Appendix H – Contamination Assessment

Hunter Water Corporation

Belmont Drought Response Desalination Plant
Contamination Assessment Report

November 2019

Table of contents

1. Introduction 1
   - 1.1 Project background 1
   - 1.2 Purpose and scope of this assessment 1
   - 1.3 Limitations 3
2. Site description 4
   - 2.1 Proposed desalination plant area 4
   - 2.2 Proposed water connection route 4
3. Desktop investigation 5
   - 3.1 Soils and geology 5
   - 3.2 Acid sulfate soils 6
   - 3.3 Hydrogeology 6
   - 3.4 Mining 7
   - 3.5 UXO Desktop Assessment 7
   - 3.6 Previous investigation reports 8
   - 3.7 NSW Environment Protection Authority 11
   - 3.8 Potential contamination sources 13
4. Sampling and analysis plan and methodology 15
   - 4.1 Summary of field activities 15
   - 4.2 Sampling and analytical program 15
5. Quality assurance/quality control 19
   - 5.1 Soil sampling methodology 19
   - 5.2 Data quality objectives 19
   - 5.3 Data Quality Indicators 20
   - 5.4 QA/QC results 20
6. Basis of assessment 21
   - 6.1 Framework for assessment 21
   - 6.2 Soil assessment criteria 21
   - 6.3 Health investigation levels and health screening levels 21
   - 6.4 Ecological investigation levels and ecological screening levels 22
   - 6.5 Asbestos 23
   - 6.6 Aesthetics 24
   - 6.7 Selected criteria 24
   - 6.8 Waste classification 24
7. Investigation results 25
   - 7.1 Soil profile 25
   - 7.2 Soil analytical results 26
8. Discussion 28

8.1 Investigation results 28
8.2 Waste classification 29
8.3 Site conceptual model 29
9. Conclusions and recommendations 31
10. Limitations 33
11. References 34

Table index

Table 3-1 Review of Contaminated Land Record Notices 12
Table 3-2 Review of Contaminated Sites Notified to EPA 12
Table 3-3 Licensed activities under the POEO Act 1997 13
Table 3-4 Potential contaminants of concern 13
Table 4-1 Field investigation program 15
Table 4-2 Investigation locations, sampling and analytical program 16
Table 5-1 Data quality objective decision process 19
Table 6-1 Adopted assessment criteria 23

Appendices

Appendix A – Figures
Appendix B – Borelogs
Appendix C – Field and laboratory QA/QC program
Appendix D – Analytical results tables
Appendix E – Laboratory certificates

List of abbreviations

Abbreviation	Definition
ANZECC	Australian and New Zealand Environmental Conservation Council
ACM	Asbestos Containing Material
ALS	Australian Laboratory Services
ASS	Acid Sulfate Soil
bgl	below ground level
BaP	Benzo(a)pyrene
BTEXN	Benzene, Toluene, Ethyl benzene, Xylenes, Naphthalene
CLM Act	Contaminated Land Management Act 1997(incorporating amendments made by the Contaminated Land Management Amendment Act 2003)
CSMP	Contaminated Soils Management Plan
NSW DEC	Former Department of Environment and Conservation. The DEC was formed on 1 July 2006 from the amalgamation of the Department of Environment and the Department of Conservation and Land Management.
NSW DECCW	Former Department of Environment, Climate Change and Water (incorporating the NSW EPA). A new agency formed on 27 April 2007, from the former DEC
DLWC	Department of Land and Water Conservation
EIA	Environmental Impact Assessment
EIL	Ecological Investigation Level
ESL	Ecological Screening Level
NSW EPA	NSW Environment Protection Authority
Ha	Hectare
HIL	Health Investigation Level (relating to defined land use scenario)
HSL	Health Screening Level
ID	Identification
LOR	Limit of Reporting
m bgl	Metres below ground level
mg/kg	milligrams per kilogram (generally equivalent to parts per million)
mg/L	Milligrams per litre
NATA	National Association of Testing Authorities of Australia
ND	not detected (above laboratory LOR)
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
OCP	Organochlorine Pesticide
OEH	Office of Environment and Heritage
PACM	Potential Asbestos Containing Material
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photo-Ionisation Detector
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
TEQ	Toxic Equivalency
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons

1. Introduction

This Contamination Assessment report presents the results of the contamination investigation for Hunter Water Corporation's (Hunter Water) proposed drought response desalination plant (also referred to as the temporary desalination plant) and associated water connection routes at Belmont, NSW.

1.1 Project background

Plans for the temporary desalination plant include:

- **Seawater intakes** – The central intake structures would be a concrete structure (referred to as a caisson) of approximately nine to 11 metres diameter, installed to a depth up to 20 m below existing surface levels. The intake structures will be finished above the existing surface (0.5 m to 1 m) to prevent being covered by dune sands over time. The raw feed water (seawater) input is proposed to be extracted from a sub-surface saline aquifer. This would be extracted by intake pipes located approximately eight to 15 m below ground level radiating out from the central structure. Pipelines and pumps are required to transfer the seawater to the desalination plant.
- **Water treatment process plant** – The water treatment process plant would comprise a range of equipment potentially in containerised form. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater)) would comprise a mix of buried and overhead methods. The general components of the water treatment process would comprise:
  - *Pre-treatment:* a pre-treatment system is required to remove micro-organisms, sediment, and organic material from the seawater.
  - *Desalination:* a reverse osmosis (RO) desalination system made up of pressurising pumps and membranes. These would be comprised of modular components. In addition, a number of tanks and internal pipework would be required.
- *Post treatment:* desalinated water would be treated to drinking water standards and stored prior to pumping to the potable water supply network.
- **Pipelines** – treated potable water will be delivered to the existing water reticulation system. This will involve trenched pipelines with some trenchless sections at roads or other sensitive areas.
- **Power supply** – Power requirements of the plant would be met by a minor upgrade to the existing power supply network in the vicinity of Hudson and Marriot Streets. A power line extension from the existing line along Ocean Park Road into a new substation within the proposed drought response desalination plant would also be required.
- **Brine disposal system** – The desalination process would produce around 28 ML/day of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to the existing nearby Belmont WWTW for disposal via the existing ocean outfall pipe.

1.2 Purpose and scope of this assessment

This report comprises the Contamination Assessment, which has been prepared to inform the Environmental Impact Assessment (EIA) with regard to the potential contamination issues within the study area and recommendations for management and/or remediation measures to be

implemented during construction. The Contamination Assessment study area is shown on Figure 1, Appendix A.

The scope of work for Contamination Assessment included the following:

- Site history review including review of any available existing information including previous soil and groundwater assessment reports, former military uses etc.
- Review of geology, hydrology and topography information for the proposal area.
- Review of NSW Environmental Protection Authority (EPA) record of notices and sites notified to the EPA under the Contaminated Land Management Act 1997 (CLM Act) and Protection of the Environment Operations (POEO) Environmental Protection Licence (EPL) Register.
- Review of the NSW Office of Water Groundwater database on groundwater information for the area.
- A general inspection of the proposal area to identify areas of potential contamination concern.

- Collection of targeted soil samples from boreholes and test pits completed as part of the geotechnical investigations from the following areas:
  - Desalination Plant and Intake - Six test pit locations (TP101 to TP106) and five borehole locations (BH101 to BH104 and BH108)
  - Water connections - Ten borehole locations (BH301 to BH306 and BHA301 to BHA304)
- Laboratory analysis of selected soil samples from each location for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), polychlorinated biphenyl (PCB), heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn and Hg), pH, cation exchange capacity (CEC) and asbestos.
- Preparation of this report with reference to the Guidelines for Consultants Reporting on Contaminated Proposal sites (OEH 2011) detailing the results of the investigations.

1.3 Limitations

Historical land titles and Council information (Section 10.7 certificates or register of development or building applications) were not reviewed as part of the desktop study. This contamination assessment was limited to soils only. Soil sampling locations were limited to the locations selected as part of the geotechnical investigation. Acid sulfate soils (ASS) were not completed as part of this contamination assessment. The ASS testing results and management options have been reported in the GHD Geotechnical Investigation Report (GHD 2018: Belmont Temporary Desalination Design. Geotechnical Investigation Report November 2018). Groundwater investigations were not completed as part of this assessment. Groundwater monitoring is currently being completed. The groundwater assessment is provided in a separate groundwater assessment report.

2. Site description

The Contamination Assessment study area is shown on Figure 1, Appendix A.

2.1 Proposed desalination plant area

The proposed drought response desalination plant lies directly to the south of the existing Belmont WWTW and within the vicinity of two disused WWTW settlement ponds.

The Pacific Ocean is located approximately 250 m to the east and Belmont Lagoon is located approximately 350 m to the west of the proposed plant.

Development in the area comprises Ocean Park Road, an unnamed access road, the Belmont WWTW and associated infrastructure and a 33 kV Ausgrid power transmission line.

Vegetation across the proposed plant area comprised Bitou bush, exotic grasses and native vegetation. Minor wetland/swamp type vegetation exists in the centre of the more western disused settlement pond.

Topographically the proposed plant lies in a relatively low lying flat area. The surface has been modified to form the embankments for the disused settlement ponds, which vary in height and are estimated to be in the order of 1.5 m - 3.0 m. To the north the Belmont WWTW lies on top of a low rise and to the east are undulating sand dunes.

2.2 Proposed water connection route

To the south of the proposed desalination plant site, the planned water connection route runs alongside Ocean Park Road to McEwan Street, South Belmont. To the north of the proposed desalination plant site, the water connection route follows an existing fire trail for approximately 4 km until the intersection of the fire trail with Kalaroo Road, Jewells. The water connection route then runs through Jewells following Wommara Avenue and Fencott Drive to the Pacific Highway.

Development in the area comprises multiple roads, the unsealed fire trail, the Fernleigh track, the Belmont WWTW, several sewer mains connecting to the WWTW and at the southern and northern extremities of the routes, residential properties.

Vegetation at the time of investigation comprised Bitou bush, exotic grasses and native vegetation including mature trees.

Topographically the area comprises:

- South of the WWTW – low lying and relatively flat/swampy area.
- North of the WWTW (fire trail) – relatively low lying area with undulating sand dunes to the east and swamp to the west of the proposed route.
- North of the WWTW (Jewells) – An undulating area from Kalaroo Road to the intersection of Ntaba Road and Dalrymple Street. Relatively steep upwards slope from the intersection of Ntaba road and the Pacific Highway.

It is noted that the intersection of Ntaba Road and Dalrymple Street lies in the vicinity of a two (2) drainage channels/creeks which connect to Crockers Creek to the east. Both channels pass under Ntaba Road in culverts. The southern culvert was noted to have standing water present at the outflow.

3. Desktop investigation

The following section provides an overview of the environmental setting of the proposal area obtained from publically available information and review of the GHD Geotechnical Investigation Report (GHD 2018: Belmont Temporary Desalination Design. Geotechnical Investigation Report November 2018). The following maps and data sources were reviewed as part of the desk top study:

- Newcastle 1:100,000 scale Coalfields Regional Geology, Geological Series Sheets 9231 and part of 9131, 9132 and 9232, Edition 1. Department of Mineral Resources, NSW
- Gosford – Lake Macquarie Special 1:100,000 Geological Sheet 9131 and part 9231. Geological Survey of New South Wales
- 1:25,000 scale Belmont – Swansea inset of the Newcastle – Hunter Area Coastal Quaternary Geology. Geological Survey of New South Wales
- Soil Landscapes of Gosford – Lake Macquarie Special 1:100,000 Sheet 9131 and part 9231. Department of Land and Water Conservation, NSW
- Acid Sulfate Soil Risk Map for Swansea. Department of Natural Resources, NSW
- Groundwater well database. Department of Primary Industries, WaterNSW
- Geoscientific Data Warehouse, Geological Survey of New South Wales

3.1 Soils and geology

Reference to the Newcastle 1:100,000 scale Coalfields Regional Geology, Geological Series Sheets 9231 and part of 9131, 9132 and 9232, Edition 1. Department of Mineral Resources, NSW and the both the regional geological and coastal Quaternary geology maps indicates:

- Medium to fine grained dune and marine sand, disturbed by fill and excavation works related to the construction of the Belmont WWTW underlying the desalination plant site. This unit is disturbed by Defence activities along the water connection alignment adjacent to the Fernleigh Track and south of Kalaroo Road.
- The geology transitions to residual soils overlying weathered sandstone, conglomerate, siltstone, coal and tuff rock of the Boolaroo and Adamstown Subgroups of the Newcastle Coal Measures along the water connection alignment to the west of Kalaroo Road.

Reference to the soil landscape map identified:

- Tuggerah (tg) landscape occurs at the proposed desalination site and along the water connection alignment north of the WWTW to Kalaroo Road and comprises gently undulating to rolling coastal dune fields. Local relief is up to 20 m and slope gradients are in the range of 5% to 45%. Soils include loose sands and are covered with heathland vegetation. Possible limitations include wind erosion hazard, high permeability soils, localized flooding, high water table, strongly acid soil in places and the landscape coincides with a mine subsidence district.

- Warners Bay (wa) landscape occurs in the northern section of the water connection route (west of Kalaroo Road), associated with areas underlain by the Newcastle Coal Measures. This landscape comprises undulating low hills, with localised steep areas, underlain by fine grained moderately deep soils. Expected limitations include moderate to high shrink swell and dispersive soils, and mine subsidence.
- Belmont Swamp (bs) landscape occurs west of the proposed desalination site around Belmont Lagoon and comprises level to very gently undulating coastal swamps including shallow lakes and very shallow water tables. Dominant soil materials consist of organic topsoils underlain by saturated fine to coarse grained sands.
- Woy Woy (ww) landscape occurs adjacent to Pacific Highway and has similar characteristics to Warners Bay landscape. Local relief varies from 5 m to 20 m with slopes also varying between soil landscapes between 5% and 45%. Soils comprise loose shelly beach sands. Limitations include periodic waterlogging in depressions, permanently high water tables and mine subsidence districts.

3.2 Acid sulfate soils

Reference to the risk maps indicate the project is located in a severe ASS risk area with the exception of the beach area east of the proposed temporary desalination plant site and the portion of the water connection alignment west of Kalaroo Road. These areas are mapped as having a low probability and 'no known occurrence' ASS risk respectively.

Further assessment of ASS was completed during the concurrent geotechnical investigation. The ASS testing results and management options have been reported in the GHD Geotechnical Investigation Report (GHD 2018).

3.3 Hydrogeology

An examination of the online WaterNSW register identified 23 registered groundwater bores within 2 km of the site (https://realtimedata.waternsw.com.au/).

Review of the Australian Groundwater Explorer (BoM, 2018) identified 41 bores within 2 km of the site, only 17 were listed as functional. For the functional wells, water uses were recorded as irrigation supply and unknown purposes. Bore depths are no greater than 7 m below ground level. Groundwater on site would be expected to vary between 1 m and 6 m below ground level (bgl).

Based on GHD understanding of the environmental setting of the site, regional groundwater is expected to flow to the east towards the Pacific Ocean.

Based on the bore usage information reviewed as part of the groundwater bore search, it is possible that groundwater within the area could be used for either drinking water, recreational or irrigation purposes.

An ongoing groundwater assessment for the purposes of environmental monitoring and establishing baseline characterisation of the groundwater regime at the site is currently being undertaken. Seven monthly monitoring rounds (September 2018 to March 2019) and one rain event monitoring round (November 2018) were completed from eight wells (GW101 - GW108).

Groundwater samples are analysed for heavy metals, TRH, BTEXN, PAHs, a nutrient suite, biological contaminants (Faecal Coliforms, Total Coliforms, E. Coli and Enterococci) and volatile organic compounds (VOC). The results and conclusions are reported in a separate groundwater report.

3.4 Mining

3.4.1 Coal mining

The Lake Macquarie Mine Subsidence District is located north of Belmont Swamp and west of the Fernleigh Track, including the residential areas of Belmont North, where the northern approximately 1.4 km of the water connection is proposed.

An initial review of coal exploration boreholes and mine working extents based on publicly available data only has been undertaken to identify shallow mine workings. Mine workings from the John Darling Colliery within the Borehole Seam and/or the Victoria Tunnel Seam of the Lambton Subgroup were identified. These workings were identified to extend beneath the proposed drought response desalination plant site and water connection alignments at a depth of 130 m or greater below the existing ground surface.

Mining is understood to have been completed in the late 1980's and no current mining was identified below the project site.

3.4.2 Sand mining

Sand mining for rutile, zircon, monazite and ilmenite was conducted in the hind dunes to the north of the Hunter Water WWTW. Mining occurred between the 1950's and 1967. Approximately 3% of the sites sand was removed during this process (Andrews Neil Pty Ltd, 2010). Extraction of sand for the construction industry commenced in the mid 1970s and continued until BHP vacated the site and large quantities of sand were removed from the site during this period. A number of abandoned quarry pits are reported to remain across the site (Andrews Neil Pty Ltd, 2010).

The sand mining process can lead to the concentration of naturally occurring radioactive fractions within the sand. In 1991, at the Jewells Crossing processing site, adjacent to the Kalaroo Road entrance, a concentration of peak radiation levels were found to exceed the National Health and Medical Research Council (NH&MRC) Action Level Criteria for dwellings, schools (including playgrounds), businesses, factories where occupancies by the same individuals occur regularly on a day to day basis (Andrews Neil Pty Ltd, 2010). Approximately 25,000 tonnes of residues were removed from this area and the area was considered by the Department of Health to be suitable for preparation as a recreational area or for other purposes where occupancy would be intermittent (Andrews Neil Pty Ltd, 2010).

