



Kooragang Island Billboards

Geotechnical and contamination report

Ooh!Media Pty Limited

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→ The Power of Commitment





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1. Introduction

This report presents the results of a geotechnical and contamination investigation for two proposed billboards on Kooragang Island for Ooh!Media. The billboards are proposed on land owned by the Port of Newcastle (PoN). One billboard is to be located along the northern side of Teal Street and the other along Cormorant Road, as shown in Figure 1.1.

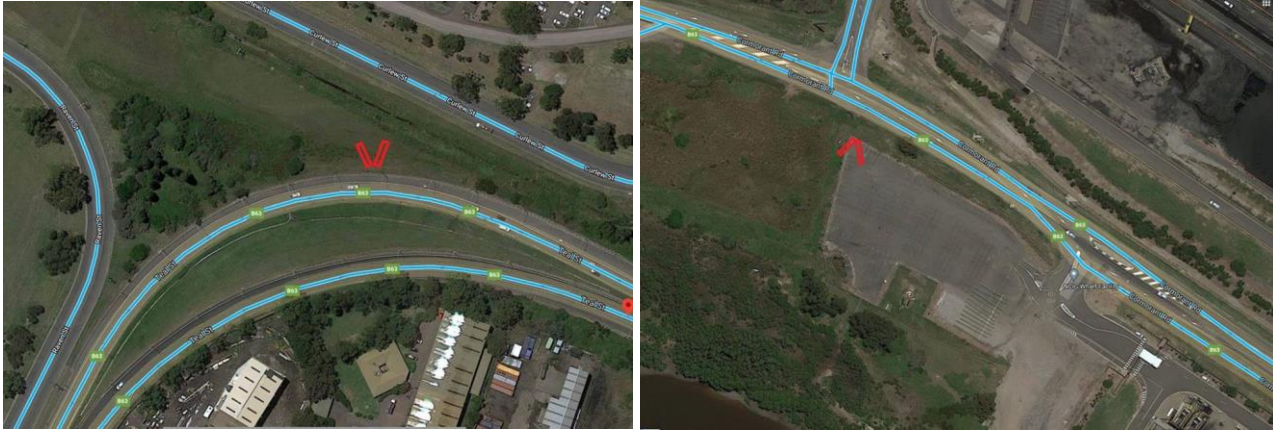


Figure 1.1 Site locations at Teal Street (one) and Cormorant Road (two)

Geotechnical and contamination assessment is required to inform detailed design and construction of the billboards. We understand each billboard will comprise two signs, each around 8.5 m in length and up to 8 m in height above the existing ground surface.

This report presents the factual results of the investigation along with commentary relating to:

- Subsurface conditions
- Suitable footing systems and founding conditions
- Geotechnical design parameters for deep (piled) foundations
- Soil aggressivity with reference to Australian Standard AS 2159-2009
- Presence (or otherwise) of potential or actual acid sulphate soils and recommendation for further assessment
- Potential risk of contamination to human health and/or the environment and recommendations for management and disposal of soils

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

1.1 Limitations

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

GHD otherwise disclaims responsibility to any person other than Ooh!Media Pty Limited 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.
- Assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.
- Information obtained from, and testing undertaken at or in connection with, 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 at other parts of the site may be different from the site conditions found at the specific sample points.

2. Kooragang Island background

Kooragang's industrial history includes land reclamation commencing in the 1950s, shown in Figure 2.1.

Subsurface conditions at Kooragang typically comprise fill comprising dredged sand with gravel to cobble size waste material (e.g. slag, timber, ballast) overlying natural soils underlying the fill and dredged sand, or at the surface where filling has not occurred, comprise soils of estuarine and marine depositional origin, including soft clays and loose sand, with sand density increasing with depth. Sedimentary bedrock levels vary between 10 m and greater than 50 m.

The proposed billboard locations are mapped as disturbed terrain¹² with respect to acid sulfate soils³. The harbour, where dredged fill material was sourced, is mapped as a low probability of acid sulfate soils and undisturbed estuarine areas around the island are mapped as having a high probability of occurrence of acid sulfate soils. As such, there is potential at Kooragang for both fill and natural soils to include actual or potential acid sulfate soils.



Figure 2.1 Recent (2020) and historic (1958) aerial image, NSW Government

¹ Matthei L.E., 1995, Soil Landscapes of the Newcastle 1:100,000 Sheet map and report, NSW Department of Land and Water Conservation, Sydney, via eSpade

² Colquhoun G.P., Hughes K.S., Deyssing L., Ballard J.C., Folkes C.B., Phillips G., Troedson A.L. & Fitzherbert J.A. 2021. New South Wales Seamless Geology dataset, version 2.1 [Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW, Maitland via MinView

³ Naylor, SD, Chapman, GA, Atkinson, G, Murphy CL, Tulau MJ, Flewin TC, Milford HB, Morand DT, 1998, Guidelines for the Use of Acid Sulfate Soil Risk Maps, 2nd ed., Department of Land and Water Conservation, Sydney via eSpade

3. Methodology

3.1 Geotechnical investigation

Investigation for the proposed billboards was undertaken on 16 December 2021 and comprised drilling of two boreholes. Borehole BH01 at Cormorant Road was drilled to 9.9 m and BH02 at Teal Street was drilled to 9.8 m depth. Borehole locations are shown in the survey in Appendix B and the below photos.



Photo 1 Teal Street borehole (BH02)



Photo 2 Cormorant Road borehole (BH01)

Boreholes were drilled with a truck mounted geotechnical drilling rig using solid flight auger and rotary washboring techniques to the limit of investigation. Standard Penetrometer Tests (SPTs) were conducted at 1.5 m intervals to provide an assessment of soil strength and correlation with geotechnical parameters. SPT samples were retained for laboratory analysis and separate contamination samples were collected for laboratory testing.

Subsurface investigation was supervised on a full-time basis by an experienced Engineering Geologist responsible for locating the boreholes, logging encountered strata, directing in-situ testing and collecting representative samples. The logging was carried out in accordance with Australian Standard AS 1726-2017.

The borehole logs are provided in Appendix C and should be read in conjunction with the Standard Sheets provided in Appendix A.

Geotechnical soil samples collected during the investigation were transported to GHD's NATA accredited geotechnical laboratory or a subcontracted NATA registered environmental laboratory.

A summary of the geotechnical tests completed is provided below.

Table 3.1 Geotechnical laboratory testing schedule

Laboratory Test	Quantity
Atterberg limits	4
Soil aggressivity suite (Chloride, Sulfate, pH and Electrical conductivity)	2
Field screen ASS (pH, pH _{FOX} , Ahern 2004)	10
ASS Chromium suite	2

3.2 Contamination investigation

Soil sampling was undertaken during the geotechnical subsurface investigations as discussed in Section 3.1. Investigation works were undertaken under the guidance of a suitably qualified environmental consultant and were completed in general accordance with guidelines developed or endorsed by NSW EPA.

Soil samples were collected from surface (0-0.2 m) and at 0.3-0.5 m and then every metre thereafter to the final depth of the borehole. Samples were collected directly from the sides of the borehole or the soil sod within the auger to minimise cross contamination. All re-usable sampling equipment was decontaminated between each sampling point using Neutracon solution and rinsing with tap water. New disposable Nitrile gloves were used when collecting samples.

Collected soil samples were immediately transferred to sample containers of appropriate composition, which were pre-treated in a manner appropriate for the laboratory analysis. All sample containers were clearly labelled with a sample number, sample location, sample depth and sample date. The sample containers were transferred to a chilled cooler for sample preservation prior to and during shipment to the testing laboratory.

The samples were transported under Chain of Custody (CoC) conditions to an independent and National Association of Testing Authorities (NATA) certified laboratory. Seven samples were analysed for the following potential contaminants of concern - heavy metals (As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and asbestos.

A single Quality Assurance / Quality Control (QA/QC) intralaboratory (field) duplicate sample pair (BH02 0.4-0.5/ DU02) were collected during the investigations. No rinsate samples, trip blanks or trip spikes were collected.

4. Investigation results

4.1 Subsurface conditions

In general terms, subsurface conditions encountered during the investigation comprised fill overlying estuarine sand and clay to the limit of investigation. The more pertinent aspects of the units encountered are summarised below, with reference to existing ground surface levels.

Cormorant Road

Relevant test location: BH01

FILL encountered to 2.8 m depth comprising an asphalt surface over sand with clay and trace fine gravel; overlying

ESTUARINE SAND and CLAY comprising:

- Upper SAND, fine to coarse grained encountered as medium dense to 3.2 m.
- CLAY, high plasticity dark grey clay with inclusions of sand and shells encountered as firm to 4.0 m.
- Lower SAND, fine to coarse grained encountered as loose to 6.5 m and dense to very dense to the limit of investigation. SPT refusal was encountered from 8.5 m to the limit of investigation.

Groundwater was encountered at 2.2 m depth.

Teal Street

Relevant test location: BH02

FILL encountered to 1.7 m depth comprising sand with clay and trace of fine gravel, shells and rootlet; overlying

ESTUARINE SAND and CLAY comprising:

- Upper SAND, fine to coarse grained sand encountered as medium dense to 1.8 m.
- CLAY, high plasticity dark grey clay with inclusions of sand and shells encountered as firm to 2.5 m.
- Lower SAND, fine to coarse grained sand encountered as very loose to loose to 5.5 m and medium dense to the limit of investigation. SPT refusal was encountered at the limit of investigation.

Groundwater was encountered at 1.6 m depth.

4.2 Laboratory test results

4.2.1 Geotechnical results

Geotechnical laboratory test results are summarised in Table 4.1 and Table 4.2, with test report sheets provided in Appendix D.

Table 4.1 Atterberg limit, Emerson and particle size distribution laboratory test results

Sample ID	Soil Description	Atterberg Limits (%)			Particle size distribution (%)		
		LL	PL	PI	Clay / silt	Sand	Gravel
BH01 1.5-1.95 m	SAND	-	-	-	3	97	0
BH01 4.0-4.45 m	SAND	NA	NP	NP	-	-	-
BH01 6.5-6.95 m	SAND with silt	-	-	-	6	94	0
BH02 5.5-5.95 m	SAND	-	-	-	2	98	0
<p>Note: Clay and silt proportions were not determined individually and are combined – i.e. percent passing 75 µm sieve. LL = liquid limit PL = plastic limit PI = plasticity index NA = Not applicable NP = Not plastic</p>							

Table 4.2 Soil aggressivity laboratory test results

Sample ID	Soil Description	pH	Cl (mg/kg)	SO ₄ (mg/kg)	EC (µS/cm)
BH01 1.5 -1.95 m	SAND	8.9	<10	<10	70
BH02 5.5-5.95 m	SAND	7.5	<10	600	330

4.2.2 Contamination results

4.2.2.1 Assessment criteria

This assessment was undertaken with reference to the relevant guidelines made or approved by the NSW EPA.

- NEPC (2013). National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999. National Environment Protection Council, as amended in May 2013
- NSW EPA (2020). Contaminated land guidelines: Consultants Reporting on Contaminated Land. New South Wales Environment Protection Authority, 2020
- NSW EPA (2014) Waste Classification Guidelines: Part 1 Classifying Waste

The main objective of the contamination assessment was to assess if soils present a risk to human health and the environment during construction activities. As the sites are to be used for commercial/industrial purposes, the following assessment criteria, which are sourced from Schedule B1 of the NEPM 1999 (Amendment 2013), have been considered:

- Human Health:
 - Health Investigation Level (HIL) Commercial/Industrial (HIL D)
 - Health Screening Levels (HSL) for Vapour Intrusion for 0 to <2 m sand soils (HSL D)
- Ecological:
 - Ecological Investigation Level (EILs) for commercial/industrial
 - Ecological Screening Levels (ESLs) for TRH, BTEX and benzo(a)pyrene fractions –commercial / industrial (both coarse and fine soil textures)

The application of EILs is dependent on site specific soil characteristics including pH, cation exchange capacity (CEC) and clay content. As these soil characteristics have not been assessed to date, the following assumptions were made:

- Soils were assumed to have a low range CEC, as such, a CEC of 5 cmol_c/kg has been assumed for the selection of copper, nickel and zinc criteria.
- Soils across the site are assumed to be basic. Based on this assumption, a pH range of 7.5 has been selected for zinc and copper criteria.
- For selection of the Cr III criterion, a clay content of 5 % has been assumed. The selection of Cr III criterion is not CEC or pH dependent.

4.2.2.2 Waste classification

The chemical concentrations pertaining to soil samples collected from designated stockpiles will be compared to the criteria outlined in Table 1 of the NSW EPA (2014) *Waste Classification Guidelines: Part 1 Classifying Waste*. The guidelines provide relevant criteria for assessing and classifying solid (non-liquid) wastes. The classification process for solid wastes also focuses on the potential for the waste to release chemical contaminants into the environment through contact with liquids (leachates).

