit	('w ≈ PL')	Can be moulded
			Moist, wet of plastic limit	('w > PL')	Weakened, free water forms on hands with handling
Wet	('W')	Feels cool, darkened colour, tends to stick together, free water forms when handling	Wet, near liquid limit	('w ≈ LL')	Highly weakened, tends to flow when tapped
			Wet, wet of liquid limit	('w > LL')	Liquid consistency, soil flows

Relative Density (Non Cohesive Soils): The Density Index is inherently difficult to assess by visual or tactile means, and is normally assessed by penetration testing (e.g. SPT, DCP, PSP or CPT) with published correlations. Assessment may be affected by moisture and *in situ* stress conditions. Density Index assessment may be refined by combination of *in situ* density testing and laboratory reference maximum and minimum density ranges.

Consistency (Cohesive Soils): May be assessed by direct measurement (shear vane, CPT etc.), or approximate tactile correlations. Cohesive soils include fine grained soils, and coarse grained soils with sufficient fine grained components to induce cohesive behaviour. A 'design shear strength' must consider the mode of testing, the *in situ* moisture content and potential for variations of moisture which may affect the shear strength.

Relative Density (Non-Cohesive Soils)			Consistency (Cohesive Soils)			
Term and (Symbol)		Density Index (%)	Term and (Symbol)		Tactile Properties	Undrained Shear Strength
Very Loose	(VL)	≤ 15	Very Soft	(VS)	Extrudes between fingers when squeezed	< 12 kPa
Loose	(L)	> 15 and ≤ 35	Soft	(S)	Can be moulded by light finger pressure	12 - 25 kPa
Medium Dense	(MD)	> 35 and ≤ 65	Firm	(F)	Can be moulded by strong finger pressure	25 - 50 kPa
Dense	(D)	> 65 and ≤ 85	Stiff	(St)	Cannot be moulded by fingers	50 - 100 kPa
Very Dense	(VD)	> 85	Very Stiff	(VSt)	Can be indented by thumb nail	100 - 200 kPa
Consistency assessment can be influenced by moisture variation.			Hard	(H)	Can be indented with difficulty by thumb nail	> 200 kPa
			Friable	(Fr)	Easily crumbled or broken into small pieces by hand	-

c) Structure (zoning, defects, cementing)

Zoning: The *in situ* zoning is described using the terms below. 'Intermixed' may be used for an irregular arrangement.

'layer' (a continuous zone across the exposed sample)

'pocket' (an irregular inclusion of different material).

'lens' (a discontinuous layer with lenticular shape)

'interbedded' or "interlaminated" (alternating soil types)

Defects: Described using terms below, with dimension orientation and spacing described where practical.

'parting' (an open or closed surface or crack sub parallel to layering with little / no tensile strength - open or closed)

'softened zone' (in clayey soils, usually adjacent to a defect with associated higher moisture content)

'fissure' (as per a parting, though not parallel or sub parallel to layering – may include desiccation cracks)

'tube' (tubular cavity, singly or one of a large number, often formed from root holes, animal burrows or tunnel erosion)

'sheared seam' (zone of sub parallel near planar closely spaced intersecting smooth or slickensided fissures dividing the mass into lenticular or wedge shaped blocks)

'tube cast' (an infilled tube – infill may vary from uncemented through to cemented or have rock properties)

'sheared surface' (a near planar, curved or undulating smooth, polished or slickensided surface, indicative of displacement)

'infilled seam' (sheet like soil body cutting through the soil mass, formed by infilling of open defects)

Cementation: Soils may be cemented by various substances (e.g. iron oxides and hydroxides, silica, calcium carbonate, gypsum), and the cementing agent shall be identified if practical. Cemented soils are described as:

'weakly cemented' easily disaggregated by hand in air or water

'moderately cemented' effort required to disaggregate the soil by hand in air or water

Materials extending beyond 'moderately cemented' are encompassed within the rock strength range. Where consistent cementation throughout a soil mass is identified as a duricrust, it is described in accordance with duricrust rock descriptors. Where alternate descriptors of cementation development are applied for consistency with regional practices or geology, or client requirements, these are outlined separately.

SOIL DESCRIPTION AND CLASSIFICATION



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d) Origin

An interpretation is provided based on observations of landform, geology and fabric, and may further include assignment of a stratigraphic unit. The use of terms 'possibly' or 'probably' indicates a higher degree of uncertainty regarding the assessed origin or stratigraphic unit. Typical origin descriptors include:

<i>Residual</i>	Formed directly from in situ weathering with no visible structure or fabric of the parent soil or rock.
<i>Extremely weathered</i>	Formed directly from in situ weathering, with remnant and/or fabric from the parent rock.
<i>Alluvial</i>	Deposited by streams and rivers (may be applied more generically as transported by water).
<i>Estuarine</i>	Deposited in coastal estuaries, including sediments from inflowing rivers, streams, and tidal currents.
<i>Marine</i>	Deposited in a marine environment.
<i>Lacustrine</i>	Deposited in freshwater lakes.
<i>Aeolian</i>	Transported by wind.
<i>Colluvial and Slopewash</i>	Soil and rock debris transported down slopes by gravity (with or without assistance of water). Colluvium is typically applied to thicker / localised deposits, and slopewash for thinner / widespread deposits.
<i>TOPSOIL</i>	Surficial soil, typically with high levels of organic material. Topsoils buried by other transported soils are termed ' <i>remnant topsoil</i> '. Tree roots within otherwise unaltered soil does not characterise topsoil.
<i>FILL</i>	Any material which has been placed by anthropogenic processes (i.e. human activity).

e) Additional Observations

Additional observations may be included to supplement the soil description. Additional observations may consist of notations relating to soil characteristics (odour, contamination, colour changes with time), inferred geology (with delineation of soil horizons or geological time scale) or notes on sampling and testing application (including the reliability, recovery, representativeness, or condition of samples or test conditions and limitations). If the material is assessed to be not representative, terms such as 'poor recovery', 'non-intact', 'recovered as' or 'probably' are applied.

SOIL CLASSIFICATION

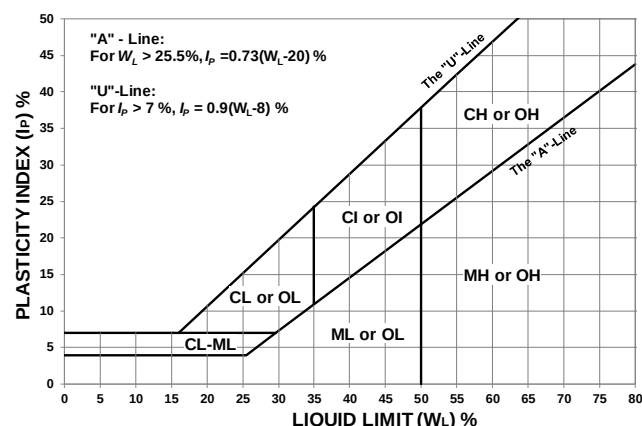
Classification allocates the material within distinct soil groups assigned a two character Group Symbol:

Coarse Grained Soils (sand and gravel: more than 65% of soil coarser than 0.075 mm)			Fine Grained Soils (silt and clay: more than 35% of soil finer than 0.075 mm)		
Major Division	Group Symbol	Soil Group	Major division	Group Symbol	Soil Group
GRAVEL (more than half of the coarse fraction is > 2.36 mm)	GW	GRAVEL, well graded	SILT and CLAY (low to medium plasticity)	ML	SILT, low plasticity
	GP	GRAVEL, poorly graded		CL	CLAY, low plasticity
	GM	Silty GRAVEL		CI	CLAY, medium plasticity
	GC	Clayey GRAVEL		OL	Organic SILT
SAND (more than half of the coarse fraction is < 2.36 mm)	SW	SAND, well graded	SILT and CLAY (high plasticity)	MH	SILT, high plasticity
	SP	SAND, poorly graded		CH	CLAY, high plasticity
	SM	Silty SAND		OH	Organic CLAY / SILT
	SC	Clayey SAND	Highly Organic	Pt	PEAT

Coarse grained soils with fines contents between 5% and 12% are provided a dual classification comprising the two group symbols separated by a dash, e.g. for a poorly graded gravel with between 5% and 12% silt fines (poorly graded 'GRAVEL with silt'), the classification is GP-GM.

For the purpose of classification, *poorly graded, uniform, or gap graded* soils are all designated as poorly graded. Soils that are dominated by boulders or cobbles are described separately and are not classified.

Classification is routinely undertaken based on tactile assessment with the soil description. Refinement of soil classification may be applied using laboratory assessment, including particle size distribution and Atterberg Limits. Atterberg Limits testing is applied to the sample portion finer than 0.425 mm. Fine grained soil components are assessed on the basis of regions defined within the Modified Casagrande Chart.



Appendix C – Engineering logs

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP01

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 29/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations Note: * indicates signatures on original issue of log or last revision of log
	Nil				CI-CH	[FILL] Sandy CLAY: medium to high plasticity, brown and orange, sand is fine to coarse grained, trace fine to coarse gravel, trace rootlets (topsoil/fill)	D	-	0.7m, Low to zero coal content
1		D Jar D	0.70		GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of sandstone/siltstone, pale grey to grey with dark grey and pale orange mottles, trace sand, fine to coarse grained, trace coal (fill)	D	MD	
2		B				2.4m, increasing gravel content, with cobbles and boulders, trace coal		L-MD	2.4m, 50 mm layer of coal
3		D				3.5m, increase in clay, becoming orange and dark red	D-M		3.5m, some coal content. Material appears weathered
4		Jar D B				4.0m, becoming silty/sandy, pale grey			
		D				4.5m, with silty (brittle) pale grey nodules, clay, trace fine sand, pale grey			
5		D	5.10 5.20		MH	SILT: pale grey and brown, with orange and red clay nodules, trace fine grained sand (fill) End of test pit at 5.2 metres. Target Depth.	D-M	L	
6									

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP01

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP02

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 29/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations Note: * indicates signatures on original issue of log or last revision of log
	Nil				CI-CH	[FILL] Sandy CLAY: medium to high plasticity, brown and orange, sand is fine to coarse grained, trace fine to coarse gravel, trace rootlets (topsoil/fill)	D	-	
1		D	0.40		GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of sandstone/siltstone, pale grey to grey with dark grey and trace pale orange, trace sand, fine to coarse grained, (fill)	D	MD	
		D	1.20		GM	[FILL] Silty GRAVEL: fine to coarse grained, yellow and pale yellow and orange and red with lime green stains, with cobbles and boulders of siltstone/sandstone (fill)	D	L-MD	
2		D	2.00		SC	[FILL] Clayey SAND: fine to coarse grained, grey to pale grey and dark grey, with fine to coarse gravel of sandstone/siltstone, with cobbles and boulders, trace silt, trace coal, (fill)	D	L	
3		D							
		B							
4		D	4.10						
						End of test pit at 4.1 metres. Refusal.			
5									
6									

See standard sheets for details of abbreviations & basis of descriptions



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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP02

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP03

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 29/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations Note: * indicates signatures on original issue of log or last revision of log
	Nil	D	0.20		CI-CH SP	[FILL] Gravelly CLAY: fine to coarse, brown to pale brown, trace rootlets [FILL] Gravelly SAND: fine to coarse grained, pale brown to yellow, gravel is fine to coarse grained, sandstone/siltstone, with silt, with cobbles and boulders, (fill)	D	-	0.2m, very low to zero coal content
1		D B							
		Jar							
2						2.0m, increase in silt content, becoming pale yellow to yellow and brown, with gravel, fine to coarse grained			
		D							
3		D				3.0m, becoming with clay, orange and red, high plasticity, with cobbles, trace coal.	M		3.0m, low coal content
4		D							
		Jar	5.00						
5		D B				End of test pit at 5 metres. Target Depth.			
6									

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP03

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP04

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 29/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil	D	0.10		CI-CH-SC	[FILL] Sandy CLAY: medium to high plasticity, dark brown and dark red, sand is fine to coarse grained, trace fine to coarse gravel, with rootlets (topsoil/fill). [FILL] Clayey SAND: fine to coarse grained, pale grey to pale brown and white, with silt, with gravel, cobbles and boulders of siltstone/sandstone (fill)	D D-M	0.1m, very low to zero coal content (small coal nodules)
1		D						
		Jar						
		B						
2		D				2.0m, trace sandstone and siltstone boulders (>500mm in length)	L-MD	
3		D						
4		D						
5		B D Jar	5.00			4.8m, with pale grey and grey siltstone boulders, trace silt 4.9m, with very hard clay nodules dark red and dark brown End of test pit at 5 metres. Target Depth.	D	
6								

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP04

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP05

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 29/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations Note: * indicates signatures on original issue of log or last revision of log
	Nil	D	0.10		CI	[FILL] Sandy CLAY: medium plasticity, brown, sand is fine to coarse grained, trace rootlets (topsoil/fill)	D	-	0.1m, high coal content
		D			GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of siltstone and coal, dark grey and pale grey with black, with fine to coarse grained sand, with cobbles and boulders (fill)	D-M	D	
1									
2		D				2.0m, with trace pale green and pale yellow			
		B							
3			3.00		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown and orange mottles, with fine to coarse grained sand (fill)	M	D	
		D							
4		Jar							
						4.5m, becoming trace gravelly			
5		B				5.0m, with trace to no gravel	D-M		
		D	5.50						
6						End of test pit at 5.5 metres. Target Depth.			

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP05

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP06

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations
	Nil	D	0.10		CI GP	[FILL] Sandy CLAY: medium plasticity, brown, sand is fine to coarse grained, trace rootlets (topsoil/fill) [FILL] GRAVEL: fine to coarse grained gravel of coal, black to grey, with silt, with sand (fill)	D	-	
1		B Jar				1.5m, with low to zero sand/silt, high gravel/boulder content, large boulders (up to 500mm)	M-D	D	1.5m, high coal content
2		D				2.5m, trace boulders			
3		D				3.0m, increase in boulder content			
4						4.0m, with boulders	M-D	L-D	
5		Jar D	5.20			4.9m, with yellow to pale brown clay and black coal, with fine to coarse grained sand, decrease in gravel and boulder content	M		
6						End of test pit at 5.2 metres. Target Depth.			

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP06

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP07

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations
	Nil				CI	[FILL] Sandy CLAY: medium plasticity, brown, sand is fine to coarse grained, trace rootlets (topsoil/fill)	D	-	
		D	0.30		GC	[FILL] GRAVEL: fine to coarse grained, grey to dark grey, some orange and red staining, with clay (fill)	D		
1		B D				0.7m, without clay, high gravel content, with trace red/orange stains, predominantly dark grey, trace silt	D		0.7m, some coal content
2		D							
3						3.0m, with boulders, with coal			
4		D				4.0m, trace clay with trace boulders, with coal			4.0m, high coal content
5		Jar B D	4.90		CI-CH	4.8m, becoming without boulders [FILL] CLAY: medium to high plasticity, brown and pale yellow to pale orange, with coal, trace silt, trace sand, fine to coarse grained	M-D		4.9m, some coal content
6			5.40			End of test pit at 5.4 metres. Target Depth.			