3.5 UXO Desktop Assessment

G-Tek Australia (G-Tek) competed an unexploded ordnance (UXO) desktop review and risk assessment of proposed test locations throughout the project area (G-Tek 2018. *UXO Desktop Assessment Report. Pipeline Works, Belmont NSW. G-Tek Australia Pty Ltd. 18019GHDA v1.01.* 4 August 2018).

During WWII the coastal area immediately east of Belmont was used as a field firing range and training area by Newcastle garrison units. It is understood that the area was used by units which travelled to the area by train to Jewells Siding and then conducted firing practices and training at Tucks Track within Nine Mile Beach. A Review of the Department of Defence (Defence) UXO website indicates that DCS Site No 132 has been identified as Nine Mile Beach, with alternate names of Red Head, Tucks Track and Jewells Siding and has been classified with an UXO Potential of Slight. Areas categorised as slight will have a confirmed history of military activities that have resulted in residual UXO but which Defence considers it inappropriate to assess as substantial. All land usage and development, within these areas, may continue without further UXO investigation or remediation (www.defence.gov.au). The UXO areas with a potential for slight are presented on Figure 1, Appendix A.

A further review of the Defence UXO site indicates that the Belmont WWTW, while on Cadastre that extends into the Nine Mile Beach Site, is not included within an area with potential for UXO. Further, borehole sites BH303 and BH304 within the Jewells area are outside the Nine Mile Beach Site and are not included within an area with potential for UXO.

BH301 and BH302 are on the boundary of the Nine Mile Beach Site and would appear to be just within the site with a “Slight” potential for remnant UXO. BH305 and BH306 are within the Nine Mile Beach Site with a “Slight” potential for remnant UXO. These four locations are along the proposed north eastern water main connection. Based on this desktop assessment, G-Tek recommended that required intrusive testing works at all indicated sites be conducted without further UXO investigation or safeguarding.

With regards to the wider Project, based on the GTEK report only the water main connection to the north of the WWTW is located either on the boundary or just within the Nine Mile Beach Site, where there is a “slight” potential for remnant UXO. Although the Defence website states that no further UXO investigation or remediation is required for these areas, it is recommended that an UXO assessment is completed on the confirmed pipeline route by the contractor prior to construction.

3.6 Previous investigation reports

A number of previous investigations have been conducted within and surrounding the area. The following reports were reviewed as part of this assessment:

- RCA, 2002, Upgrade of Belmont WWTW, Document Reference 566b-033/0
- SKM, 2012, Spoil Investigation Report, Document Reference EN03103-N-CL-RP-0002
- AECOM, 2017a, Temporary Desalination Project Readiness Activities Stage 1 Belmont Conceptual Hydrogeological Model, Document Reference 60515293_Belmont CSM RPT_Rev 1
- AECOM, 2017b, Phase 1 Site Contamination Review. Potential Temporary Desalination Site, Belmont. Document reference 60515293. Rev B
- AECOM, 2017c, Preliminary Environmental Assessment, Lower Hunter Water Plan: Temporary Desalination Project. Document Reference 60281456. Rev 0

3.6.1 RCA 2002

The RCA investigation comprised the drilling of three boreholes to depths of approximately 8 m including the installation of groundwater piezometers. The report includes a summary of results from a previous RCA investigation performed in 1999 that comprised two boreholes drilled to a depth of up to 6 m and a J&K (1994) geotechnical investigation that included four boreholes of unknown depth.

The results of the investigations indicated the site is underlain by:

- Fill, generally comprising sand with variable quantities of gravel to depths of up to 4.7 m; overlying
- Natural sand, fine to medium grained, medium dense or better, to greater than 8 m depth

Groundwater was encountered in the boreholes at depths ranging from 4.3 m to 5.6 m, approximately 0.5 m AHD.

Laboratory testing indicated the sands were not actual or potential ASS. No contamination testing was undertaken.

3.6.2 SKM 2012

The SKM investigation comprised test pitting, sampling and laboratory analysis to assess the contaminants present in deposited fill materials and the disused settlement ponds adjacent to Belmont WWTW and was undertaken by SKM for Hunter Water Corporation in 2011.

The investigation comprised excavation of 18 test pits, four grab samples and drilling of four boreholes (to facilitate construction of groundwater monitoring wells) to depths ranging 0.2 m to 5 m in the vicinity of the proposed desalination plant.

The WWTW investigation area consisted of undulating sand dunes. To the south of the WWTW site, two decommissioned sludge ponds were dry with a layer of sediment located on the surface of the western pond. Spoil material, approximately 60 m x 80 m x 2 m in extent was deposited along the southern boundary of the sludge ponds. Sampling was based on a 25 m x 25 m grid spacing over the fill placement areas.

Results of the investigation indicated the site is underlain by:

- Fill, generally comprising sand with variable quantities of gravel and concrete with some brick fragments, terracotta pipes and bitumen/asphalt to depths of up to 2.4 m; overlying.
- Sand, generally fine to medium grained, generally medium dense or better, for the remainder of the boreholes.

Results were assessed against the former NEPM 1999 guidelines for commercial/industrial land use (HIL F). Results were reported above the HIL F for benzo(a)pyrene in SP10.1 and SP20.1. Comparison of the concentrations against the current NEPM 2013 guidelines reported concentrations below the commercial/industrial assessment criteria. It was noted that the elevated benzo(a)pyrene in these materials may be attributed asphalt in the fill materials sampled. No asbestos was identified in any sample submitted for analysis.

Two sediment samples collected from the sludge ponds reported elevated ammonia and total nitrogen above the laboratory limit of reporting (LOR). Two samples collected from the sludge ponds were analysed for E Coli, Faecal and Total Coliforms with all samples reporting results below the LOR with the exception of total coliforms in SED 2 which recorded a concentration equal to the LOR.

Based on the results, SKM concluded the risks posed to human health and the environment by the deposited fill material was low. Sediment samples collected from the sludge ponds indicate that the western most pond contains elevated concentrations of phosphorous, ammonia and nitrogen. This sample was collected from dry sludge. Microbial results indicate that minimal coliforms are present in the ponds.

Four groundwater monitoring bores were installed during the investigations and groundwater levels were noted to be in the range of 1.025 m to 2.68 m below the top of the cap. It is noted that no information was available with regards to the height of the well cap above ground.

All groundwater analytical results were reported less than the adopted assessment criteria with the exception of:

- Copper (MW3 and MW4) - marginally above the ANZECC 2000 guidelines but below the NEPM 1999 and considered unlikely to warrant further investigation.
- Nickel (MW1) - MW1 was considered up gradient and indicative of a background monitoring point. It was considered that nickel may be elevated at background levels.
- Zinc (MW2) - marginally above the ANZECC 2000 guidelines but below the NEPM 1999 and considered unlikely to warrant further investigation.

- Ammonia (MW2) - Ammonia concentrations in MW2 were five times greater than the ANZECC 2000 guidelines. It was concluded that the source of ammonia was possibly from waste on the adjoining council land.
- Nitrogen at all locations - all wells showed elevated levels of total nitrogen indicating background levels may be elevated in the area.
- Phosphorous - Concentrations of phosphorous were elevated in all wells with concentration at MW4 more than three times greater than MW1 which may indicate a correlation with elevated phosphorous levels observed in the sediment sample (SED 1) collected from the up-gradient sludge ponds.
- TPH - Concentrations were above the LOR but below the adopted assessment criteria for TPH C_{10}-C_{36} in MW3. It was considered that the TPH was originated from the fill material on site.

3.6.3 AECOM 2017a

This report presents an interpreted hydrogeology model of the site, comprising an unconfined aquifer within the Quaternary aged sands, which confines the underlying aquifer within the Permian aged sandstone (bedrock).

The report finds the water table lies within the sand unit at approximately 4 m below ground level (mbgl). Groundwater flow is expected to be to the east, the degree of which is currently unknown. Localised westward flow may occur proximal to connected surface waters such as Belmont Lagoon. The thickness of the aquifer ranges 15 m to 40 m, however, is expected to thin significantly towards the coast.

3.6.4 AECOM 2017b

This report outlines the findings of Phase 1 Environmental Site Assessment (ESA) for the proposed location of the temporary desalination plant to be located within the boundary of the Belmont WWTW. Key information obtained by AECOM from the review of available historical information and the site inspection is as follows:

- The neighbouring operational WWTW has reported concentrations of nutrients and heavy metals above adopted groundwater criteria and concentrations of microbiological analysis above the LOR which may present potential contamination links to the site (SKM, 2012).
- Filling and waste material stockpiles adjacent to the site as shown on the 2004 aerial photograph (and confirmed during the inspection) may present potential sources of contamination.
- The land has been identified to contain potential Unexploded Ordinance (UXO) Contamination, originating from a field firing range for infantry indirect fire, grenades, explosive charges and artillery which may impact the site.
- Potential filling was evident on and surrounding the site.
- Potential historical infrastructure associated with pipework connections to the old sludge ponds are reported to exist beneath the site.
- Hunter Water maintenance construction compound was located to the west of the site and was established in 2006. During the inspection this area had large stockpiles of spoil labelled as contaminated waste and waste with tar. The surface of the compound appeared to be unsealed compacted gravel, no fuel or chemical storage or infrastructure was observed in this area.

Overall, AECOM considered that there was a moderate risk of potential contamination associated with the site that may present an unacceptable risk to human health and/or the environment. Following the above conclusion, AECOM recommended the following:

- A UXO survey of the site.
- A more detailed contamination assessment of the site with the main objective being assessing the potential contamination status of soil and groundwater and identifying the need for remediation or management measures to mitigate unacceptable contamination risks to make the site suitable for the proposed construction and use of the temporary desalination plant.

3.6.5 AECOM 2017c

This report details the findings of an environmental risk screening undertaken for the desalination plant project, including potential impacts on the surrounding natural and built environment and the potential concerns of the local community and stakeholders.

AECOM 2017b identified a moderate risk of potential contamination associated with the site that may present an unacceptable risk to human health and/or the environment. Contamination sources included:

- Belmont WWTW has previously reported elevated concentrations of nutrients, heavy metals and microbials which may present potential contamination risks.
- Filling and waste material stockpiles as well as redundant evaporation pond infrastructure are located within the temporary desalination plant site footprint and may present potential sources of contamination.
- It is likely that there are potential asbestos/contaminated materials associated with possible remaining subsurface pipework.

The potential for contamination within the indicative project water supply connection corridors is unknown, however contamination is considered to be unlikely considering the proximity of the corridors to natural wetland areas. Contamination issues are more likely to be encountered within these corridors where they are located in proximity to the WWTW.

AECOM 2017b recommended that an intrusive investigation be undertaken as part of the EIS to assess the potential contamination status of soil and groundwater at the site and to identify mitigation and management measures to minimise impacts on the environment during construction and operation of the project.

AECOM 2017c identified key environmental concerns associated with the construction phase, which comprised:

- Erosion and sedimentation of nearby watercourses
- Accidental spillages of chemicals/fuel by construction plant and equipment
- The potential for wind erosion from unsecured stockpiles created during construction
- Disturbance of contaminated soils on-site, if present

It was anticipated that these impacts could be appropriately managed and mitigated in accordance with general construction management measures.

3.7 NSW Environment Protection Authority

A search of the datasets maintained by NSW EPA including notices under the CLM Act and Protection of the Environment Operations (POEO) Act Environment Protection License (EPL) Register was carried out. The search results are summarised below.

Contaminated land record of notices

A site will be on the Contaminated Land: Record of Notices only if the EPA has issued a regulatory notice in relation to the site under the CLM Act. A search of the EPA record of notices for the Belmont, Belmont South and Marks Point suburbs revealed one documented contaminated site to date, summarised below.

Table 3-1 Review of Contaminated Land Record Notices

Organisation	Address	Date	Reason	Direction
Former Mobil Service Station (now 7-Eleven), Marks Point	770-772 Pacific Highway	2003 - 2015	Agreed voluntary remediation proposal, (2003 and 2007) Site Audit Statement (2015) Notice of completion or withdrawal of VMP (2015) Amendment of repeal of order or notice (2015)	1.5 km SW of proposed plant

List of NSW contaminated sites notified to EPA

The sites appearing on the EPA "List of NSW contaminated sites notified to the EPA" indicate that the notifiers consider that the sites are contaminated and warrant reporting to EPA. However, the contamination may or may not be significant enough to warrant regulation by the EPA. The EPA needs to review information before it can make a determination as to whether the site warrants regulation.

The search identified seven sites within 3 km of the study area that has been notified to the NSW EPA.

Table 3-2 Review of Contaminated Sites Notified to EPA

Organisation	Address	Type	Status	Distance from study area
Coles Express Belmont	502 Pacific Highway	Service Station	Regulation under CLM Act not required	1.75 km NW
Former Ampol Service Station, Belmont	467-469 Pacific Highway	Former service station	Regulation under CLM Act not required	2.25 km N
Belmont Bus Depot, north Belmont	2 Floraville Road	Other petroleum	Regulation under CLM Act not required	2.75 km N
Caltex, Belmont North	406 Pacific Highway	Service station	Regulation under CLM Act not required	2.75 km N
Woolworths Service station, Belmont North	399 Pacific Highway	Service station	Regulation under CLM Act not required	2.75 km N
Former Mobil Aviation Depot, Belmont Airport, Marks Point	864 Pacific Highway	Other petroleum	Regulation under CLM Act not required	2.75 km S
Former Mobil Service Station (now 7-Eleven), Marks Point	770-772 Pacific Highway	Service station	Contamination formerly regulated under the CLM Act	1.75 km S

POEO licence register

The POEO register identifies premises that are licensed for certain activities under the POEO Act. Information listed on the Register of particular relevance to this assessment includes site location, activity type, relevant clean up notice and non-compliance information. Each licence provides information on potential point and non-point sources of soil and groundwater contamination that may be generated on site through standard operations, accidental spills and leaks.

A search of the register identified three premises with a current or previous POEO licence within the study area. This is summarised in Table 3-3.

Table 3-3 Licensed activities under the POEO Act 1997

Organisation	Address	Activity	Distance and direction from plant area	Distance and direction from closest water routes
Hunter and New England Area Health Service	Croudace Road, Belmont	Hospital – hazardous, industrial or Group A waste (generation or storage)	3.2 km NW	1.9 km NW
Hunter Water Corporation	Off Ocean Park Road, Belmont	Waste water treatment works	250 m NE	250 m NE
Lake Macquarie Yacht Club	1 Ada Street, Belmont	Boat mooring and storage	1.4 km NW	360 m W
Marks Point Marina	Edith Street, Marks Point	Boat construction and maintenance	2.3 km SW	1.3 km NE

Of the above sites listed, the WWTW is the only potential area of environmental concern. Due to the distance away from the proposed temporary desalination plant and water connections, the yacht club and hospital area unlikely to affect the proposed development.

3.8 Potential contamination sources

Table 3-4 summarises the potential areas of environmental concern based on the results of the desktop review and site inspection.

Table 3-4 Potential contaminants of concern

Source	Description	Potential Contaminants of Concern
Desalination plant area		
Deposition of wastes and fill from the former WWTW	Historical placement of WWTW wastes	Heavy metals, PAH, TPH, BTEX, phenols, asbestos, nutrient and microbial
Sludge ponds	Sludge from former WWTW operations	Heavy metals, PAH, TPH, BTEX, phenols, asbestos, nutrient and microbial
Leaks and spills from the adjacent WWTW	Leaks and spills associated with the current WWTW	Heavy metals, PAH, TPH, BTEX, phenols, nutrient and microbial
Spillage or leakage of oils, fuels	Spills and leaks associated with equipment and machinery used on former WWTW site	Heavy metals, PAH, TRH, BTEXN, PCBs
Waste stored within Hunter Water compound	Potentially contaminated waste soils (tar etc.)	Heavy metals, PAH, TRH, BTEXN, Phenols, asbestos

Source	Description	Potential Contaminants of Concern
Subsurface infrastructure potentially beneath the site	Subsurface infrastructure (pipes, conduit) potentially containing sludge residues or asbestos	Heavy metals, PAH, TPH, BTEX, phenols and asbestos
Illegal Dumping	Asbestos containing materials (ACM) may be present as a result of illegal dumpling	Asbestos, heavy metals, PAH, TRH, BTEXN, OCPs, OPPs and PCBs
Water connections		
Commercial properties that may store fuels and chemicals	Storage of fuels and chemicals in commercial or industrial properties (past or present) along the water routes	Heavy metals, PAH, TRH, BTEXN
Existing bitumen and road base	Impacts associated with the existing bitumen and road base materials (historical materials may be coal tar based)	TRH, BTEXN and PAH
Illegal Dumping	Asbestos containing materials (ACM) may be present as a result of illegal dumpling along the site	Asbestos, heavy metals, PAH, TRH, BTEXN, OCPs, OPPs and PCBs
Pest and Weed Control	Use of herbicides and pesticides within the road corridor	OCP, OPP, arsenic and lead
UXO	Use of the area for Defence training	UXOs

Based on the results of the desktop assessment, there is a potential for contamination to be present within soils in the former WWTW sludge ponds and surrounding areas due to the deposition of fill. There is also the potential for subsurface infrastructure containing asbestos to remain on site. There is a minor potential for soil contamination along the proposed water connection routes due to existing bitumen road base, adjacent properties, illegal dumping and pest and weed control.

There is also potential for migration of contamination (surface water and groundwater) from these sources.

4. Sampling and analysis plan and methodology

4.1 Summary of field activities

Field investigations we undertaken between 31 July 2018 and 6 September 2018. A summary of the activities undertaken during this time is presented below.