The method used to chemically assess waste is the specific contaminant concentration (SCC) test. Where the SCC value exceeds the specified contaminant threshold (CT) value, further assessment using toxicity characteristic leaching procedure (TCLP) may be used to determine the total concentration of each contaminant in the waste sample and its leachability. The guidelines set different maximum levels for the CT of each contaminant and its leachability, in order for waste to be classified as either general solid waste or restricted solid waste. If the level exceeds the restricted solid waste criteria, the material is classified as hazardous waste.

4.2.2.3 Results

Laboratory reports and result tables are presented in Appendix D and Appendix E.

Health criteria

Concentrations of contaminants were either below the laboratory limit of reporting (LOR) or the nominated health assessment criteria (HIL D/HSL D) for all samples analysed.

Based on the results there is a low potential for soils to be a significant risk to the health of workers/users of the Site.

Ecological criteria

Concentrations of contaminants were either below the laboratory limit of reporting (LOR) or the nominated assessment criteria (EILs/ESLs)

Based on the results there is a low potential for soils to be a significant risk to the surrounding environment.

Waste Classification

All results were reported below the NSW EPA (2014) General Solid Waste CT1 (No Leaching).

Based on the results the soils would be classified as general solid waste. However, given PASS has been detected in soil samples, soils would be classified as PASS and may need treatment prior to disposal.

4.2.3 Acid sulfate soils results

4.2.3.1 Assessment criteria

The ASSMAC (1998) action criteria for treatment of ASS have been adopted and used to assess the net acidity in each soil sample. The criteria are presented in Table 4.3.

When analytical results exceed the action criteria, a treatment regime and management plan for the materials is triggered. For disturbances of less than 1000 tonnes the action criteria vary according to the texture of the material, however if more than 1000 tonnes is to be disturbed all action criteria are the same: 0.03 for S% and 18 mol H⁺/tonne for acid. As spoil generated from this works is estimated to be less than 1000 tonnes these action criteria have been selected.

Table 4.3 Action criteria for ASS treatment

Soil texture	Clay content %	< 1000 tonnes disturbed		> 1000 tonnes disturbed	
		Sulfur Content %	Acid mol/Tonne	Sulfur content %	Acid mol/Tonne
Coarse (sands-gravels)	≤ 5	0.03	18		
Medium (sandy loam-light clay)	5 - 40	0.06	36	0.03	18
Fine (medium to heavy clays, silty clays)	≥ 40	0.10	62		

Note: Bold indicates selected criteria

4.2.3.2 Results

Results from the ASS field screening are presented in Appendix E. In summary:

- Values for pH_F were neutral to alkaline ranging from 6.8 to 9.2
- Values for pH_{Fox} were acidic to alkaline ranging from 2.3 to 8.6
- The ΔpH, defined as pH_F minus pH_{Fox}, ranged from 0.1 to 6.8

Chromium Reducible Sulfur (CRS) ASS suite analysis was undertaken on the four samples which reported the highest change in pH. With results as follows:

- ASS – Acidity Trail results were reported below the detection limit
- ASS – Potential Acidity results ranged from 46 – 340 mole H⁺/t and 0.074 -0.55 %S

4.2.4 Quality assurance and quality control

Laboratory quality assurance and quality control

The results reported indicate that the laboratory was achieving levels of performance within their recommended control limits during the period when the samples from this program were analysed. Based on a review of the laboratory QA/QC data, it is considered that the analytical results are reasonably representative of conditions at the time of the investigation.

5. Discussion and recommendations

5.1 Geotechnical model

A geotechnical model is an idealisation based on geotechnical interpretation. An idealised geotechnical model for this investigation is summarised in Table 5.1 below.

Table 5.1 Geotechnical model

Description	Unit	Consistency / Relative Density	Depth encountered (m)	
			Cormorant Road	Teal Street
FILL	Unit 1 FILL	-	0 to 2.8 m	0 to 1.7 m
Upper SAND	Unit 2b Estuarine SAND	Medium dense	2.8 to 3.2 m	1.7 to 1.8 m
CLAY	Unit 3 Estuarine CLAY	Firm	3.2 to 4.0 m	1.8 to 2.5 m
Lower SAND	Unit 2a Estuarine SAND	Very loose to loose	4.0 to 6.5 m	2.5 to 5.5 m
	Unit 2b Estuarine SAND	Medium dense	-	5.5 to >10 m
	Unit 2c Estuarine SAND	Dense to very dense	6.5 to >10 m	-
Groundwater			2.2 m	1.6 m

5.2 Footing selection

Due to the deep fill and loose estuarine soils, shallow footings are not recommended. Deep footings (i.e. piles) founding within the medium dense (Unit 2b) or dense to very dense (Unit 2c) sand are recommended. As the billboard will be subject to lateral loading, the choice of pile type and size needs to also consider lateral deflection tolerance.

Due to the shallow groundwater level, challenges may be encountered with construction of conventional bored piles associated with caving of the sand soils into the excavation and management of groundwater. Furthermore, the presence of potential acid sulfate soils makes displacement piles attractive as opposed to bored piles that generate spoil.

Given the above, and subject to confirmation by detailed structural and geotechnical foundation design, driven displacement piles (steel, timber or precast concrete) or continuous flight auger (CFA) piles (which do generate some spoil) are recommended.

5.3 Geotechnical design parameters

Piles may be founded in the medium dense or better sand units (Unit 2b and 2c) a minimum three pile diameters into the unit.

For driven piles, termination depths could be determined using dynamic pile driving assessment with signal matching (wave equation analysis).

CFA piles (non-displacement) should be designed using static pile design methods (such as Poulos and Davis, 1980) and the preliminary geotechnical design parameters provided in Table 5.2.

Typical elastic moduli have been provided to assist with lateral design of piles if required.

Table 5.2 Preliminary geotechnical parameters for CFA piles

Unit		Density Index (%)	Bulk Unit Weight (kN/m ³)	Apparent Friction ϕ (°)	Undrained shear strength S_u (kPa)	Elastic modulus - static E_s (MPa)
1	Fill	35-80	18-20	27-35	-	10 - 30
2a	Estuarine SAND – loose	15-35	14-16	25-29	-	5 - 10
2b	Estuarine SAND – medium dense	35-50	16-17	30-33	-	12 - 18
2c	Estuarine SAND – dense to very dense	65-85	18-19	35-37	-	25 - 40
3	Clay – firm	-	16-17	-	25 – 50	10 - 25

Piles should be designed and installed in accordance with Australian Standard AS 2159-2009 *Piling – Design and Installation*. The basic geotechnical reduction factor (ϕ_{gb}), of 0.45 (for a low redundancy system) should be applied to the ultimate values and appropriate checks on pile settlement, including consideration of uplift, as appropriate. It is expected that pile settlement (serviceability) will limit allowable pile capacity rather than the ultimate geotechnical pile capacity.

5.4 Footing inspection and testing

Geotechnical design parameters and conditions used as the basis of this assessment should be confirmed by geotechnical inspection during construction. If subsurface conditions encountered during construction differ from those provided in this report, further geotechnical advice should be sought.

Inspection of footings and foundations should be undertaken by an experienced geotechnical engineer or engineering geologist to verify that the recommended foundation material has been reached and to check initial assumptions relating to foundation conditions, cleanliness, roughness and possible variations that may occur across the site.

5.5 Earthquake loads

Based on Australian Standard AS 1170.4-2007 *Earthquake Design Actions*, an acceleration coefficient of 0.11 is considered applicable for the Newcastle area.

On the basis of the typical subsurface profiles discussed above, the site sub-soil class of C_e – Shallow soil site has been assessed in accordance with AS 1170.4-2007.

5.6 Exposure classification

The soil aggression and oxidised pH (pH_{FOX}) test results above have been assessed in terms of Tables 6.4.2(C) and 6.5.2(C) of Australian Standard AS 2159-2009 *Piling – Design and Installation*. Table 5.3 below presents the soil condition and classification for each sample tested.

Table 5.3 Exposure classifications

Unit	Sample/s tested	Initial or oxidised pH	Classification (as per AS2159)		
			Soil Condition	Concrete	Steel
1 FILL	BH01 0.9-1 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
1 FILL	BH01 1.5 -1.95 m	Initial	Non-cohesive	Non-aggressive	Non-aggressive
1 FILL	BH01 2.5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
3 Estuarine CLAY	BH01 3.5 m	Oxidised	Cohesive	Mild	Non-aggressive
2a Estuarine SAND	BH01 5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
2a Estuarine SAND	BH01 6.5 m	Oxidised	Non-cohesive	Very severe	Severe
2c Estuarine SAND	BH01 8.5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive

Unit	Sample/s tested	Initial or oxidised pH	Classification (as per AS2159)		
			Soil Condition	Concrete	Steel
1 FILL	BH02 1 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
3 Estuarine CLAY	BH02 2 m	Oxidised	Cohesive	Mild	Non-aggressive
2a Estuarine SAND	BH02 4 m	Oxidised	Non-cohesive	Very severe	Severe
2b Estuarine SAND	BH02 5.5-5.95 m	Initial	Non-cohesive	Non-aggressive	Non-aggressive
2b Estuarine SAND	BH02 6.5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
2b Estuarine SAND	BH02 8.5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive
2b Estuarine SAND	BH02 9.5 m	Oxidised	Non-cohesive	Non-aggressive	Non-aggressive

Oxidised pH values for two of the above samples (BH01 6.5 m and BH02 4 m) resulted in classifications more than mild. Initial pH values of 6.8 and 9.1 were oxidised with pH_{FOX} values below 3. The initial pH values would result in classifications of non-aggressive to concrete and steel. It is anticipated that these soils will remain below the water table and therefore will not become oxidised.

Therefore, recommended exposure classifications are as follows:

- Unit 1 FILL, non-aggressive to concrete and steel
- Unit 2 Estuarine SAND, non-aggressive to concrete and steel
- Unit 3 Estuarine CLAY, mild to concrete and non-aggressive to steel

5.7 Acid sulphate soils

The results of the CRS analysis indicated that acidity in the samples analysed was primarily present as unoxidized pyrite (i.e. potential acid sulfate soils (PASS)). The net acidity in all four samples exceeded the National ASS Guidance (Sullivan et al., 2018) and ASSMAC (1998) action criteria (18 mol H⁺/tonne equivalent 0.03 %S) for sands. Although acid neutralising capacity (ANC) was detected in sufficient quantities to neutralise the potential acidity generated from two of the samples (BH01 3.5m and BH02 2m), it cannot be confirmed if this ANC would effectively neutralise the acidity generated under conditions likely to be encountered during construction works.

Based on the results there is PASS present within the area that would require liming to neutralise the acidity generated from the disturbance of PASS. Current data suggests liming between 3.5 and 26 kg CaCO₃/t (based on Net Acidity excluding ANC values) would be required. An Acid Sulfate Soil Management Plan (ASSMP) will be required to direct the storage, handling and treatment of any excavated soil material.

5.8 Contamination

All results were reported below the health and ecological assessment criteria for commercial/industrial land use. Based on this soils present a low risk to human health and the environment under a commercial/industrial land use. During construction it is recommended that any soils that are excavated are stockpiled away from sensitive receptors such as waterways.

Soils were reported below the NSW EPA (2014) General Solid CT1 and would be classified as General Solid Waste – PASS. It is noted that this classification is preliminary only and further testing would need to be completed prior to disposal of soils off site. It is also noted that given that the soils contain PASS, treatment may need to be done prior to disposal.

6. References

ASSMAC (1998) NSW Acid Sulfate Soils Manual

Colquhoun G.P., Hughes K.S., Deyssing L., Ballard J.C., Folkes C.B, Phillips G., Troedson A.L. & Fitzherbert J.A. 2021. New South Wales Seamless Geology dataset, version 2.1 [Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW, Maitland via MinView

Matthei L.E., 1995, Soil Landscapes of the Newcastle 1:100,000 Sheet map and report, NSW Department of Land and Water Conservation, Sydney, via eSpade

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NSW EPA (2014). Waste Classification Guidelines, Part 1: Classifying Waste. November 2014

NSW EPA (2021). Guidelines for Consultants Reporting on Contaminated sites

Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, Canberra ACT. CC BY 4.0

Appendices

Appendix A

General Notes and Standard Sheets

GENERAL NOTES



GHD

Specialist Services in Geotechnical Engineering,
Geology, Field/Laboratory Testing and Hydrogeology
www.ghd.com/Geotechnical

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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GLOSSARY OF SYMBOLS



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This standard sheet should be read in conjunction with all test hole log sheets and any idealised geological sections prepared for the investigation report.