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP07

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP08

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GP	[FILL] Sandy Silty GRAVEL: fine to coarse grained, brown to dark brown, trace cobbles and boulders of coal, trace clay (fill)	M-D	0.0m, Test pit contains very high coal content (2 layers)
0.60		D B			GP	[FILL] GRAVEL: fine to coarse grained gravel of siltstone and coal, dark brown to black, with cobbles and boulders of coal (fill)	D	
1		D						
2		Jar	2.10		GC	[FILL] Clayey GRAVEL: fine to coarse grained, black with grey speckles, with fine to coarse grained sand, with cobbles and boulders of coal	D	
3		D B						
3.5		Jar				3.5m, with boulders of coal, orange, green and yellow staining	D	
4		D						
5		D						
5.40						5.4m, refusal on very large boulders, up to 1m in diameter End of test pit at 5.4 metres. Refusal.	D	
6								

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP08

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP09

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale brown, with rootlets (fill/topsoil)	D	0.0m, Test pit has fairly consistent coal content
					GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of siltstone, sandstone and coal, grey and pale grey, trace cobbles (fill)	D	
1		D						
		D				1.5m, becoming yellow and pale yellow grey, with clay, with coal	D-M	
2		Jar						
		D				2.5m, with coal gravel	D	
		D						
3						3.0m, 300 mm band of highly weathered material recovered as clay		
		B						
		D						
4		Jar	4.00		GP	[FILL] GRAVEL: fine to coarse grained, grey, brown, orange and black, with sand, with clay, with coal (fill)		
5		D						
			5.30					
						End of test pit at 5.3 metres. Target Depth.		
6								

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP09

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP10

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.20		CI-CH GP	[FILL] Gravelly CLAY: medium to high plasticity, dark red and brown, with roots (fill/topsoil) [FILL] GRAVEL: fine to coarse grained gravel of sandstone, siltstone and coal, mottled shiny black, pale yellow, orange and pale grey, some white, trace sand, trace cobbles and boulders, trace rootlets (fill)		0.2m, high coal content
1		D				1.4m, become pale brown and yellow with orange (ironstone) nodules, with fine to coarse grained sand		
2		B D Jar				2.0m, trace cobbles and boulders		
3		D				3.0m, increase in clay content, becoming orange to red		
4		Jar D	3.50		GC	[FILL] Clayey GRAVEL: fine to coarse grained of siltstone and carbonaceous siltstone, pale grey and dark grey, with fine to coarse grained sand, trace cobbles and boulders, trace coal (fill)		
5		D						
5.20						End of test pit at 5.2 metres. Target Depth.		
6								

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP10

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP11

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.25		CI-CH GP	[FILL] Gravelly CLAY: medium to high plasticity, brown to pale orange brown, gravel is fine to coarse grained, trace roots (fill/topsoil) [FILL] GRAVEL: fine to coarse grained gravel of sandstone/siltstone, pale grey with pale red, trace cobbles (fill)	D	0.25m, Low to zero coal content
1		D Jar B				1.4m, pale yellow to pale brown, trace roots and sticks (50mm long), trace rounded gravel, fine to coarse grained 1.8m, grey to dark grey, with fine to coarse grained sand, with boulders, trace orange/red clay nodules	D M-D	1.8m, Low coal content
2								
3		D Jar	3.00		GP	[FILL] GRAVEL: fine to coarse grained gravel and coal and siltstone, dark grey to black, with cobbles and boulders (fill)		3.0m, Increase in coal content
4		D B				4.5m, high coal content, dark grey to black, with gravel		
5		D	5.30			End of test pit at 5.3 metres. Target Depth.		
6								

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP11

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP12

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.20		CI-CH GP	[FILL] Gravelly CLAY: medium to high plasticity, dark brown and red, gravel is fine to coarse grained, trace roots (fill/topsoil) [FILL] GRAVEL: fine to coarse grained gravel of sandstone, siltstone and coal, grey and black with mottles of yellow and white, with coarse grained sand, with cobbles and boulders, trace clay (fill) 0.5m, 300mm thick band of coal 0.8m, trace cobbles and boulders up to 1000mm diameter, containing coal	D D D	0.0m, Coal content present throughout test tip
1		D Jar B						
2								
3		D Jar B D						
4			4.00			3.7m, trace clay, medium to high plasticity, orange mottles	M-D	
5						4.0m, Refusal on boulders, from 500mm to 1200mm in diameter End of test pit at 4 metres. Refusal.		
6								

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Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP12

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP13

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.20		CI-CH GM	[FILL] Gravelly CLAY: medium to high plasticity, brown to pale orange brown, gravel is fine to coarse grained, with rootlets (fill) [FILL] Sandy GRAVEL: fine to coarse grained gravel of siltstone, grey to dark grey, with orange staining, with silt, trace boulders (400-600mm) (fill)	D	0.0m, Coal content present throughout test tip
1		D						
		Jar						
		D	1.40		SC	[FILL] Clayey SAND: fine to coarse grained, grey to dark grey, with orange staining, with gravel of siltstone/sandstone and coal (fill)	D	
		B						
		D						
2								
		D						
3						3.0m, becoming brown and pale brown, with orange and black mottles		
		D						
4						4.0m, becoming dark grey, grey, dark brown, orange, red and black (highly weathered), varied materials and colours		
		D						
		Jar						
		B						
5								
		D	5.50					
						End of test pit at 5.5 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP13

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP14

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale brown, with rootlets (fill)	D	
		D			GP	[FILL] Gravelly SAND: fine to coarse grained, brown and pale brown, gravel is fine to coarse, trace boulders of sandstone and siltstone (fill)	D	0.1m, Low to zero coal content
1		D				0.6m, becoming pale grey to grey, trace clay, with cobbles and boulders		
			1.30		GC	[FILL] Gravelly CLAY: medium to high plasticity, brown to orange brown and pale brown, trace cobbles and boulders (fill)		1.3m, Zero coal content
2		Jar				2.2m, with pockets of high plasticity clay, trace silt, without boulders		
		D						
3			3.00		CI-CH	[FILL] CLAY: medium to high plasticity, orange with pale grey, red clay pockets, with sand, fine to coarse grained (fill)	M-D	
		D						
4								
		B						
5		D						
		Jar						
			5.50					
						End of test pit at 5.5 metres. Target Depth.		
6								

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP14

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP15

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

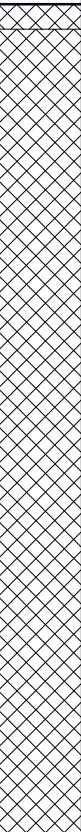
Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC GP	[FILL] Clayey GRAVEL: fine to coarse grained, brown to orange brown, with rootlets (fill) [FILL] Sandy GRAVEL: fine to coarse grained gravel of siltstone/sandstone, pale grey and grey, with clay, trace calcite, trace orange stained nodules, trace boulders (fill)	D	0.1m, Low to zero coal content
1		D B Jar						
2								
3		D D Jar B D	3.30			2.6m, with gravel of coal, with boulders 2.9m, 200 mm layer of pale grey to grey gravel		2.9m, Some coal content
4						3.3m, refusal on rock End of test pit at 3.3 metres. Refusal.		
5								
6								

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP15

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP16

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 19/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC GP	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale brown, trace cobbles (fill) [FILL] Clayey Sandy GRAVEL: fine to coarse grained gravel of siltstone, pale brown to pale grey and orange stained nodules, trace rootlets (fill)	M-D	
1		D Jar				1.0m, trace calcite	D	
2		D B						
3		D D				3.0m, with boulders of siltstone and sandstone	M-D	
4		B D				3.4m, with black gravel and cobbles of coal, with clay, trace calcite	M	3.4m, High coal content
5		Jar D B D				5.1m, decrease in coal content	M	
6			5.50			End of test pit at 5.5 metres. Target Depth.		

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP16

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP17

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
						[COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects			
	Nil		0.10		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale orange brown, trace cobbles (fill)	M-D		
		D			GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of sandstone/siltstone and coal, pale grey to grey, with fine to coarse grained sand, with cobbles, trace boulders, trace rootlets (fill)			
1									
		Jar							
		D							
		B							
2									
		D							
3									
		D							
		B							
			3.50		CI-CH	[FILL] Gravelly CLAY: medium to high plasticity, dark grey to black and orange mottles, with fine to coarse grained sand, with boulders of sandstone, siltstone and coal (fill)	M		3.5m, Some coal content
4									
		D							
		B							
5									
		D							
			5.50						
						End of test pit at 5.5 metres. Target Depth.			
6									

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP17

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP18

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC SC	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale orange brown, trace cobbles (fill) [FILL] Clayey Gravelly SAND: fine to coarse grained, pale grey, with orange mottles, with gravel of sandstone and coal, trace boulders (fill)	D D	
1								
2		Jar B D				1.7m, becoming orange to pale orange and pale red to red, with coal	M-D	1.7m, Some coal content
3		D D				2.7m, with boulders	M-D	2.7m, Some coal content
4		D B D Jar					M	4.0m, Some coal content
5			5.10			End of test pit at 5.1 metres. Target Depth.		
6								

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP18

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP19

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC GP	[FILL] Clayey GRAVEL: fine to coarse grained, brown to orange brown, trace cobbles (fill) [FILL] Sandy GRAVEL: fine to coarse grained, gravel of sandstone, siltstone and coal, grey, black and orange mottles, trace boulders (fill)	D	
1		D Jar	1.60		GP	[FILL] GRAVEL: fine to coarse grained gravel of coal, black to dark grey and orange red pale grey mottles, with clay, trace cobbles (fill)	M-D	
2		B D						
3						3.0m, increasing in coal content, trace boulders containing calcite	M-D	
4		D Jar						
5		D	5.20					
6						End of test pit at 5.2 metres. Target Depth.		

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Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP19

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP20

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GP	[FILL] Sandy GRAVEL: fine to coarse grained, brown to pale orange brown, with rootlets (fill)		
			0.30		GP	[FILL] Sandy GRAVEL: fine to coarse grained, grey and pale brown with pale orange mottles, with clay nodules, trace rootlets (fill)	D	
1		D Jar						
			1.70		GP	[FILL] GRAVEL: fine to coarse grained gravel of coal, sandstone and siltstone, dark grey to black, mottled black grey orange red, with cobbles and boulders (fill)	D	
2		D B				2.3m, decrease in coal content		
		D						
3		Jar				3.0m, with gravel of coal, dark grey and black, mottles black grey orange red, with clay, trace boulders		
		D						
4		B						
		D						
5			5.20			End of test pit at 5.2 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP20

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP21

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GP	[FILL] brown to orange brown		
					GP	[FILL] Sandy GRAVEL: fine to coarse grained, grey to dark grey with orange mottles, with boulders (fill)	D	
1		D Jar						
			1.90		GP	[FILL] GRAVEL: fine to coarse grained gravel of siltstone and coal, dark grey and black with orange and pale grey mottles, with clay (fill)	M-D	
2		D B						
			2.80		GP	[FILL] GRAVEL: coarse grained, black and dark grey to grey, orange mottles, with cobbles and boulders of siltstone and coal, trace clay (fill) 3.2m, becoming grey and pale grey, decrease in coal content	D	2.8m, Some coal content
3		D B						
			4.80		GP	[FILL] Sandy GRAVEL: fine to coarse grained gravel of coal and siltstone, grey with orange/red mottles, sand is fine to coarse grained, with cobbles and boulders, with clay (fill)	D	4.8m, Some coal content
4		D Jar B						
5			5.30					
6						End of test pit at 5.3 metres. Target Depth.		

See standard sheets for details of abbreviations & basis of descriptions



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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP21

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP22

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GP CL- CI	[FILL] Sandy GRAVEL: fine to coarse grained, brown to pale brown, with rootlets (fill) [FILL] Sandy CLAY: low to medium plasticity, brown with orange grey and black mottles, sand is fine to coarse grained, with fine to coarse grained gravel of coal, siltstone, trace rootlets (fill)	M-D	
1		D Jar						
2		D B						
3		D B	3.00		GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of coal and siltstone, brown to pale brown with orange grey red mottles, clay is medium to high plasticity, trace cobbles (fill)	M	
4		D Jar						
5		D B						
5.40						End of test pit at 5.4 metres. Target Depth.		
6								

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Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP22

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP23

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 31/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
						[COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects			
	Nil		0.10		GP GP	[FILL] Sandy GRAVEL: fine to coarse grained, brown to pale brown, with roots (fill) [FILL] Sandy GRAVEL: fine to coarse grained gravel for sandstone, siltstone and trace coal, brown to pale grey, with red and orange mottles, with pockets of clay, trace cobbles (fill)	D		
1		D B Jar D							
2		D							
3		D				3.0m, brown and grey mottled red and pink, with boulders, with organics	M		
4		B D				4.0m, increase in coal content			
5		D Jar							
			5.40			End of test pit at 5.4 metres. Target Depth.			
6									

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Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP23

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP24

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GP SC	[FILL] Clayey GRAVEL: fine to coarse grained, brown to pale brown (fill) [FILL] Clayey SAND: fine to coarse grained, brown to pale grey, with orange stains and trace black, with fine to coarse gravel of siltstone and trace coal, with organics (fill)	D-M	
1		D Jar				1.5m, increasing coal content	M	
2		D B	2.00			[FILL] Clayey GRAVEL: medium to coarse grained gravel of coal, black and some pale grey, with orange stains, with fine to coarse grained sand, trace cobbles and boulders (fill)		
3								
4		Jar D				4.0m, increasing coal content, with boulders of clay (300mm diameter)		
5		B D	5.30					
6						End of test pit at 5.3 metres. Target Depth.		

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP24

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP25

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GP	[FILL] Clayey Sandy GRAVEL: fine to coarse grained gravel of sandstone and siltstone, trace coal, pale brown with orange red and pale grey mottles, sand is fine to coarse grained, trace cobbles, trace rootlets (fill)	D	
1		D Jar						
2		D B				2.0m, becoming brown, with boulders		
3		D				2.5m, increase in organic material		
4		D Jar B				3.0m, increase in coal content, becoming dark brown to brown and black		
5		D	5.00		GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of coal, trace boulders		
6			5.40			End of test pit at 5.4 metres. Target Depth.		

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP25

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP26

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GP	[FILL] Clayey Sandy GRAVEL: fine to coarse grained gravel of sandstone and siltstone, grey to pale grey with orange and red mottles, sand is fine to coarse grained, trace coal gravel (fill)	D	
1		D Jar	1.00		SC	[FILL] Clayey SAND: fine to coarse grained sand, grey to pale grey with orange red mottles, with fine to coarse grained gravel of siltstone, trace coal (fill)	M	
2		D B						
3		D						
4		D Jar B				3.5m, with gravel of coal, trace boulders, with organics	M	
5		D						
5.40						End of test pit at 5.4 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



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Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP26

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP27

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GC	[FILL] Clayey GRAVEL: fine to coarse grained of siltstone/sandstone and trace coal, grey and pale grey with orange and black mottles, with fine to coarse grained sand, trace rootlets (fill)	D	
1		D Jar				1.0m, with gravel of coal	M-D	
		D				1.5m, with gravel of coal and clay	M	
2		B						
		D						
3			3.00		CI	[FILL] Gravelly CLAY: medium plasticity, dark brown to brown, orange and red mottles, fine to coarse grained gravel of siltstone and coal (fill)	M	
		D						
4		Jar				3.8m, trace boulders		
						4.2m, increase in coal content		
		B						
		D						
5			5.40					
						End of test pit at 5.4 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP27

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP28

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of sandstone and siltstone, trace coal, grey to pale grey, with fine to coarse grained sand, trace rootlets (fill)	D	
1		D Jar						
2		D B						
3		D	2.80		SC	[FILL] Clayey SAND: fine to coarse grained, grey to pale grey, with fine to coarse gravel, trace boulders, with calcite, trace gravel of coal (fill)	M	
4		D B Jar						
5		D B	5.10					
6						End of test pit at 5.1 metres. Target Depth.		

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Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP28

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP29

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 30/10/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil							Note: * indicates signatures on original issue of log or last revision of log
		D	0.20		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown, trace rootlets (fill)		
		D			GP	[FILL] Sandy GRAVEL: fine to coarse grained gravel for sandstone/siltstone, grey and pale grey, minor orange staining, with boulders, trace clay (fill)	D	0.2m, low to zero coal content
1		Jar						
		D				1.5m, trace clay, orange staining	D	1.5m, low coal content
2		B						
		D				3.0m, trace clay, orange and red staining, trace coal gravel	D	3.0m, increasing coal content
3								
		Jar				4.1m, with gravel of coal	D	4.0m, some coal content
4		D						
		B						
		D	4.90					
5						End of test pit at 4.9 metres. Target Depth.		
6								

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP29

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP30

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.10		GC GP	[FILL] Clayey GRAVEL: fine to coarse grained, brown, trace roots (fill) [FILL] Sandy Clayey GRAVEL: fine to coarse grained gravel of siltstone and coal, grey to dark grey with pale grey and orange stains, fine to coarse grained sand, trace cobbles and boulders, trace roots (fill)	D	
1		D Jar B				1.0m, becoming pale yellow to pale grey, with clay, trace boulders	M	
2		D B D				2.0m, becoming darker pale yellow to pale grey, trace boulders		
3		D Jar						
4		B D	3.80		CI	[FILL] Gravelly CLAY: medium plasticity, pale grey to brown, fine to coarse grained gravel, with fine to coarse grained sand, trace boulders, trace coal (fill) 4.2m, increase in coal content, with orange mottles	M	
5		D	4.90		CI	[FILL] Gravelly CLAY: medium plasticity, black to dark brown and orange mottles, fine to coarse gravel of coal (fill)	M	
6			5.30			End of test pit at 5.3 metres. Target Depth.		