Table 4-1 Field investigation program

Date	Activity
31 July 2018	Drilling and sampling BH104 – Plant area
14 August 2018	Drilling and sampling from BH305, BHA301 – Water connection
17 August 2018	Drilling and sampling BH102 and BH103 – Plant area
22 August 2018	Drilling and sampling BH108 – Plant area
29 August 2018	Drilling of BH101 – Plant area
30 August 2018	Drilling and sampling from BH301, BH302, BH306, BHA302 and BHA304 – Water connection
4 September 2018	Drilling and sampling from BH303, BH304 and BHA303 - Water connection
6 September 2018	Excavation and sampling from test pits TP101 to TP106 – Plant area

4.2 Sampling and analytical program

4.2.1 Contaminant analysis

Soil samples were collected during geotechnical investigations to provide a preliminary indication of the potential for soil contamination within the study area. Samples were selected based on the findings of the desktop review (Section 3) and field observations and included:

Plant site and intake

- Samples were collected from five boreholes and six test pits with analysis including pH, CEC, asbestos, heavy metals, BTEXN, TRH, PAH. Two composite samples were analysed for OCP and PCB.

Water connections

- Samples were collected from ten boreholes with analysis including pH, CEC, asbestos, heavy metals, BTEXN, TRH, PAH. Three composite samples were analysed for OCP and PCB.

The analytical program is summarised in Table 4-2. The investigation locations are presented in Figure 1, Appendix A.

Table 4-2 Investigation locations, sampling and analytical program

Location	Total Depth (m)	Investigation Method	Soil Samples Analysed (mbgl)	Analytical Parameters
Plant site and intake				
BH101	20.0	Borehole	BH101_0.0-0.2 BH101_0.45-0.5	Asbestos, Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH102	22.0	Borehole	BH102_0.0-0.2 BH102_0.5-0.6	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH103	41.1	Borehole	BH103_0.0-0.2 BH103_0.5-0.6	Asbestos, Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH104	20.0	Borehole	BH104_0.0-0.2 BH104_0.2-0.3	Asbestos, Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH108	20.5	Borehole	BH108_0.0-0.2	Asbestos, Heavy metals, TRH, BTEXN, PAH
TP101	2.0	Test pit	TP101_0.0-0.2 TP101_0.5-0.6	pH, CEC, Heavy metals, TRH, BTEXN, PAH pH, CEC
TP102	2.0	Test pit	TP102_0.0-0.2	Heavy metals, TRH, BTEXN, PAH
TP103	1.9	Test pit	TP103_0.0-0.2 TP103_1.0-1.1	Heavy metals, TRH, BTEXN, PAH pH
TP104	2.2	Test pit	TP104_0.0-0.2	Heavy metals, TRH, BTEXN, PAH
TP105	1.6	Test pit	TP105_0.0-0.2	pH, CEC, Heavy metals, TRH, BTEXN, PAH
TP106	1.8	Test Pit	TP06_0.0-0.2/FD20	Asbestos, Heavy metals, TRH, BTEXN, PAH
COMP1	-	-	BH102_0.0-0.2 and BH103_0.0-0.2	OCP, PCBs
COMP2	-	-	BH101_0.0-0.2 and BH104_0.0-0.2	OCP, PCBs

Location	Total Depth (m)	Investigation Method	Soil Samples Analysed (mbgl)	Analytical Parameters
Water connections				
BH301	5.0	Borehole	BH301_0.0-0.2 BH301_0.45-0.5	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH302	5.0	Borehole	BH302_0.0-0.2 BH302_0.2-0.3 BH302_4.0-4.5M	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH pH
BH303	5.0	Borehole	BH303_0.0-0.2 BH303 2.5-2.95M	pH, CEC, Heavy metals, TRH, BTEXN, PAH pH
BH304	1.65	Borehole	BH304_0.0-0.2 BH304_0.45-0.5 BH304 0.5-0.95M	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH pH
BH305	5.0	Borehole	BH305_0.0-0.2 BH305_0.9-1.0	Asbestos, Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BH306	5.0	Borehole	BH306_0.0-0.2 BH306_0.2-0.3	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
COMP3	-	-	BH301_0.0-0.2, BH302_0.0-0.2 and BH306_0.0-0.2	OCP, PCB
BHA301	5.0	Borehole	BHA301_0.0-0.2 BHA301_0.5-0.7	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BHA302	5.0	Borehole	BHA302_0.0-0.2 BHA302_0.45-0.5 BHA302 1.0-1.45M	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH pH
BHA303	5.0	Borehole	BHA303_0.0-0.2 BHA303_0.45-0.5	Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH
BHA304	5.0	Borehole	BHA304_0.0-0.2 BHA304_0.45-0.5	Asbestos, Heavy metals, TRH, BTEXN, PAH Heavy metals, TRH, BTEXN, PAH

Location	Total Depth (m)	Investigation Method	Soil Samples Analysed (mbgl)	Analytical Parameters
COMP4	-	-	TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2 and TP106_0.0-0.2	OCP, PCB
COMP5	-	-	TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7, TP106_0.6-0.7	OCP, PCB

Metals included As, Cd, Cr, Cu, Hg, Pb, Ni, and Zn

TRH – Total recoverable hydrocarbons

BTEXN – Benzene, toluene, ethylbenzene, xylenes and naphthalene

PAH – Polycyclic aromatic hydrocarbons

OCP – Organochlorine pesticides

PCB – Polychlorinated biphenyl

5. Quality assurance/quality control

5.1 Soil sampling methodology

Soil investigations were undertaken by GHD Geotechnical and Environmental Engineers. All works were undertaken in accordance with GHD's written Standard Field Operating Procedures. Soil sampling was undertaken as part of the geotechnical investigations between July 2018 and September 2018.

Geotechnical test pits and boreholes were excavated using either an excavator or truck mounted drill rig.

Soil samples were generally collected at the surface, 0.5 m below ground level (mbgl) and at 0.5 m intervals thereafter. Samples were collected from significant soil horizons encountered including fill materials and underlying natural materials and other strata which exhibited unusual characteristics. Samples collected during the geotechnical investigations were collected either directly from the auger or directly from the excavator bucket. Samples were collected using new, disposable nitrile gloves to limit cross contamination between sampling locations.

Samples were placed in unpreserved laboratory supplied snap lock bags (ASS testing) and glass jars with a Teflon lid (soil contamination testing) and stored in an ice filled cooler for sample preservation prior to and during shipment to the testing laboratory. All sample jars and bags were clearly labelled with a sample number, sample location, sample depth, and sample date. All samples were transported under signed Chain of Custody documentation to ALS Environmental (primary laboratory), an independent and National Association of Testing Authorities Australia (NATA) accredited laboratory for the analysis requested.

Soils encountered during the investigations were described in accordance with the Unified Soil Classification System, with features such as discolouration, staining, odours and other indications of contamination being noted. This information was recorded on field test pit and borehole logging sheets which have been summarised and provided in Appendix B.

5.2 Data quality objectives

The purpose of establishing data quality objectives is to ensure the field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the assessment. The data quality objectives and the procedures designed to achieve these objectives are listed in Table 5-1 below.

Table 5-1 Data quality objective decision process

Process	Response
Step 1. Define the problem that necessitates the study.	The proposed drought response desalination plant lies adjacent to a WWTW and partially over former sludge ponds and has been subject to historical placement of fill. The proposed water connections run alongside fire trails, access tracks, roads and footpaths. As a result, the proposed construction work has a potential to disturb contaminated soils. The presence of contamination impacts within the study area is currently unknown. Hunter Water need to understand the potential risks to workers and environment that may be caused through the disturbance of contaminated soils.

Process	Response
Step 2. Identify the Goal of the Study. State how environmental data will be used in meeting objectives and solving the problem, identify study questions, define alternative outcomes.	The objectives of the investigations were to: • Understand the potential contamination issues within the proposal area • Provide recommendations for management and/or remediation to be implemented during construction
Step 3. Identify Information Inputs. Identify data and information needed to answer study questions.	Data inputs for the proposal include: • Previous investigations undertaken • Desktop review of available information regarding the Site • Soil sampling undertaken as part of this investigation
Step 4. Define the Boundaries of the Study. Specify the target population and characteristics of interest, define spatial and temporal limits, scale of inference.	The spatial boundaries of the works are defined by those described in Section 2 and 3 and shown in Figure 1, Appendix A.
Step 5. Develop the Analytic Approach. Define the parameters of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.	Reviews of historical site information and previous assessments as outlined in Section 3 have been used to identify the major contaminants of concern. Results reported as part of this investigation will be used to better characterise the areas of concern.
Step 6. Specify Performance or Acceptance Criteria. Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.	The guidelines as listed in Section 6 will be used to assess the contamination status of the soils and groundwater within the study area. Data Quality Indicators as described in Section 5.3 will be used to evaluate the acceptability of the data.
Step 7. Develop the Plan for Obtaining Data. Select the resource-effective sampling and analysis plan that meets the performance criteria.	Samples were collected as per Section 4 from geotechnical boreholes/ test pits. QA/QC procedures were used and QC samples collected to allow evaluation of Data Quality Indicators as described in Appendix C.

5.3 Data Quality Indicators

GHD has selected the following Data Quality Indicators to ensure that the data is of a quality from which to draw conclusions:

- Data Representativeness – is the data representative of site conditions?
- Data Completeness – are there comprehensive records available from all field work undertaken, and have all areas of concern been sampled and analysed?
- Data Comparability – is the quality of the data such that samples analysed at different times can be compared, and is data consistent with field observations?
- Precision and Accuracy for Sampling and Analysis – does the laboratory achieve the relevant Quality Control Criteria?

5.4 QA/QC results

The methodology, results and discussion of the Quality assurance/Quality Control program are presented in Appendix C.

6. Basis of assessment

6.1 Framework for assessment

The framework on which the contamination status of the proposal area was assessed was based on guidelines published or approved by the NSW EPA under *Section 105* of the *Contaminated Land Management (CLM) Act 1997*, supplemented by other relevant guidelines where required.

The guidelines that were referenced include the following:

- NEPC (2013). National Environment Protection (Assessment of site Contamination) Measure (NEPM), 1999 as amended in May 2013
- NSW EPA (1995). Contaminated sites: Sampling Design Guidelines, 1995
- OEH (2011). Contaminated sites: Guidelines for Consultants Reporting on Contaminated sites, 2011
- NSW DEC (2017). Contaminated Land Management: Guidelines for NSW site Auditor Scheme, (3rd Edition), 2017
- NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, 2015

6.2 Soil assessment criteria

The National Environment Protection (Assessment of Site Contamination) Measure (referred to herein as the NEPM) was produced by the federal National Environmental Protection Council (NEPC) in 1999 and has been revised and updated in 2013 by way of the National Environmental Protection (Assessment of site Contamination) Amendment Measure 2013.

The NEPM includes a range of health investigation levels (HILs) and health screening levels (HSLs), ecological investigation levels (EILs) and ecological screening levels (ESLs) for a range of contaminants and for a range of land use and exposure scenarios. The selection of the assessment criteria has been based on the following site specific characteristics:

- Subsurface materials generally comprised coarse, sandy soils
- There is a potential for direct contact within contaminated soils
- There is a potential for ecological impacts through incorrect management of contaminated soils during construction

6.3 Health investigation levels and health screening levels

Health investigation levels (HILs) and HSLs have been developed for a broad range of metals and organic substances and are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types. HSLs are specific for soil types. Site specific conditions determine the depth to which HILs apply for land uses other than residential (generally to depth of 3 m).

Given that a portion of the investigation area is a former WWTW, and proposed to be a desalination plant and that the water connection routes pass alongside fire trails and roadways, both the recreational and open space and commercial/industrial assessment criteria have been adopted to assess potential risks to human health. The criteria are sourced from Schedule B1 of the NEPM and Table 4 of CRC Care Technical Report No. 10 and are summarised below:

- HIL C – Public open space such as park, playgrounds and playing fields, secondary schools and footpaths
- HIL D – Commercial/industrial including premises such as shops, offices, factories and industrial sites
- HSLs for Direct Contact – HSL C Recreational/open space
- HSLs for Direct Contact – HSL D Commercial/industrial

6.4 Ecological investigation levels and ecological screening levels

Ecological investigation levels (EILs) have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. EILs depend on land use scenarios and generally apply to the top 2 m of soil. Added contaminant limit based EILs have been derived for As, Cu, Cr III, DDT, naphthalene, Ni, Pb and Zn. EILs have been developed for three generic land use settings including areas of ecological significance, urban residential areas and public open space, and commercial and industrial land uses.

The application of added contaminant limit based EILs is also dependent on site specific soil characteristics including pH, cation exchange capacity and clay content. A selection of samples across the site were analysed for pH and CEC and the following assumptions have been made based on the results.

- pH analysis was undertaken as part of the contamination investigation and geotechnical works and ranged between 4.5 and 6.7. The average pH value (of 14 samples) was 5.9. A pH of 6.0 has been adopted for this assessment.
- Cation exchange capacity analysis was undertaken during this assessment on six samples. Values ranged between 0.4 milliequivalents per 100 g and 14 milliequivalents per 100 g. A CEC of 5 milliequivalents per 100 g has been adopted for this assessment as the most conservative CEC.
- Clay content for sand and fill materials was identified during the geotechnical works (GHD, 2018) and ranged between 0.1% and 5.1% with an average of 2.2%. A clay content of 2.5% was adopted for the Cr III criterion as this is the value within the NEPM closest to the average. The selection of Cr III criterion is not CEC or pH dependent.

Ecological Screening Levels (ESLs) have been developed for selected petroleum hydrocarbon compounds and total recoverable hydrocarbon (TRH) fractions and are applicable for assessing risk to terrestrial ecosystems. ESLs also depend on land use scenarios (identical to EILs) and broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil.

As with health assessment criteria, based on the previous and current land use, and the proposed end use for the site, the following assessment criteria have been considered:

- Soil specific added contaminant limits (ACL) and ESLs (coarse textures) for urban residential and public open spaces
- Soil specific ACLs and ESLs (coarse textures) for commercial and industrial use

6.5 Asbestos

The NEPM provides guidance relating to the assessment of known and suspected asbestos contamination in soil and addresses both friable and non-friable forms of asbestos. The health screening levels for asbestos in soil have been adopted from the Western Australian Department of Health (WA DoH) *Guidelines for Remediation and Management of Asbestos Contaminated Sites in Western Australia* (WA DoH 2009).

The NEPM guidance emphasises that the assessment and management of asbestos contamination should take into account the condition of the asbestos materials and the potential for damage and resulting release of asbestos fibres. Therefore, for the purposes of assessing the significance of asbestos in soil contamination, three terms are used as summarised below:

- Bonded asbestos containing material (Bonded ACM) – sound condition although possibly broken or fragments and the asbestos is bound in a matrix.
- Fibrous asbestos (FA) – friable asbestos materials such as severely weathered ACM and asbestos in the form of loose fibrous materials such as insulation.
- Asbestos fines (AF) – including free fibres of asbestos, small fibre bundles and also fragmented ACM that passes through a 7 mm x 7 mm sieve.

From a risk to human health perspective, FA and AF are generally considered to be the equivalent to “friable” asbestos in Safe Work Australia (2011), which is defined therein as ‘material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos’.

Bonded asbestos ACM in sound condition represents a low human health risk. However, both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres and may represent a significant human health risk if disturbed and fibres are made airborne.

Commercial/Industrial “D” health screening levels (HSL) have been adopted as the most appropriate to the Assessment Area. The adopted assessment criteria is outlined in Table 6-1.

Table 6-1 Adopted assessment criteria

Form of Asbestos	Health Screening Level (w/w) – Commercial/Industrial
Bonded ACM	0.05%
FA and AFa (friable asbestos)	0.001%
All forms of asbestos	No visible asbestos for surface soil

a. The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

A tiered approach to risk assessment of asbestos contamination is recommended, including the development of an appropriate Conceptual Site Model (CSM). A weight of evidence approach is recommended with consideration given to factors such as the distribution of different fill types, the heterogeneity of the contamination and the uncertainty associated with the sampling methodology.

The NEPM states that if the Tier 1 screening levels are not exceeded, and an appropriate level of investigation has been carried out, then no contamination management actions are required except for ensuring the surface soil is free of visual asbestos. This may be achieved by multidirectional raking or tilling and hand-picking of exposed fragments of bonded ACM. Final visual inspection of the assessment and remediated areas should not detect any visible asbestos.

6.6 Aesthetics

Assessment of aesthetic issues was undertaken as outlined in Schedule B(1) of the NEPM (1999) which states that 'there are no specific numeric aesthetic guidelines, however site assessment requires balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity'.

General assessment considerations included:

- That chemically discoloured soils or large quantities of various types of inert refuse, particularly if unsightly, may cause ongoing concern to site users.
- The depth of the materials, including chemical residues, in relation to the final surface of the site.
- The need for, and practicality of, any long-term management of foreign material.

The NEPM notes that in some cases, documentation of the nature and distribution of the foreign material may be sufficient to address concerns relating to potential land use restrictions.

6.7 Selected criteria

The methodology for assessing contamination levels in soils was to use the HILs, HSLs, EILs and ESLs (selected as relevant to the area of the site and the proposed land use) as cut off points to classify soils either as:

- Soils not contaminated, which pose no risk to the environment or human health and warrant no further action, i.e. concentrations less than or equal to the EILs/ESLs.
- Soils containing elevated concentrations of contaminants, which may pose a risk to the environment but pose no risk to human health under the proposed land use scenarios i.e. concentrations greater than the ecological values and less than the adopted HILs. A qualitative risk assessment may be sufficient to evaluate the potential impact for the proposed land use.
- Soils significantly contaminated which pose a risk to both the environment and human health, i.e. concentrations significantly greater than relevant investigation or screening levels. Soils in this category would likely require remediation or management, or further assessment by site-specific health and/or ecological risk assessment (Tier 2 or 3) carried out as appropriate for the proposed land use. This will usually require the collection of additional site data. Alternatively a conservative management approach (such as removal, capping or placement under roadways) may be adopted, depending on the likely cost effectiveness of further assessment when compared with the cost of conservative management.