GENERAL

Symbol	Description	Symbol	Description
D	Disturbed Sample	R	Rising Head Permeability Test
B	Bulk Sample	F	Falling Head Permeability Test
U(50)	Undisturbed Sampled (suffixed by sample size or tube diameter in mm if applicable)	PBT	Plate Bearing Test
CS	Core Sample (suffixed by diameter in mm)		Water Inflow (make)
ES	Soil sample for environmental sampling		Water Outflow (loss)
PID	Photoionisation Detector		Temporary Water Level
SPT	Standard Penetration Test (with blows per 0.15m)		Final Water Level
N	SPT Value		Point Load Test (axial)
HB/HW	SPT Hammer Bouncing/Hammer Weight		Point Load Test (diametric)
PP/HP	Pocket/Hand Penetrometer (suffixed by value kPa)	PL	Point Load (kPa)
PK	Packer Test (kPa)	IMP	Impression Device Test
PZ	Piezometer Installation	PM	Pressuremeter Test
SV/VS	Shear Vane Test (suffixed by value in kPa)		

SOIL SYMBOLS

Main Components				Minor Components			
	SAND		FILL		sandy		vegetation, roots
	GRAVEL		SILT		gravelly		silty
	CLAY		TOPSOIL		clayey	<i>Note: Natural soils are generally a combination of constituents, e.g. sandy CLAY</i>	

ROCK SYMBOLS

Sedimentary						Igneous	
	SANDSTONE		SILTSTONE		CONGLOMERATE		GRANITE C ROCK
	CLAYSTONE		SHALE		COAL		BASALT IC ROCK
							IGNEOUS DYKE

Note: Additional rock symbols may be allocated for a particular project

NATURAL DEFECTS (Coding)

Defect Type		Orientation					
Jt	Joint	For vertical non-oriented core ... "Dip" angle (eg. 5°) measured relative to horizontal.					
Pt	Parting	For inclined non-oriented core ... "Angle" measured relative to core axis.					
SS	Sheared Surface	For inclined oriented core ... "Dip" angle and "Dip Direction" angle (eg. 45°/225° mag.).					
WSm	Weathered Seam	Orientation (con't)		Roughness		Coating	
SSm	Sheared Seam	VT	Vertical	Pol	Polished	Cn	Clean
CSm	Crushed Seam	HZ or 0°	Horizontal	So	Smooth	Sn	Stained
ISm	Infilled Seam	d / °	Degrees	Rf	Rough	Ve	Veneer
SZ	Sheared Zone			VR	Very Rough	Co	Coating
VN	Vein			Slk	Slickensided		
Shape				Infilling / Common Materials			
Pln	Planar	St	Stepped	CLAY	Clay	Mi	Micaceous
Cu	Curved	Ir	Irregular	Ca	Calcite	Mn	Manganese
Un	Undulating	Dis	Discontinuous	X	Carbonaceous	Py	Pyrite
Others				Kt	Chlorite	Qz	Quartz
OP	Open	CL	Closed	Ti	Tight	Fe	Iron Oxide
						MU	Unidentified Mineral

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

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

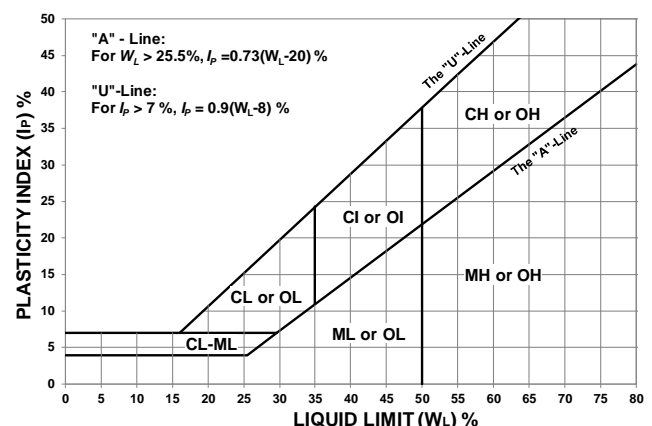
Classification allocates the material within distinct soil groups assigned a two character Group Symbol:

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.

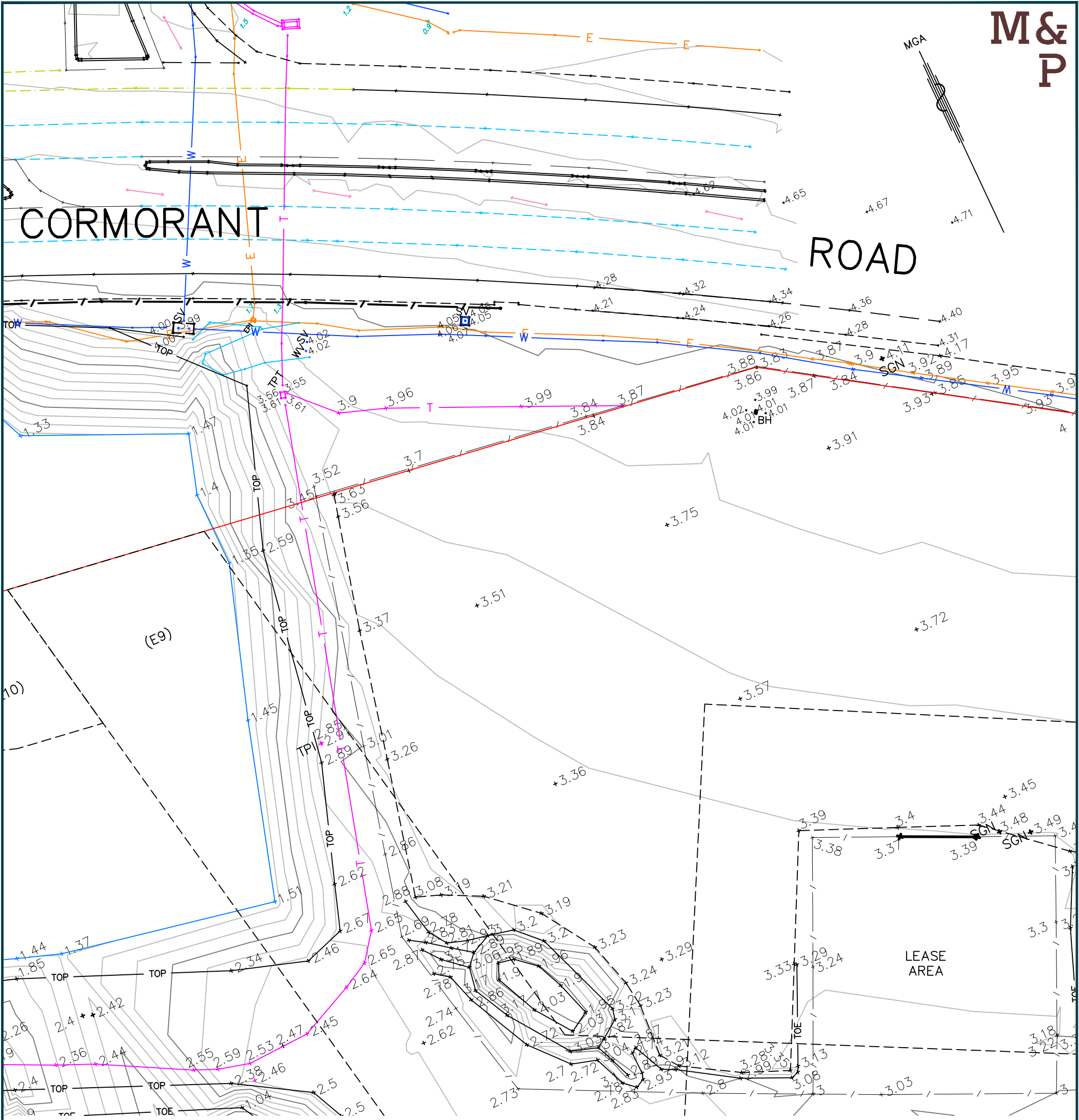
For the purpose of classification, *poorly graded, uniform, or gap graded* soils are all designated as poorly graded. Soils that are dominated by boulders or cobbles are described separately and are not classified.

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 B

Survey plans



M&P

CORMORANT

ROAD

SURVEY INFORMATION

- THE SURVEY IS ON MAP GRID OF AUSTRALIA (MGA) CO-ORDINATES (GDA 94) ZONE 56.
-THE ORIGIN OF CO-ORDINATES IS SSM 160874
E382971.380 N6361581.077
-SOURCE OF CO-ORDINATES: SCIMS
-DATE 03/08/2020
- ALL REDUCED LEVELS ARE ON AUSTRALIAN HEIGHT DATUM (A.H.D.)
-ORIGIN OF LEVELS SSM 160874, RL3.835
-SOURCE OF REDUCED LEVELS: SCIMS
-DATE OF REDUCED LEVELS 03/08/2020
- CONTOUR INTERVAL IS 0.2m.
- MGA AND ISG CO-ORDINATE SYSTEMS ARE BASED ON A MATHEMATICAL EARTH MODEL AND SUBJECT TO VARIABLE SCALE FACTORS. DISTANCES CALCULATED FROM CO-ORDINATES MAY VARY SIGNIFICANTLY FROM GROUND MEASUREMENTS. IF FURTHER CLARIFICATION IS REQUIRED CONTACT MONTEATH AND POWYS.

LINE TYPES

- DENOTES DISH DRAIN
- DENOTES UNDERGROUND ELECTRICITY CABLE
- DENOTES OVERHEAD ELECTRICITY CABLE
- DENOTES TELECOMMUNICATIONS CABLE
- DENOTES WATER MAIN
- DENOTES FENCING
- DENOTES RETAINING WALL
- DENOTES EDGE OF CONCRETE
- DENOTES TOP OF BANK
- DENOTES TOE OF BANK
- DENOTES CENTRELINE OF BITUMEN
- DENOTES EDGE OF BITUMEN
- DENOTES EDGE OF GRAVEL
- DENOTES TREE LINE
- DENOTES GUARD RAIL
- DENOTES WATER LINE



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Appendix C

Borehole logs






BOREHOLE LOG SHEET

Client : Ooh!Media Pty Limited
Project : Kooragang Island Billboard Geotechnical and Contamination Assessment
Location : Cormorant Road, Cormorant Road, Kooragang Island

HOLE No. BH01**SHEET 1 OF 2**

Position : Refer to test location plan **Surface RL:** 4.01m **AHD** **Angle from Horiz. :** 90° **Processed :** E.D
Rig Type : HydroP Scout **Mounting:** Track **Contractor :** Total Drilling Pty Ltd **Driller :** T.M **Checked :** JMS
Date Started : 16/12/2021 **Date Completed :** 16/12/2021 **Logged by :** E.D **Date:** 26/02/2022

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Note: * indicates signatures on original issue of log or last revision of log				
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	Comments/ Observations			
1 2 3 4 5 6 7	↑ Augur ↓			SPT 11/13/12 N=27	0.05		SP	ASPHALT	M		Appears well compacted			
					[FILL] SAND: fine to coarse grained, brown, with clay, trace fine gravel (fill)									
					SPT 4/5/6 N= 11	2.80		SP	SAND: fine to coarse grained, grey, with trace clay and trace shell (estuarine)	M	MD			
						3.20		CH	CLAY: high plasticity, black, with fine to coarse grained sand, trace shells (estuarine)	w = PL	F			
				SPT 2/2/7 N=7	4.00		SP	SAND: fine to coarse grained, grey, with clay and shells (estuarine)	M	L				
				SPT 4/4/2 N=6	5.50		SP	SAND: fine to coarse grained, pale grey, trace clay (estuarine)	M	L				
	↑ Washbore + TC blade bit auger ↓			SPT 15/17/20 N=37						D				
			SPT 11/19/30											

See standard sheets for
details of abbreviations
& basis of descriptions



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 CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.**12552168**

BOREHOLE LOG SHEET

Client : Ooh!Media Pty Limited
Project : Kooragang Island Billboard Geotechnical and Contamination Assessment
Location : Cormorant Road, Cormorant Road, Kooragang Island

HOLE No. BH01**SHEET 2 OF 2**

Position : Refer to test location plan **Surface RL:** 4.01m **AHD** **Angle from Horiz. :** 90° **Processed :** E.D
Rig Type : HydroP Scout **Mounting:** Track **Contractor :** Total Drilling Pty Ltd **Driller :** T.M **Checked :** JMS
Date Started : 16/12/2021 **Date Completed :** 16/12/2021 **Logged by :** E.D **Date:** 26/02/2022

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	
9	— Washbore + TC blade bit auger — ↓			N=40				[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 / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	M	L	
				SPT 15/22/25/100mm N=ref							
10				SPT 10/14/25/100mm N=ref	9.92			SAND: as previous			
11								End of borehole at 9.92 metres. Target Depth			
12											
13											
14											
15											
16											