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP30

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP31

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil		0.30		GC	[FILL] Clayey GRAVEL: fine to coarse grained, brown, trace roots (fill)	D	
1		D			GP	[FILL] Sandy GRAVEL: fine to coarse grained gravel of siltstone, trace coal, pale grey to dark grey, some orange staining, with cobbles and boulders, trace clay, (fill)	D	
2		B D				2.0m, increase in coal content, with clay		
3		D				3.0m, increase in coal gravel,		
4		Jar D B	3.70		GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of siltstone and, coal, black to dark grey with orange, with cobbles and boulders up to 600mm diameter (fill)		
5			5.10			End of test pit at 5.1 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



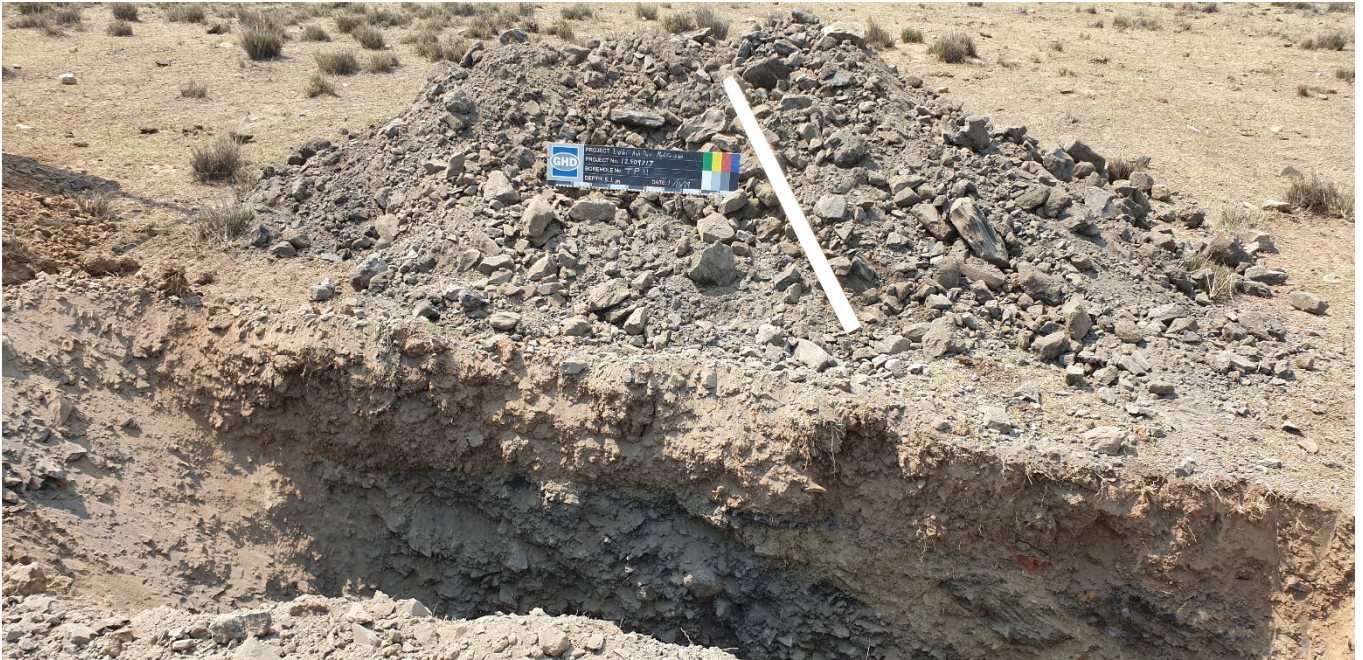
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Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP31

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP32

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments Observations
	Nil				CI	[FILL] Gravelly CLAY: medium plasticity, brown, gravel is fine to coarse grained, trace roots (fill)	D		
0.50		D Jar			GP	[FILL] Sandy GRAVEL: fine to coarse grained gravel of siltstone, sandstone and coal, brown and grey, sand is fine to coarse grained, trace clay (fill)	D	L	
2.00		D B			GC	[FILL] Clayey Sandy GRAVEL: fine to coarse grained gravel of siltstone, sandstone and coal, black and brown with orange and pale grey mottles, with fine to coarse grained sand, with cobbles and boulders (fill)	M	L	
4.00		D Jar B D			CI	[FILL] Gravelly CLAY: medium plasticity, pale grey and grey, with fine to coarse grained sand, fine to coarse grained gravel (fill)	M	MD-D	
5.30						End of test pit at 5.3 metres. Target Depth.			

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP32

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP33

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				GP	[FILL] Sandy GRAVEL: fine to coarse grained, brown to pale brown to grey with orange mottles, with clay, with roots (fill)	D	
1		D						0.5m, strong organic odour
		Jar						
		D						
2		B				1.9m, with gravel of coal, with clay, with roots	M	
		D						
3								
		D				3.0m, increasing in boulder content, trace calcite, high coal gravel content, with roots	M	
		Jar						
4			4.10		CI	[FILL] Gravelly CLAY: medium plasticity, brown with orange and black mottles, fine to corae grained gravel of calcite, trace boulders of calcite (fill)	M	
		D						
5								
		D	5.40					
6						End of test pit at 5.4 metres. Target Depth.		

See standard sheets for details of abbreviations & basis of descriptions



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Job No.

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AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP33

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

TEST PIT LOG SHEET

Client: AGL Macquaire

Project: Liddell Ash Dam Modification

Location: Liddell Power Station, NSW

HOLE No. TP34

SHEET 1 OF 1

Position: Refer to test location plan

Surface RL: Not recorded

Processed: MP

Method of Exploration: 29T Excavator

Hole Size: 600 x 3000

Checked: AWJ

Date: 01/11/19

Logged by: DP

Date: 20/11/2019

Scale (m)	Water	Samples & Tests	Depth (RL) metres	Graphic Log	USC Symbol	Material Description [COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition Consistency / Density Index	Comments Observations
	Nil				CI	[FILL] Sandy Gravelly CLAY: medium plasticity, brown and black and with pale grey and orange mottles, fine to coarse grained gravel of coal, trace rootlets (fill)	M	
0.40		D			GC	[FILL] Clayey GRAVEL: fine to coarse grained gravel of coal, black and dark brown with red and orange staining, trace rootlets (fill)	M	0.4m, Some coal content
1								
		Jar B						
2		D						
2.50					GP	[FILL] GRAVEL: fine to coarse grained gravel of coal, black and brown, with clay (fill)		2.5m, High coal content, very consistent
3		D						
4								
		D Jar B						
5								
5.40								
						End of test pit at 5.4 metres. Target Depth.		
6								

See standard sheets for details of abbreviations & basis of descriptions



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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12509717



AGL Macquarie
Liddell Ash Dam Modification
Geotechnical Investigation
Test Pit Photographs – TP34

Job no.	12509717
File ref.	-
Scale	N/A
Date	November 2019

Appendix D – Laboratory test reports

100

Chris.Gillmore@qhd.com,
Howard.bridgman@qhd.com,
Barry.wyatt@onesight.com

[illegible]

Enviro Sample Vic

From: Andrew Black
Sent: Thursday, 7 November 2019 10:38 AM
To: Enviro Sample Vic
Subject: FW: GHD project ref: 12509717
Attachments: Updated 12509717 Chain Of Custody Record.pdf

Here you go Canh, analysis now updated.

Andrew Black
Phone: +61 410 220 750
Email: AndrewBlack@eurofins.com

From: Howard Bridgman [mailto:Howard.Bridgman@ghd.com]
Sent: Thursday, 7 November 2019 10:36 AM
To: #AU08_EnviroSampleNTL; Andrew Black
Cc: Amy Wynne Jones; Chris.Gilmore@ghd.com; Dominic.Piekaar@ghd.com
Subject: RE: GHD project ref: 12509717

EXTERNAL EMAIL*

Sample receipt

Updated COC analysis request for 12509717

regards

Howard Bridgman
BE(Environmental) CEnvP (SC)
Technical Director – Contamination Assessment and Remediation

GHD

Proudly employee owned

T: +61 2 4979 9043 | M: 0410 331 845 | E: howard.bridgman@ghd.com

From: EnviroSampleNTL@eurofins.com <EnviroSampleNTL@eurofins.com>
Sent: Wednesday, 6 November 2019 4:22 PM
To: Howard Bridgman <Howard.Bridgman@ghd.com>; Dominic Piekaar <Dominic.Piekaar@ghd.com>
Cc: Amy Wynne Jones <Amy.WynneJones@ghd.com>
Subject: RE: GHD project ref: 12509717

Hi Howard,

No problem at all. Thank you.

Kind Regards,

Ruvimbo Timba

Enviro Sample NTL

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD	Contact Name : Project Manager : Chris Gilmore	Purchase Order : PROJECT Number : 12506717	COC Number : Eurofins mgt quote ID :
Office Address : Level 3, 24 Honeysuckle Drive Newcastle	Email for results : Chris.Gilmore@ghd.com	PROJECT Name : Liddell Ash Dam Modification	Data output format :

Special Directions & Comments :

Eurofins | mgt DI water batch number:

Analytes				Some common holding times (with correct preservation). For further information contact the lab									
				Waters					Soils				
				BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days						
				TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days						
				Heavy Metals	6 months	Heavy Metals	6 months						
				Mercury, CrVI	28 days	Mercury, CrVI	28 days						
				Microbiological testing	24 hours	Microbiological testing	72 hours						
				BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days						
				Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, QS	24 hours						
				Ferrous Iron	7 days	ASLP, TOLP	7 days						
				Containers:							Sample comments :		
				1LP	250P	125P	1LA	40mL vial	125mL A	Jar			
1	TP01_1.0	29/10/2019	Soil										
2	TP01_4.0	29/10/2019	Soil										
3	TP02 (depth on jar)	29/10/2019	Soil										
4	TP02 (depth on jar)	29/10/2019	Soil										
5	TP03_1.5	29/10/2019	Soil										
6	TP03_5.0	29/10/2019	Soil										
7	TP04 (depth on jar)	29/10/2019	Soil										
8	TP04 (depth on jar)	29/10/2019	Soil										
9	TP05 (depth on jar)	29/10/2019	Soil										
10	TP05_3.5	29/10/2019	Soil										
11	TP06_1.5	30/10/2019	Soil										
12	TP06_5.0	30/10/2019	Soil										
13	TP07 (depth on jar)	30/10/2019	Soil										
14	TP07_5.0	30/10/2019	Soil										
15	TP08_2.2	30/10/2019	Soil										
16	TP08_3.4	30/10/2019	Soil										
17	TP09_1.8	30/10/2019	Soil										
18	TP09_4.2	30/10/2019	Soil										
19	TP10_2.2	30/10/2019	Soil										
20	TP10_4.0	30/10/2019	Soil										
21	TP11_0.7	30/10/2019	Soil										
22	TP11_3.5	30/10/2019	Soil										
23	TP12_2.4	30/10/2019	Soil										
24	TP12_3.5	30/10/2019	Soil										
25	TP13_1.2	30/10/2019	Soil										
26	TP13_4.8	30/10/2019	Soil										
27	TP14_2.1	31/10/2019	Soil										
28	TP14_5.1	31/10/2019	Soil										
29	TP15_1.5	31/10/2019	Soil										
30	TP15_3.1	31/10/2019	Soil										
31	TP16_1.2	31/10/2019	Soil										
32	TP16_4.5	31/10/2019	Soil										
33	TP17_1.3	31/10/2019	Soil										
34	TP17 (depth on jar)	31/10/2019	Soil										
35	TP18_1.8	31/10/2019	Soil										
36	TP18_5.0	31/10/2019	Soil										
37	TP19_1.2	31/10/2019	Soil										
38	TP19_3.8	31/10/2019	Soil										
39	TP20_0.8	31/10/2019	Soil										
40	TP20_3.5	31/10/2019	Soil										
41	TP21_1.0	31/10/2019	Soil										
42	TP21_4.9	31/10/2019	Soil										
43	TP22_1.0	31/10/2019	Soil										
44	TP22_4.0	31/10/2019	Soil										
45	TP23_1.2	31/10/2019	Soil										
46	TP23_5.1	31/10/2019	Soil										
47	TP24_1.0	1/11/2019	Soil										
48	TP24_3.8	1/11/2019	Soil										
49	TP25_0.8	1/11/2019	Soil										
50	TP25_4.2	1/11/2019	Soil										
51	TP26_0.9	1/11/2019	Soil										
52	TP26_3.9	1/11/2019	Soil										
53	TP27_0.7	1/11/2019	Soil										
54	TP27_4.0	1/11/2019	Soil										
55	TP28_1.0	1/11/2019	Soil										
56	TP28_3.7	1/11/2019	Soil										
57	TP29_0.7	30/10/2019	Soil										
58	TP30_0.6	1/11/2019	Soil										
59	TP30_3.3	1/11/2019	Soil										
60	TP31_4.0	1/11/2019	Soil										
61	TP32_0.7	1/11/2019	Soil										
62	TP32_4.4	1/11/2019	Soil										
63	TP33_1.4	1/11/2019	Soil										
64	TP33_3.8	1/11/2019	Soil										
65	TP34_1.4	1/11/2019	Soil										
66	TP34_4.5	1/11/2019	Soil										

Relinquished By:	Received By: RTMUBA	Turn around time	Method Of Shipment	Temperature on arrival:
Date & Time: 5/11/19	Date & Time: 5/11/19 15:00pm	1 DAY ☐ 2 DAY ☐ 3 DAY ☐ 5 DAY ☐ 10 DAY ☐ Other: ☐	☐ Courier ☐ Hand Delivered ☐ Post Cooling Container #:	Date/Time: 5/11/19 15:00pm Chilled: ☒ Yes ☐ No Temp: 7.8
Signature: [Signature]	Signature: [Signature]			Report number: 7.6 10.3

Enviro Sample Vic

From: Andrew Black
Sent: Wednesday, 6 November 2019 3:44 PM
To: Enviro Sample Vic
Subject: FW: GHD project ref: 12509717

Hey Canh

It's on hold at the moment for that one you were asking about earlier today from GHD.

Andrew Black
Phone: +61 410 220 750
Email: AndrewBlack@eurofins.com

From: #AU08_EnviroSampleNTL
Sent: Wednesday, 6 November 2019 3:44 PM
To: Andrew Black
Subject: FW: GHD project ref: 12509717

From: Howard Bridgman [<mailto:Howard.Bridgman@ghd.com>]
Sent: Wednesday, 6 November 2019 3:42 PM
To: #AU08_EnviroSampleNTL; Dominic.Piekaar@ghd.com
Cc: Amy Wynne Jones
Subject: RE: GHD project ref: 12509717

Sample receipt – please place on hold at present I will advise tomorrow on the analysis- apologies for the delay

Howard Bridgman
BE(Environmental) CEnvP (SC)
Technical Director – Contamination Assessment and Remediation

GHD
Proudly employee owned
T: +61 2 4979 9043 | M: 0410 331 845 | E: howard.bridgman@ghd.com

From: EnviroSampleNTL@eurofins.com <EnviroSampleNTL@eurofins.com>
Sent: Tuesday, 5 November 2019 2:09 PM
To: [Dominic Piekaar <Dominic.Piekaar@ghd.com>](mailto:Dominic.Piekaar@ghd.com)
Cc: [Howard Bridgman <Howard.Bridgman@ghd.com>](mailto:Howard.Bridgman@ghd.com); [Amy Wynne Jones <Amy.WynneJones@ghd.com>](mailto:Amy.WynneJones@ghd.com)
Subject: RE: GHD project ref: 12509717

Hi Dominic,

Thank you for getting back to me. I notice there is no analysis selected, would you like these samples placed on hold for the time being?

From: Dominic.Piekaar@ghd.com [<mailto:Dominic.Piekaar@ghd.com>]
Sent: Tuesday, 5 November 2019 1:59 PM
To: #AU08_EnviroSampleNTL

Sample Receipt Advice

Company name: **GHD Pty Ltd NEWCASTLE**
Contact name: Howard Bridgman
Project name: LIDDELL ASH DAM MODIFICATION
Project ID: 12509717
COC number: Not provided
Turn around time: 5 Day
Date/Time received: Nov 7, 2019 10:36 AM
Eurofins reference: **686797**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins
Sample Receipt : 8.6 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Split sample sent to requested external lab.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Received extra samples TP29_4.0 and TP31_0.7.

Contact notes

If you have any questions with respect to these samples please contact:

Andrew Black on Phone : (+61) 2 9900 8490 or by e.mail: AndrewBlack@eurofins.com

Results will be delivered electronically via e.mail to Howard Bridgman - howard.bridgman@ghd.com.