The assessment criteria used to assess soil contamination levels are provided in Table A, Appendix D.

6.8 Waste classification

Soils that may require offsite disposal as part of site works will need to be classified using the six-step process and criteria detailed in *Waste Classification Guidelines – Part 1: Classification of Waste* (NSW EPA 2014). Analytical results will be assessed against Table 1 of the guidelines to provide an indication of the type of waste classification likely to be present for soils on site.

7. Investigation results

7.1 Soil profile

Borehole and test pit logs that were completed as part of the geotechnical assessment are presented in GHD's Geotechnical Investigation Report (GHD 2018).

Typical subsurface profile encountered across the site comprised fill over alluvial sand. The exceptions to this were:

- BH303, where subsurface conditions comprised fill to 1.8 m depth over alluvial clay.
- BH304, where subsurface conditions comprised fill to 0.3 m depth over overlying residual materials, overlying weathered rock.

A description of the subsurface units encountered during the intrusive works is provided below:

- FILL or TOPSOIL – generally comprising silty SAND, sandy GRAVEL and CLAY, to depths of up to 1.3 m.
- ALLUVIAL SAND, SAND and silty SANDS. Thin clay and silt lenses, up to 0.5 m thick, were encountered in BH305, BH306 and BHA304.
- Alluvial CLAY, comprising either Very soft CLAY (BH303 - 580 metres west of the northern potable pipeline connection - at depth greater than 3.5 m) or Firm CLAY (BH302) below 4.1 m depth, BH303 between 1.8 m and 3.5 m and BH103 (within the proposed temporary desalination plant site) below 31 m depth to the limit of investigation at 41.1 m).
- RESIDUAL, comprising Gravelly SAND (BH304, overlying weathered conglomerate).

No odours or staining was observed during the collection of soil samples. There were no other visual signs of contamination noted within the boreholes and test pits excavated during the assessment. However, coal fragments were noted within the overburden/side bank east of the track around BH305. One fragment of potential asbestos containing material (ACM) was noted on the track halfway between TP106 and GW102. Small fragments of potential ACM were also noted near the surface of.

Each contamination sample was screened for Volatile Organic Compound (VOC) vapours using a Photo-Ionisation Detector (PID). All PID results were below 1.0 ppm.

Groundwater was encountered at all of the test locations, excluding TP101, TP106 and BH304. It is noted that groundwater levels are anticipated to vary based on climatic conditions, tidal variations and rainfall. All of the test pits were seen to collapse prior to achieving target depth. Water levels were logged in boreholes as follows:

- Desalination plant – 0.95 mbgl (BH101) to 4.1 mbgl (BH105)
- Water connection route – 0.4 mbgl (BHA302) and 3.5 mbgl (BH303)

7.2 Soil analytical results

Analytical results are summarised in Table A in Appendix D, while detailed laboratory results sheets and Chain of Custody documents are provided in Appendix E. Test locations with results above assessment criteria are presented in Figure 2, Appendix A.

7.2.1 Health

All samples reported concentrations below the adopted assessment criteria.

No asbestos was identified in soil samples submitted for analysis.

7.2.2 Ecological

All samples reported concentrations below the adopted assessment criteria, with the exception of the following:

Desalination plant area

- BH104_0.2-0.3 with concentrations of copper above the EIL recreational land use.
- TP106_0.0-0.2 and its duplicate (FD20) with concentrations of copper and zinc above the both the recreational and commercial/industrial land use EILs.
- BH102_0.0-0.2 with concentrations of TRH F3 above the ESL Urban residential (coarse fraction).
- BH104_0.0-0.2 and BH104_0.2-0.3 with concentrations of TRH F3 above the ESL Urban residential (coarse fraction).

Water connection

- BHA303_0.0-0.2 with concentrations of zinc above the EIL urban residential/public open space land use.
- BHA304_0.45-0.5 with concentrations of zinc above the EIL urban residential/public open space land use.
- BHA304_0.0-0.2 with concentrations of benzo(a)pyrene above the ESL Urban residential (coarse fraction).

7.2.3 Waste classification

Soil results were compared against specific contaminant concentration (SCC) for classification without TCLP as outlined in Table 1 of the NSW EPA (2014) *Waste Classification Guidelines.*

Waste classification results are presented in Table B in Appendix D. In summary, soils were generally within with General Solid Waste contaminant threshold (CT1) with the exception of the following:

Desalination plant area

- Lead at TP106 0-0.2 which exceeded the CT1 threshold.

Water connection

- Lead at BHA304 0.45-0.5 which exceeded the CT1 threshold.

Based on the results, soils were generally classified as General Solid Waste with the exception of soils at TP106 0-0.2 which would be classified as restricted solid waste and BHA304 0.45-0.5 which would be classified as hazardous waste. It is noted that soils where either acid sulfate soils or asbestos fragments are identified, these would also be classified as either acid sulfate soils or asbestos waste.

8. Discussion

8.1 Investigation results

8.1.1 Subsurface conditions

The typical subsurface profile encountered across the site comprised varying depths of fill over alluvial sands although alluvial clays were present from 1.8 mbgl at BH303 and residual weathered rock was present at 0.3 mbgl at BH304.

Groundwater was encountered in all but three of the test locations (TP101, TP106 and BH304). Water levels were logged at the desalination plant site between 0.95 mbgl (BH101) to 4.1 mbgl (BH105), along the water connection route between 0.4 mbgl (BHA302) and 3.5 mbgl (BH303).

8.1.2 Health assessment criteria

The soil sampling program undertaken as part of this investigation reported concentrations of contaminants below both HIL C and HIL D for all samples..

No asbestos was detected in soil samples analysed. However, one fragment of non-friable potential ACM was observed between TP106 and GW102 within the proposed temporary desalination plant site and other small fragments of non-friable potential ACM were found on the surface near GW108 (70 m west of the construction footprint opposite the proposed desalination plant site). These fragments were bonded and given that there was no fibres identified in soils, the risk to workers is considered to be low and can be managed through an unexpected finds protocol in a contaminated soil management plan (CSMP).

8.1.3 Ecological assessment criteria

Desalination Plant

Concentrations of copper and zinc were above both recreational and commercial/industrial land use EILs in TP106_0.0-0.2/FD20. TP106 was located adjacent to an access track and the results are considered to be due to the presence of fill consisting of silty sand with gravel including asphalt, concrete, bricks and rock.

Concentrations of copper (BH104_0.0-0.2) and TRH F3 (BH104_0.0-0.2 and BH104_0.2-0.3) in fill samples from BH104 were above urban residential land use. This location was located on the northern boundary of the former sludge ponds. Fill at this location was described as dark grey to brown silty sands and sands.

Concentrations of TRH F3 above the urban residential ESL in BH102_0.0-0.2 which was located south of the sludge ponds. Fill at this location was described as brown to grey sand with rootlets and trace plastic and wire.

Although levels of contaminants were found to above both the recreational and commercial/ industrial EILs/ESLs, based on the former use of a portion of the site as a WWTW and the proposed future use as a desalination plant, there is limited ecological amenity in this area and it is considered unlikely that these contaminants would present a significant risk to the environment in this area.

Water connection

Concentrations of zinc were above recreational land use EILs in shallow fill of BH303 which was located adjacent to an access track in a bushland area. The elevated results are considered to be due to the presence of fill consisting of clayey sands with gravel including concrete.

Concentrations of benzo(a)pyrene were above the recreational ESLs in shallow fill from BHA304. Further, concentrations of zinc were above recreational EILs in deeper fill materials (0.45-0.5 mbgl). BHA304 was located at the western end of a southern water connection route adjacent to a roadway and bushland. Fill was described as silty sand with gravel, trace coal and concrete fragments. As these locations are nearby to bushland areas, there is a potential risk to the environment should these soils be disturbed in an uncontrolled manner. This risk can be mitigated with the implementation of soil management plans during construction.

8.2 Waste classification

Based on review of results against the NSW EPA Waste classification guidelines, soils would generally be classified as General Solid Waste, with the exception of the following

- Soils at TP106 and BH304 which would be classified as Restricted Solid waste based on lead concentrations.
- Soils where asbestos is identified would also be classified as asbestos waste.
- Soils where acid sulfate soils are identified would be classified as acid sulfate soil waste.

These classifications are only preliminary and further testing and analysis would be required to confirm the classification of soils prior to disposal.

8.3 Site conceptual model

Based on the findings of this investigation the following site conceptual model was developed.

8.3.1 Sources

The following potential sources of contamination have been identified across the proposal area:

Desalination plant area

- Placement of fill in the footprint of the former WWTW settling ponds
- Spillage or leakage of oils, fuels
- Wastes stored within Hunter Water compounds
- Subsurface infrastructure beneath the site

Water connection routes

- Commercial properties that may store/use fuels and chemicals
- Existing bitumen and road base and run-off from roadways (fuel and oil residues)
- Illegal dumping of waste along the connection routes
- Historical use of herbicides and pesticides
- Migration of contamination (soil, surface water and groundwater) from adjoining commercial/industrial properties that may store fuels, oils and chemicals (cemetery, TAFE college)

8.3.2 Pathways

Migration pathways

The following migration pathways were identified for the proposal area:

- Vertical and horizontal migration of surface water and sediment
- Vertical and horizontal migration of groundwater
- Windborne dust

Exposure (contaminant uptake) pathways

Based on the identified receptors and the release, fate, and transport characteristics of the chemicals of potential concern, pathways through which receptors may become exposed include inhalation, ingestion and dermal absorption. These are discussed briefly below in the context of the site setting:

- Inhalation Exposure Pathway: There is the potential for creation of dust from unsealed surfaces and filled areas of the site. Risk of potential inhalation of asbestos fibres contaminated dusts. Soil or groundwater vapour inhalation is also possible but unlikely.
- Ingestion Exposure Pathway: Ingestion of contaminants by current and future site workers through construction and/or maintenance activities which may involve direct contact with contaminated soils or groundwater.
- Dermal Exposure Pathway: Exposure may occur via sorption through biological membranes such as skin. This pathway may be a concern whenever contaminated soil, groundwater comes into direct contact with a biological membrane. This pathway could also be a concern if contaminated surface water (runoff from the sites) was to come into direct contact with benthic and aquatic flora and fauna within off-site surface-water receiving environments.

8.3.3 Potential receptors

The following potential sensitive human and environmental receptors of contamination were identified for the site and surrounding areas:

- Human health receptors:
  - Site workers or visitors (e.g. workers, subcontractors and members of public)
  - Off-site receptors (users of surrounding water bodies, beach areas or walking tracks for recreational purposes)
  - Current and future occupants of surrounding properties
- Environmental receptors
  - Flora and fauna within the proposal area and surrounding land
  - Local drainage channels and surface water
  - Groundwater beneath the study area
  - Off-site ecosystems

9. Conclusions and recommendations

This Contamination Assessment report presents the results of the contamination investigation for Hunter Water's proposed drought response desalination plant and associated water routes at Belmont, NSW. This report comprises the Contamination Assessment, which has been prepared to inform the Environmental Impact Assessment (EIA) with regard to the potential contamination issues within the study area and recommendations for management and/or remediation measures to be implemented during construction.

The desktop review portion of the works identified that a potential exists for contamination to be present in the following areas of the site:

- Fill material and potentially contaminated soils within the footprint of the former WWTW (sludge ponds) and Hunter Water compounds
- Existing bitumen and road base
- Historical use of herbicides and pesticides
- Illegal dumping of waste along the access tracks, trails and road corridor
- Other commercial/industrial properties that may store oils, fuels, grease, herbicides and pesticides

As such, further assessment of soils throughout the study area was undertaken, targeting the proposed temporary desalination plant area and locations along the water connection routes.

One potential ACM fragment was noted on the surface between TP106 and GW103 (within the temporary desalination plant site), with additional smaller fragments noted near GW108 (70 m west of the temporary desalination plant site, outside of the construction footprint). These fragments were bonded and given that there were no fibres identified in soils, these are considered to be a low risk to workers. The results of the investigation indicates that soils within the proposed area are unlikely to present a significant health risk to workers during construction works and future site users post construction. The risk of exposure from any isolated contaminated areas or unexpected finds can be managed during construction with a CSMP.

Concentrations of copper, zinc, TRH and benzo(a)pyrene were reported above the EILs and ESLs in five locations across all three sub-areas. The concentrations of contaminants are most likely attributable to the presence of fill materials and proximity of the samples to either the former WWTW sludge ponds or being adjacent to roadways. The elevated levels of these contaminants could present a potential environmental risk to nearby sensitive receptors such as bushland and waterways if not managed appropriately during construction.

Based on the investigations undertaken to date and taking into account the proposed future land use (desalination plant and associated service corridors), the site is considered suitable from a contamination perspective for redevelopment. As no significant human health or environmental risks to construction workers or future site users have been identified, no remediation within the site is proposed at this stage.

Soils at the study area would generally be classified as General Solid Waste, with the exception of soils at TP106 and BHA304 which are currently classified as Restricted Solid Waste. These classifications may be reduced with further sampling and TCLP analysis. In addition, soils where either asbestos fragments or acid sulfate soils are identified would also be classified as either asbestos waste or acid sulfate soil waste. It is noted that these classifications are preliminary only and further sampling and analysis would be required prior to disposal off site.

The desktop review identified that the northern portion of the water main connection was noted to be either on the boundary or just within an area of a former Defence military area which was classified as having a Slight potential for residual UXO (Figure 1, Appendix A). Although the Defence website states that no further UXO investigation or remediation is required for these areas, it is recommended that an UXO assessment is completed on the confirmed pipeline route by the contractor prior to construction.

Recommendations

Based on the desk top review and the results of the current investigations, it is considered that the potential risks from disturbance and exposure of potential contamination within the site can be managed development of a CSMP as part of the Construction Environmental Management Plan, which would include requirements for:

- Stockpiling soils away from sensitive receptors such as waterways and drainage lines
- Testing of soils to assess suitability if they are to be placed near sensitive receptors
- Waste management
- Management and safe guarding procedures for UXO waste
- Unexpected contaminated soils finds protocols

The site has been investigated for contamination as detailed in this report. However, a degree of uncertainty is inherent in any site contamination investigation and a potential exists for undetected contaminated soils, wastes or hazardous building materials to be identified during any future works that disturb the ground surface. In particular, there is a potential for unidentified contaminated materials to be present under areas of the site not investigated or in any fill materials that may be present on site. Indications of potential contamination may include:

- Stained or discoloured fill, soils or seepage water
- Construction/demolition wastes such as concrete, bricks, timber, tiles, fibre cement sheeting, fragments and pipes
- General rubbish such as plastic, glass, packaging
- Imported materials such as ash or slag or coal chitter

Should unexpected contaminated soils be identified during any future ground works, advice should be sought from a suitably qualified environmental consultant and any additional investigations/remediation be completed in general accordance with guidelines developed or endorsed by NSW EPA.

10. Limitations

This report has been prepared by GHD for Hunter Water Corporation (Hunter Water) and may only be used and relied on by Hunter Water for the purpose agreed between GHD and the Hunter Water as set out in Section 1.2 of this report.

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

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

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

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

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

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

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

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

11. References

AECOM, 2017a, Temporary Desalination Project Readiness Activities Stage 1 Belmont Conceptual Hydrogeological Model, Document Reference 60515293_Belmont CSM RPT_Rev 1.

AECOM, 2017b, Phase 1 Site Contamination Review. Potential Temporary Desalination Site, Belmont. Document reference 60515293. Rev B.

AECOM, 2017c, Preliminary Environmental Assessment, Lower Hunter Water Plan: Temporary Desalination Project. Document Reference 60281456. Rev 0.

Contaminated Land Management (CLM) Act 1997.

Department of Land and Water Conservation, NSW Soil Landscapes of Gosford – Lake Macquarie Special 1:100,000 Sheet 9131 and part 9231.

Department of Natural Resources, NSW. Acid Sulfate Soil Risk Map for Swansea.

Department of Mineral Resources, NSW. Newcastle 1:100,000 scale Coalfields Regional Geology, Geological Series Sheets 9231 and part of 9131, 9132 and 9232, Edition 1.

Geological Survey of New South Wales 1: 100,000 Gosford-Lake Macquarie Special, Geological Series Sheet 9131 and part 9231 (First Edition, 2015).

Geological Survey of New South Wales 1:25,000 scale Belmont – Swansea inset of the Newcastle – Hunter Area Coastal Quaternary Geology.

G-Tek 2018. UXO Desktop Assessment Report. Pipeline Works, Belmont NSW. G-Tek Australia Pty Ltd. 18019GHDA v1.01. 4 August 2018.

NSW EPA (1995). Contaminated sites: Sampling Design Guidelines.

NSW DEC (2017). Contaminated Land Management: Guidelines for NSW site Auditor Scheme, (3rd Edition), 2017.

NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, 2015.

National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1), National Environment Protection Council, May 2013.