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Job No.**12552168**

BOREHOLE LOG SHEET

Client : Ooh!Media Pty Limited

Project : Kooragang Island Billboard Geotechnical and Contamination Assessment

Location : Teal Street, Cormorant Road, Kooragang Island

HOLE No. BH02

SHEET 1 OF 2

Position : Refer to test location plan

Surface RL: 3.34m

AHD

Angle from Horiz. : 90°

Processed : E.D

Rig Type : HydroP Scout

Mounting: Track

Contractor : Total Drilling Pty Ltd

Driller : T.M

Checked : JMS



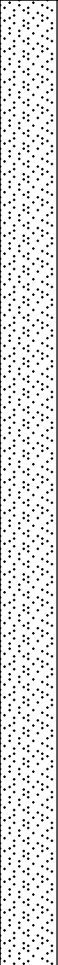
Date Started : 16/12/2021

Date Completed : 16/12/2021

Logged by : E.D

Date: 26/02/2022

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth metres	Graphic Log	USC Symbol	Description	Moisture Condition	
1	V-bit auger				0.40		SC	[FILL] Clayey SAND: fine to coarse grained, brown, with fine gravel, trace shells and rootlet (fill)	M	
					SC		[FILL] Clayey SAND: fine to coarse grained, brown, trace fine gravel (fill)	M		
2				SPT 11/ 25 for 125mm HB N=ref	1.70		SP	SAND: fine to coarse grained, grey, with clay (estuarine)	M	MD
					1.80		CH	CLAY: high placity, black, with fine to medium grained sand (estuarine)	w = PL	F
3				SPT 0/0/0 N=0	2.50		SP	SAND: fine to coarse grained, grey with clay and trace shell (estuarine)	M	VL-L
4				SPT 2/2/2 N=4						
5										
6	Washbore + TC blade bit auger			SPT 4/8/6 N=14						MD
7				SPT 7/10/9 N=19						
8				SPT 4/7/3 N=10				7.50 m: clay content increasing		

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details of abbreviations
& basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

12552168

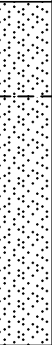
BOREHOLE LOG SHEET

Client : Ooh!Media Pty Limited
Project : Kooragang Island Billboard Geotechnical and Contamination Assessment
Location : Teal Street, Cormorant Road, Kooragang Island

HOLE No. BH02**SHEET 2 OF 2**

Position : Refer to test location plan **Surface RL:** 3.34m **AHD** **Angle from Horiz. :** 90° **Processed :** E.D
Rig Type : HydroP Scout **Mounting:** Track **Contractor :** Total Drilling Pty Ltd **Driller :** T.M **Checked :** JMS
Date Started : 16/12/2021 **Date Completed :** 16/12/2021 **Logged by :** E.D **Date:** 26/02/2022

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL					Comments/ Observations	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth metres	Graphic Log	USC Symbol	Description	Moisture Condition	Consistency / Density Index	
9	Washbore + TC blade bit auger			SPT 7/10/14 N=24	8.50		SP	SAND: as previous	M	VL-L	
					SAND: fine to medium, grey, with clay, trace shells (estuarine)			M	VD		
10				SPT 14/19/15 for 130 mm N=ref	9.82			End of borehole at 9.82 metres. Target Depth			
11											
12											
13											
14											
15											
16											

See standard sheets for
 details of abbreviations
 & basis of descriptions



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 CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.**12552168**

Appendix D

**Geotechnical and contamination
laboratory test results**

CERTIFICATE OF ANALYSIS 286899

Client Details

Client	GHD Pty Ltd
Attention	David Brooke
Address	57-63 Herbert Street, Artarmon, NSW, 2064

Sample Details

Your Reference	<u>12552168</u>
Number of Samples	2 Soil
Date samples received	19/01/2022
Date completed instructions received	19/01/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	27/01/2022
Date of Issue	25/01/2022
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Inorganics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Misc Inorg - Soil			
Our Reference		286899-1	286899-2
Your Reference	UNITS	BH01	BH02
Depth		1.50-1.95	5.50-5.95
Date Sampled		16/12/2021	16/12/2021
Type of sample		Soil	Soil
Date prepared	-	20/01/2022	20/01/2022
Date analysed	-	20/01/2022	20/01/2022
pH 1:5 soil:water	pH Units	8.9	7.5
Electrical Conductivity 1:5 soil:water	µS/cm	70	330
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	<10	600

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/01/2022	[NT]	[NT]	[NT]	[NT]	20/01/2022	[NT]
Date analysed	-			20/01/2022	[NT]	[NT]	[NT]	[NT]	20/01/2022	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	100	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Samples were out of the recommended holding time for this analysis.



Material Test Report

Report No: SYD2200066

Issue No: 1

Client: Ooh! Media
76 Berry St
Nth Sydney NSW 2060

Project: 12552168



Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accreditation Approved Signatory: D.P. Brooke

No: 679

Date of Issue: 1/02/2022

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No SYD22-0016-01
Sampled By Sampled by GHD Geotechnical
Client Location Kooragang Island Billboard
BH / TP No. BH01
Depth (m) 1.50 - 1.95
Soil Classification SAND (SP)
as per AS1726 tables 9 & 10

Other Test Results

Description	Method	Result	Limits
Curvature Coefficient	AS 1289.3.6.1	1.28	
Uniformity Coefficient		2.19	

Particle Size Distribution

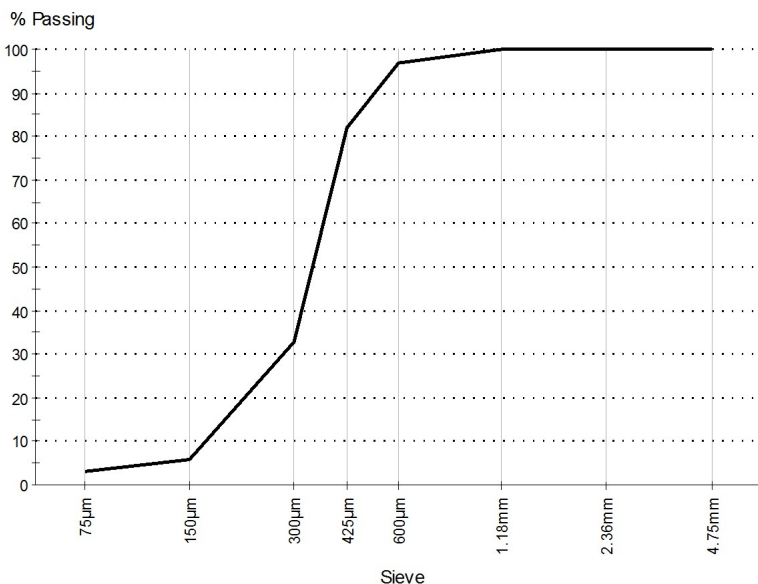
AS 1289.3.6.1

Drying by: Oven

Date Tested: 24/01/2022

Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	100	
1.18mm	100	
600µm	97	
425µm	82	
300µm	33	
150µm	6	
75µm	3	



Comments

N/A



Sydney Laboratory
Unit 5/43 Herbert St
Artarmon NSW 2064
email: artarmon@ghd.com.au
web: www.ghd.com.au/ghdgeotechnics
Tel: (02) 9462 4860
Fax: (02) 9462 4710

Material Test Report

Report No: SYD2200067

Issue No: 1

Client: Ooh! Media
76 Berry St
Nth Sydney NSW 2060

Project: 12552168



Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accreditation Approved Signatory: D.P. Brooke

No: 679

Date of Issue: 1/02/2022

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No SYD22-0016-02
Sampled By Sampled by GHD Geotechnical
SAND pale grey
Client Location Kooragang Island Billboard
BH / TP No. BH01
Depth (m) 4.00 - 4.45

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)			
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	N/A	
Plastic Limit (%)	AS 1289.3.2.1	NP	
Plasticity Index (%)	AS 1289.3.3.1	NP	

Comments

NP = Non Plastic



Material Test Report

Report No: SYD2200068

Issue No: 1

Client: Ooh! Media
76 Berry St
Nth Sydney NSW 2060

Project: 12552168



Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accreditation Approved Signatory: D.P. Brooke

No: 679

Date of Issue: 1/02/2022

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No SYD22-0016-03
Sampled By Sampled by GHD Geotechnical
Client Location SAND with silt
Kooragang Island Billboard
BH / TP No. BH01
Depth (m) 6.50 - 6.95

Other Test Results

Description	Method	Result	Limits
Curvature Coefficient	AS 1289.3.6.1	1.01	
Uniformity Coefficient		2.48	

Particle Size Distribution

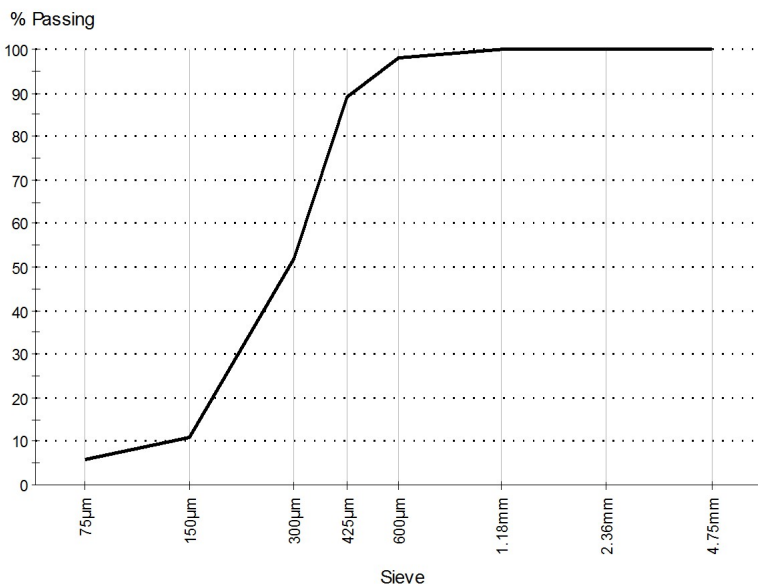
AS 1289.3.6.1

Drying by: Oven

Date Tested: 24/01/2022

Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	100	
1.18mm	100	
600µm	98	
425µm	89	
300µm	52	
150µm	11	
75µm	6	



Comments

N/A



Material Test Report

Report No: SYD2200069

Issue No: 1

Client: Ooh! Media
76 Berry St
Nth Sydney NSW 2060

Project: 12552168



Accredited for compliance with ISO / IEC 17025 - Testing

NATA Accreditation Approved Signatory: D.P. Brooke

No: 679

Date of Issue: 1/02/2022

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No SYD22-0016-04
Sampled By Sampled by GHD Geotechnical
Client Location Kooragang Island Billboard
BH / TP No. BH02
Depth (m) 5.50 - 5.95
Soil Classification SAND (SP)
as per AS1726 tables 9 & 10

Other Test Results

Description	Method	Result	Limits
Curvature Coefficient	AS 1289.3.6.1	1.03	
Uniformity Coefficient		2.06	

Particle Size Distribution

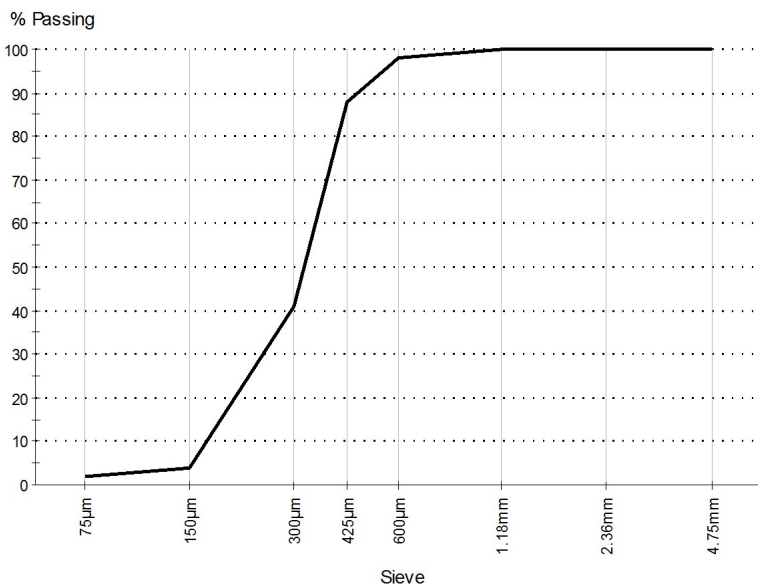
AS 1289.3.6.1

Drying by: Oven

Date Tested: 24/01/2022

Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	100	
1.18mm	100	
600µm	98	
425µm	88	
300µm	41	
150µm	4	
75µm	2	



Comments

N/A



Eurofins | Environment Testing ABN 50 005 085 521

 Sydney Laboratory

Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2056
02 9900 8400 EnviroSampleNSW@aurofins.com