GHD Pty Ltd
3/24 Honeysuckle Dve
Newcastle
NSW 2300



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: **Howard Bridgman**

Report **686797-S**
Project name **LIDDELL ASH DAM MODIFICATION**
Project ID **12509717**
Received Date **Nov 07, 2019**

Client Sample ID			TP01 4.0	TP02_3.5	TP04_5.0	TP06 1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08942	M19-No08943	M19-No08944	M19-No08945
Date Sampled			Oct 29, 2019	Oct 29, 2019	Oct 29, 2019	Oct 30, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	-	-
TRH C10-C14	20	mg/kg	< 20	-	-	-
TRH C15-C28	50	mg/kg	< 50	-	-	-
TRH C29-C36	50	mg/kg	< 50	-	-	-
TRH C10-C36 (Total)	50	mg/kg	< 50	-	-	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	-	-
Toluene	0.1	mg/kg	< 0.1	-	-	-
Ethylbenzene	0.1	mg/kg	< 0.1	-	-	-
m&p-Xylenes	0.2	mg/kg	< 0.2	-	-	-
o-Xylene	0.1	mg/kg	< 0.1	-	-	-
Xylenes - Total	0.3	mg/kg	< 0.3	-	-	-
4-Bromofluorobenzene (surr.)	1	%	85	-	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	-	-	-
TRH C6-C10	20	mg/kg	< 20	-	-	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	-	-	-
TRH >C10-C16	50	mg/kg	< 50	-	-	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	-	-	-
TRH >C16-C34	100	mg/kg	< 100	-	-	-
TRH >C34-C40	100	mg/kg	< 100	-	-	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	-	-	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	-	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	-	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	-	-
Acenaphthene	0.5	mg/kg	< 0.5	-	-	-
Acenaphthylene	0.5	mg/kg	< 0.5	-	-	-
Anthracene	0.5	mg/kg	< 0.5	-	-	-
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	-	-
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	-	-
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	-	-	-
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	-	-	-
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	-	-
Chrysene	0.5	mg/kg	< 0.5	-	-	-

Client Sample ID			TP01 4.0	TP02_3.5	TP04_5.0	TP06 1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08942	M19-No08943	M19-No08944	M19-No08945
Date Sampled			Oct 29, 2019	Oct 29, 2019	Oct 29, 2019	Oct 30, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	-	-	-
Fluoranthene	0.5	mg/kg	< 0.5	-	-	-
Fluorene	0.5	mg/kg	< 0.5	-	-	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	-	-	-
Naphthalene	0.5	mg/kg	< 0.5	-	-	-
Phenanthrene	0.5	mg/kg	< 0.5	-	-	-
Pyrene	0.5	mg/kg	< 0.5	-	-	-
Total PAH*	0.5	mg/kg	< 0.5	-	-	-
2-Fluorobiphenyl (surr.)	1	%	72	-	-	-
p-Terphenyl-d14 (surr.)	1	%	85	-	-	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	280	160	99
Total Organic Carbon	0.1	%	0.7	-	-	-
Sulphur	5	mg/kg	370	-	-	-
% Moisture	1	%	7.3	21	17	7.4
Heavy Metals						
Arsenic	2	mg/kg	3.6	-	-	-
Beryllium	2	mg/kg	< 2	-	-	-
Boron	10	mg/kg	< 10	-	-	-
Cadmium	0.4	mg/kg	< 0.4	-	-	-
Chromium	5	mg/kg	16	-	-	-
Cobalt	5	mg/kg	11	-	-	-
Copper	5	mg/kg	21	-	-	-
Lead	5	mg/kg	16	-	-	-
Manganese	5	mg/kg	240	-	-	-
Mercury	0.1	mg/kg	< 0.1	-	-	-
Nickel	5	mg/kg	36	-	-	-
Selenium	2	mg/kg	< 2	-	-	-
Zinc	5	mg/kg	63	-	-	-

Client Sample ID			TP08 2.2	TP08 3.4	TP11 3.5	TP13 1.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08946	M19-No08947	M19-No08948	M19-No08949
Date Sampled			Oct 30, 2019	Oct 30, 2019	Oct 30, 2019	Oct 30, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	< 20	-
TRH C10-C14	20	mg/kg	-	110	38	-
TRH C15-C28	50	mg/kg	-	900	340	-
TRH C29-C36	50	mg/kg	-	350	150	-
TRH C10-C36 (Total)	50	mg/kg	-	1360	528	-
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	-
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	-
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	-	84	96	-

Client Sample ID			TP08 2.2	TP08 3.4	TP11 3.5	TP13 1.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08946	M19-No08947	M19-No08948	M19-No08949
Date Sampled			Oct 30, 2019	Oct 30, 2019	Oct 30, 2019	Oct 30, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	-	< 0.5	< 0.5	-
TRH C6-C10	20	mg/kg	-	< 20	< 20	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	-	< 20	< 20	-
TRH >C10-C16	50	mg/kg	-	190	67	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	-	190	67	-
TRH >C16-C34	100	mg/kg	-	960	370	-
TRH >C34-C40	100	mg/kg	-	130	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	-	1280	437	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	0.6	0.6	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.2	1.2	-
Acenaphthene	0.5	mg/kg	-	< 0.5	< 0.5	-
Acenaphthylene	0.5	mg/kg	-	< 0.5	< 0.5	-
Anthracene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benz(a)anthracene	0.5	mg/kg	-	0.6	< 0.5	-
Benzo(a)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(g,h,i)perylene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	-
Chrysene	0.5	mg/kg	-	0.7	0.5	-
Dibenz(a,h)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	-
Fluoranthene	0.5	mg/kg	-	1.3	0.7	-
Fluorene	0.5	mg/kg	-	< 0.5	< 0.5	-
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Naphthalene	0.5	mg/kg	-	< 0.5	< 0.5	-
Phenanthrene	0.5	mg/kg	-	1.4	0.8	-
Pyrene	0.5	mg/kg	-	1.2	0.6	-
Total PAH*	0.5	mg/kg	-	5.2	2.6	-
2-Fluorobiphenyl (surr.)	1	%	-	69	74	-
p-Terphenyl-d14 (surr.)	1	%	-	77	94	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	260	-	500	230
Total Organic Carbon	0.1	%	-	26	6.4	-
Sulphur	5	mg/kg	-	2900	910	-
% Moisture	1	%	23	7.0	7.8	10
Heavy Metals						
Arsenic	2	mg/kg	-	< 2	2.9	-
Beryllium	2	mg/kg	-	< 2	< 2	-
Boron	10	mg/kg	-	< 10	< 10	-
Cadmium	0.4	mg/kg	-	< 0.4	< 0.4	-
Chromium	5	mg/kg	-	26	18	-
Cobalt	5	mg/kg	-	10	18	-
Copper	5	mg/kg	-	31	26	-
Lead	5	mg/kg	-	11	13	-
Manganese	5	mg/kg	-	240	150	-
Mercury	0.1	mg/kg	-	< 0.1	< 0.1	-
Nickel	5	mg/kg	-	56	73	-
Selenium	2	mg/kg	-	< 2	< 2	-
Zinc	5	mg/kg	-	55	76	-

Client Sample ID			TP14 2.1 Soil M19-No08950 Oct 31, 2019	TP17_4.0 Soil M19-No08951 Oct 31, 2019	TP19 1.2 Soil M19-No08952 Oct 31, 2019	TP20 3.5 Soil M19-No08953 Oct 31, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	-	-
TRH C10-C14	20	mg/kg	< 20	-	-	-
TRH C15-C28	50	mg/kg	< 50	-	-	-
TRH C29-C36	50	mg/kg	< 50	-	-	-
TRH C10-C36 (Total)	50	mg/kg	< 50	-	-	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	-	-
Toluene	0.1	mg/kg	< 0.1	-	-	-
Ethylbenzene	0.1	mg/kg	< 0.1	-	-	-
m&p-Xylenes	0.2	mg/kg	< 0.2	-	-	-
o-Xylene	0.1	mg/kg	< 0.1	-	-	-
Xylenes - Total	0.3	mg/kg	< 0.3	-	-	-
4-Bromofluorobenzene (surr.)	1	%	92	-	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	-	-	-
TRH C6-C10	20	mg/kg	< 20	-	-	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	-	-	-
TRH >C10-C16	50	mg/kg	< 50	-	-	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	-	-	-
TRH >C16-C34	100	mg/kg	< 100	-	-	-
TRH >C34-C40	100	mg/kg	< 100	-	-	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	-	-	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	-	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	-	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	-	-
Acenaphthene	0.5	mg/kg	< 0.5	-	-	-
Acenaphthylene	0.5	mg/kg	< 0.5	-	-	-
Anthracene	0.5	mg/kg	< 0.5	-	-	-
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	-	-
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	-	-
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	-	-	-
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	-	-	-
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	-	-
Chrysene	0.5	mg/kg	< 0.5	-	-	-
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	-	-	-
Fluoranthene	0.5	mg/kg	< 0.5	-	-	-
Fluorene	0.5	mg/kg	< 0.5	-	-	-
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5	-	-	-
Naphthalene	0.5	mg/kg	< 0.5	-	-	-
Phenanthrene	0.5	mg/kg	< 0.5	-	-	-
Pyrene	0.5	mg/kg	< 0.5	-	-	-
Total PAH*	0.5	mg/kg	< 0.5	-	-	-
2-Fluorobiphenyl (surr.)	1	%	69	-	-	-
p-Terphenyl-d14 (surr.)	1	%	93	-	-	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	470	170	440
Total Organic Carbon	0.1	%	0.2	-	-	-
Sulphur	5	mg/kg	720	-	-	-
% Moisture	1	%	11	9.9	10	16

Client Sample ID			TP14 2.1	TP17_4.0	TP19 1.2	TP20 3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08950	M19-No08951	M19-No08952	M19-No08953
Date Sampled			Oct 31, 2019	Oct 31, 2019	Oct 31, 2019	Oct 31, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	4.3	-	-	-
Beryllium	2	mg/kg	< 2	-	-	-
Boron	10	mg/kg	< 10	-	-	-
Cadmium	0.4	mg/kg	< 0.4	-	-	-
Chromium	5	mg/kg	120	-	-	-
Cobalt	5	mg/kg	32	-	-	-
Copper	5	mg/kg	35	-	-	-
Lead	5	mg/kg	11	-	-	-
Manganese	5	mg/kg	650	-	-	-
Mercury	0.1	mg/kg	< 0.1	-	-	-
Nickel	5	mg/kg	180	-	-	-
Selenium	2	mg/kg	< 2	-	-	-
Zinc	5	mg/kg	77	-	-	-

Client Sample ID			TP21 4.9	TP22 1.0	TP24 1.0	TP26 3.9
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08954	M19-No08955	M19-No08956	M19-No08957
Date Sampled			Oct 31, 2019	Oct 31, 2019	Nov 01, 2019	Nov 01, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	-	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	-	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	-	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	-	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	-	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	-	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	-	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	-	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	-	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	93	-	86	87
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	-	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	-	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	-	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	-	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	-	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	-	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	-	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5

Client Sample ID			TP21 4.9 Soil M19-No08954 Oct 31, 2019	TP22 1.0 Soil M19-No08955 Oct 31, 2019	TP24 1.0 Soil M19-No08956 Nov 01, 2019	TP26 3.9 Soil M19-No08957 Nov 01, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Anthracene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	-	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	79	-	87	90
p-Terphenyl-d14 (surr.)	1	%	94	-	101	106
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	440	250	520
Total Organic Carbon	0.1	%	1.2	-	1.8	3.7
Sulphur	5	mg/kg	660	-	670	720
% Moisture	1	%	12	9.7	11	12
Heavy Metals						
Arsenic	2	mg/kg	3.3	-	3.1	4.5
Beryllium	2	mg/kg	< 2	-	< 2	< 2
Boron	10	mg/kg	< 10	-	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	-	< 0.4	< 0.4
Chromium	5	mg/kg	28	-	89	26
Cobalt	5	mg/kg	18	-	42	18
Copper	5	mg/kg	24	-	48	23
Lead	5	mg/kg	15	-	7.1	12
Manganese	5	mg/kg	280	-	900	300
Mercury	0.1	mg/kg	< 0.1	-	< 0.1	< 0.1
Nickel	5	mg/kg	85	-	230	74
Selenium	2	mg/kg	< 2	-	< 2	< 2
Zinc	5	mg/kg	72	-	78	62

Client Sample ID			TP28 3.7 Soil M19-No08958 Nov 01, 2019	TP30 3.3 Soil M19-No08959 Nov 01, 2019	TP32 0.7 Soil M19-No08960 Nov 01, 2019	TP33 1.4 Soil M19-No08961 Nov 01, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	-	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	-	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	-	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	-	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	-	< 50

Client Sample ID			TP28 3.7	TP30 3.3	TP32 0.7	TP33 1.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08958	M19-No08959	M19-No08960	M19-No08961
Date Sampled			Nov 01, 2019	Nov 01, 2019	Nov 01, 2019	Nov 01, 2019
Test/Reference	LOR	Unit				
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	104	61	-	93
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	-	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	-	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	-	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	-	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	-	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	-	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	-	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	-	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	85	82	-	87
p-Terphenyl-d14 (surr.)	1	%	96	93	-	100
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	110	110	-
Total Organic Carbon	0.1	%	1.9	1.0	-	2.0
Sulphur	5	mg/kg	920	440	-	830
% Moisture	1	%	11	10	8.0	11
Heavy Metals						
Arsenic	2	mg/kg	2.4	< 2	-	5.2
Beryllium	2	mg/kg	< 2	< 2	-	< 2
Boron	10	mg/kg	< 10	< 10	-	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	-	< 0.4

Client Sample ID			TP28 3.7	TP30 3.3	TP32 0.7	TP33 1.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M19-No08958	M19-No08959	M19-No08960	M19-No08961
Date Sampled			Nov 01, 2019	Nov 01, 2019	Nov 01, 2019	Nov 01, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Chromium	5	mg/kg	72	130	-	90
Cobalt	5	mg/kg	29	52	-	57
Copper	5	mg/kg	36	52	-	52
Lead	5	mg/kg	6.6	< 5	-	9.0
Manganese	5	mg/kg	510	1000	-	1100
Mercury	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Nickel	5	mg/kg	170	370	-	210
Selenium	2	mg/kg	< 2	< 2	-	< 2
Zinc	5	mg/kg	63	67	-	120

Client Sample ID			TP34 4.5
Sample Matrix			Soil
Eurofins Sample No.			M19-No08962
Date Sampled			Nov 01, 2019
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	630
% Moisture	1	%	12

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins mgt Suite B4			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Nov 08, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Nov 08, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Nov 08, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Nov 08, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Nov 08, 2019	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Melbourne	Nov 08, 2019	7 Days
- Method: LTM-INO-4030 Conductivity			
Total Organic Carbon	Melbourne	Nov 12, 2019	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Sulphur	Melbourne	Nov 08, 2019	7 Days
- Method: LTM-MET-3010 Alkali Metals Sulfur Silicon and Phosphorus by ICP-AES			
NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)	Melbourne	Nov 08, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Nov 08, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

Company Name: GHD Pty Ltd NEWCASTLE
Address: 3/24 Honeysuckle Dve
Newcastle
NSW 2300

Project Name: LIDDELL ASH DAM MODIFICATION
Project ID: 12509717

Order No.: 12509717
Report #: 686797
Phone: 02 4979 9999
Fax: 02 4979 9988

Received: Nov 7, 2019 10:36 AM
Due: Nov 14, 2019
Priority: 5 Day
Contact Name: Howard Bridgman

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	TP01 4.0	Oct 29, 2019		Soil	M19-No08942			X	X	X	X	X
2	TP02 3.5	Oct 29, 2019		Soil	M19-No08943	X				X		
3	TP04 5.0	Oct 29, 2019		Soil	M19-No08944	X				X		
4	TP06 1.5	Oct 30, 2019		Soil	M19-No08945	X				X		
5	TP08 2.2	Oct 30, 2019		Soil	M19-No08946	X				X		
6	TP08 3.4	Oct 30, 2019		Soil	M19-No08947			X	X	X	X	X
7	TP11 3.5	Oct 30, 2019		Soil	M19-No08948	X		X	X	X	X	X
8	TP13 1.2	Oct 30, 2019		Soil	M19-No08949	X				X		
9	TP14 2.1	Oct 31, 2019		Soil	M19-No08950			X	X	X	X	X

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Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
10	TP17 4.0	Oct 31, 2019		Soil	M19-No08951	X				X		
11	TP19 1.2	Oct 31, 2019		Soil	M19-No08952	X				X		
12	TP20 3.5	Oct 31, 2019		Soil	M19-No08953	X				X		
13	TP21 4.9	Oct 31, 2019		Soil	M19-No08954			X	X	X	X	X
14	TP22 1.0	Oct 31, 2019		Soil	M19-No08955	X						
15	TP24 1.0	Nov 01, 2019		Soil	M19-No08956	X		X	X	X	X	X
16	TP26 3.9	Nov 01, 2019		Soil	M19-No08957	X		X	X	X	X	X
17	TP28 3.7	Nov 01, 2019		Soil	M19-No08958			X	X	X	X	X
18	TP30 3.3	Nov 01, 2019		Soil	M19-No08959	X		X	X	X	X	X
19	TP32 0.7	Nov 01, 2019		Soil	M19-No08960	X				X		
20	TP33 1.4	Nov 01, 2019		Soil	M19-No08961			X	X	X	X	X
21	TP34 4.5	Nov 01, 2019		Soil	M19-No08962	X						