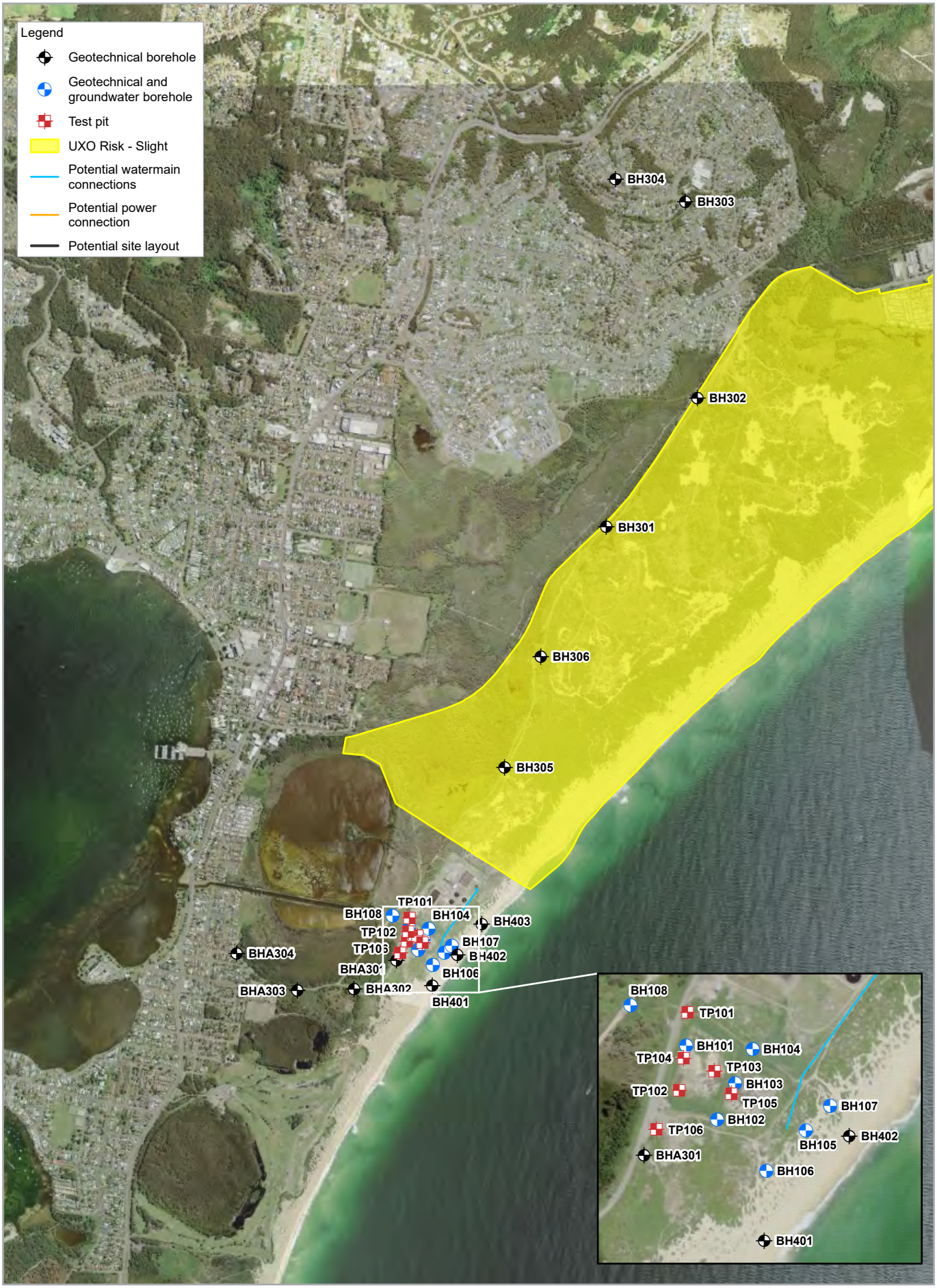
OEH (2011) Office of Environment and Heritage, Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.

RCA, 2002, Upgrade of Belmont WWTW, Document Reference 566b-033/0.

SKM, 2012, Spoil Investigation Report, Document Reference EN03103-N-CL-RP-0002.

Appendices

Appendix A – Figures



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Metres

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

N

Hunter Water Corporation
Belmont Temporary Desalination Plant
Contamination Assessment Report

Geotechnical and contamination test locations

Project No. **22-19573**
Revision No. **0**
Date **01/10/2019**

Figure 1

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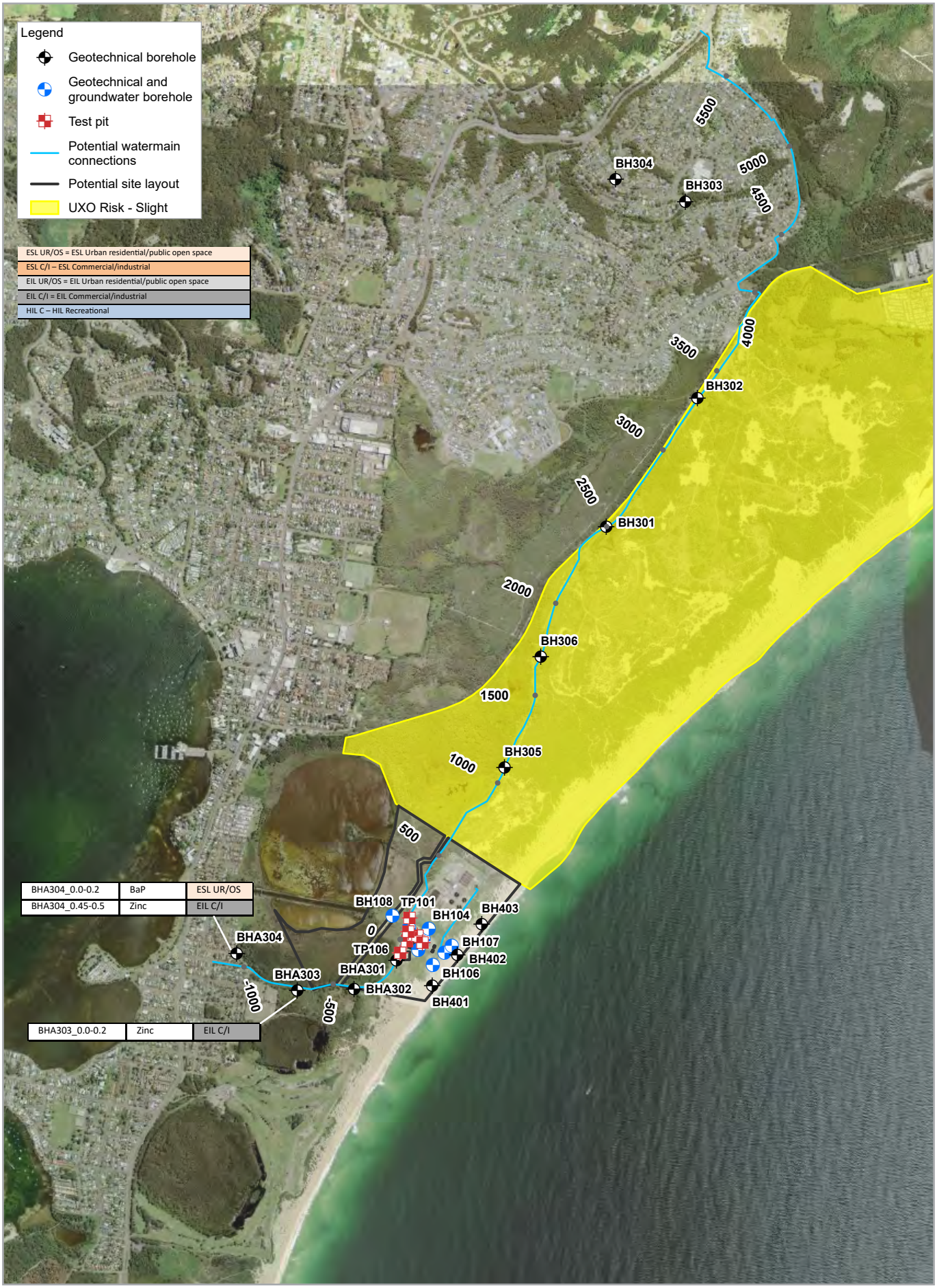
Print date: 01 Oct 2019 - 14:35

Data source: LPI_Imagery_Best: © Department of Finance, Services & Innovation 2017. Created by: TMorton



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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Hunter Water Corporation
Belmont Temporary Desalination Plant
Contamination Assessment Report

Potable water pipeline area Test locations with results above assessment criteria

Project No. **22-19573**
Revision No. **0**
Date **01/10/2019**

Figure 2a

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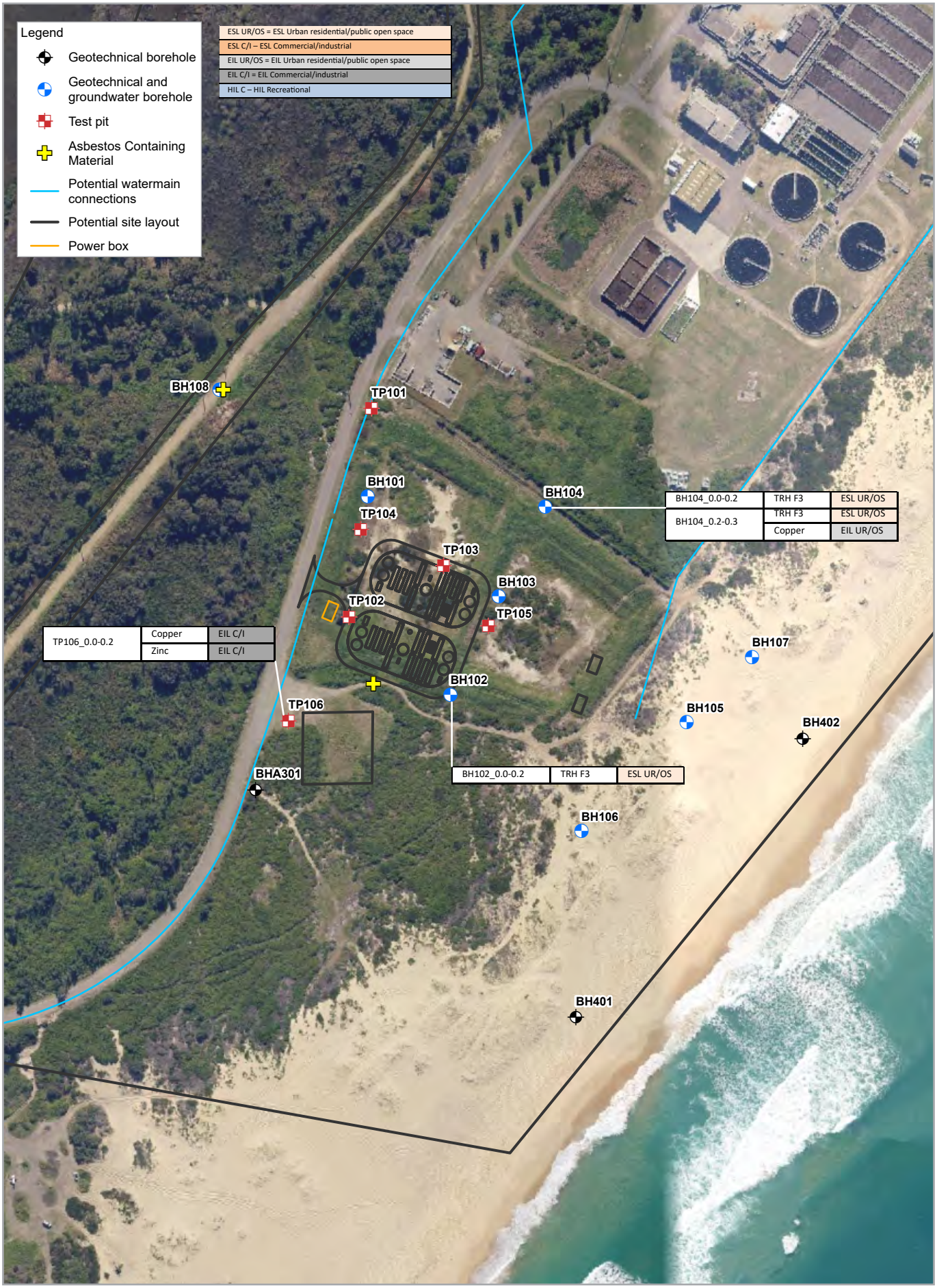

Paper Size ISO A4

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Metres

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

N

Hunter Water Corporation
Belmont Temporary Desalination Plant
Contamination Assessment Report

Temporary desalination plant area Test locations with results above criteria

Project No. **22-19573**
Revision No. **0**
Date **01/10/2019**

Figure 2b

G:\22\19573\Design\04 Deliverables\02 Other\2219573_Contam_0.aprx\2219573_C003_PlantArea_AboveCriteria_0
Print date: 01 Oct 2019 - 14:49

Appendix B – Borelogs

BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH301

SHEET 1 OF 1

Position : 376642.0 E 6344656.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** RCO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 30/8/2018	**Date Completed :** 30/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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 / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 2.1m	Dx3 Dx2 Dx3 D	0.70		-	FILL, Silty SAND, dark grey, fine to coarse grained, with fine to coarse, sub-rounded to sub-angular gravel, trace coal fragments, (fill). 0.40m, becoming brown, gravel becoming fine to medium.	D D-M	-	
1				SPT 25 for 20mm N=ref Dx3 D SPT 11/14/14 N=28 D			SW	SAND, grey, fine to coarse grained, (marine/estuarine?).	D-M	VD	
2				D					W		
				D	2.70					MD	
				D SPT 2/4/7 N=11 D			SM	Silty SAND, dark brown, fine to coarse grained, (marine/estuarine?).	W	MD	
3				D	3.50		SW	SAND, grey, fine to coarse grained, trace of silt, (marine/estuarine?).	W	MD	
4				D D SPT 3/5/9 N=14 D							
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH302

SHEET 1 OF 1

Position : 377119.0 E 6345329.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** RCO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 30/8/2018	**Date Completed :** 30/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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 / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 2.45m	Dx3	0.20		-	FILL, Sandy GRAVEL, brown, fine to coarse grained, sub-rounded to sub-angular, sand is fine to coarse grained, with silt, (fill).	D	-	
				Dx2			-		D	-	
				Dx3	0.50		SW	FILL, SAND, dark grey to black, fine to coarse grained, trace of fine to medium grained, sub-rounded to sub-angular gravel, trace of coal fragments, (fill).	M	D	
				D				SAND, grey, fine to coarse grained, trace of dark brown clayey sand lenses (<10mm thick), (marine/estuarine?).	M		
1				SPT 6/4/6 N=10							
				Dx2				1.30m, becoming pale grey, no clayey sand lenses.	D-M		
				D				1.45m, becoming dark grey, trace of silt.			
				SPT 6/9/9 N=18							
				D							
2				D				1.90m, becoming grey, no silt.			
				D				2.40m, becoming pale grey, trace of silt.	W	MD	
				D							
				SPT 3/3/4 N=7							
3				D				2.95m, becoming grey.			
				D							
				D							
4				D	4.10		CL	CLAY, dark grey, low plasticity, with fine to coarse grained sand, (estuarine).	M	F	
				SPT 2/3/4 N=7							4.45m, PP on SPT sample = 40 - 100kPa
				D							
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH303

SHEET 1 OF 1

Position : 377056.0 E 6346354.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** RCO
Rig Type : Scout	**Mounting:** Truck	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 3/9/2018	**Date Completed :** 3/9/2018		**Logged by :** D. Cooper	**Date:** 20/09/2018

DRILLING					MATERIAL						
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 3.5m	Dx3	0.20		-	FILL, Sandy GRAVEL, brown, fine to coarse, sub-rounded to sub-angular, sand is fine to coarse grained, with silt, (fill).	D-M	-	
				Dx2			-	FILL, CLAY, mottled brown, grey and black, low plasticity (w>PL), (fill).	M	-	
				Dx2	0.70			0.40m, becoming trace of fine to coarse grained sand.			0.5m, PP on SPT Sample = 150 - 170 kPa
				D SPT 4/4/4 N=8			-	FILL, CLAY, brown mottled orange brown and black, low plasticity, (w>PL), trace of fine to coarse grained, sub-rounded gravel, trace of fine to coarse grained sand, trace charcoal, (fill).	M		
1				Dx3 D SPT 3/4/3 N=7							
				Dx2 D	1.80		CL	CLAY, dark grey, low plasticity, (w>PL), trace of fine, sub-rounded gravel, trace fine to coarse grained sand, (alluvium).	M	F-St	
2				Dx2							
				D							2.5m, PP on SPT Sample = 70-120 kPa
				D SPT 3/3/4 N=7				2.80-2.85m, Clayey SAND lens.			
3				D							
				D				3.50m, becoming trace of Sandy GRAVEL bands, with silt, generally less than 20mm thick, w>LL.	W	VS	
				D							
4				D SPT 3/3/3 N=6							4.0m, PP on SPT Sample = 10-20 kPa
				D							
				D	5.00			End of borehole at 5 metres. Target Depth			
5											
6											
7											
8											

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

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH304

SHEET 1 OF 1

Position : 376691.0 E 6346471.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : Scout	**Mounting:** Truck	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 3/9/2018	**Date Completed :** 3/9/2018		**Logged by :** D. Cooper	**Date:** 20/09/2018

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

DRILLING					MATERIAL						
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
1	AD/V	Nil		Dx3 Dx2 Dx3 D SPT 16/15/25 for 145mm DB N=ref SPT 10 for 50mm DB 8 blows N=ref	0.10 0.30 0.90 1.65		- - SW GW	FILL, Silty SAND, grey, fine to coarse grained, (fill). FILL, Sandy GRAVEL, orange brown, fine to coarse grained, sub-rounded, with silt, sand is fine to coarse grained, trace coal fragments, (fill/disturbed). Gravelly SAND, orange brown, fine to coarse grained, gravel is fine to coarse grained, sub-rounded, with clay, (residual). Sandy GRAVEL, orange brown, fine to coarse, sub-rounded, sand is fine to coarse grained, with silt, trace of clay, (extremely weathered conglomerate). End of borehole at 1.65 metres. Refusal	D D D D	- - VD VD	