☐ Brisbane Laboratory

Unit 1 21 Smallwood Place Murarie QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

Perth Laboratory

Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

 Melbourne Laboratory

6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

 $\frac{1}{5}$ [illegible]

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

 **Sydney Laboratory**
Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

 **Brisbane Laboratory**
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07 3902 4600 EnviroSampleQLD@eurofins.com

 **Perth Laboratory**
Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ **Melbourne Laboratory**
6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@aurofin.com

215

Company		GHD		Project No		12552168		Project Manager		Alison Monkley		Sampler(s)			
Address		Floor 3 24 Honeysuckle drive Newcastle NSW		Project Name				EDD Format ESdat, EQulS etc				Handed over by			
Contact Name		Alison Monkley		Analyses <small>Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.</small>								Email for Invoice		Alison.Monkley@ghd.com.au	
Phone No		0447108208										Email for Results		11	
Special Directions		11													
Purchase Order															
Quote ID No															
No	Client Sample ID	Sampled Date/Time <small>dd/mm/yy hh:mm</small>	Matrix Solid (S) Water (W)												
1	BH01 6.5m	16/12	S												
2	BH01 7.5m	↓	↓												
3	BH01 8.5m														
4	BH01 9.5m														
5	BH01 0-0.2m														
6	BH01 0.3-0.5m														
7	BH01 0.9-1m														
8	BH01 2m														
9	BH01 3m														
10	BH01 1.5m														
Total Counts															
Method of Shipment				<input type="checkbox"/> Courier (#) <input type="checkbox"/> Hand Delivered <input type="checkbox"/> Postal		Name		Signature		Date		Time			
Laboratory Use Only				Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Temperature	
				Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Report No	
				OR		NTL		OR		22-12-21		8:30am		852456	

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

 Sydney Laboratory

Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2056
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory

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07 3902 4600 EnviroSampleQLD@eurofins.com

Perth Laboratory

Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

 Melbourne Laboratory

6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

315

Company		GHD		Project No		12552168		Project Manager		Alison Monckley		Sampler(s)			
Address		"		Project Name				EDD Format ESdai, EQulS etc				Handed over by			
Contact Name		Alison Monckley		Analyses <small>Where details are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.</small>								Email for Invoice		Alison.Monckley@ghd.com	
Phone No		0447108208										Email for Results		" "	
Special Directions		"													
Purchase Order															
Quote ID No												Containers <small>Change container type & size if necessary.</small>		Required Turnaround Time (TAT) <small>Default will be 5 days if not ticked</small>	
No	Client Sample ID	Sampled Date/Time <small>dd/mm/yyyy hh:mm</small>	Matrix <small>Solid (S) Water (W)</small>									<div>500mL Plastic</div> <div>250mL Plastic</div> <div>125mL Plastic</div> <div>200mL Amber Glass</div> <div>40mL VOA vial</div> <div>500mL PFAS Bottle</div> <div>Jar (Glass or HDPE)</div> <div>Other (Asbestos AS4984, WA Guidelines)</div>		<div><input type="checkbox"/> Overnight (reporting by 9am) ♦</div> <div><input type="checkbox"/> Same day ♦ <input type="checkbox"/> 1 day ♦</div> <div><input type="checkbox"/> 2 days ♦ <input type="checkbox"/> 3 days ♦</div> <div><input type="checkbox"/> 5 days (Standard)</div> <div><input type="checkbox"/> Other()</div>	
														Sample Comments / Dangerous Goods Hazard Warning	
1	BH02 0-0.2m	16/12	S											Sar/Acid sulphate	
2	BH02 0.4-0.5m														
3	BH02 1m														
4	BH02 1.5m														
5	BH02 2m														
6	BH02 3m														
7	BH02 4m														
8	BH02 5m														
9	BH02 6.5m														
10	BH02 7.5m														
Total Counts															
Method of Shipment		<input type="checkbox"/> Courier (#) <input type="checkbox"/> Hand Delivered <input type="checkbox"/> Postal		Name		Signature		Date		Time					
Laboratory Use Only		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Temperature			
		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Report No			
		[Signature]		[Signature]		[Signature]		22.12.21		8.30am		852456			



CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory
Unit F3 Bid.F 16 Mars Road Lane Cove West NSW 2056
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1 21 Smallwood Place Murarie QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
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08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
6 Montfey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

4/5

Company		GHID		Project No		12552168		Project Manager		Alison Monkley		Sampler(s)			
Address		11		Project Name				EDD Format				Handed over by			
Contact Name		Alison Monkley		Analyses Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.								Email for Invoice		Alison.Monkley@ghd.com	
Phone No		0447108208										Email for Results			
Special Directions		11													
Purchase Order															
Quote ID No															
No		Client Sample ID		Sampled Date/Time dd/mm/yy hh:mm		Matrix Solid (S) Water (W)									
1		BH02 8.5m													
2		BH02 9.5m													
3		BH02 - 0.2m													
4		BH02 0.4-0.5m													
5		BH02 1m													
6		BH02 1.5m													
7		BH02 2m													
8		BH02 4m													
9															
10															
Total Counts															
Method of Shipment		<input type="checkbox"/> Courier (#)		<input type="checkbox"/> Hand Delivered		<input type="checkbox"/> Postal		Name		Signature		Date		Time	
Laboratory Use Only		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Temperature			
		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Report No		852456	

Eurofins Environment Testing Australia Pty Ltd

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

5/5

Quinn Raw

From: Alison Monkley <Alison.Monkley@ghd.com>
Sent: Wednesday, 22 December 2021 8:37 AM
To: Quinn Raw
Subject: RE: 125521G8 COC

Categories: COCs/Clients

852456

EXTERNAL EMAIL*

Hi Quinn,

Please analyse the following samples for TRH,BTEX, PAH, heavy metals (standard 8), OCPs and PCBs

- BH01 0-0.2
- BH01 0.9-1
- BH01 3
- BH02 0-0.2
- BH02 1
- BH02 2

Please analyse the following for ASS field test

- BH01 0.9-1
- BH01 2.5
- BH01 3.5
- BH01 5
- BH01 6.5
- BH01 8.5
- BH02 1
- BH02 2
- BH02 4
- BH02 6.5
- BH02 8.5
- BH02 9.5

Alison Monkley

B.Eng (Env), B.Sc, ME (groundwater)

Business Group Leader – Contamination Assessment and Remediation

GHD

Proudly employee-owned | ghd.com

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle, NSW, 2300, Australia
D +61 2 4979 9990 M +61 447 108 208 E alison.monkley@ghd.com

→ The Power of Commitment

Connect



Please consider the environment before printing this

From: Quinn Raw <QuinnRaw@eurofins.com>

Sent: Tuesday, 21 December 2021 12:15 PM

To: Alison Monkley <Alison.Monkley@ghd.com>

Subject: RE: 125521G8 COC

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne

6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261 Site # 1254

Sydney

Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth

46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 6253 4444
NATA # 2377 Site # 2370

Eurofins Environment Testing NZ Limited

NZBN: 9429046024954

Auckland

35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: GHD Pty Ltd NEWCASTLE
Contact name: Alison Monkley
Project name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM
Project ID: 12552168
Turnaround time: 10 Day
Date/Time received: Dec 22, 2021 8:30 AM
Eurofins reference: 852456

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 17.9 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.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

BH01 1.5M Jar labelled "1.4-1.5". Logged as BH01 1.5M as no other sample mislabelled. Please advise if incorrect. | BH01 2M & BH01 3M ASS bag listed twice on COC. | BH01 1.5M (Jar and Bag) labelled "BH01 1.4-1.5M". Logged as per COC | Two extra samples received; BH01 0.3-0.5 DUP02 & BH02 0.4-0.5M DUP02. Logged on HOLD. Please advise if analysis required. | Alison; please double check all sample names and analyses are correct. Some samples listed twice on COC, once with multiple sample containers (usually jar and bag) and again with only one (usually Asbestos Bag). |

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Alison Monkley - alison.monkley@ghd.com.au.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NEWCASTLE email address.

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

Project Name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM
Project ID: 12552168

Order No.:
Report #: 852456
Phone: 02 4979 9999
Fax: 02 4979 9988

Received: Dec 22, 2021 8:30 AM
Due: Jan 7, 2022
Priority: 10 Day
Contact Name: Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID					
1	BH01 0-0.2M	Dec 16, 2021		Soil	N21-De52382		X		X	X
2	BH01 0.9-1M	Dec 16, 2021		Soil	N21-De52383		X	X	X	X
3	BH01 2.5M	Dec 16, 2021		Soil	N21-De52384			X		
4	BH01 3M	Dec 16, 2021		Soil	N21-De52385		X		X	X
5	BH01 3.5M	Dec 16, 2021		Soil	N21-De52386			X		
6	BH01 5M	Dec 16, 2021		Soil	N21-De52387			X		
7	BH01 6.5M	Dec 16, 2021		Soil	N21-De52388			X		
8	BH01 8.5M	Dec 16, 2021		Soil	N21-De52389			X		
9	BH01 0-0.2M	Dec 16, 2021		Soil	N21-De52390	X				



Environment Testing

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261 Site # 1254

Sydney
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16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle
4/52 Industrial Drive
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Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

Eurofins ARL Pty Ltd

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Phone : +61 8 6253 4444
NATA # 2377 Site # 2370

Eurofins Environment Testing NZ Limited

NZBN: 9429046024954

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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

Project Name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM
Project ID: 12552168

Order No.:
Report #: 852456
Phone: 02 4979 9999
Fax: 02 4979 9988

Received: Dec 22, 2021 8:30 AM
Due: Jan 7, 2022
Priority: 10 Day
Contact Name: Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
10	BH02 1M	Dec 16, 2021		Soil	N21-De52391		X	X	X	X
11	BH02 2M	Dec 16, 2021		Soil	N21-De52392		X	X	X	X
12	BH02 4M	Dec 16, 2021		Soil	N21-De52393			X		
13	BH02 6.5M	Dec 16, 2021		Soil	N21-De52394			X		
14	BH02 8.5M	Dec 16, 2021		Soil	N21-De52395			X		
15	BH02 9.5M	Dec 16, 2021		Soil	N21-De52396			X		
16	BH01 0.3-0.5M	Dec 16, 2021		Soil	N21-De52397	X				
17	BH01 1.5M	Dec 16, 2021		Soil	N21-De52398	X				
18	BH01 2M	Dec 16, 2021		Soil	N21-De52399	X				
19	BH01 4M	Dec 16, 2021		Soil	N21-De52400	X				
20	BH01 7.5M	Dec 16, 2021		Soil	N21-De52401	X				



Environment Testing

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne

6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261 Site # 1254

Sydney

Unit F3, Building F
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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth

46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 6253 4444
NATA # 2377 Site # 2370

Eurofins Environment Testing NZ Limited

NZBN: 9429046024954

Auckland

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Company Name: GHD Pty Ltd NEWCASTLE

Address: 3/24 Honeysuckle Dve
Newcastle
NSW 2300

Project Name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM

Project ID: 12552168

Order No.:

Report #: 852456

Phone: 02 4979 9999

Fax: 02 4979 9988

Received:

Dec 22, 2021 8:30 AM

Due:

Jan 7, 2022

Priority:

10 Day

Contact Name:

Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
21	BH01 9.5M	Dec 16, 2021		Soil	N21-De52402	X				
22	BH01 0.3-0.5M	Dec 16, 2021		Soil	N21-De52403	X				
23	BH01 0.9-1M	Dec 16, 2021		Soil	N21-De52404	X				
24	BH01 1.5M	Dec 16, 2021		Soil	N21-De52405	X				
25	BH02 0-0.2M	Dec 16, 2021		Soil	N21-De52406		X		X	X
26	BH02 0.4-0.5M	Dec 16, 2021		Soil	N21-De52407	X				
27	BH02 1.5M	Dec 16, 2021		Soil	N21-De52408	X				
28	BH02 3M	Dec 16, 2021		Soil	N21-De52409	X				
29	BH02 5M	Dec 16, 2021		Soil	N21-De52410	X				
30	BH02 7.5M	Dec 16, 2021		Soil	N21-De52411	X				
31	BH02 0-0.2M	Dec 16, 2021		Soil	N21-De52412	X				



Environment Testing

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne

6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261 Site # 1254

Sydney

Unit F3, Building F
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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth

46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 6253 4444
NATA # 2377 Site # 2370

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NZBN: 9429046024954

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Company Name: GHD Pty Ltd NEWCASTLE

Address: 3/24 Honeysuckle Dve
Newcastle
NSW 2300

Project Name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM

Project ID: 12552168

Order No.:

Report #: 852456

Phone: 02 4979 9999

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Contact Name:

Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
32	BH02 0.4-0.5M	Dec 16, 2021		Soil	N21-De52413	X				
33	BH02 1M	Dec 16, 2021		Soil	N21-De52414	X				
34	BH02 1.5M	Dec 16, 2021		Soil	N21-De52415	X				
35	BH02 2M	Dec 16, 2021		Soil	N21-De52416	X				
36	BH02 4M	Dec 16, 2021		Soil	N21-De52417	X				
37	BH01 0.3-0.5 DUP02	Dec 16, 2021		Soil	N21-De52418	X				
38	BH02 0.4-0.5M DUP02	Dec 16, 2021		Soil	N21-De52419	X				
Test Counts						23	6	12	6	6

GHD Pty Ltd
3/24 Honeysuckle Dve
Newcastle
NSW 2300



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Alison Monkley**

Report **852456-S**
Project name **KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM**
Project ID **12552168**
Received Date **Dec 22, 2021**

Client Sample ID			G01 BH01 0-0.2M	BH01 0.9-1M	BH01 2.5M	BH01 3M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52382	N21-De52383	N21-De52384	N21-De52385
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
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	< 40	< 20	-	< 20
TRH C15-C28	50	mg/kg	< 100	< 50	-	< 50
TRH C29-C36	50	mg/kg	180	< 50	-	59
TRH C10-C36 (Total)	50	mg/kg	180	< 50	-	59
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	%	98	100	-	75
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 100	< 50	-	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	-	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	-	< 20
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

Client Sample ID			G01 BH01 0-0.2M	BH01 0.9-1M	BH01 2.5M	BH01 3M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52382	N21-De52383	N21-De52384	N21-De52385
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
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	%	90	99	-	105
p-Terphenyl-d14 (surr.)	1	%	60	85	-	92
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 1	< 0.1	-	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
a-HCH	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Aldrin	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
b-HCH	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
d-HCH	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Dieldrin	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endosulfan I	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endosulfan II	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endrin	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Endrin ketone	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
g-HCH (Lindane)	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Heptachlor	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Methoxychlor	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Toxaphene	0.5	mg/kg	< 10	< 0.5	-	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.5	< 0.05	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Dibutylchloroendate (surr.)	1	%	61	93	-	101
Tetrachloro-m-xylene (surr.)	1	%	91	103	-	108
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1221	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1232	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1242	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1248	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1254	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Aroclor-1260	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Total PCB*	0.1	mg/kg	< 1	< 0.1	-	< 0.1
Dibutylchloroendate (surr.)	1	%	61	93	-	101
Tetrachloro-m-xylene (surr.)	1	%	91	103	-	108
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 100	< 50	-	< 50
TRH >C16-C34	100	mg/kg	< 200	< 100	-	< 100
TRH >C34-C40	100	mg/kg	< 200	< 100	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 200	< 100	-	< 100

Client Sample ID			G01 BH01 0-0.2M	BH01 0.9-1M	BH01 2.5M	BH01 3M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52382	N21-De52383	N21-De52384	N21-De52385
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	6.0	< 2	-	2.2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	-	< 0.4
Chromium	5	mg/kg	14	< 5	-	7.1
Copper	5	mg/kg	16	< 5	-	6.4
Lead	5	mg/kg	13	< 5	-	26
Mercury	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
Nickel	5	mg/kg	8.9	< 5	-	6.9
Zinc	5	mg/kg	58	12	-	170
% Moisture	1	%	7.8	1.8	-	16
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	-	8.6	9.0	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	-	7.0	7.5	-
Reaction Ratings* ^{S05}	0	-	-	1.0	1.0	-

Client Sample ID			BH01 3.5M	BH01 5M	BH01 6.5M	BH01 8.5M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52386	N21-De52387	N21-De52388	N21-De52389
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.3	8.6	6.8	8.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.9	7.6	2.5	5.9
Reaction Ratings* ^{S05}	0	-	3.0	4.0	4.0	1.0

Client Sample ID			BH02 1M	BH02 2M	BH02 4M	BH02 6.5M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52391	N21-De52392	N21-De52393	N21-De52394
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	-	-
TRH C10-C14	20	mg/kg	< 20	< 20	-	-
TRH C15-C28	50	mg/kg	< 50	< 50	-	-
TRH C29-C36	50	mg/kg	< 50	< 50	-	-
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	-	-
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	%	51	98	-	-

Client Sample ID			BH02 1M	BH02 2M	BH02 4M	BH02 6.5M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52391	N21-De52392	N21-De52393	N21-De52394
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	-	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	-	-
TRH C6-C10	20	mg/kg	< 20	< 20	-	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	-	-
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	< 0.5	< 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	< 0.5	< 0.5	-	-
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	-	-
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-	-
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	< 0.5	< 0.5	-	-
Pyrene	0.5	mg/kg	< 0.5	< 0.5	-	-
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	-	-
2-Fluorobiphenyl (surr.)	1	%	116	87	-	-
p-Terphenyl-d14 (surr.)	1	%	101	110	-	-
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	-	-
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	-	-
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	-	-
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	-	-
a-HCH	0.05	mg/kg	< 0.05	< 0.05	-	-
Aldrin	0.05	mg/kg	< 0.05	< 0.05	-	-
b-HCH	0.05	mg/kg	< 0.05	< 0.05	-	-
d-HCH	0.05	mg/kg	< 0.05	< 0.05	-	-
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	-	-
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	-	-
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	-	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	-	-
Endrin	0.05	mg/kg	< 0.05	< 0.05	-	-
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	-	-
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	-	-
g-HCH (Lindane)	0.05	mg/kg	< 0.05	< 0.05	-	-
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	-	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	-	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	-	-
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	-	-
Toxaphene	0.5	mg/kg	< 0.5	< 0.5	-	-

Client Sample ID			BH02 1M	BH02 2M	BH02 4M	BH02 6.5M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-De52391	N21-De52392	N21-De52393	N21-De52394
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	-	-
Dibutylchloroendate (surr.)	1	%	108	109	-	-
Tetrachloro-m-xylene (surr.)	1	%	122	96	-	-
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1232	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1242	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1248	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1254	0.1	mg/kg	< 0.1	< 0.1	-	-
Aroclor-1260	0.1	mg/kg	< 0.1	< 0.1	-	-
Total PCB*	0.1	mg/kg	< 0.1	< 0.1	-	-
Dibutylchloroendate (surr.)	1	%	108	109	-	-
Tetrachloro-m-xylene (surr.)	1	%	122	96	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	-	-
TRH >C16-C34	100	mg/kg	< 100	< 100	-	-
TRH >C34-C40	100	mg/kg	< 100	< 100	-	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	-	-
Heavy Metals						
Arsenic	2	mg/kg	< 2	3.2	-	-
Cadmium	0.4	mg/kg	< 0.4	< 0.4	-	-
Chromium	5	mg/kg	5.6	28	-	-
Copper	5	mg/kg	< 5	16	-	-
Lead	5	mg/kg	7.3	39	-	-
Mercury	0.1	mg/kg	< 0.1	< 0.1	-	-
Nickel	5	mg/kg	< 5	23	-	-
Zinc	5	mg/kg	61	260	-	-
% Moisture	1	%	20	22	-	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.5	8.5	9.1	8.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	8.1	5.5	2.3	8.6
Reaction Ratings* ^{S05}	0	-	4.0	4.0	4.0	4.0

Client Sample ID			BH02 8.5M	BH02 9.5M	BH02 0-0.2M
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			N21-De52395	N21-De52396	N21-De52406
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
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	%	-	-	93
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene ^{N02}	0.5	mg/kg	-	-	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	-	-	< 50
TRH C6-C10	20	mg/kg	-	-	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	-	-	< 20
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	%	-	-	122
p-Terphenyl-d14 (surr.)	1	%	-	-	138
Organochlorine Pesticides					
Chlordanes - Total	0.1	mg/kg	-	-	< 0.1
4,4'-DDD	0.05	mg/kg	-	-	< 0.05
4,4'-DDE	0.05	mg/kg	-	-	< 0.05
4,4'-DDT	0.05	mg/kg	-	-	< 0.05
a-HCH	0.05	mg/kg	-	-	< 0.05
Aldrin	0.05	mg/kg	-	-	< 0.05
b-HCH	0.05	mg/kg	-	-	< 0.05

Client Sample ID			BH02 8.5M	BH02 9.5M	BH02 0-0.2M
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			N21-De52395	N21-De52396	N21-De52406
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit			
Organochlorine Pesticides					
d-HCH	0.05	mg/kg	-	-	< 0.05
Dieldrin	0.05	mg/kg	-	-	< 0.05
Endosulfan I	0.05	mg/kg	-	-	< 0.05
Endosulfan II	0.05	mg/kg	-	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	-	< 0.05
Endrin	0.05	mg/kg	-	-	< 0.05
Endrin aldehyde	0.05	mg/kg	-	-	< 0.05
Endrin ketone	0.05	mg/kg	-	-	< 0.05
g-HCH (Lindane)	0.05	mg/kg	-	-	< 0.05
Heptachlor	0.05	mg/kg	-	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	-	< 0.05
Methoxychlor	0.05	mg/kg	-	-	< 0.05
Toxaphene	0.5	mg/kg	-	-	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	-	< 0.1
Dibutylchloroendate (surr.)	1	%	-	-	143
Tetrachloro-m-xylene (surr.)	1	%	-	-	122
Polychlorinated Biphenyls					
Aroclor-1016	0.1	mg/kg	-	-	< 0.1
Aroclor-1221	0.1	mg/kg	-	-	< 0.1
Aroclor-1232	0.1	mg/kg	-	-	< 0.1
Aroclor-1242	0.1	mg/kg	-	-	< 0.1
Aroclor-1248	0.1	mg/kg	-	-	< 0.1
Aroclor-1254	0.1	mg/kg	-	-	< 0.1
Aroclor-1260	0.1	mg/kg	-	-	< 0.1
Total PCB*	0.1	mg/kg	-	-	< 0.1
Dibutylchloroendate (surr.)	1	%	-	-	143
Tetrachloro-m-xylene (surr.)	1	%	-	-	122
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	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
Heavy Metals					
Arsenic	2	mg/kg	-	-	< 2
Cadmium	0.4	mg/kg	-	-	< 0.4
Chromium	5	mg/kg	-	-	< 5
Copper	5	mg/kg	-	-	< 5
Lead	5	mg/kg	-	-	< 5
Mercury	0.1	mg/kg	-	-	< 0.1
Nickel	5	mg/kg	-	-	< 5
Zinc	5	mg/kg	-	-	25
% Moisture					
% Moisture	1	%	-	-	13

Client Sample ID			BH02 8.5M	BH02 9.5M	BH02 0-0.2M
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			N21-De52395	N21-De52396	N21-De52406
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit			
Acid Sulfate Soils Field pH Test					
pH-F (Field pH test)*	0.1	pH Units	9.2	8.8	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.1	7.2	-
Reaction Ratings* ^{S05}	0	-	3.0	1.0	-

Sample History

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

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 Suite B9			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 11, 2022	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8	Sydney	Jan 11, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Polychlorinated Biphenyls	Sydney	Jan 11, 2022	28 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Acid Sulfate Soils Field pH Test	Brisbane	Jan 07, 2022	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
% Moisture	Sydney	Dec 23, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

Company Name:	GHD Pty Ltd NEWCASTLE	Order No.:		Received:	Dec 22, 2021 8:30 AM
Address:	3/24 Honeysuckle Dve Newcastle NSW 2300	Report #:	852456	Due:	Jan 7, 2022
		Phone:	02 4979 9999	Priority:	10 Day
		Fax:	02 4979 9988	Contact Name:	Alison Monkley
Project Name:	KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM				
Project ID:	12552168				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID					
1	BH01 0-0.2M	Dec 16, 2021		Soil	N21-De52382		X		X	X
2	BH01 0.9-1M	Dec 16, 2021		Soil	N21-De52383		X	X	X	X
3	BH01 2.5M	Dec 16, 2021		Soil	N21-De52384			X		
4	BH01 3M	Dec 16, 2021		Soil	N21-De52385		X		X	X
5	BH01 3.5M	Dec 16, 2021		Soil	N21-De52386			X		
6	BH01 5M	Dec 16, 2021		Soil	N21-De52387			X		
7	BH01 6.5M	Dec 16, 2021		Soil	N21-De52388			X		
8	BH01 8.5M	Dec 16, 2021		Soil	N21-De52389			X		
9	BH01 0-0.2M	Dec 16, 2021		Soil	N21-De52390	X				