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Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
22	TP01 1.0	Oct 29, 2019		Soil	M19-No08963		X					
23	TP02 1.5	Oct 29, 2019		Soil	M19-No08964		X					
24	TP03 1.5	Oct 29, 2019		Soil	M19-No08965		X					
25	TP03 5.0	Oct 29, 2019		Soil	M19-No08966		X					
26	TP04 1.5	Oct 29, 2019		Soil	M19-No08967		X					
27	TP05 1.5	Oct 29, 2019		Soil	M19-No08968		X					
28	TP05 3.5	Oct 29, 2019		Soil	M19-No08969		X					
29	TP06 5.0	Oct 30, 2019		Soil	M19-No08970		X					
30	TP07 0.5	Oct 30, 2019		Soil	M19-No08971		X					
31	TP07 5.0	Oct 30, 2019		Soil	M19-No08972		X					
32	TP09 1.6	Oct 30, 2019		Soil	M19-No08973		X					
33	TP09 4.2	Oct 30, 2019		Soil	M19-No08974		X					

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Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
34	TP10 2.2	Oct 30, 2019		Soil	M19-No08975		X					
35	TP10 4.0	Oct 30, 2019		Soil	M19-No08976		X					
36	TP11 0.7	Oct 30, 2019		Soil	M19-No08977		X					
37	TP12 2.4	Oct 30, 2019		Soil	M19-No08978		X					
38	TP12 3.5	Oct 30, 2019		Soil	M19-No08979		X					
39	TP13 4.8	Oct 30, 2019		Soil	M19-No08980		X					
40	TP14 5.1	Oct 31, 2019		Soil	M19-No08981		X					
41	TP15 1.5	Oct 31, 2019		Soil	M19-No08982		X					
42	TP15 3.1	Oct 31, 2019		Soil	M19-No08983		X					
43	TP16 1.2	Oct 31, 2019		Soil	M19-No08984		X					
44	TP16 4.5	Oct 31, 2019		Soil	M19-No08985		X					
45	TP17 1.3	Oct 31, 2019		Soil	M19-No08986		X					

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Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
46	TP18 1.8	Oct 31, 2019		Soil	M19-No08987		X					
47	TP18 5.0	Oct 31, 2019		Soil	M19-No08988		X					
48	TP19 3.8	Oct 31, 2019		Soil	M19-No08989		X					
49	TP20 0.8	Oct 31, 2019		Soil	M19-No08990		X					
50	TP21 1.0	Oct 31, 2019		Soil	M19-No08991		X					
51	TP22 4.0	Oct 31, 2019		Soil	M19-No08992		X					
52	TP23 1.2	Oct 31, 2019		Soil	M19-No08993		X					
53	TP23 5.1	Oct 31, 2019		Soil	M19-No08994		X					
54	TP24 3.8	Nov 01, 2019		Soil	M19-No08995		X					
55	TP25 0.8	Nov 01, 2019		Soil	M19-No08996		X					
56	TP25 4.2	Nov 01, 2019		Soil	M19-No08997		X					
57	TP26 0.9	Nov 01, 2019		Soil	M19-No08998		X					

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Sample Detail						Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	Sulphur	Total Organic Carbon	Moisture Set	Eurofins mgt Suite B4	NEPM 2013 Metals without Cr6+ (As, Be, B, Cd, Co, Cr, Cu, Hg, Pb, Ni, Mn, Se, Zn)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
58	TP27 0.7	Nov 01, 2019		Soil	M19-No08999		X					
59	TP27 4.0	Nov 01, 2019		Soil	M19-No09000		X					
60	TP28 1.0	Nov 01, 2019		Soil	M19-No09001		X					
61	TP29 0.7	Oct 30, 2019		Soil	M19-No09002		X					
62	TP30 0.6	Nov 01, 2019		Soil	M19-No09003		X					
63	TP31 4.0	Nov 01, 2019		Soil	M19-No09004		X					
64	TP32 4.4	Nov 01, 2019		Soil	M19-No09005		X					
65	TP33 3.6	Nov 01, 2019		Soil	M19-No09006		X					
66	TP34 1.4	Nov 01, 2019		Soil	M19-No09007		X					
67	TP29 4.0	Nov 01, 2019		Soil	M19-No09008		X					
68	TP31 0.7	Nov 01, 2019		Soil	M19-No09009		X					
Test Counts						15	47	10	10	19	10	10

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Sulphur	mg/kg	< 5			5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Beryllium	mg/kg	< 2			2	Pass	
Boron	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Cobalt	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Lead	mg/kg	< 5			5	Pass	
Manganese	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Selenium	mg/kg	< 2			2	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	110			70-130	Pass	
TRH C10-C14	%	93			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	119			70-130	Pass	
Toluene	%	124			70-130	Pass	
Ethylbenzene	%	105			70-130	Pass	
m&p-Xylenes	%	103			70-130	Pass	
Xylenes - Total	%	104			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	106			70-130	Pass	
TRH C6-C10	%	109			70-130	Pass	
TRH >C10-C16	%	83			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	80			70-130	Pass	
Acenaphthylene	%	76			70-130	Pass	
Anthracene	%	73			70-130	Pass	
Benz(a)anthracene	%	79			70-130	Pass	
Benzo(a)pyrene	%	83			70-130	Pass	
Benzo(b&j)fluoranthene	%	74			70-130	Pass	
Benzo(g,h,i)perylene	%	78			70-130	Pass	
Benzo(k)fluoranthene	%	79			70-130	Pass	
Chrysene	%	92			70-130	Pass	
Dibenz(a,h)anthracene	%	72			70-130	Pass	
Fluoranthene	%	99			70-130	Pass	
Fluorene	%	77			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	70			70-130	Pass	
Naphthalene	%	82			70-130	Pass	
Phenanthrene	%	75			70-130	Pass	
Pyrene	%	98			70-130	Pass	
LCS - % Recovery							
Total Organic Carbon	%	107			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	111			80-120	Pass	
Beryllium	%	100			80-120	Pass	
Boron	%	96			80-120	Pass	
Cadmium	%	99			80-120	Pass	
Chromium	%	115			80-120	Pass	
Cobalt	%	113			80-120	Pass	
Copper	%	113			80-120	Pass	
Lead	%	109			80-120	Pass	
Manganese	%	114			80-120	Pass	
Mercury	%	93			75-125	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Nickel			%	111			80-120	Pass	
Selenium			%	102			80-120	Pass	
Zinc			%	109			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	M19-No13840	NCP	%	107			70-130	Pass	
TRH C10-C14	S19-No07536	NCP	%	108			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M19-No13840	NCP	%	90			70-130	Pass	
Toluene	M19-No13840	NCP	%	98			70-130	Pass	
Ethylbenzene	M19-No13840	NCP	%	103			70-130	Pass	
m&p-Xylenes	M19-No13840	NCP	%	97			70-130	Pass	
o-Xylene	M19-No13840	NCP	%	101			70-130	Pass	
Xylenes - Total	M19-No13840	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	M19-No13840	NCP	%	119			70-130	Pass	
TRH C6-C10	M19-No13840	NCP	%	107			70-130	Pass	
TRH >C10-C16	S19-No07536	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-No10948	NCP	%	80			70-130	Pass	
Acenaphthylene	M19-No10948	NCP	%	77			70-130	Pass	
Anthracene	M19-No10948	NCP	%	73			70-130	Pass	
Benz(a)anthracene	M19-No10948	NCP	%	79			70-130	Pass	
Benzo(a)pyrene	M19-No10948	NCP	%	79			70-130	Pass	
Benzo(b&j)fluoranthene	M19-No10948	NCP	%	76			70-130	Pass	
Benzo(g,h,i)perylene	M19-No10948	NCP	%	78			70-130	Pass	
Benzo(k)fluoranthene	M19-No10948	NCP	%	77			70-130	Pass	
Chrysene	M19-No10948	NCP	%	94			70-130	Pass	
Dibenz(a,h)anthracene	M19-No10948	NCP	%	78			70-130	Pass	
Fluoranthene	M19-No10948	NCP	%	96			70-130	Pass	
Fluorene	M19-No10948	NCP	%	80			70-130	Pass	
Indeno(1,2,3-cd)pyrene	M19-No10948	NCP	%	71			70-130	Pass	
Naphthalene	M19-No10948	NCP	%	82			70-130	Pass	
Phenanthrene	M19-No10948	NCP	%	76			70-130	Pass	
Pyrene	M19-No10948	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-No10946	NCP	%	87			75-125	Pass	
Beryllium	M19-No09974	NCP	%	84			75-125	Pass	
Boron	M19-No09974	NCP	%	77			75-125	Pass	
Cadmium	M19-No10946	NCP	%	106			75-125	Pass	
Chromium	M19-No10946	NCP	%	87			75-125	Pass	
Cobalt	M19-No10946	NCP	%	92			75-125	Pass	
Copper	M19-No10946	NCP	%	90			75-125	Pass	
Lead	M19-No10946	NCP	%	87			75-125	Pass	
Manganese	M19-No10946	NCP	%	84			75-125	Pass	
Mercury	M19-No10946	NCP	%	96			70-130	Pass	
Nickel	M19-No10946	NCP	%	89			75-125	Pass	
Selenium	M19-No10946	NCP	%	83			75-125	Pass	
Zinc	M19-No10946	NCP	%	73			75-125	Fail	Q08

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M19-No09127	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M19-No09876	NCP	mg/kg	170	67	85	30%	Fail	Q15
TRH C15-C28	M19-No09876	NCP	mg/kg	790	320	85	30%	Fail	Q15
TRH C29-C36	M19-No09876	NCP	mg/kg	860	380	77	30%	Fail	Q15
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M19-No09127	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	M19-No09127	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	M19-No09127	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	M19-No09127	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	M19-No09127	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	M19-No09127	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M19-No09127	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M19-No09127	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M19-No09876	NCP	mg/kg	240	98	83	30%	Fail	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g,h,i)perylene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a,h)anthracene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1,2,3-cd)pyrene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M19-No10947	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Organic Carbon	M19-No08707	NCP	%	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-No09875	NCP	mg/kg	7.4	8.2	11	30%	Pass	
Beryllium	M19-No09875	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	M19-No09875	NCP	mg/kg	10	19	61	30%	Fail	Q15
Cadmium	M19-No09875	NCP	mg/kg	1.6	1.5	8.0	30%	Pass	
Chromium	M19-No09875	NCP	mg/kg	93	100	9.0	30%	Pass	
Cobalt	M19-No09875	NCP	mg/kg	25	26	1.0	30%	Pass	
Copper	M19-No09875	NCP	mg/kg	1200	1500	21	30%	Pass	
Lead	M19-No09875	NCP	mg/kg	150	180	17	30%	Pass	
Manganese	M19-No09875	NCP	mg/kg	360	390	7.0	30%	Pass	
Mercury	M19-No09875	NCP	mg/kg	0.3	0.3	10	30%	Pass	
Nickel	M19-No09875	NCP	mg/kg	93	91	2.0	30%	Pass	
Selenium	M19-No09875	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Zinc	M19-No09875	NCP	mg/kg	1800	1700	4.0	30%	Pass	

Duplicate								
				Result 1	Result 2	RPD		
Conductivity (1:5 aqueous extract at 25°C as rec.)	M19-No08946	CP	uS/cm	260	220	16	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Sulphur	M19-No11862	NCP	mg/kg	240	240	1.0	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	M19-No08951	CP	%	9.9	9.9	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Conductivity (1:5 aqueous extract at 25°C as rec.)	M19-No08960	CP	uS/cm	110	130	17	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Andrew Black	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Julie Kay	Senior Analyst-Inorganic (VIC)



Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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**Sydney Laboratory**

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Maximum Dry Density

Report No: MDD:SYD19-0478-04**Issue No: 1***This report replaces all previous issues of report no 'MDD:SYD19-0478-04'.***Client:**

AGL Macquarie Pty Ltd

Project:

12509717



Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accredited
Laboratory Number:
679

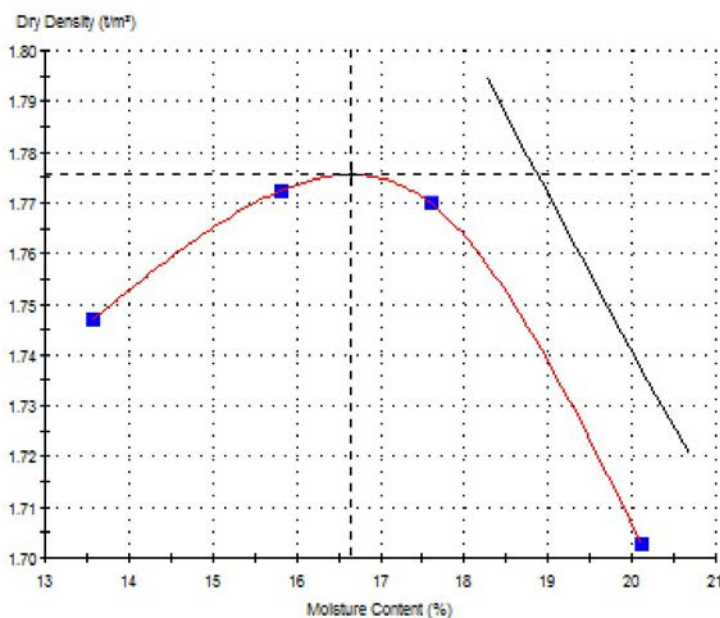
Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details**Sample ID:** SYD19-0478-04**Field Sample:** TP01 @ 4.1m**Date Sampled:****Source:****Material:** Clayey gravelly SAND**Specification:****Location:** Liddell Power Station - Ash Dam Modification**Sampled****Maximum Dry Density****Method:** AS 1289.5.1.1**Description:** Determination of the dry density/moisture content relation of a soil using standard compactive effort.**Test Results**

Description	Result	Limits
Maximum Dry Density (t/m ³)	1.776	
Optimum Moisture Content (%)	16.6	
Oversize Sieve (mm)	19.0	
Oversize Material (%)	10.3	
Mould Type	1 litre	
Particle Density (t/m ³)	2.671	

Chart**Comments**

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902621**Issue No: 1***This report replaces all previous issues of report no 'SYD1902621'.***Client:**

AGL Macquarie Pty Ltd

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-05
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP01
Depth (m) 4.0
Soil Description Sandy gravelly CLAY: black / brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	34	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	18	
Plasticity Index (%)	AS 1289.3.3.1	16	
Emerson Class Number	AS 1289.3.8.1	3	
Soil Description		Sandy gravelly CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902606**Issue No: 1***This report replaces all previous issues of report no 'SYD1902606'.***Client:**

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Project:

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Laboratory Number:
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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

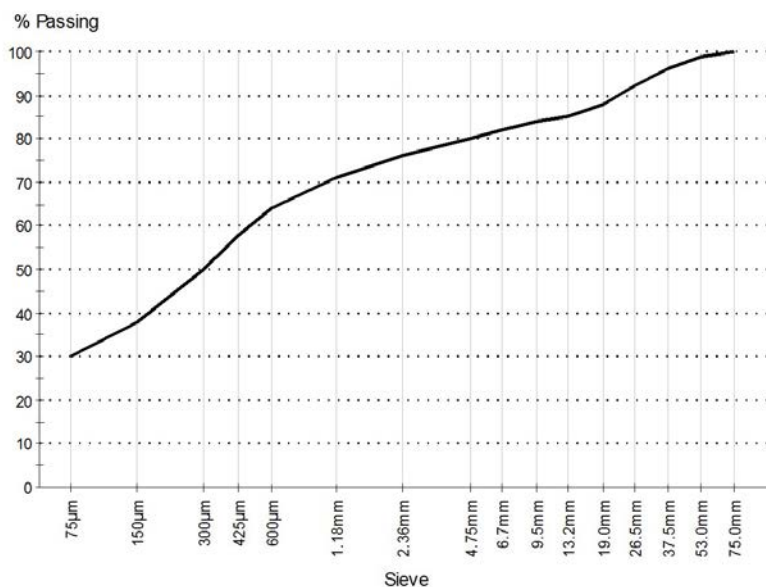
GHD Sample No SYD19-0476-01
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP02
Depth (m) 2.5
Soil Description Clayey SAND with gravel grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	8.3	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	99	
37.5mm	96	
26.5mm	92	
19.0mm	88	
13.2mm	85	
9.5mm	84	
6.7mm	82	
4.75mm	80	
2.36mm	76	
1.18mm	71	
600µm	64	
425µm	58	
300µm	50	
150µm	38	
75µm	30	

Comments

N/A

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Maximum Dry Density

Report No: MDD:SYD19-0478-05**Issue No: 1***This report replaces all previous issues of report no 'MDD:SYD19-0478-05'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

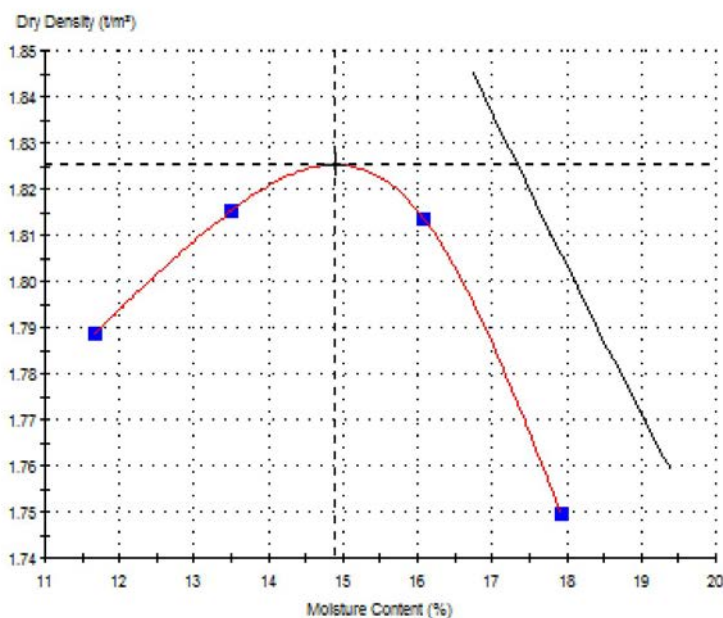
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details**Sample ID:** SYD19-0478-05**Field Sample:** TP04 @ 1.7m**Date Sampled:****Source:****Material:** Clayey gravelly SAND**Specification:****Location:** Liddell Power Station - Ash Dam Modification**Sampled****Maximum Dry Density****Method:** AS 1289.5.1.1**Description:**

Determination of the dry density/moisture content relation of a soil using standard compactive effort.