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH305

SHEET 1 OF 1

Position : 376112.0 E 6343400.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 14/8/2018	**Date Completed :** 14/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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 / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 0.60m	Dx4 Dx3	0.48		-	FILL,Silty SAND, dark brown-black, fine to coarse grained, trace of fine to medium grained, sub-rounded gravel, (fill).	M	-	
				D SPT 5/5/7 N=12 D SPT 3/3/4 N=7	1.70		SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	M W	MD	
2				D	2.20		ML	SILT, dark brown, low plasticity, abundant organics, strong organic odour, (peat).	M- W	S	
				D D SPT 3/4/6 N=10 D D			SW	SAND, grey, fine to coarse grained, trace of silt, (marine/estuarine?). 2.50m, becoming trace of shell fragments.	W	MD	
4				D D SPT 2/2/3 N=5 D						L- MD	
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

See standard sheets for details of abbreviations & basis of descriptions

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Job No.
22-19573

BOREHOLE LOG SHEET

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BH306

SHEET 1 OF 1

Position : 376301.0 E 6343979.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 30/8/2018	**Date Completed :** 30/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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 / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 2.40m	Dx3	0.20		-	FILL, Sandy GRAVEL, brown to dark grey, fine to coarse grained, sub-rounded to sub-angular, with silt, sand is fine to coarse grained, trace of coal fragments, (fill).	D	-	
				Dx2	0.30		SW		D	-	
				Dx3			SW	SAND, dark grey, fine to coarse grained, trace of silt ,(topsoil).	D-M	MD	
				D				SAND, pale yellow brown, fine to coarse grained, (aeolian).			
				SPT 6/5/7 N=12	1.00		SW	SAND, grey, fine to coarse grained, (marine/estuarine?).	D-M	MD	
1				D							
				D							
				SPT 4/4/5 N=9							
				D							
				D							
2				D					W		
				D	2.65		ML	Sandy SILT, dark brown, low plasticity, abundant organics, (estuarine).	W	VS-S	
				D							
				SPT 1/1/0 N=1	3.10		SW	SAND, grey to dark grey, fine to coarse grained, with silt, (marine/estuarine?).	W	MD-D	
3				D							
				D							
				D							
				D							
				SPT 6/10/11 N=21				4.30m, becoming grey, trace of silt.			
4				D							
				D							
				D	5.00			End of borehole at 5 metres. Target Depth			
5											
6											
7											
8											

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BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BHA301

SHEET 1 OF 1

Position : 375548.0 E 6342393.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 14/8/2018	**Date Completed :** 14/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL						
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
1	AD/T	Nil	▽ 2.40m	Dx3 Dx2 Dx3 D SPT 2/4/3 N=7 D D SPT 2/2/3 N=5 D	0.03 0.30 1.40		SW	FILL, Silty SAND, brown to pale grey, fine to coarse grained, trace fine to medium grained, sub-rounded gravel, trace coal chitter, (fill). SAND, pale grey to pale yellow brown, fine to coarse grained, trace rootlets, trace silt, (topsoil). SAND, pale yellow to brown, fine to coarse grained, (aeolian).	D D D-M	- - MD	
2				D D			SW	SAND, grey, fine to coarse grained, with silt, (marine/estuarine?). 2.20m, becoming brown, trace of silt.	M W	MD	
3				D D SPT 2/3/3 N=6 D	3.50						
4				D D D SPT 5/11/18 N=29 D			SW	SAND, pale grey, fine to coarse grained, trace of shells, (marine/estuarine?).	W	D-VD	
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

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BOREHOLE LOG SHEET

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BHA302

SHEET 1 OF 1

Position : 375326.0 E 6342244.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** HAL
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 30/8/2018	**Date Completed :** 30/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL						
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 0.40m	Dx3	0.20		-	FILL, SAND, grey, fine to coarse grained, with fine to coarse grained, sub-rounded to sub-angular gravel, with silt, (alluvium).	D	-	
				Dx2			SW		M	MD	
				Dx3	0.45		SW	SAND, brown, fine to coarse grained, with silt, (marine/estuarine?).	W	-	
1				D SPT 4/4/4 N=8 D D SPT 2/3/3 N=6 D				SAND, grey to brown, fine to coarse grained, trace of silt, trace of fine grained, sub-rounded gravel, (marine/estuarine?).			
2				D				1.90m, becoming grey.			
3				D D SPT 3/6/7 N=13 D						MD-D	
4				D							
				D D SPT 4/8/7 N=15 D							
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

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BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BHA303

SHEET 1 OF 1

Position : 375030.0 E 6342235.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Scout	**Mounting:** Truck	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 3/9/2018	**Date Completed :** 3/9/2018		**Logged by :** D. Cooper	**Date:** 20/09/2018

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DRILLING					MATERIAL						
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 0.5m	Dx3 Dx2	0.40		-	FILL, Clayey SAND, brown, fine to coarse grained (fill). 0.10m, becoming with fine to coarse grained, sub-rounded to sub-angular gravel. 0.20-0.30m, concrete across entirety of hole.	M	-	
				Dx3			SW	SAND, grey, fine to coarse grained, trace of silt, (marine/estuarine?).	M	MD	
1				D SPT 4/3/4 N=7 D D SPT 3/3/4 N=7 D				0.80m, becoming pale yellow brown to grey. 1.50m, becoming grey.			
2				D							
3				D D SPT 2/3/6 N=9 D							
4				D							
				D D SPT 6/4/5 N=9 D							
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

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BOREHOLE LOG SHEET

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. BHA304

SHEET 1 OF 1

Position : 374713.0 E 6342431.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 30/8/2018	**Date Completed :** 30/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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 / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations
0	AD/T	Nil	▽ 0.8m	Dx3 Dx2 Dx3			-	FILL,, Silty SAND, brown, fine to coarse grained, with fine to coarse grained, sub-rounded to sub-angular gravel, trace coal and concrete fragments, (fill).	D	-	
				D	0.70		SM	Silty SAND, dark grey, fine to coarse grained, (marine/estuarine?).	M W		
1				SPT 2/3/4 N=7	0.90		SW	SAND, grey, fine to coarse grained, (marine/estuarine?).	W	MD	
				Dx3 D SPT 3/3/2 N=5	1.40		ML	Sandy SILT, dark grey, low plasticity, sand is fine to coarse grained, abundant of organics, (estuarine).	W	VS-S	
				D	1.80		SW	SAND, grey, fine to coarse grained, with silt, (estuarine).	W	L	
2				D D D SPT 1/1/1 N=2				2.60m, becoming trace of silt.			
3				D D D D SPT 2/3/3 N=6						MD	
4				D D							
5				D	5.00			End of borehole at 5 metres. Target Depth			
6											
7											
8											

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont, WWTP, NSW

HOLE No. GW101/BH101

SHEET 1 OF 3

Position : 375613.0 E 6342563.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 29/8/2018	**Date Completed :** 29/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL								PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil		Dx3	0.02		SW	SAND, dark grey, fine to coarse grained, with silt, (topsoil).	D	-			Monument cover, well cap @ 0.95m agl Concrete
				Dx2			SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	D-M	MD			
				Dx2				0.49-0.50m, dark grey, silty sand layer.	M				
				D SPT 2/3/4 N=7	0.90			0.50m, trace fine, sub-rounded gravel.					
1			0.95m				SM	Silty SAND, dark grey, fine to coarse grained, (fill/alluvium).	W	-			
				Dx2	1.20								
				D SPT 3/3/5 N=8			SW	SAND, grey, fine to coarse grained, (marine?).	W	MD			
				D									Backfill
2													
				D SPT 3/4/6 N=10									50mm PVC casing
3													
4										D			Bentonite
				D SPT 6/9/12 N=21									5 mm Specialised Sand Backfill
5	Hollow Flight Auger												
				SPT 2/7/10 N=17									
6													
7										VD			
				D SPT 10/20/25 N=45									
8													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont, WWTP, NSW

HOLE No. GW101/BH101

SHEET 2 OF 3

Position : 375613.0 E 6342563.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 29/8/2018	**Date Completed :** 29/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9							SW	SAND, as previous.	W	VD			5 mm Specialised Sand Backfill
10				SPT 8/15/25 for 120mm N=ref									
11	Hollow Flight Auger												
12													50mm PVC Screen Pipe
13				SPT 5/12/21 N=33									5 mm Specialised Sand Backfill
14													
15													
16													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont, WWTP, NSW

HOLE No. GW101/BH101

SHEET 3 OF 3

Position : 375613.0 E 6342563.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 29/8/2018	**Date Completed :** 29/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Hollow Flight Auger			D SPT 7/16/25 for 135mm N=ref	16.30		SW	SAND, as previous.	W	VD			
							SW	SAND, grey, fine to coarse grained, trace clay, (estuarine/marine?).	W	VD			
18					17.50		SW	SAND, grey, fine to coarse grained, trace of fine grained, sub-rounded gravel, (marine/estuarine?).	W	VD			5 mm Specialised Sand Backfill
19				D SPT 8/16/25 for 125mm N=ref									
20					20.00			End of borehole at 20 metres.					Base of piezo @ 20m bgl
21													
22													
23													
24													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW102/BH102

SHEET 1 OF 3

Position : 375661.0 E 6342448.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 15/8/2018	**Date Completed :** 15/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL								PIEZOMETER
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 2.3m	Dx3 Dx2			-	FILL, SAND, brown to grey, fine to coarse grained, with silt, abundant rootlets, trace plastic(band aid), (fill).	D	-			Monument cover, well cap @ 1.0 m agl Concrete
				Dx2									Bentonite
				D	0.80								
1				SPT 2/3/4 N=7			SW	FILL, SAND, pale yellow brown, fine to coarse grained, trace wire, (fill).	D	-			
				D	1.30								
				D			SW	SAND, pale yellow brown, fine to coarse, (aeolian).	D	MD			
				SPT 3/4/5 N=9	1.70								
				Dx2			SW	SAND, brown to grey, fine to coarse grained, with silt (alluvium).	M W	MD			
2													
				SPT 3/3/4 N=7	2.70		SW	SAND, grey, fine to coarse grained, trace of shells (marine?).	W	MD			50mm PVC casing
3													Backfill
										MD-D			
4				D SPT 3/5/7 N=12									
	Hollow Flight Auger												
5													
				D SPT 2/3/4 N=7									Bentonite
6													5 mm Specialised Sand Backfill
										VD			
7				D SPT 3/13/22 N=35									
8													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW102/BH102

SHEET 2 OF 3

Position : 375661.0 E 6342448.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 15/8/2018	**Date Completed :** 15/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9	Hollow Flight Auger			D			SW	SAND, as previous.	W	VD			5 mm Specialised Sand Backfill
10				D SPT 5/13/20 N=33									
11													
12				D									
13				SPT 5/20/25 for 110mm N=ref									5 mm Specialised Sand Backfill
14													50mm PVC Screen Pipe
15				D									
16													

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Job No. 22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 22195730 2 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW102/BH102

SHEET 3 OF 3

Position : 375661.0 E 6342448.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 15/8/2018	**Date Completed :** 15/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

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

DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17				D SPT 7/18/25 for 90mm N=ref			SW	SAND, as previous.	W	VD			
				D									
18													5 mm Specialised Sand Backfill
19	Hollow Flight Auger				19.00								
				D SPT 14/24/25 for 120mm N=ref			SW	SAND, pale grey, fine to coarse grained, trace fines (clay), (marine/estuarine?)	W	VD			
20													
21													
22					22.00			End of borehole at 22 metres. Target Depth					Base of piezo @ 21.9m bgl
23													
24													

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 1 OF 6

Position : 375689.0 E 6342505.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 16/8/2018	**Date Completed :** 16/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

DRILLING					MATERIAL								PIEZOMETER
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 1.3m	Dx3 Dx2			SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	D	-			Monument cover, well cap @ 0.8m agl Concrete Concrete
					0.50								
				Dx2 D SPT 2/1/3 N=4 Dx2 D SPT 2/3/3 N=6 Dx2			SM	Silty SAND, dark grey to brown, fine to coarse grained, organic odour, (alluvium). 0.70m, minor zones of sand, trace of silt.	M W	MD			
					1.80								
2							SW	SAND, grey fine to coarse grained, (marine?).	W	MD			Backfill 50mm PVC casing
3				D SPT 3/5/6 N=11									
4				D SPT 5/8/12 N=20						D			
5	Washboring							5.30-5.35m, trace of fine grained, sub-rounded to rounded gravel.					Bentonite
6				D SPT 6/9/12 N=21									5 mm Specialised Sand Backfill
7				SPT 7/11/17 N=28									
8													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 2 OF 6

Position : 375689.0 E 6342505.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 16/8/2018	**Date Completed :** 16/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9	Washboring			D SPT 14/19/25 N=44			SW	SAND, as previous.	W	VD			5 mm Specialised Sand Backfill
10													
11													
12				D SPT 13/21/25 for 145mm N=ref									
13													5 mm Specialised Sand Backfill
14													
15				D SPT 19/25 for 120mm N=ref									
16													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 3 OF 6

Position : 375689.0 E 6342505.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 16/8/2018	**Date Completed :** 16/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Washboring			D SPT 24/25 for 110m N=ref			SW	SAND, as previous.	W	VD			
18													5 mm Specialised Sand Backfill 50mm PVC Screen Pipe
19													
20													
21													
22													
23													5 mm Specialised Sand Backfill
24													

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 4 OF 6

Position : 375689.0 E 6342505.0 N | **Surface RL:** | **Angle from Horiz. :** 90° | **Processed :** MAG
Rig Type : Hanjin D&B | **Mounting:** Track | **Contractor :** Total Drilling Pty Ltd | **Driller :** M. Sawyer | **Checked :** AWJ
Date Started : 16/8/2018 | **Date Completed :** 16/8/2018 | **Logged by :** D. Cooper | **Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
25							SW	SAND, as previous.	W	VD			
26													
27													
28	Washboring												5 mm Specialised Sand Backfill
29													
30													Base of piezo @ 30.1 mbgl
31					31.00		CI-CH	CLAY, grey, medium to high plasticity (w>PL), trace charcoal, (estaurine?).	M	VSt			
32													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 5 OF 6

Position : 375689.0 E 6342505.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 16/8/2018	**Date Completed :** 16/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
33	Washboring			D SPT 8/12/15 N=27			CI-CH	CLAY, as previous.	M	VSt VSt	PP on SPT sample =320-380 kPa		
34													
35													
36													
37													
38													
39													
40													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW103/BH103

SHEET 6 OF 6

Position : 375689.0 E 6342505.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** MAG
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 16/8/2018	**Date Completed :** 16/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

DRILLING					MATERIAL								Note: * indicates signatures on original issue of log or last revision of log PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
41	Washboring				41.10		CI-CH	CLAY, as previous.	M	VSt VSt			
								End of borehole at 41.1 metres. Target Depth					
42													
43													
44													
45													
46													
47													
48													

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Job No. 22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW104/BH104

SHEET 1 OF 3

Position : 375716.0 E 6342557.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 31/8/2018	**Date Completed :** 31/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL								PIEZOMETER
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 1.5m	Dx3	0.10		-	FILL, Silty SAND, dark grey, fine to coarse grained, (fill).	D	-			Monument cover, well cap @ 1.1m agl Concrete
				Dx2			-	FILL, SAND, brown, fine to coarse grained, trace of silt, (fill).	D	-			
				Dx2	0.70		SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	D	MD-D			
1				D SPT 3/4/6 N=10									
				Dx2									
				D SPT 5/5/5 N=10					W				
					1.70		SW	SAND, brown, fine to coarse grained, with silt, (estuarine/marine?).	W	MD-D			
2					2.00		SW	SAND, grey, fine to coarse grained, trace of silt, trace of fine grained, sub-rounded gravel, (marine?).	W	MD-D			50mm PVC casing, Backfill
3				D SPT 3/4/6 N=10									
4				D SPT 4/5/7 N=12									Bentonite
5	Hollow Flight Auger												
6				D SPT 4/4/5 N=9									
7				D SPT 3/10/18 N=28									
8													

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW104/BH104

SHEET 2 OF 3

Position : 375716.0 E 6342557.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 31/8/2018	**Date Completed :** 31/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9	Hollow Flight Auger						SW	SAND, as previous.	W	MD-D			
10				SPT 3/9/14 N=23									5 mm Specialised Sand Backfill
11													
12													50mm PVC Screen Pipe
13				SPT 6/15/25 for 140mm N=ref						VD			
14													
15													
16													

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 22195730 2 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW104/BH104

SHEET 3 OF 3

Position : 375716.0 E 6342557.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 31/8/2018	**Date Completed :** 31/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Hollow Flight Auger			SPT 7/9/15 N=24			SW	SAND, as previous.	W	MD-D			5 mm Specialised Sand Backfill
18													
19				SPT 10/17/25 for 130mm N=ref						VD			
20					20.00			End of borehole at 20 metres. Target Depth					Base of piezo @ 20.0m
21													
22													
23													
24													

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW105/BH105

SHEET 1 OF 3

Position : 375798.0 E 6342432.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 28/8/2018	**Date Completed :** 28/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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

DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 4.1m	D SPT 4/5/5 N=10			SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	D	MD			Monument cover, well cap @ 0.9m agl Concrete
1				D SPT 3/2/5 N=7					M				
2													
3				D SPT 3/4/4 N=8									Backfill 50mm PVC casing
4				D SPT 2/3/3 N=6					W	L-MD			
5													
6				D SPT 2/2/3 N=5									Bentonite
7				D SPT 2/2/4 N=6				SAND, grey, fine to coarse grained, trace of clayey sand lenses, (marine/estuarine?).					
8													