Company Name:	GHD Pty Ltd NEWCASTLE	Order No.:		Received:	Dec 22, 2021 8:30 AM
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Project Name:	KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM	Phone:	02 4979 9999	Priority:	10 Day
Project ID:	12552168	Fax:	02 4979 9988	Contact Name:	Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
10	BH02 1M	Dec 16, 2021		Soil	N21-De52391		X	X	X	X
11	BH02 2M	Dec 16, 2021		Soil	N21-De52392		X	X	X	X
12	BH02 4M	Dec 16, 2021		Soil	N21-De52393			X		
13	BH02 6.5M	Dec 16, 2021		Soil	N21-De52394			X		
14	BH02 8.5M	Dec 16, 2021		Soil	N21-De52395			X		
15	BH02 9.5M	Dec 16, 2021		Soil	N21-De52396			X		
16	BH01 0.3-0.5M	Dec 16, 2021		Soil	N21-De52397	X				
17	BH01 1.5M	Dec 16, 2021		Soil	N21-De52398	X				
18	BH01 2M	Dec 16, 2021		Soil	N21-De52399	X				
19	BH01 4M	Dec 16, 2021		Soil	N21-De52400	X				
20	BH01 7.5M	Dec 16, 2021		Soil	N21-De52401	X				

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Project Name:	KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM				
Project ID:	12552168				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
21	BH01 9.5M	Dec 16, 2021		Soil	N21-De52402	X				
22	BH01 0.3-0.5M	Dec 16, 2021		Soil	N21-De52403	X				
23	BH01 0.9-1M	Dec 16, 2021		Soil	N21-De52404	X				
24	BH01 1.5M	Dec 16, 2021		Soil	N21-De52405	X				
25	BH02 0-0.2M	Dec 16, 2021		Soil	N21-De52406		X		X	X
26	BH02 0.4-0.5M	Dec 16, 2021		Soil	N21-De52407	X				
27	BH02 1.5M	Dec 16, 2021		Soil	N21-De52408	X				
28	BH02 3M	Dec 16, 2021		Soil	N21-De52409	X				
29	BH02 5M	Dec 16, 2021		Soil	N21-De52410	X				
30	BH02 7.5M	Dec 16, 2021		Soil	N21-De52411	X				
31	BH02 0-0.2M	Dec 16, 2021		Soil	N21-De52412	X				

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Project ID:	12552168				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Moisture Set	Eurofins Suite B9
Melbourne Laboratory - NATA # 1261 Site # 1254										
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794								X		
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
32	BH02 0.4-0.5M	Dec 16, 2021		Soil	N21-De52413	X				
33	BH02 1M	Dec 16, 2021		Soil	N21-De52414	X				
34	BH02 1.5M	Dec 16, 2021		Soil	N21-De52415	X				
35	BH02 2M	Dec 16, 2021		Soil	N21-De52416	X				
36	BH02 4M	Dec 16, 2021		Soil	N21-De52417	X				
37	BH01 0.3-0.5 DUP02	Dec 16, 2021		Soil	N21-De52418	X				
38	BH02 0.4-0.5M DUP02	Dec 16, 2021		Soil	N21-De52419	X				
Test Counts						23	6	12	6	6

Internal Quality Control Review and Glossary

General

- 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.
- All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- 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.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/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 5.4
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	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
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

- 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.
- 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.
- 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.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 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	
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							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4,4'-DDD	mg/kg	< 0.05			0.05	Pass	
4,4'-DDE	mg/kg	< 0.05			0.05	Pass	
4,4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-HCH	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-HCH	mg/kg	< 0.05			0.05	Pass	
d-HCH	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
g-HCH (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
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							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	89			70-130	Pass	
TRH C10-C14	%	115			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	87			70-130	Pass	
Toluene	%	85			70-130	Pass	
Ethylbenzene	%	82			70-130	Pass	
m&p-Xylenes	%	85			70-130	Pass	
o-Xylene	%	84			70-130	Pass	
Xylenes - Total*	%	85			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	125			70-130	Pass	
TRH C6-C10	%	88			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	87			70-130	Pass	
Acenaphthylene	%	90			70-130	Pass	
Anthracene	%	97			70-130	Pass	
Benz(a)anthracene	%	82			70-130	Pass	
Benzo(a)pyrene	%	87			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(b&j)fluoranthene	%	82			70-130	Pass	
Benzo(g,h,i)perylene	%	82			70-130	Pass	
Benzo(k)fluoranthene	%	102			70-130	Pass	
Chrysene	%	86			70-130	Pass	
Dibenz(a,h)anthracene	%	88			70-130	Pass	
Fluoranthene	%	88			70-130	Pass	
Fluorene	%	92			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	90			70-130	Pass	
Naphthalene	%	88			70-130	Pass	
Phenanthrene	%	83			70-130	Pass	
Pyrene	%	89			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	73			70-130	Pass	
4,4'-DDD	%	70			70-130	Pass	
4,4'-DDE	%	72			70-130	Pass	
4,4'-DDT	%	80			70-130	Pass	
a-HCH	%	72			70-130	Pass	
Aldrin	%	75			70-130	Pass	
b-HCH	%	76			70-130	Pass	
d-HCH	%	82			70-130	Pass	
Dieldrin	%	77			70-130	Pass	
Endosulfan I	%	79			70-130	Pass	
Endosulfan II	%	82			70-130	Pass	
Endosulfan sulphate	%	89			70-130	Pass	
Endrin	%	93			70-130	Pass	
Endrin aldehyde	%	77			70-130	Pass	
Endrin ketone	%	85			70-130	Pass	
g-HCH (Lindane)	%	80			70-130	Pass	
Heptachlor	%	72			70-130	Pass	
Heptachlor epoxide	%	75			70-130	Pass	
Hexachlorobenzene	%	76			70-130	Pass	
Methoxychlor	%	77			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1016	%	76			70-130	Pass	
Aroclor-1260	%	96			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	110			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	101			80-120	Pass	
Cadmium	%	103			80-120	Pass	
Chromium	%	113			80-120	Pass	
Copper	%	118			80-120	Pass	
Lead	%	100			80-120	Pass	
Mercury	%	103			80-120	Pass	
Nickel	%	120			80-120	Pass	
Zinc	%	113			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	S22-Ja04649	NCP	%	86		70-130	Pass	
TRH C10-C14	S21-De59667	NCP	%	118		70-130	Pass	
Spike - % Recovery								
BTEX				Result 1				
Benzene	S22-Ja04649	NCP	%	88		70-130	Pass	
Toluene	S22-Ja04649	NCP	%	93		70-130	Pass	
Ethylbenzene	S22-Ja04649	NCP	%	96		70-130	Pass	
m&p-Xylenes	S22-Ja04649	NCP	%	97		70-130	Pass	
o-Xylene	S22-Ja04649	NCP	%	98		70-130	Pass	
Xylenes - Total*	S22-Ja04649	NCP	%	97		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1				
Naphthalene	S22-Ja04649	NCP	%	103		70-130	Pass	
TRH C6-C10	S22-Ja04649	NCP	%	85		70-130	Pass	
Spike - % Recovery								
Polycyclic Aromatic Hydrocarbons				Result 1				
Acenaphthene	S21-De56860	NCP	%	99		70-130	Pass	
Acenaphthylene	S21-De56860	NCP	%	113		70-130	Pass	
Anthracene	S21-De56860	NCP	%	104		70-130	Pass	
Benz(a)anthracene	S21-De47752	NCP	%	75		70-130	Pass	
Benzo(a)pyrene	S21-De56860	NCP	%	98		70-130	Pass	
Benzo(b&j)fluoranthene	S21-De56860	NCP	%	94		70-130	Pass	
Benzo(g,h,i)perylene	S21-De56860	NCP	%	100		70-130	Pass	
Benzo(k)fluoranthene	S21-De56860	NCP	%	111		70-130	Pass	
Chrysene	S21-De56860	NCP	%	75		70-130	Pass	
Dibenz(a,h)anthracene	S21-De56860	NCP	%	103		70-130	Pass	
Fluoranthene	S21-De56860	NCP	%	98		70-130	Pass	
Fluorene	S21-De56860	NCP	%	106		70-130	Pass	
Indeno(1,2,3-cd)pyrene	S21-De56860	NCP	%	106		70-130	Pass	
Naphthalene	S21-De56860	NCP	%	101		70-130	Pass	
Phenanthrene	S21-De56860	NCP	%	94		70-130	Pass	
Pyrene	S21-De56860	NCP	%	98		70-130	Pass	
Spike - % Recovery								
Organochlorine Pesticides				Result 1				
Chlordanes - Total	S21-De49180	NCP	%	81		70-130	Pass	
4,4'-DDD	S21-De49180	NCP	%	79		70-130	Pass	
4,4'-DDE	S21-De49180	NCP	%	86		70-130	Pass	
4,4'-DDT	S21-De49180	NCP	%	73		70-130	Pass	
a-HCH	S21-De49180	NCP	%	76		70-130	Pass	
Aldrin	S21-De49180	NCP	%	81		70-130	Pass	
b-HCH	S21-De49180	NCP	%	80		70-130	Pass	
d-HCH	S21-De49180	NCP	%	77		70-130	Pass	
Dieldrin	S21-De49180	NCP	%	83		70-130	Pass	
Endosulfan I	S21-De49180	NCP	%	80		70-130	Pass	
Endosulfan II	S21-De49180	NCP	%	73		70-130	Pass	
Endosulfan sulphate	S21-De49180	NCP	%	82		70-130	Pass	
Endrin	S21-De49180	NCP	%	79		70-130	Pass	
Endrin aldehyde	S21-De49180	NCP	%	75		70-130	Pass	
Endrin ketone	S21-De49180	NCP	%	82		70-130	Pass	
g-HCH (Lindane)	S21-De49180	NCP	%	81		70-130	Pass	
Heptachlor	S21-De49180	NCP	%	82		70-130	Pass	
Heptachlor epoxide	S21-De49180	NCP	%	80		70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Hexachlorobenzene	S21-De49180	NCP	%	80			70-130	Pass	
Methoxychlor	S21-De49180	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	S21-De49180	NCP	%	74			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S21-De59667	NCP	%	120			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S21-De58108	NCP	%	79			75-125	Pass	
Cadmium	S21-De58108	NCP	%	86			75-125	Pass	
Chromium	S21-De58108	NCP	%	92			75-125	Pass	
Copper	S21-De58108	NCP	%	93			75-125	Pass	
Lead	S21-De58108	NCP	%	96			75-125	Pass	
Mercury	S21-De58108	NCP	%	91			75-125	Pass	
Nickel	S21-De58108	NCP	%	93			75-125	Pass	
Zinc	S21-De58108	NCP	%	93			75-125	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S22-Ja05141	NCP	%	89			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S22-Ja01773	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S21-De59666	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S21-De59666	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S21-De59666	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S22-Ja01773	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S22-Ja01773	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S22-Ja01773	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S22-Ja01773	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S22-Ja01773	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S22-Ja01773	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S22-Ja01773	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S22-Ja01773	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g,h,i)perylene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a,h)anthracene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Indeno(1.2.3-cd)pyrene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Pyrene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Chlordanes - Total	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
4,4'-DDD	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDE	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDT	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
a-HCH	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Aldrin	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
b-HCH	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
d-HCH	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Dieldrin	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan I	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan II	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan sulphate	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-HCH (Lindane)	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S21-De58631	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Toxaphene	S21-De58631	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Polychlorinated Biphenyls				Result 1	Result 2	RPD		
Aroclor-1016	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1221	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1232	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1242	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1248	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1254	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1260	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Total PCB*	S21-De58631	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S21-De59666	NCP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S21-De59666	NCP	mg/kg	< 100	< 100	<1	30%	Pass
TRH >C34-C40	S21-De59666	NCP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S21-De58038	NCP	mg/kg	5.6	8.0	36	30%	Fail
Cadmium	S21-De58038	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S21-De58038	NCP	mg/kg	9.3	12	21	30%	Pass
Copper	S21-De58038	NCP	mg/kg	28	39	32	30%	Fail
Lead	S21-De58038	NCP	mg/kg	14	18	27	30%	Pass
Mercury	S21-De58038	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Nickel	S21-De58038	NCP	mg/kg	5.3	7.1	29	30%	Pass
Zinc	S21-De58038	NCP	mg/kg	27	37	29	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	N21-De51889	NCP	%	17	19	8.0	30%	Pass

Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	N21-De52387	CP	pH Units	8.6	8.7	pass	30%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	N21-De52389	CP	pH Units	8.6	8.8	pass	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
G01	The LORs have been raised due to matrix interference
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
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.
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Emma Beesley	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)
Myles Clark	Senior Analyst-SPOCAS (QLD)
Roopesh Rangarajan	Senior Analyst-Volatile (NSW)



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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**5 DAY TAT ADDITIONAL ANALYSIS:FW: Eurofins Test Results, Invoice - Report 852456
: Site KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM (12552168)**

Andrew Black <AndrewBlack@eurofins.com>

Tue 2/15/2022 11:27 AM

To: #AU03_EnviroSampleBris <EnviroSampleBris@eurofins.com>

INFO: INTERNAL EMAIL - Sent from your own Eurofins email domain.