Test Results

Description	Result	Limits
Maximum Dry Density (t/m^3)	1.825	
Optimum Moisture Content (%)	14.9	
Oversize Sieve (mm)	19.0	
Oversize Material (%)	12.6	
Mould Type	1 litre	
Particle Density (t/m^3)	2.670	

Chart**Comments**

N/A

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Aggregate/Soil Test Report

Report No: SYD1902622**Issue No: 1***This report replaces all previous issues of report no 'SYD1902622'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-06
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP04
Depth (m) 2.1
Soil Description Sandy CLAY trace gravel mottled grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	36	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	17	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Sandy CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A



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Aggregate/Soil Test Report

Report No: SYD1902607

Issue No: 1

This report replaces all previous issues of report no 'SYD1902607'.

Client:

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Project:

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 Laboratory Number:

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0476-02
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP04
Depth (m) 4.9
Soil Description Clayey SAND with gravel grey brown (2 bags)

Other Test Results

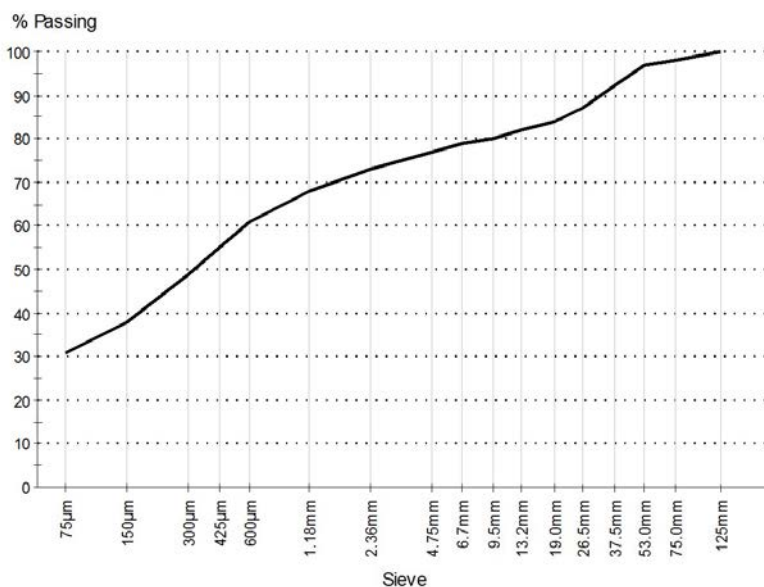
Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	18.3	
Date Tested		12/11/2019	
Moisture Content (%)	AS 1289.2.1.1	13.1	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven

Date Tested: 12/11/2019



Note: Sample Washed

Sieve Size	% Passing	Limits
125mm	100	
75.0mm	98	
53.0mm	97	
37.5mm	92	
26.5mm	87	
19.0mm	84	
13.2mm	82	
9.5mm	80	
6.7mm	79	
4.75mm	77	
2.36mm	73	
1.18mm	68	
600µm	61	
425µm	55	
300µm	49	
150µm	38	
75µm	31	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902608**Issue No: 1***This report replaces all previous issues of report no 'SYD1902608'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

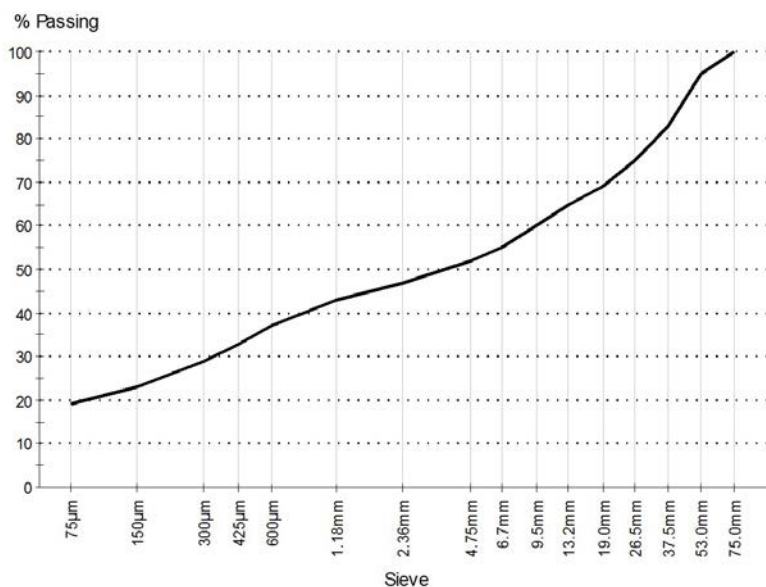
GHD Sample No SYD19-0476-03
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP05
Depth (m) 5.0
Soil Description Clayey GRAVEL with sand grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	20.3	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	95	
37.5mm	83	
26.5mm	75	
19.0mm	69	
13.2mm	65	
9.5mm	60	
6.7mm	55	
4.75mm	52	
2.36mm	47	
1.18mm	43	
600µm	37	
425µm	33	
300µm	29	
150µm	23	
75µm	19	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902609**Issue No: 1***This report replaces all previous issues of report no 'SYD1902609'.***Client:**

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Project:

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details**GHD Sample No**

SYD19-0476-04

Sampled By

Sampled by GHD

Location

Liddell Power Station - Ash Dam Modification

BH / TP No.

TP08

Depth (m)

2.5

Soil Description

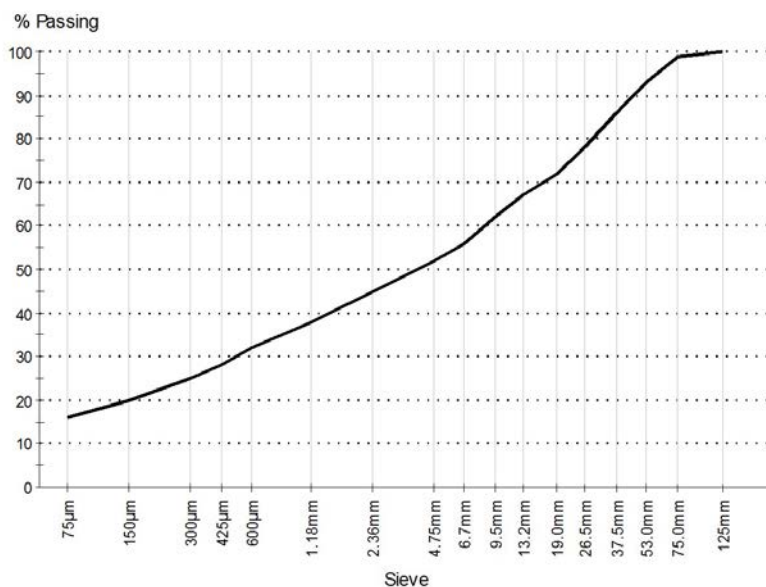
Clayey GRAVEL with sand dark grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	8.2	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
125mm	100	
75.0mm	99	
53.0mm	93	
37.5mm	86	
26.5mm	78	
19.0mm	72	
13.2mm	67	
9.5mm	62	
6.7mm	56	
4.75mm	52	
2.36mm	45	
1.18mm	38	
600µm	32	
425µm	28	
300µm	25	
150µm	20	
75µm	16	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902792**Issue No: 1***This report replaces all previous issues of report no 'SYD1902792'.***Client:**

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Project:

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 3/12/2019

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Sample Details

GHD Sample No SYD19-0511-01
Sampled By Sampled by GHD
Location Liddel Power Station - Ash Dam Modification
BH / TP No. TP09
Depth (m) 2.80m
Soil Description Gravelly SAND with Clay: pale brown/pale grey

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	39	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	23	
Plasticity Index (%)	AS 1289.3.3.1	16	
Date Tested		28/11/2019	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description	Gravelly Sand with Clay: pale brown/pale grey		
Type of Water		Distilled	
Temperature of Water (°C)		24	
Date Tested		28/11/2019	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902631**Issue No: 1***This report replaces all previous issues of report no 'SYD1902631'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0478-03
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP12
Depth (m) 3.7
Soil Description Gravelly clayey SAND orange / yellow brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	34	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	15	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Gravelly Clayey SAND	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902611**Issue No: 1***This report replaces all previous issues of report no 'SYD1902611'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

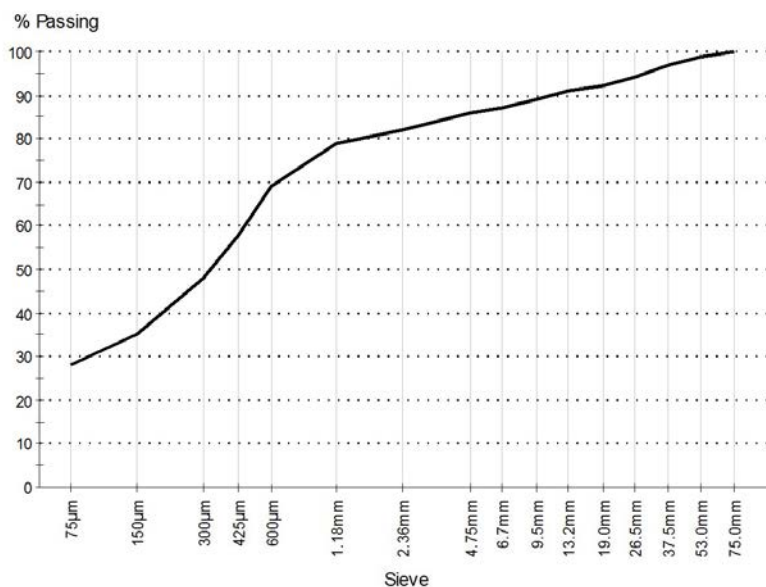
GHD Sample No SYD19-0476-06
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP13
Depth (m) 1.5m
Soil Description Clayey SAND with gravel yellow brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	10.3	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	99	
37.5mm	97	
26.5mm	94	
19.0mm	92	
13.2mm	91	
9.5mm	89	
6.7mm	87	
4.75mm	86	
2.36mm	82	
1.18mm	79	
600µm	69	
425µm	58	
300µm	48	
150µm	35	
75µm	28	

Comments

N/A

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Maximum Dry Density

Report No: MDD:SYD19-0478-06**Issue No: 1***This report replaces all previous issues of report no 'MDD:SYD19-0478-06'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

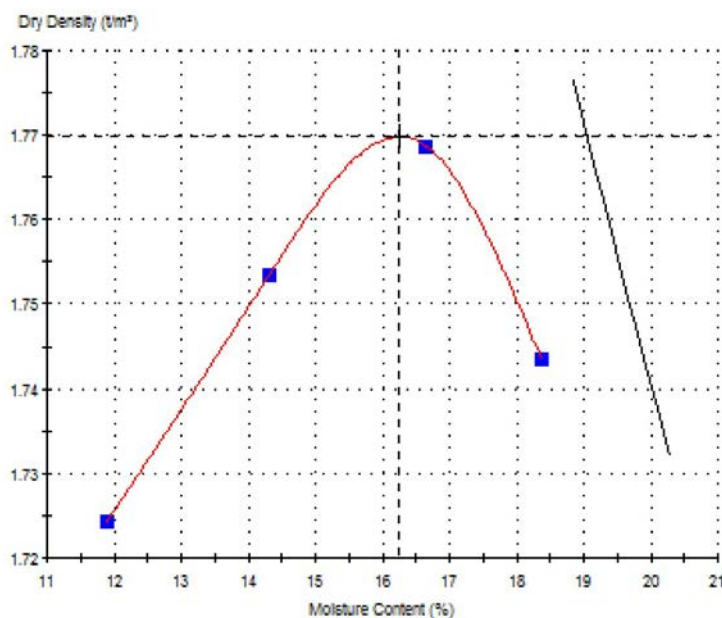
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details**Sample ID:** SYD19-0478-06**Field Sample:** TP13 @ 5.0m**Date Sampled:****Source:****Material:** Clayey SAND with gravel**Specification:****Location:** Liddell Power Station - Ash Dam Modification**Sampled****Maximum Dry Density****Method:** AS 1289.5.1.1**Description:**

Determination of the dry density/moisture content relation of a soil using standard compactive effort.

Test Results

Description	Result	Limits
Maximum Dry Density (t/m ³)	1.770	
Optimum Moisture Content (%)	16.3	
Oversize Sieve (mm)	19.0	
Oversize Material (%)	10.0	
Mould Type	1 litre	
Particle Density (t/m ³)	2.670	

Chart**Comments**

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902623**Issue No: 1***This report replaces all previous issues of report no 'SYD1902623'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-07
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP15
Depth (m) 1.50
Soil Description Sandy CLAY trace gravel mottled grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	N/A	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	44	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	22	
Plasticity Index (%)	AS 1289.3.3.1	22	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Sandy CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902612**Issue No: 1***This report replaces all previous issues of report no 'SYD1902612'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

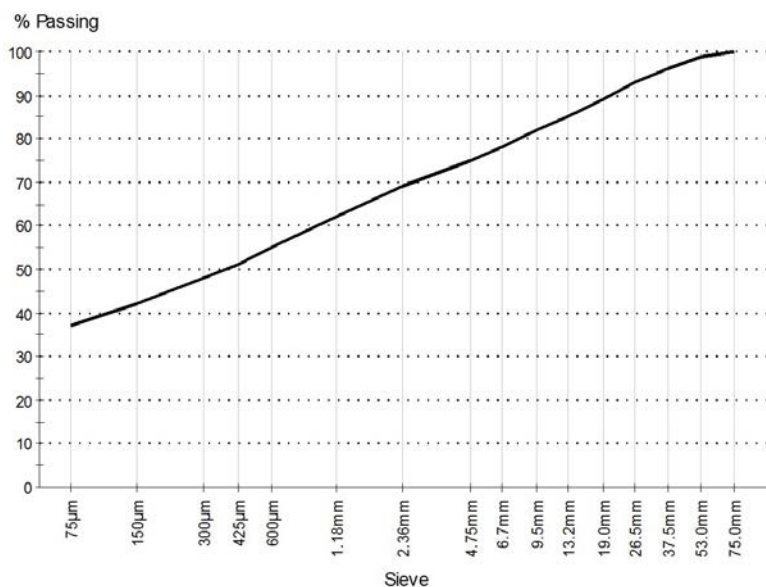
GHD Sample No SYD19-0476-07
 Sampled By Sampled by GHD
 Location Liddell Power Station - Ash Dam Modification
 BH / TP No. TP16
 Depth (m) 2.0m
 Soil Description Gravelly sandy CLAY orange brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	11.9	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	99	
37.5mm	96	
26.5mm	93	
19.0mm	89	
13.2mm	85	
9.5mm	82	
6.7mm	78	
4.75mm	75	
2.36mm	69	
1.18mm	62	
600µm	55	
425µm	51	
300µm	48	
150µm	42	
75µm	37	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902613**Issue No: 1***This report replaces all previous issues of report no 'SYD1902613'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