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Job No. 22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW105/BH105

SHEET 2 OF 3

Position : 375798.0 E 6342432.0 N **Surface RL:** **Angle from Horiz. :** 90° **Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track **Contractor :** Total Drilling Pty Ltd **Driller :** M. Sawyer **Checked :** AWJ
Date Started : 28/8/2018 **Date Completed :** 28/8/2018 **Logged by :** D. Cooper **Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9	AD/T	Nil		D			SW	SAND, as previous. 8.5m, becoming dark grey, trace silt.	W				
10				D SPT 7/17/25 for 140mm N=ref				9.5m, becoming grey, no silt.		VD			5 mm Specialised Sand Backfill
11													
12													
13				SPT 10/19/25 for 100mm N=ref									50mm PVC Screen Pipe
14													
15								14.5m, trace of fine grained, sub-rounded to rounded gravel.					5 mm Specialised Sand Backfill
16													

See standard sheets for details of abbreviations & basis of descriptions

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Job No. **22-19573**

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW105/BH105

SHEET 3 OF 3

Position : 375798.0 E 6342432.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 28/8/2018	**Date Completed :** 28/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL								PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations		Piezometer Log	Components
17	AD/T	Nil		SPT 9/20/25 for 110mm N=ref			SW	SAND, as previous.	W	VD				5 mm Specialised Sand Backfill
18														
19				SPT 6/18/25 for 100mm N=ref										
20					20.50									Base of piezo @ 20.5m
								End of borehole at 20.5 metres. Target Depth						
21														
22														
23														
24														

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW106/BH106

SHEET 1 OF 3

Position : 375737.0 E 6342369.0 N **Surface RL:** **Angle from Horiz. :** 90° **Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track **Contractor :** Total Drilling Pty Ltd **Driller :** M. Sawyer **Checked :** AWJ
Date Started : 27/8/2018 **Date Completed :** 27/8/2018 **Logged by :** D. Cooper **Date:** 20/09/2018

DRILLING					MATERIAL								
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 4.1m	D SPT 3/3/3 N=6	0.0		SW	SAND, pale yellow brown, fine to coarse grained, (aeolian).	M	MD			Monument cover, well cap @ 1.0m agl Concrete
1				D SPT 2/5/4 N=7									
2													
3				D SPT 3/4/5 N=9				SAND, grey, fine to coarse grained, (marine?).					Backfill 50mm PVC casing
4				D SPT 1/1/2 N=3					W	L			
5													
6	Hollow Flight Auger			D SPT 3/3/4 N=7				5.8m, trace silt/clay.		MD			Bentonite
7				D SPT 4/7/10 N=17				7.0m, without fines.		D			
8													

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PIEZOMETER

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW106/BH106

SHEET 2 OF 3

Position : 375737.0 E 6342369.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 27/8/2018	**Date Completed :** 27/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
9							SW	SAND, as previous.	W	D			
10				D SPT 4/14/25 for 140mm N=ref			SW	10.0m, trace shell fragments.	W	VD			
11	Hollow Flight Auger												
12													
13				SPT 9/21/25 for 80mm N=ref									50mm PVC Screen Pipe
14													5 mm Specialised Sand Backfill
15													
16													

See standard sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW106/BH106

SHEET 3 OF 3

Position : 375737.0 E 6342369.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 27/8/2018	**Date Completed :** 27/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Hollow Flight Auger			SPT 8/25 for 135mm N=ref			SW	SAND, as previous.	W	VD			5 mm Specialised Sand Backfill
18													
19				SPT 19/25 for 100mm N=ref									
20					20.40 20.50		CI-CH	CLAY, grey, medium to high plasticity, trace fine to medium grained sand, (estuarine?).	M	-			Base of piezo @ 20.5m
21								End of borehole at 20.5 metres. Target Depth					
22													
23													
24													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW107/BH107

SHEET 1 OF 3

Position : 375836.0 E 6342470.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 24/8/2018	**Date Completed :** 24/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 4.3m	D SPT 3/5/7 N=12			SW	SAND, yellow-brown, fine to coarse grained (aeolian).	D	D			Monument cover, well cap @ 0.9m agl Concrete
1				D SPT 5/6/8 N=14					D-M				
2													
3				D SPT 4/6/7 N=13	2.88		SW	SAND, grey, fine to coarse grained, trace of silt, (marine?).	M				Backfill 50mm PVC casing
4				D SPT 3/5/4 N=9					W	MD			
5								5.5m, trace of clayey sand zones, dark grey.					
6				D SPT 3/4/5 N=9				5.8m, becoming yellow brown, trace silt, trace coal/charcoal fragments.					Bentonite 5 mm Specialised Sand Backfill
7				D SPT 2/3/4 N=7				7.0m, becoming pale grey,					
8													

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW107/BH107

SHEET 2 OF 3

Position : 375836.0 E 6342470.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 24/8/2018	**Date Completed :** 24/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL								PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations		Piezometer Log	Components
9							SW	SAND, as previous.	M W	D				
10				D SPT 1/8/19 N=27										
11	Hollow Flight Auger													
12														
13				D SPT 8/16/25 for 130mm N=ref						VD				50mm PVC Screen Pipe
14														
15														5 mm Specialised Sand Backfill
16														

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW107/BH107

SHEET 3 OF 3

Position : 375836.0 E 6342470.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 24/8/2018	**Date Completed :** 24/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Hollow Flight Auger			D SPT 7/15/25 for 130mm N=ref			SW	SAND, as previous.	M	VD			5 mm Specialised Sand Backfill
18													
19				SPT 3/10/21 N=31									
20					20.10			End of borehole at 20.1 metres. Target Depth					Base of piezo @ 20.5m bgl
21													
22													
23													
24													

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22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW108/BH108

SHEET 1 OF 3

Position : 375527.0 E 6342625.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 22/8/2018	**Date Completed :** 22/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
0	AD/T	Nil	▽ 0.8m	Dx3 Dx2			-	FILL, Sandy GRAVEL, brown, fine to coarse grained, sub-rounded to sub-angular, sand is fine to to coarse grained, with silt, trace of slag (fill).	D M	-			Monument cover, well cap @ 0.8m agl Concrete
				D SPT 5/6/6 N=12	0.70		SM	SAND, brown, fine to coarse grained, with silt (estuarine?).	M W	MD			
1				D SPT 5/6/8 N=14	1.20		SW	SAND, grey, fine to coarse grained (marine?).	W	- MD			Backfill 50mm PVC casing
2													Bentonite
3				D SPT 2/3/3 N=6									5 mm Specialised Sand Backfill
4	Hollow Flight Auger			D SPT 3/4/5 N=9									
5													
6				D SPT 3/4/7 N=11									
7				D SPT 4/11/16 N=27				7.0m, becoming trace of brown zones, trace silt.		D			
8													

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW108/BH108

SHEET 2 OF 3

Position : 375527.0 E 6342625.0 N	**Surface RL:**	**Angle from Horiz. :** 90°		**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer		**Checked :** AWJ
Date Started : 22/8/2018	**Date Completed :** 22/8/2018	**Logged by :** D. Cooper		**Date:** 20/09/2018

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DRILLING					MATERIAL								PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations		Piezometer Log	Components
9							SW	SAND, as previous.	W	- D				
10					10.20									
				D SPT 8/13 20 N=33			SW	SAND, brown, fine to coarse grained, trace of silt (marine).	W	D				
11														
	Hollow Flight Auger				11.90									50mm PVC Screen Pipe
12							SW	SAND, grey, fine to coarse grained, (marine).	W	- D				
13				D SPT 6/13/21 N=34										
14														
15														
16														

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER

GEO_BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD_GEO_TEMPLATE.GDT 3/10/18

Client : Hunter Water Corporation
Project : Belmont Temporary Desalination Plant
Location : Belmont WWTP, NSW

HOLE No. GW108/BH108

SHEET 3 OF 3

Position : 375527.0 E 6342625.0 N	**Surface RL:**	**Angle from Horiz. :** 90°	**Processed :** SBO
Rig Type : Hanjin D&B **Mounting:** Track	**Contractor :** Total Drilling Pty Ltd	**Driller :** M. Sawyer	**Checked :** AWJ
Date Started : 22/8/2018	**Date Completed :** 22/8/2018	**Logged by :** D. Cooper	**Date:** 20/09/2018

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DRILLING					MATERIAL							PIEZOMETER	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	Piezometer Log	Components
17	Hollow Flight Auger			D SPT 9/22/25 for 105mm N=ref			SW	SAND, as previous. 16.4m, trace of orange-brown clayey sand bands.	W	- VD			
18													
19				D SPT 20/25 for 130mm N=ref	19.23		SW	SAND, grey with black speckles, fine to medium grained, trace of clay, (marine/estuarine?).	W	-			
20					20.50			End of borehole at 20.5 metres. Target Depth					Base of piezo @ 20.5m
21													
22													
23													
24													

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP101

SHEET 1 **OF** 1

Position: 375615.20 E 6342614.00 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
						[COBBLES / BOULDERS / FILL / TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions or minor components, durability, strength, weathering / alteration, defects			Note: * indicates signatures on original issue of log or last revision of log
		Dx2			-	FILL, Silty SAND, brown, fine to coarse grained, trace fine to coarse grained, sub-rounded to sub-angular gravel, trace fibro (possible asbestos) fragments, (fill).	D	-	
			0.20						
		Dx2			SP	SAND, yellow brown, fine to coarse grained (aeolian).	D	VL-L	
		B					M		
		Dx2						MD	
1	GNE								
			1.40						
		D			SP	SAND, dark grey, fine to coarse grained, with silt (marine?).	M	VL-L	
			1.60						
		B			SP	SAND, grey, fine to coarse grained (marine?).	M	L-MD	
			2.00						
2						End of test pit at 2 metres. Collapsing to 1.50m.			
3									

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 22-19573

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP102

SHEET 1 **OF** 1

Position: 375602.19 E 6342493.34 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
		Dx2			-	FILL, SAND, brown to grey, fine to coarse grained, with silt (fill/disturbed).	M	-	
		Dx2	0.20		-	FILL, CLAY, brown, low to medium plasticity, with fine to coarse grained sand, abundant rootlets (fill/disturbed).	M	-	
		B D	0.40		SW	SAND, grey, fine to coarse grained, trace of silt, organic odour (marine?).	M W	VL-L	
	▽ 0.8m					0.60m, pale grey, becoming trace of silt.			
1		D				0.90m, becoming grey.		L-MD	
		D				1.50m, becoming brown to grey.			
		D	2.00						
2						End of test pit at 2 metres. Hole collapsing.			
3									

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Job No. 22-19573

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP103

SHEET 1 **OF** 1

Position: 375657.00 E 6342523.00 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
		Dx2			SW	SAND, pale yellow brown, fine to coarse grained (aeolian).	D	VL	
		Dx2					M		
							M-W		
		Dx2	0.50		SW	SAND, dark grey to black, fine to coarse grained, with silt, trace clay (estuarine?)	M-W	VL	
			0.70		SW	SAND, grey to dark grey, fine to coarse grained, trace of silt.	M-W	VL	
1		Dx2							
	▽ 1.2m							L	
							W	MD	
		D							
			1.90			End of test pit at 1.9 metres. Hole caving in to 0.50m.			
2									
3									

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Job No. 22-19573

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP104

SHEET 1 **OF** 1

Position: 375609.00 E 6342544.00 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
			0.02		SM	FILL, Silty SAND, dark grey, fine to coarse grained (fill/topsoil).	D	-	
		Dx3			SW	SAND, pale yellow brown, fine to coarse grained (aeolian).	D	VL-L	
		Dx2							
		B	0.55						
		D			SW	SAND, grey, fine to coarse grained, trace silt, (marine?).	M	VL-L	
		B					W		
1	GNE							L-MD	
		D							
		D						MD	
2		B							
			2.20			End of test pit at 2.2 metres. Hole collapsed to 1.20m.			
3									

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Hunter Water Corporation
Belmont Temporary Desalination Plant
GEOTECHNICAL INVESTIGATION
TESTPIT PHOTOGRAPHS – TP104

job no	22/19573
file ref	
scale	N/A
date	06/09/18

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP105

SHEET 1 **OF** 1

Position: 375683.00 E 6342488.00 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
		Dx3			SW	SAND, pale yellow brown, fine to coarse grained (aeolian).	D	VL	
		Dx2 B					M		
						0.45m, becoming grey.	W		
			0.60						
		Dx2			SW	SAND, dark grey to black, fine to coarse grained, with silt, trace clay (marine/estuarine?).	W	VL	
			0.80						
					SW	SAND, grey, fine to coarse grained (marine?).	W	VL	
1		Dx2						L	
	▽ 1.3m	B						L-MD	
			1.60						
						End of test pit at 1.6 metres. Hole collapsing.		MD	
2									
3									

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

See standard sheets for details of abbreviations & basis of descriptions

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 22-19573

TEST PIT LOG SHEET

Client: Hunter Water Corporation

Project: Belmont Temporary Desalination Plant

Location: Belmont WWTP, NSW

HOLE No. TP106

SHEET 1 **OF** 1

Position: 375567.00 E 6342433.00 N	**Surface RL:**		**Processed:** RCO
Method of Exploration: 5T Excavator with 450mm bucket	**Hole Size:** 4.0 m x 0.45m		**Checked:** AWJ
Date: 06/09/18	**Logged by:** D. Cooper		**Date:** 20/09/2018

Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Material Description	Moisture Condition	Consistency / Density Index	Comments Observations
		Dx3			-	FILL, Silty SAND, dark grey, fine to coarse grained, with fine to coarse grained, sub-rounded to sub-angular gravel (gravel comprises fragments of asphalt, concrete, bricks and rock) (fill).	D	-	
			0.20						
		Dx2			-	FILL, CLAY, mottled orange brown and green, medium plasticity, with fine to coarse, sub-rounded to sub-angular gravel (fill).	D	-	
		D							
			0.60						
		Dx2			-	FILL, SAND, grey to brown, fine to coarse grained, with fine to coarse, sub-rounded to sub-angular gravel, trace cobbles up to 180mm diameter (fill).	D	-	
			0.75						
		D			SW	SAND, pale yellow brown, with brown striations, fine to coarse grained, trace of silt (aeolian).	D-M	VL-L	
		D						-	
1		B							
						1.10m, becoming grey.	M	L	
		D				1.25m, becoming yellow brown.			
						1.50-1.65m, becoming grey.			
		B							
		D	1.80					MD	
						End of test pit at 1.8 metres. Hole collapsing.			
2									
3									

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

See standard sheets for details of abbreviations & basis of descriptions

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CLIENTS | PEOPLE | PERFORMANCE

Hunter Water Corporation
Belmont Temporary Desalination Plant
GEOTECHNICAL INVESTIGATION
TESTPIT PHOTOGRAPHS – TP106

job no	22/19573
file ref	
scale	N/A
date	06/09/18

Appendix C – Field and laboratory QA/QC program

Overview

QA and QC practices were applied to data gathering and subsequent sample handling procedures. These were designed to provide control over both field and laboratory operations. Additionally, the analytical laboratories completed their own internal QA procedures (as required by NATA registration) during the analysis of samples. Details of the QA/QC program are described below.

Field QC sampling

All fieldwork was conducted in general accordance with the GHD SOP. The SOP ensures that all samples are collected by a set of uniform and systematic methods.

The SOP describes field activities including:

- Implemented decontamination procedures
- Sample identification procedures
- Information requirements for soil logs
- Chain of Custody information requirements
- Sample duplicate frequency

Field Investigation QA/QC results- Soil

Field QA/QC

Field QA/QC procedures used during the proposal comprised:

- **Blind duplicates:** These are prepared in the field by duplicating the original sample and placing two equivalent portions into two separate containers. The duplicate samples are analysed for the identical set of parameters requested for the corresponding original sample. For the blind duplicate sample pairs, relative percentage differences (RPD) are calculated. Blind duplicates provide an indication of the analytical precision of the proposal laboratory, but may also be affected by factors such as sampling methodology, inherent heterogeneity of the sample medium and different laboratory analytical techniques.

Field QC assessment procedure

Assessment of field QC duplicate samples was undertaken by calculating the Relative Percent Difference (RPD) of duplicate samples. For the purposes of this investigation, an RPD value of 30% for inorganics and 50% for organics has been considered appropriate for the assessment of QC results. A result exceeding this value does not necessarily mean the data is invalid, but rather the impact on the data may need to be assessed.

During soil sampling two intra-laboratory duplicates were analysed by ALS which is NATA accredited for the analysis requested. Duplicates and their primary sample pairs are listed below in Table C-1.

Table C-1 Primary and duplicate sample pairs – Soils

Duplicate type	Primary sample	Duplicate	Parameters
Intra laboratory duplicate	TP106_0.0-0.2	FD20	TRH, BTEX, PAH, heavy metals
Intra-laboratory duplicate	BH202_0.02-0.2	FD15	TRH, BTEX, PAH, heavy metals

RPDs were calculated for intra-laboratory duplicate samples as part of the QA/QC program. RPDs are presented in Table A, Appendix D. Generally, RPDs were within GHDs nominal rate with the exception of arsenic, cadmium, lead and zinc (RPDs ranging between 32% to 45%) for duplicate pair BH202_0.02-0.2 and FD15. This sample was collected from sandy gravelly fill materials and is considered to be the result of heterogeneity within the fill. The higher results have been used for data interpretation.

Based on the RPDs calculated for the field blind duplicates, the results and precision of the data is considered to be of an acceptable quality upon which to draw conclusions as part of this assessment.