5 day TAT additional analysis thanks team for CrSuite

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Website: eurofins.com.au/environmental-testing

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For sample receipt enquiries (eg. SRAs, changes to analysis) please contact EnvirosampleNSW@eurofins.com or 02 9900 8421 (7am – 9pm).

For despatch enquiries (eg. courier bookings, bottle orders) please contact AU04_Despatch_SYD@eurofins.com or 0488 400 929 (8am – 4pm).

864020

From: Alison Monkley <Alison.Monkley@ghd.com>

Sent: Tuesday, 15 February 2022 12:26 PM

To: Andrew Black <AndrewBlack@eurofins.com>

Subject: Eurofins Test Results, Invoice - Report 852456 : Site KOORAGANG ISLAND BILLBOARD
GEOTECH/CONTAM (12552168)

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Hi Andrew,

Can you please organise ASS CRS for the following samples

BH01 3.5m De 52386 DH5A013
BH01 6.5m De 52388
BH02 2m De 52392
BH02 4m De 52393
BSDE332
H=331

Thanks

Al

Alison Monkley

B.Eng (Env), B.Sc, ME (groundwater)

Business Group Leader – Contamination Assessment and Remediation

GHD

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle, NSW, 2300, Australia

D +61 2 4979 9990 M +61 447 108 208 E alison.monkley@ghd.com

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Eurofins Environment Testing Australia Pty Ltd

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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43 Detroit Drive
Rolleston, Christchurch 7675
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IANZ # 1290

Sample Receipt Advice

Company name: GHD Pty Ltd NEWCASTLE
Contact name: Alison Monkley
Project name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM
Project ID: 12552168
Turnaround time: 5 Day
Date/Time received: Feb 15, 2022 11:27 AM
Eurofins reference: 864020

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 17.9 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.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Alison Monkley - alison.monkley@ghd.com.au.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NEWCASTLE email address.



Environment Testing

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Company Name: GHD Pty Ltd NEWCASTLE

Address: 3/24 Honeysuckle Dve
Newcastle
NSW 2300

Project Name: KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM
Project ID: 12552168

Order No.:
Report #: 864020
Phone: 02 4979 9999
Fax: 02 4979 9988

Received: Feb 15, 2022 11:27 AM
Due: Feb 22, 2022
Priority: 5 Day
Contact Name: Alison Monkley

Eurofins Analytical Services Manager : Andrew Black

Sample Detail

Chromium Reducible Sulfur Suite

Moisture Set

Melbourne Laboratory - NATA # 1261 Site # 1254

Sydney Laboratory - NATA # 1261 Site # 18217

Brisbane Laboratory - NATA # 1261 Site # 20794

Mayfield Laboratory - NATA # 1261 Site # 25079

Perth Laboratory - NATA # 2377 Site # 2370

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	BH01 3.5M	Dec 16, 2021		Soil	B22-Fe32649	X	X
2	BH01 6.5M	Dec 16, 2021		Soil	B22-Fe32650	X	X
3	BH02 2M	Dec 16, 2021		Soil	B22-Fe32651	X	X
4	BH02 4M	Dec 16, 2021		Soil	B22-Fe32652	X	X
Test Counts						4	4

GHD Pty Ltd
3/24 Honeysuckle Dve
Newcastle
NSW 2300



NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Alison Monkley**

Report **864020-S-V2**
Project name **KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM**
Project ID **12552168**
Received Date **Feb 15, 2022**

Client Sample ID			BH01 3.5M	BH01 6.5M	BH02 2M	BH02 4M
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			B22-Fe32649	B22-Fe32650	B22-Fe32651	B22-Fe32652
Date Sampled			Dec 16, 2021	Dec 16, 2021	Dec 16, 2021	Dec 16, 2021
Test/Reference	LOR	Unit				
Actual Acidity (NLM-3.2)						
pH-KCL (NLM-3.1)	0.1	pH Units	8.3	6.5	8.1	8.0
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	< 0.003
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	< 2	< 2	< 2	< 2
Potential Acidity - Chromium Reducible Sulfur						
Chromium Reducible Sulfur (s-SCr) (NLM-2.1) ^{S04}	0.005	% S	0.076	0.074	0.16	0.55
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	47	46	100	340
Extractable Sulfur						
Sulfur - KCl Extractable	0.005	% S	N/A	N/A	N/A	N/A
HCl Extractable Sulfur	0.005	% S	N/A	N/A	N/A	N/A
Retained Acidity (S-NAS)						
Net Acid soluble sulfur (SNAS) NLM-4.1	0.02	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (s-SNAS) NLM-4.1 ^{S02}	0.02	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur (a-SNAS) NLM-4.1	10	mol H+/t	N/A	N/A	N/A	N/A
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
Acid Neutralising Capacity (ANCbt)						
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	1.5	N/A	2.0	1.4
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2) ^{S03}	0.02	% S	0.48	N/A	0.63	0.44
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	300	N/A	390	270
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
Net Acidity (Including ANC)						
CRS Suite - Net Acidity - NASSG (Including ANC)	0.02	% S	< 0.02	0.07	< 0.02	0.26
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	< 10	46	< 10	160
CRS Suite - Liming Rate - NASSG (Including ANC) ^{S01}	1	kg CaCO3/t	< 1	3.5	< 1	12
Extraneous Material						
<2mm Fraction	0.005	g	30	24	26	30
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Net Acidity (Excluding ANC)						
CRS Suite - Net Acidity - NASSG (Excluding ANC)	0.02	% S	0.08	0.07	0.16	0.55
CRS Suite - Net Acidity - NASSG (Excluding ANC)	10	mol H+/t	47	46	100	340
CRS Suite - Liming Rate - NASSG (Excluding ANC)	1	kg CaCO3/t	3.6	3.5	7.6	26
% Moisture	1	%	22	18	35	32

Sample History

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

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
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	Feb 17, 2022	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	Feb 17, 2022	6 Week
- Method: LTM-GEN-7050/7070			
Chromium Suite - NASSG (Excluding ANC)	Brisbane	Mar 08, 2022	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
% Moisture	Brisbane	Feb 17, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			

Company Name:	GHD Pty Ltd NEWCASTLE	Order No.:		Received:	Feb 15, 2022 11:27 AM
Address:	3/24 Honeysuckle Dve Newcastle NSW 2300	Report #:	864020	Due:	Feb 22, 2022
Project Name:	KOORAGANG ISLAND BILLBOARD GEOTECH/CONTAM	Phone:	02 4979 9999	Priority:	5 Day
Project ID:	12552168	Fax:	02 4979 9988	Contact Name:	Alison Monkley
Eurofins Analytical Services Manager : Andrew Black					

Sample Detail						Chromium Reducible Sulfur Suite	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254							
Sydney Laboratory - NATA # 1261 Site # 18217							
Brisbane Laboratory - NATA # 1261 Site # 20794						X	X
Mayfield Laboratory - NATA # 1261 Site # 25079							
Perth Laboratory - NATA # 2377 Site # 2370							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	BH01 3.5M	Dec 16, 2021		Soil	B22-Fe32649	X	X
2	BH01 6.5M	Dec 16, 2021		Soil	B22-Fe32650	X	X
3	BH02 2M	Dec 16, 2021		Soil	B22-Fe32651	X	X
4	BH02 4M	Dec 16, 2021		Soil	B22-Fe32652	X	X
Test Counts						4	4

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.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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
LCS - % Recovery										
Actual Acidity (NLM-3.2)										
pH-KCL (NLM-3.1)				%	101			80-120	Pass	
Titratable Actual Acidity (NLM-3.2)				%	95			80-120	Pass	
LCS - % Recovery										
Potential Acidity - Chromium Reducible Sulfur										
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)				%	104			80-120	Pass	
LCS - % Recovery										
Extractable Sulfur										
HCl Extractable Sulfur				%	101			80-120	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Actual Acidity (NLM-3.2)					Result 1	Result 2	RPD			
pH-KCL (NLM-3.1)	S22-Fe31816	NCP	pH Units		4.9	4.9	<1	30%	Pass	
Titratable Actual Acidity (NLM-3.2)	S22-Fe31816	NCP	% pyrite S		0.030	0.030	1.0	30%	Pass	
Titratable Actual Acidity (NLM-3.2)	S22-Fe31816	NCP	mol H+/t		20	20	1.0	30%	Pass	
Duplicate										
Potential Acidity - Chromium Reducible Sulfur					Result 1	Result 2	RPD			
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	S22-Fe31816	NCP	% S		< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	S22-Fe31816	NCP	mol H+/t		< 3	< 3	<1	30%	Pass	
Duplicate										
Extractable Sulfur					Result 1	Result 2	RPD			
Sulfur - KCl Extractable	S22-Fe31816	NCP	% S		N/A	N/A	N/A	30%	Pass	
HCl Extractable Sulfur	S22-Fe31816	NCP	% S		N/A	N/A	N/A	30%	Pass	
Duplicate										
Retained Acidity (S-NAS)					Result 1	Result 2	RPD			
Net Acid soluble sulfur (SNAS) NLM-4.1	S22-Fe31816	NCP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (s-SNAS) NLM-4.1	S22-Fe31816	NCP	% S		N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (a-SNAS) NLM-4.1	S22-Fe31816	NCP	mol H+/t		N/A	N/A	N/A	30%	Pass	
Duplicate										
Acid Neutralising Capacity (ANCbt)					Result 1	Result 2	RPD			
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	S22-Fe31816	NCP	% CaCO3		N/A	N/A	N/A	30%	Pass	
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)	S22-Fe31816	NCP	% S		N/A	N/A	N/A	30%	Pass	
ANC Fineness Factor	S22-Fe31816	NCP	factor		1.5	1.5	<1	30%	Pass	
Duplicate										
Net Acidity (Including ANC)					Result 1	Result 2	RPD			
CRS Suite - Net Acidity - NASSG (Including ANC)	S22-Fe31816	NCP	% S		0.03	0.03	1.0	30%	Pass	
CRS Suite - Net Acidity - NASSG (Including ANC)	S22-Fe31816	NCP	mol H+/t		20	20	1.0	30%	Pass	
CRS Suite - Liming Rate - NASSG (Including ANC)	S22-Fe31816	NCP	kg CaCO3/t		1.5	1.5	1.0	30%	Pass	
Duplicate										
					Result 1	Result 2	RPD			
% Moisture	B22-Fe26334	NCP	%		23	23	<1	30%	Pass	

Comments

V2- new version to include the ANC liming on all samples as per client request.

Eurofins | Environment Testing accreditation number 1261, site 18217 is currently in progress of a controlled transition to a new custom built location at 179 Magowar Road, Girraween, NSW 2145. All results on this report denoted as being performed by Eurofins | Environment Testing Unit F3, Building F, 16 Mars road, Lane Cove West, NSW 2066, corporate site 18217, will have been performed on either Lane Cove or new Girraween site

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
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO ₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m ³ in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m ³ '
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl is greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

Authorised by:

Andrew Black	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)



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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Appendix E

**Contamination laboratory result summary
tables**

[illegible]



Table 1 Human Health and Ecological Exceedance Criteria

[illegible][illegible]

[illegible]

	General Solid Waste - Less than CT1 or SCC1
	Restricted Solid Waste - Exceeds General Solid Waste CT1 or SCC1
	Hazardous Waste - Exceeds Restricted Solid Waste CT2 or SCC2



Table 3 Acid Sulfate Soils Field Indicator Values and CRS Results

	ASS - Field				NA			Inorganics	Particle Size Analysis		ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - ANC			ASS - Acid Base Accounting					ASS - Liming Rate	
	pHF	pHFox	pHF - pHFox	Reaction Ratings	HCl Extractable Sulfur Correction Factor	Analysed Material	Extraneous Material	Moisture Content (%)	>2mm Fraction	<2mm Fraction	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulphur (acidity units)	Chromium Reducible Sulfur	Acid Neutralising Capacity (acidity units)	Acid Neutralising Capacity (sulfur units)	Acid Neutralising Capacity	Net Acidity including ACN (acidity units)	Net Acidity including ACN (sulfur units)	Net Acidity excluding ACN (acidity units)	Net Acidity excluding ACN (sulfur units)	ANC Fitness Factor	Liming Rate excluding ACN	Liming Rate including ACN
	pH units	pH units	pH units	-	-	%	%	%	g	g	pH units	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	% CaCO3	mole H+/t	% S	mole H+/t	% S	-	kg CaCO3/t	kg CaCO3/t
LOR	0.1	0.1	0.1	0	1	0.1	0.1	1	0.005	0.005	0.1	2	0.003	3	0.005	2	0.02	0.01	10	0.02	10	0.02	-	1	1

[illegible]



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