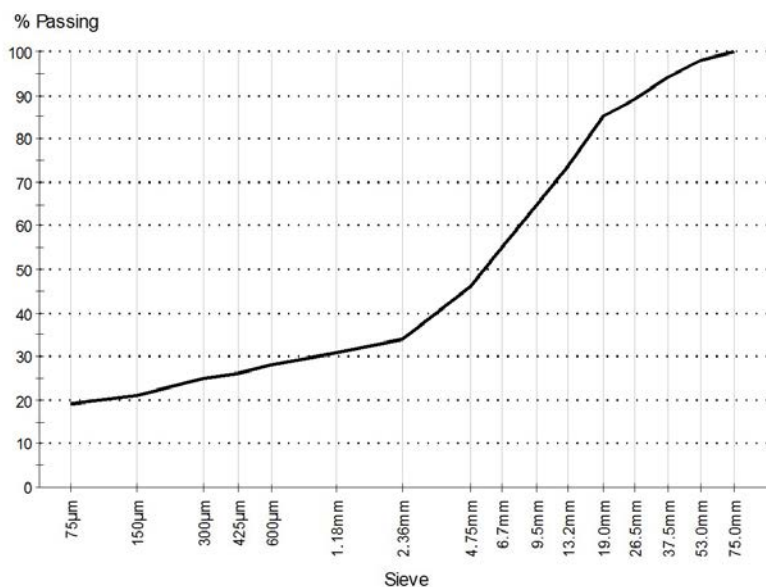
GHD Sample No SYD19-0476-08
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP17
Depth (m) 3.4m
Soil Description Clayey GRAVEL with sand brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	13.5	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	98	
37.5mm	94	
26.5mm	89	
19.0mm	85	
13.2mm	74	
9.5mm	65	
6.7mm	55	
4.75mm	46	
2.36mm	34	
1.18mm	31	
600µm	28	
425µm	26	
300µm	25	
150µm	21	
75µm	19	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902614**Issue No: 1***This report replaces all previous issues of report no 'SYD1902614'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

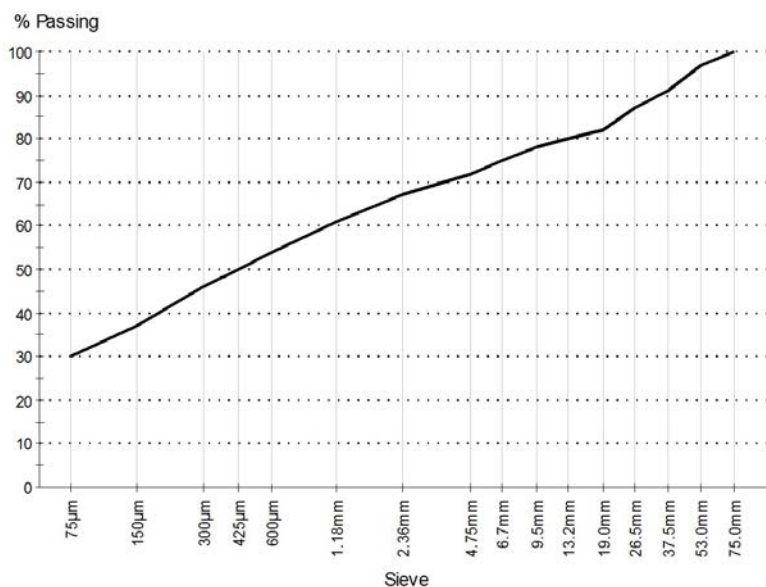
GHD Sample No SYD19-0476-09
 Sampled By Sampled by GHD
 Location Liddell Power Station - Ash Dam Modification
 BH / TP No. TP18
 Depth (m) 1.8m
 Soil Description Clayey gravelly SAND grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	11.7	
Date Tested		12/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 15/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	97	
37.5mm	91	
26.5mm	87	
19.0mm	82	
13.2mm	80	
9.5mm	78	
6.7mm	75	
4.75mm	72	
2.36mm	67	
1.18mm	61	
600µm	54	
425µm	50	
300µm	46	
150µm	37	
75µm	30	

Comments

N/A

**Sydney Laboratory**

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Maximum Dry Density

Report No: MDD:SYD19-0478-07**Issue No: 1***This report replaces all previous issues of report no 'MDD:SYD19-0478-07'.***Client:**

AGL Macquarie Pty Ltd

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Laboratory Number:
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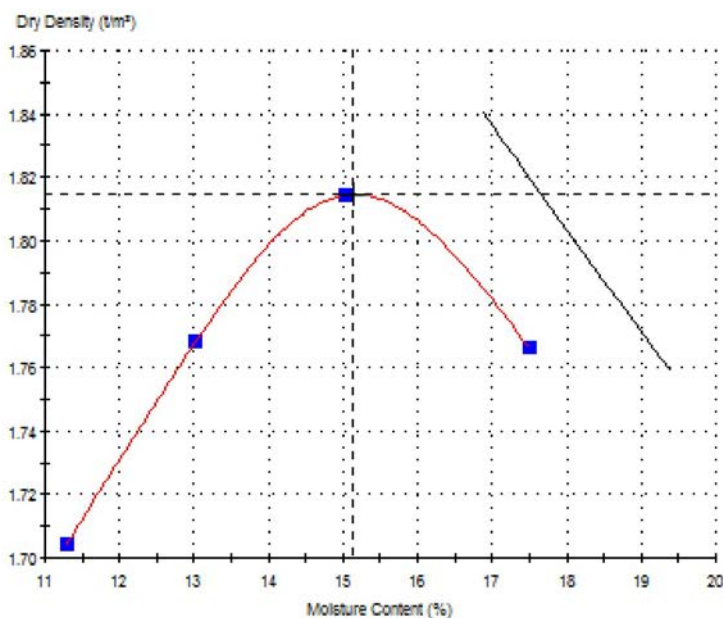
Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details**Sample ID:** SYD19-0478-07**Field Sample:** TP18 @ 4.7m**Date Sampled:****Source:****Material:** Gravelly SAND with clay**Specification:****Location:** Liddell Power Station - Ash Dam Modification**Sampled****Maximum Dry Density****Method:** AS 1289.5.1.1**Description:** Determination of the dry density/moisture content relation of a soil using standard compactive effort.**Test Results**

Description	Result	Limits
Maximum Dry Density (t/m ³)	1.815	
Optimum Moisture Content (%)	15.1	
Oversize Sieve (mm)	19.0	
Oversize Material (%)	15.0	
Mould Type	1 litre	
Particle Density (t/m ³)	2.670	

Chart**Comments**

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902624**Issue No: 1***This report replaces all previous issues of report no 'SYD1902624'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-08
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP18
Depth (m) 4.9
Soil Description Sandy CLAY trace gravel mottled grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	36	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	17	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Sandy CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902615**Issue No: 1***This report replaces all previous issues of report no 'SYD1902615'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

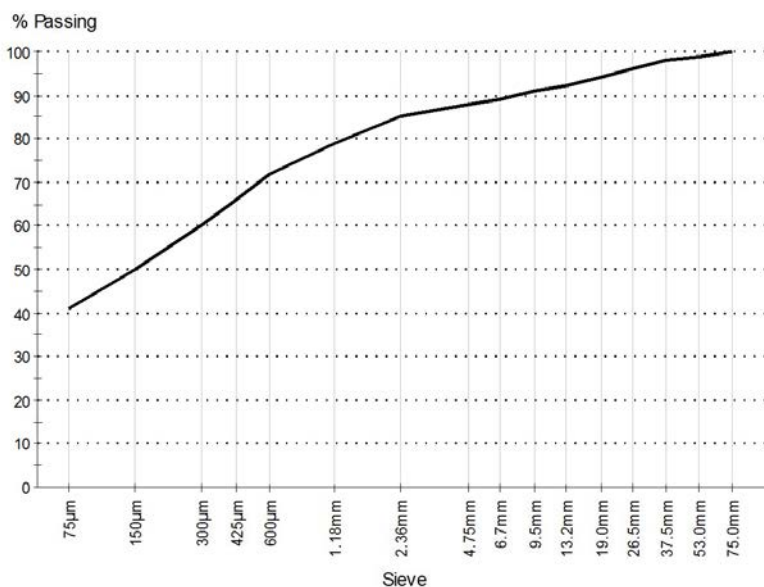
GHD Sample No SYD19-0476-10
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP22
Depth (m) 2.1m
Soil Description Sandy CLAY with gravel grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	10.2	
Date Tested		12/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 15/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	99	
37.5mm	98	
26.5mm	96	
19.0mm	94	
13.2mm	92	
9.5mm	91	
6.7mm	89	
4.75mm	88	
2.36mm	85	
1.18mm	79	
600µm	72	
425µm	66	
300µm	60	
150µm	50	
75µm	41	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902625**Issue No: 1***This report replaces all previous issues of report no 'SYD1902625'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-09
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP23
Depth (m) 4.0
Soil Description Sandy CLAY trace gravel mottled grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	41	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	21	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Sandy CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902616**Issue No: 1***This report replaces all previous issues of report no 'SYD1902616'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

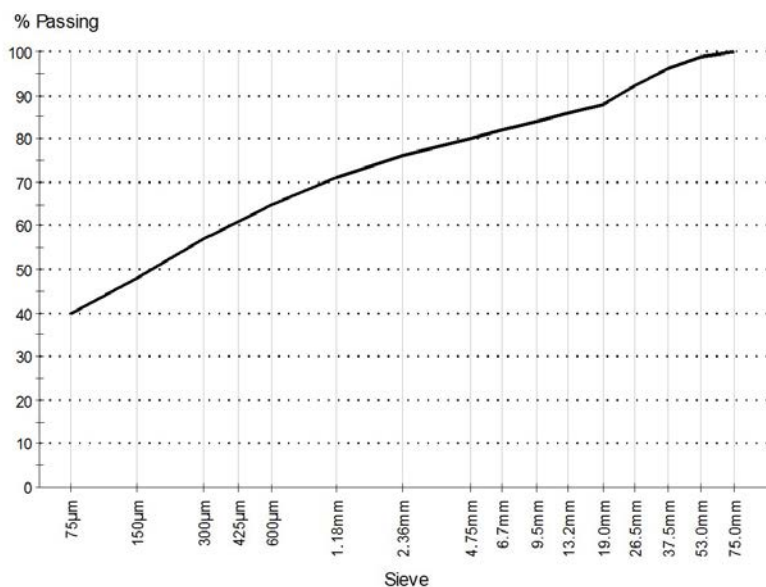
GHD Sample No SYD19-0476-11
 Sampled By Sampled by GHD
 Location Liddell Power Station - Ash Dam Modification
 BH / TP No. TP24
 Depth (m) 1.7m
 Soil Description Sandy CLAY with gravel grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	13.4	
Date Tested		12/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 15/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	99	
37.5mm	96	
26.5mm	92	
19.0mm	88	
13.2mm	86	
9.5mm	84	
6.7mm	82	
4.75mm	80	
2.36mm	76	
1.18mm	71	
600µm	65	
425µm	61	
300µm	57	
150µm	48	
75µm	40	

Comments

N/A

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Maximum Dry Density

Report No: MDD:SYD19-0478-08**Issue No: 1***This report replaces all previous issues of report no 'MDD:SYD19-0478-08'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

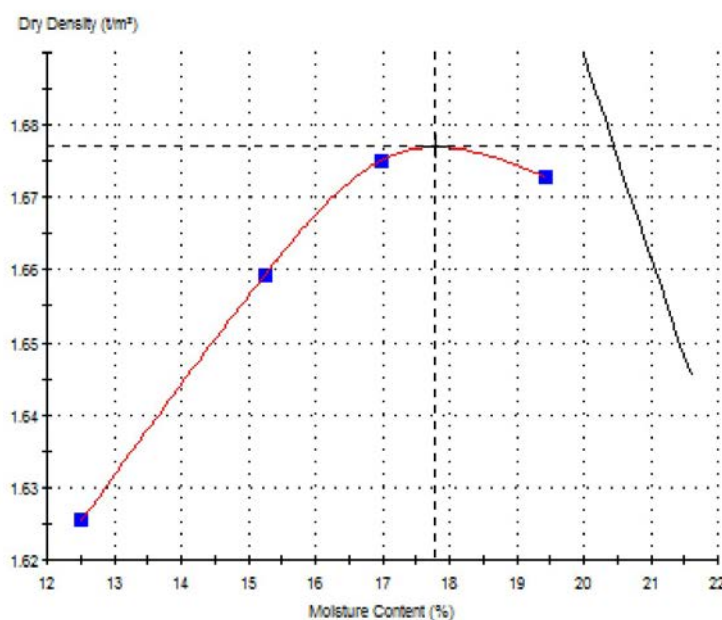
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details**Sample ID:** SYD19-0478-08**Field Sample:** TP25 @ 4.5m**Date Sampled:****Source:****Material:** Sandy clayey GRAVEL**Specification:****Location:** Liddell Power Station - Ash Dam Modification**Sampled****Maximum Dry Density****Method:** AS 1289.5.1.1**Description:**

Determination of the dry density/moisture content relation of a soil using standard compactive effort.

Test Results

Description	Result	Limits
Maximum Dry Density (t/m ³)	1.677	
Optimum Moisture Content (%)	17.8	
Oversize Sieve (mm)	19.0	
Oversize Material (%)	19.0	
Mould Type	1 litre	
Particle Density (t/m ³)	2.552	

Chart**Comments**

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902617**Issue No: 1***This report replaces all previous issues of report no 'SYD1902617'.***Client:**

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Date of Issue: 20/11/2019

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Sample Details

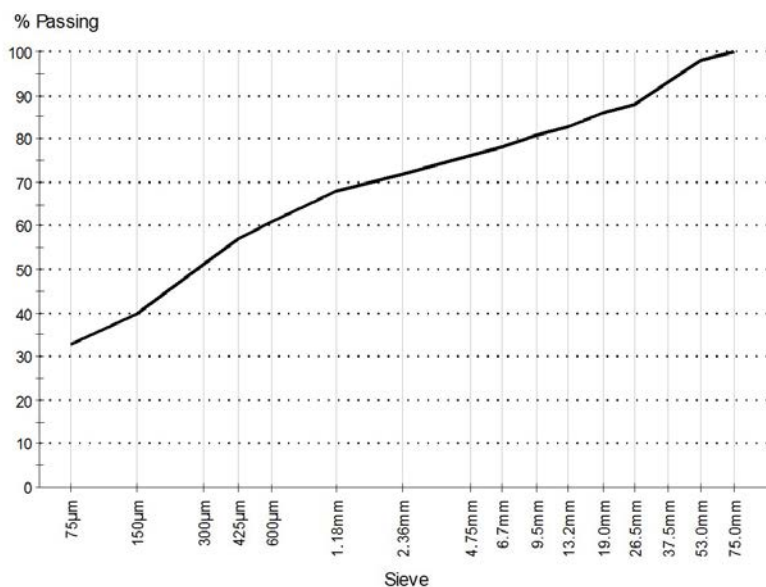
GHD Sample No SYD19-0477-01
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP26
Depth (m) 4.50
Soil Description Clayey SAND with gravel grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	12.5	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	98	
37.5mm	93	
26.5mm	88	
19.0mm	86	
13.2mm	83	
9.5mm	81	
6.7mm	78	
4.75mm	76	
2.36mm	72	
1.18mm	68	
600µm	61	
425µm	57	
300µm	51	
150µm	40	
75µm	33	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902627**Issue No: 1***This report replaces all previous issues of report no 'SYD1902627'.***Client:**

AGL Macquarie Pty Ltd

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0477-11
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP27
Depth (m) 2.1
Soil Description Sandy CLAY trace gravel mottled grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	41	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	21	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Sandy CLAY	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902618**Issue No: 1***This report replaces all previous issues of report no 'SYD1902618'.***Client:**

AGL Macquarie Pty Ltd

Project:

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

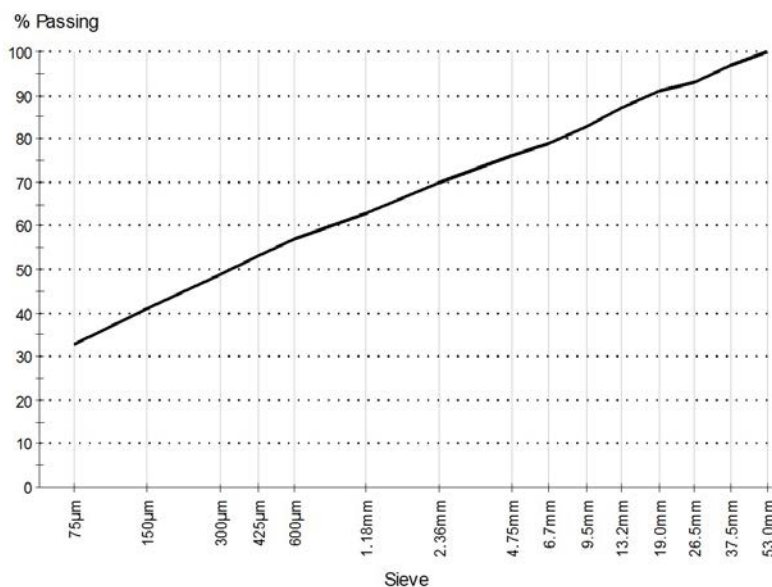
GHD Sample No SYD19-0477-02
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP28
Depth (m) 2.30
Soil Description Clayey gravelly SAND grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	11.4	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
53.0mm	100	
37.5mm	97	
26.5mm	93	
19.0mm	91	
13.2mm	87	
9.5mm	83	
6.7mm	79	
4.75mm	76	
2.36mm	70	
1.18mm	63	
600µm	57	
425µm	53	
300µm	49	
150µm	41	
75µm	33	

Comments

N/A

**Sydney Laboratory**

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Aggregate/Soil Test Report

Report No: SYD1902628**Issue No: 1***This report replaces all previous issues of report no 'SYD1902628'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0478-01
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP29
Depth (m) 4.70
Soil Description Gravelly SAND with clay brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	37	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	17	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Gravelly SAND with Clay: brown	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902619**Issue No: 1***This report replaces all previous issues of report no 'SYD1902619'.***Client:**

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Approved Signatory: D.P. Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

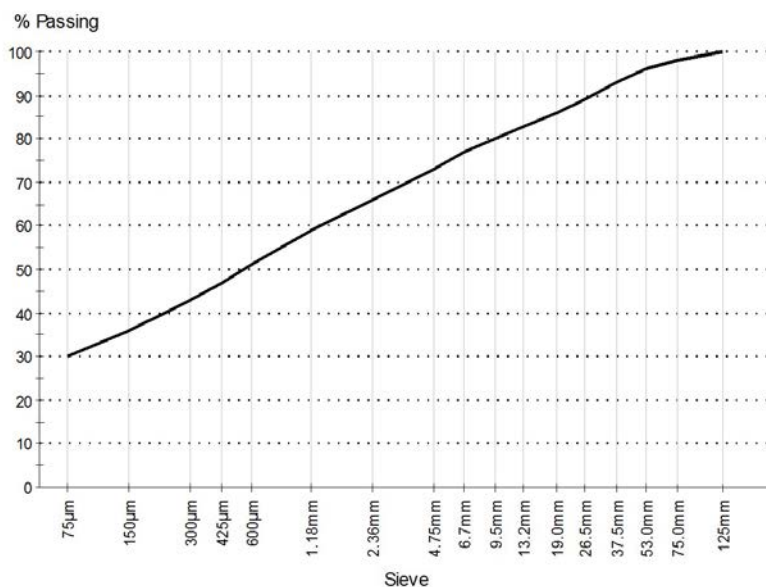
GHD Sample No SYD19-0477-03
 Sampled By Sampled by GHD
 Location Liddell Power Station - Ash Dam Modification
 BH / TP No. TP30
 Depth (m) 4.0
 Soil Description Clayey gravelly SAND

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	16.9	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
125mm	100	
75.0mm	98	
53.0mm	96	
37.5mm	93	
26.5mm	89	
19.0mm	86	
13.2mm	83	
9.5mm	80	
6.7mm	77	
4.75mm	73	
2.36mm	66	
1.18mm	59	
600µm	51	
425µm	47	
300µm	43	
150µm	36	
75µm	30	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902620**Issue No: 1***This report replaces all previous issues of report no 'SYD1902620'.***Client:**

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

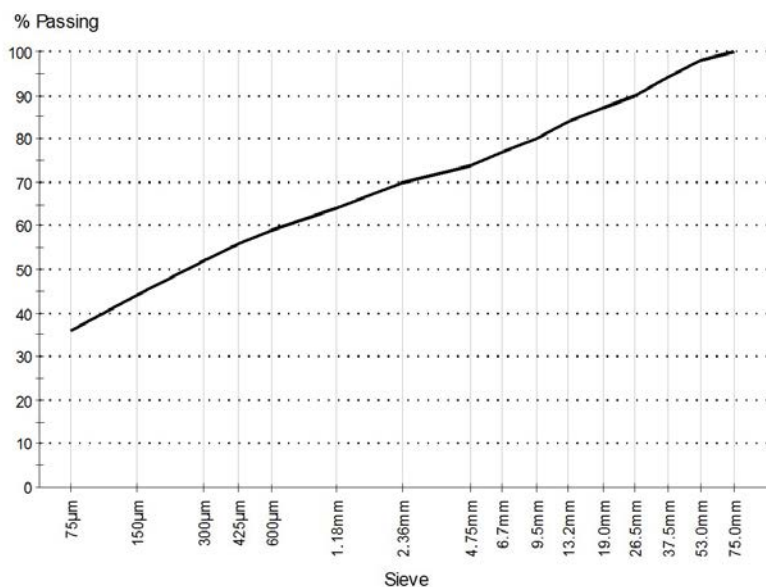
GHD Sample No SYD19-0477-04
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP32
Depth (m) 2.20
Soil Description Gravelly sandy CLAY grey brown

Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	12.7	
Date Tested		11/11/2019	

Particle Size Distribution

AS 1289.3.6.1

Drying by: Oven**Date Tested:** 12/11/2019**Note:** Sample Washed

Sieve Size	% Passing	Limits
75.0mm	100	
53.0mm	98	
37.5mm	94	
26.5mm	90	
19.0mm	87	
13.2mm	84	
9.5mm	80	
6.7mm	77	
4.75mm	74	
2.36mm	70	
1.18mm	64	
600µm	59	
425µm	56	
300µm	52	
150µm	44	
75µm	36	

Comments

N/A

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Aggregate/Soil Test Report

Report No: SYD1902630**Issue No: 1***This report replaces all previous issues of report no 'SYD1902630'.***Client:**

AGL Macquarie Pty Ltd

Project:

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NATA Accredited
Laboratory Number:

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Approved Signatory: D.P Brooke (Sydney Laboratory Manager)

Date of Issue: 20/11/2019

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Sample Details

GHD Sample No SYD19-0478-02
Sampled By Sampled by GHD
Location Liddell Power Station - Ash Dam Modification
BH / TP No. TP33
Depth (m) 2.0
Soil Description Gravelly SAND with clay grey brown

Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	Not Tested	
Mould Length (mm)		0	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	43	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	25	
Plasticity Index (%)	AS 1289.3.3.1	18	
Emerson Class Number	AS 1289.3.8.1	2	
Soil Description		Gravelly SAND with Clay: grey/brown	
Type of Water		distilled	
Temperature of Water (°C)		25	
Date Tested		13/11/2019	

Comments

N/A



Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP05	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040046	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C22	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		29-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

Australia

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP06	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040047	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C23	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP08	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040048	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C25	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Certificate of Analysis

GHD GROUP PTY LTD

Unit ID: TP09

Compartment Name: Soil

Make:

Make:

Model:

Model:

Serial No:

Serial No:

Site:

Capacity:

Lab No: 10700040049

UIN: 07A9C27

Testing Laboratory: Sydney Non-Routine

Date Received: 06-Dec-19

Date Reported: 20-Dec-19

Fluid Manufacturer: Unidentified

Fluid Type: Unidentified

Fluid Grade: -

DATE SAMPLED

DATE SAMPLED

DATE SAMPLED

DATE SAMPLED

TEST/METHOD

UNITS

30-Oct-19

Auto Ignition Temp (PE165)

Auto Ignition (PE165)

°C

>500

DIAGNOSIS:

Results were obtained on the sample as received.

Diagnosed by: Kumar.Audiappan

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP10	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040050	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C2E	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP12	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040051	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C30	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:
Results were obtained on the sample as received.

Diagnosed by: Kumar.Audiappan

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP16	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040052	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C32	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP19	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040053	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C34	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Certificate of Analysis

GHD GROUP PTY LTD

Unit ID: TP30

Compartment Name: Soil

Make:

Make:

Model:

Model:

Serial No:

Serial No:

Site:

Capacity:

Lab No: 10700040054

UIN: 07A9C38

Testing Laboratory: Sydney Non-Routine

Date Received: 06-Dec-19

Date Reported: 20-Dec-19

Fluid Manufacturer: Unidentified

Fluid Type: Unidentified

Fluid Grade: -

DATE SAMPLED

DATE SAMPLED

DATE SAMPLED

DATE SAMPLED

TEST/METHOD

UNITS

30-Oct-19

Auto Ignition Temp (PE165)

Auto Ignition (PE165)

°C

>500

DIAGNOSIS:

Results were obtained on the sample as received.

Diagnosed by: Kumar.Audiappan

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GHD Group Pty Ltd
Attn: Amy Wynne Jones
No Address supplied

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Certificate of Analysis

GHD GROUP PTY LTD		Unit ID:	TP34	Compartment Name:	Soil
		Make:		Make:	
		Model:		Model:	
		Serial No:		Serial No:	
		Site:		Capacity:	
Lab No:	10700040055	Date Received:	06-Dec-19	Fluid Manufacturer:	Unidentified
UIN:	07A9C3A	Date Reported:	20-Dec-19	Fluid Type:	Unidentified
Testing Laboratory:	Sydney Non-Routine			Fluid Grade:	-

TEST/METHOD	UNITS	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
		30-Oct-19			
Auto Ignition Temp (PE165)					
Auto Ignition (PE165)	°C	>500			

DIAGNOSIS:

Results were obtained on the sample as received.

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Appendix E – Results tables



Appendix E
Table A
Soil Analytical Results

			Inorganics			TOC	Metals													BTEXN						TRH - NEPM 2013							
			Electrical conductivity (lab)	Moisture Content (%)	Sulfur as S	Total Organic Carbon	Arsenic	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Zinc						Naphthalene (BTEXN)	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 >C10-C16 minus Naphthalene	>C10-C16 Fraction	F3 >C16-C34 Fraction	F4 >C34-C40 Fraction	>C10-C40 (Sum of Total)	
EQL			10	1	5	0.1	2	2	10	0.4	5	5	5	5	0.1	5	2	5	0.1	0.1	0.1	0.1	0.2	0.3	0.5	20	20	50	50	100	100	100	
NEPM 2013 EIL-Urban Residential- Public Open Space 0-2m							100				251		95	1110			178		143						170								
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil 0-2m																			50	85	70		105		180 ^{RP}				120 ^{PIB}	300	2,800		
NEPM 2013 Table 1A(1) HIL C Rec							300	90	20,000	90	300	300	17,000	600	19,000	80	1,200	700	30,000														
NEPM 2013 Table 1A(3) HSL C Rec Soil for Vapour Intrusion, Sand																																	
0-1m																			NL	NL	NL			NL	NL	NL		NL					
1-2m																			NL	NL	NL			NL	NL	NL		NL					
2-4m																			NL	NL	NL			NL	NL	NL		NL					
>=4m																			NL	NL	NL			NL	NL	NL		NL					
Field ID	Depth	Date																															
TP02 3.5	3.4 - 3.5	29/10/2019	280	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP04 5.0	4.9 - 5	29/10/2019	160	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP01 4.0	3.9 - 4	29/10/2019	-	7.3	370	0.7	3.6	<2	<10	<0.4	16	11	21	16	240	<0.1	36	<2	63	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP17 4.0	3.9 - 4	31/10/2019	470	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP06 1.5	1.4 - 1.5	30/10/2019	99	7.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP08 2.2	2.1 - 2.2	30/10/2019	260	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP08 3.4	3.3 - 3.4	30/10/2019	-	7.0	2,900	26	<2	<2	<10	<0.4	26	10	31	11	240	<0.1	56	<2	55	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	190	190	960	130	1,280
TP11 3.5	3.4 - 3.5	30/10/2019	500	7.8	910	6.4	2.9	<2	<10	<0.4	18	18	26	13	150	<0.1	73	<2	76	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	67	67	370	<100	437
TP13 1.2	1.1 - 1.2	30/10/2019	230	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP14 2.1	2 - 2.1	31/10/2019	-	11	720	0.2	4.3	<2	<10	<0.4	120	32	35	11	650	<0.1	180	<2	77	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP19 1.2	1.1 - 1.2	31/10/2019	170	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP20 3.5	3.4 - 3.5	31/10/2019	440	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP21 4.9	4.8 - 4.9	31/10/2019	-	12	660	1.2	3.3	<2	<10	<0.4	28	18	24	15	280	<0.1	85	<2	72	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP22 1.0	0.9 - 1	31/10/2019	440	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP24 1.0	0.9 - 1	1/11/2019	250	11	670	1.8	3.1	<2	<10	<0.4	89	42	48	7.1	900	<0.1	230	<2	78	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP26 3.9	3.8 - 3.9	1/11/2019	520	12	720	3.7	4.5	<2	<10	<0.4	26	18	23	12	300	<0.1	74	<2	62	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP28 3.7	3.6 - 3.7	1/11/2019	-	11	920	1.9	2.4	<2	<10	<0.4	72	29	36	6.6	510	<0.1	170	<2	63	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP30 3.3	3.2 - 3.3	1/11/2019	110	10	440	1.0	<2	<2	<10	<0.4	130	52	52	<5	1,000	<0.1	370	<2	67	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP32 0.7	0.6 - 0.7	1/11/2019	110	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP33 1.4	1.3 - 1.4	1/11/2019	-	11	830	2.0	5.2	<2	<10	<0.4	90	57	52	9.0	1,100	<0.1	210	<2	120	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<20	<20	<50	<50	<100	<100	<100
TP34 4.5	4.4 - 4.5	1/11/2019	630	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ambient background concentration (ABC)							NA			61.5			34.8			10.57			148.4			73.3			NA								
Added Contaminant Limit (based on conservative lowest pH and CEC)							NA			190			60			1100			30			70			NA								
Calculated EIL							100			251			95			1110			178			143			170								



Appendix E
Table A
Soil Analytical Results

	TRH - NEPM 1999					PAHs																			
	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b,j)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene-PAH	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab Calc	Total 8 PAHs (as Bap TEQ)(zero LOR) - Lab Calc	Total 8 PAHs (as Bap TEQ)(half LOR) - Lab Calc	Total 8 PAHs (as Bap TEQ)(full LOR) - Lab Calc
EQL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	20	20	50	50	50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NEPM 2013 EIL-Urban Residential- Public Open Space 0-2m																			170						
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil 0-2m										0.7															
NEPM 2013 Table 1A(1) HIL C Rec																						300	3	3	3
NEPM 2013 Table 1A(3) HSL C Rec Soil for Vapour Intrusion, Sand																									
0-1m																			NL						
1-2m																			NL						
2-4m																			NL						
>=4m																			NL						

Field ID	Depth	Date																									
TP02 3.5	3.4 - 3.5	29/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TP04 5.0	4.9 - 5	29/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TP01 4.0	3.9 - 4	29/10/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2		
TP17 4.0	3.9 - 4	31/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TP06 1.5	1.4 - 1.5	30/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TP08 2.2	2.1 - 2.2	30/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
TP08 3.4	3.3 - 3.4	30/10/2019	<20	110	900	350	1,360	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	1.3	<0.5	<0.5	<0.5	1.4	1.2	5.2	<0.5	0.6	1.2
TP11 3.5	3.4 - 3.5	30/10/2019	<20	38	340	150	528	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	0.7	<0.5	<0.5	<0.5	0.8	0.6	2.6	<0.5	0.6	1.2
TP13 1.2	1.1 - 1.2	30/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP14 2.1	2 - 2.1	31/10/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP19 1.2	1.1 - 1.2	31/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP20 3.5	3.4 - 3.5	31/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP21 4.9	4.8 - 4.9	31/10/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP22 1.0	0.9 - 1	31/10/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP24 1.0	0.9 - 1	1/11/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP26 3.9	3.8 - 3.9	1/11/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP28 3.7	3.6 - 3.7	1/11/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP30 3.3	3.2 - 3.3	1/11/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP32 0.7	0.6 - 0.7	1/11/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TP33 1.4	1.3 - 1.4	1/11/2019	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	
TP34 4.5	4.4 - 4.5	1/11/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Ambient background concentration (ABC)
Added Contaminant Limit (based on conservative lowest pH and CEC)
Calculated EIL

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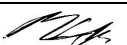
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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A Wynne Jones	M Kiejda		M Dunlop		05/07/2021

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