Laboratory QA/QC control

Laboratory QA

The analytical laboratories undertook the analyses utilising their own internal procedures and test methods (for which they are NATA accredited) and in accordance with their own quality assurance system which forms part of their NATA accreditation.

Laboratory QC procedures

Laboratory QC procedures typically included analysis of the following:

- **Laboratory duplicate samples**: The analytical laboratory collects duplicate sub-samples from one sample submitted for analytical testing at a rate equivalent to 1 in 20 samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on analytical batch and the analytical precision (repeatability) of the test result.
- **Spiked samples**: An authentic field sample is spiked by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques.
- **Certified reference standards**: A reference standard of known (certified) concentration is analysed along with a batch of samples. The Certified Reference Standard provides an indication of the analytical accuracy of the test method.
- **Surrogate standard/spikes**: These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are spiked into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. They provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.
- **Laboratory blank**: Usually an organic or aqueous solution that is as free as possible of analyte of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

Laboratory QC results are presented in Appendix E.

Methodology used to assess QC results

The results of the field and laboratory QC samples were assessed to determine:

- The quality of the data generated
- Whether the data meets the objectives of the study
- Whether the data is acceptable for the intended use

Laboratory QC assessment procedure

The individual laboratories undertake assessment of laboratory QC internally. Duplicates are assessed by calculating the RPD. Percent Recovery (PR) is used to assess spiked samples and surrogate standards. Acceptable values for RPD and PR can vary depending on the type of analyte tested, concentrations of analytes, and sample matrix.

Certified Reference Standards and Materials are analysed by comparing the test result to the certified concentration plus or minus a certified tolerance. Certified tolerances vary depending on the type of analyte tested and the certified concentration of the analyte.

Laboratory QA/QC results- Soil

The NATA certified laboratory results sheets, as presented in Appendix E, refer to a quality control program comprising the analysis of spikes, blanks and duplicate samples. Generally, 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. The laboratory QA/QC outliers are listed in Table D-2.

Table C-2 Laboratory QA/QC Exceedance Summary - Soils

Batch	Analyte/sample	Issue	Comment
EB1826927 ES1823856 ES1825384	No outliers identified		
ES1824374	Zinc in anonymous sample (lab ID ES1824297-002)	Matrix spike recovery not determined as background level was greater than or equal to 4x spike level	Zinc present in sample at elevated concentrations more than 4x LOR. This single outlier not considered to be significant.
ES1825728	PAHs for lab duplicate of BH304_0.0-0.2	RPD exceeding LOR based limits (40.4%)	All analytical results for total PAHs below the laboratory limit of reporting or relevant criteria. Exceedence not considered significant.
	PAH, TPH, TRH and BTEXN in BH104_0.0-0.2 and BH104_0.2-0.3	Extraction and analysis undertaken 22-23 days after due date.	Based on laboratory preservation methods, holding time exceedance is not considered significant
	Total recoverable mercury in BH104_0.0-0.2 and BH104_0.2-0.3	Extraction and analysis undertaken 9-10 days after due date.	Based on laboratory preservation methods, holding time exceedance is not considered significant

Batch	Analyte/sample	Issue	Comment
ES1826044	PAHs for lab duplicate of BH201_0.0-0.2	RPD exceeding LOR based limits (54.5%)	All analytical results for total PAHs below the laboratory limit of reporting or relevant criteria. Exceedence not considered significant.
	pH extraction/preparation for BH201_0.0-0.2 and BH303_0.0-0.2	Extraction undertaken 8 days after due date.	Exceedence not considered significant.
	TPH, TRH and BTEXN in BHA303_0.0-0.2, BH201_0.0-0.2, BH202_0.02-0.2, FD15, BH304_0.45-0.5, BHA303_0.45-0.5, BH201_0.45-0.5, BH202_0.45-0.5, BH304_0.0-0.2, BH303_0.0-0.2	Analysis undertaken 1 day after due date.	All analytical results for were below the laboratory limit of reporting or relevant criteria. Exceedence not considered significant.
ES1826547	pH extraction/ preparation for TP101_0.0-0.2, TP101_0.5-0.6, TP105_0.0-0.2, TP105_0.6-0.7	Extraction undertaken 6 days after due date.	Exceedence not considered significant.
ES1826738 Amendment 1	pH extraction/ preparation for BH303 2.5-2.95M, BH304 0.5-0.95M, BH201 4.0-4.45M	Extraction undertaken 2 days after due date.	Exceedence not considered significant.
	pH extraction/ preparation for BH302 4.0-4.45M, BHA302 1.0-1.45M	Extraction undertaken 6 days after due date.	Exceedence not considered significant.
	Conductivity extraction/ preparation for BH303 2.5-2.95M, BH304 0.5-0.95M, BH201 4.0-4.45M	Extraction undertaken 2 days after due date.	Exceedence not considered significant.
	Conductivity extraction/ preparation for BH302 4.0-4.45M, BHA302 1.0-1.45M	Extraction undertaken 6 days after due date.	Exceedence not considered significant.
ES1827112 Amendment 1	pH extraction/ preparation for BH202_2.5-2.95M	Extraction undertaken 9 days after due date.	Exceedence not considered significant.
	Conductivity extraction/ preparation for BH202_2.5-2.95M	Extraction undertaken 9 days after due date.	Exceedence not considered significant.

Based on a review of the laboratory QA/QC data, it is considered that the analytical results are reasonably representative of site conditions at the time of this assessment. Where outliers were noted above, they were considered to be attributed to soil sample heterogeneity.

Appendix D – Analytical results tables

Date	Field ID	Sample Type	Moisture (%)	pH (Lab)	Exchangeable Calcium	Asbestos (Trace)	Asbestos Fibres	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
						Asbestos		Metals							
			%	pH Units	meq/100g	Fibres	g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.1	0.1	5	0.1	5	1	2	5	5	0.1	2	5
NEPM 2013 EIL/ACL-Urban Residential- Public Open Space 0-2m								100		250	95	1,100		30	230
NEPM 2013 EIL/ACL-Commerical/industrial 0-2m								160		420	140	1800		55	360
NEPM 2013 Table 1B(6) ESL Urban residential/open space (coarse)															
NEPM 2013 Table 1B(6) ESL Commercial/industrial (coarse)															
NEPM 2013 Table 1A(1) HIL C Rec								300	90	300	17,000	600	80	1,200	30,000
NEPM 2013 Table 1A(1) HIL D Comm/Ind								3,000	900	3,600	240,000	1,500	730	6,000	400,000
CRC Care Table 4 Direct Contact HSL C Rec/open space															
CRC Care Table 4 Direct Contact HSL D Commerical Industrial															
Plant Site and Intake															
29/08/2018	BH101_0.0-0.2	Normal	<1.0	-	-	No	No	<5	<1	<2	<5	<5	<0.1	<2	32
29/08/2018	BH101_0.45-0.5	Normal	4.6	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	16
17/08/2018	BH102_0.0-0.2	Normal	14.2	-	-	-	-	<5	<1	7	86	36	0.6	<2	106
17/08/2018	BH102_0.5-0.6	Normal	9.8	-	-	-	-	<5	<1	2	24	7	0.1	<2	43
17/08/2018	BH103_0.0-0.2	Normal	1.3	-	-	No	No	<5	<1	<2	<5	<5	<0.1	<2	19
17/08/2018	BH103_0.5-0.6	Normal	25.2	-	-	-	-	<5	<1	2	11	<5	<0.1	<2	16
31/07/2018	BH104_0.0-0.2	Normal	3.9	-	-	No	No	<5	<1	5	72	25	0.4	<2	108
31/07/2018	BH104_0.2-0.3	Normal	6.2	-	-	-	-	<5	1	7	120	36	0.6	2	166
22/08/2018	BH108_0.0-0.2	Normal	-	-	-	No	No	-	-	-	-	-	-	-	-
6/09/2018	TP101_0.0-0.2	Normal	3	6	2.5	-	-	<5	<1	<2	6	6	<0.1	<2	36
6/09/2018	TP101_0.5-0.6	Normal	-	6.5	0.4	-	-	-	-	-	-	-	-	-	-
6/09/2018	TP102_0.0-0.2	Normal	11	-	-	-	-	<5	<1	4	61	16	0.3	<2	38
6/09/2018	TP103_0.0-0.2	Normal	5.9	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	<5
6/09/2018	TP104_0.0-0.2	Normal	<1.0	-	-	-	-	<5	<1	<2	10	<5	<0.1	<2	29
6/09/2018	TP105_0.0-0.2	Normal	<1.0	6.6	0.8	-	-	<5	<1	<2	<5	<5	<0.1	<2	21
6/09/2018	TP103 0.5-0.6M	Normal	28.4	6.5	-	-	-	-	-	-	-	-	-	-	-
6/09/2018	TP105_0.6-0.7	Normal	-	6.7	8.4	-	-	-	-	-	-	-	-	-	-
6/09/2018	TP103 1.0-1.1M	Normal	14.6	5.7	-	-	-	-	-	-	-	-	-	-	-
6/09/2018	TP106_0.0-0.2	Normal	14.9	-	-	No	No	25	<1	5	194	246	<0.1	<2*	3,130
6/09/2018	FD20	Field Duplicate	13.8	-	-	-	-	20	<1	5	206	287	<0.1	3	3,740
	RPD		*8*	-	-	-	-	*22*	-	*0*	*6*	*15*	-	***40***	*18*
17/08/2018	COMP 1 (BH102_0.0-0.2, BH103_0.0-0.2)	Composite (2 Samples)	5.2	-	-	-	-	-	-	-	-	-	-	-	-
30/08/2018	COMP 2 (BH101_0.0-0.2, BH104_0.0-0.2)	Composite (2 Samples)	2.8	-	-	-	-	-	-	-	-	-	-	-	-
Water Connection															
30/08/2018	BH301_0.0-0.2	Normal	6.3	-	-	-	-	<5	<1	2	7	8	<0.1	2	22
30/08/2018	BH301_0.45-0.5	Normal	9.2	-	-	-	-	9	<1	5	13	18	<0.1	6	21
30/08/2018	BH302_0.0-0.2	Normal	9.5	-	-	-	-	6	<1	3	14	9	<0.1	4	29
30/08/2018	BH302_0.2-0.3	Normal	5.6	-	-	-	-	<5	<1	5	10	11	<0.1	4	52
30/08/2018	BH302 4.0-4.45M	Normal	32.6	5.6	-	-	-	-	-	-	-	-	-	-	-
4/09/2018	BH303_0.0-0.2	Normal	12.6	6	14	-	-	8	<1	6	12	34	<0.1	3	125
3/09/2018	BH303 2.5-2.95M	Normal	18.8	6.2	-	-	-	-	-	-	-	-	-	-	-
4/09/2018	BH304_0.0-0.2	Normal	10.4	-	-	-	-	<5	1	4	6	87	<0.1	3	92
4/09/2018	BH304_0.45-0.5	Normal	9.7	-	-	-	-	6	2	4	<5	63	<0.1	<2	103
3/09/2018	BH304 0.5-0.95M	Normal	7.8	5.6	-	-	-	-	-	-	-	-	-	-	-
14/08/2018	BH305_0.0-0.2	Normal	6.4	-	-	No	No	<5	<1	3	<5	7	<0.1	3	11
14/08/2018	BH305_0.9-1.0	Normal	16.1	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	<5
30/08/2018	BH306_0.0-0.2	Normal	5.6	-	-	-	-	7	<1	16	16	20	<0.1	13	69
30/08/2018	BH306_0.2-0.3	Normal	13.6	-	-	-	-	<5	<1	6	<5	<5	<0.1	<2	<5
31/08/2018	COMP 3 (BH301_0.0-0.2, BH302_0.0-0.2, BH306_0.0-0.2)	Composite (3 Samples)	6	-	-	-	-	-	-	-	-	-	-	-	-
14/08/2018	BHA301_0.0-0.2	Normal	<1.0	-	-	-	-	<5	<1	<2	<5	8	<0.1	<2	30
14/08/2018	BHA301_0.5-0.7	Normal	2.4	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	<5
30/08/2018	BHA302_0.0-0.2	Normal	7.3	-	-	-	-	6	<1	4	18	23	<0.1	<2	168
30/08/2018	BHA302_0.2-0.3	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-
30/08/2018	BHA302_0.45-0.5	Normal	24.7	-	-	-	-	6	<1	9	<5	<5	<0.1	3	<5
30/08/2018	BHA302 1.0-1.45M	Normal	18.1	4.5	-	-	-	-	-	-	-	-	-	-	-
4/09/2018	BHA303_0.0-0.2	Normal	26.8	-	-	-	-	9	<1	8	39	54	<0.1	8	289
4/09/2018	BHA303_0.45-0.5	Normal	21.3	-	-	-	-	<5	<1	2	<5	<5	<0.1	<2	7
30/08/2018	BHA304_0.0-0.2	Normal	6.8	-	-	No	No	7	<1	8	16	100	<0.1	6	144
30/08/2018	BHA304_0.45-0.5	Normal	6.2	-	-	-	-	15	<1	6	33	148	<0.1	5	282
18/09/2018	COMP 4 (TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2)	Composite (4 Samples)	5.3	-	-	-	-	-	-	-	-	-	-	-	-
18/09/2018	COMP 5 (TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7, TP106_0.6-0.7)	Composite (4 Samples)	15.1	-	-	-	-	-	-	-	-	-	-	-	-

Field ID	Benzene	Toluene	Ethylbenzene	Xylene Total	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)
	BTEXN				TRH - NEPM 2013						
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.2	0.5	0.5	0.5	10	10	50	50	100	100	50
NEPM 2013 EIL/ACL-Urban Residential- Public Open Space 0-2m											
NEPM 2013 EIL/ACL-Commerical/industrial 0-2m											
NEPM 2013 Table 1B(6) ESL Urban residential/open space (coarse)	50	85	70	105	180		120		300	2800	
NEPM 2013 Table 1B(6) ESL Commercial/industrial (coarse)	75	135	165	180	215		170		1700	3300	
NEPM 2013 Table 1A(1) HIL C Rec											
NEPM 2013 Table 1A(1) HIL D Comm/Ind											
CRC Care Table 4 Direct Contact HSL C Rec/open space	120	18,000	5,300	15,000		5,100		3,800	5,300	7,400	
CRC Care Table 4 Direct Contact HSL D Commerical Industrial	430	99,000	27,000	81,000		26,000		20,000	27,000	38,000	
Plant Site and Intake											
BH101_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH101_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH102_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	420	180	600
BH102_0.5-0.6	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	130	<100	130
BH103_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH103_0.5-0.6	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH104_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	350	140	490
BH104_0.2-0.3	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	600	200	800
BH108_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-
TP101_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
TP101_0.5-0.6	-	-	-	-	-	-	-	-	-	-	-
TP102_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
TP103_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
TP104_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
TP105_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
TP103 0.5-0.6M	-	-	-	-	-	-	-	-	-	-	-
TP105_0.6-0.7	-	-	-	-	-	-	-	-	-	-	-
TP103 1.0-1.1M	-	-	-	-	-	-	-	-	-	-	-
TP106_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
FD20	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
RPD	-	-	-	-	-	-	-	-	-	-	-
COMP 1 (BH102_0.0-0.2, BH103_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-
COMP 2 (BH101_0.0-0.2, BH104_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-
Water Connection											
BH301_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH301_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	100	<100	100
BH302_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH302_0.2-0.3	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH302 4.0-4.45M	-	-	-	-	-	-	-	-	-	-	-
BH303_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH303 2.5-2.95M	-	-	-	-	-	-	-	-	-	-	-
BH304_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	100	<100	100
BH304_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH304 0.5-0.95M	-	-	-	-	-	-	-	-	-	-	-
BH305_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH305_0.9-1.0	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH306_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BH306_0.2-0.3	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
COMP 3 (BH301_0.0-0.2, BH302_0.0-0.2, BH306_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-
BHA301_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA301_0.5-0.7	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA302_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA302_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-
BHA302_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA302 1.0-1.45M	-	-	-	-	-	-	-	-	-	-	-
BHA303_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA303_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA304_0.0-0.2	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	<100	<100	<50
BHA304_0.45-0.5	<0.2	<0.5	<0.5	<0.5	<10	<10	<50	<50	170	150	320
COMP 4 (TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-
COMP 5 (TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7, TP106_0.6-0.7)	-	-	-	-	-	-	-	-	-	-	-

Field ID	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo[b+j]fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chysene	Dibenz(a,h)anthracene	Fluoranthene	Naphthalene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc
	PAHs																	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NEPM 2013 EIL/ACL-Urban Residential- Public Open Space 0-2m												170						
NEPM 2013 EIL/ACL-Commerical/industrial 0-2m																		
NEPM 2013 Table 1B(6) ESL Urban residential/open space (coarse)					0.7													
NEPM 2013 Table 1B(6) ESL Commercial/industrial (coarse)					1.4													
NEPM 2013 Table 1A(1) HIL C Rec																	300	3
NEPM 2013 Table 1A(1) HIL D Comm/Ind																	4,000	40
CRC Care Table 4 Direct Contact HSL C Rec/open space												1,900						
CRC Care Table 4 Direct Contact HSL D Commerical Industrial												11,000						
Plant Site and Intake																		
BH101_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH101_0.45-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH102_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH102_0.5-0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH103_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH103_0.5-0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH104_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH104_0.2-0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH108_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP101_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TP101_0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP102_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TP103_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TP104_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TP105_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TP103 0.5-0.6M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP105_0.6-0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP103 1.0-1.1M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP106_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
FD20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 1 (BH102_0.0-0.2, BH103_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 2 (BH101_0.0-0.2, BH104_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Connection																		
BH301_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	1	<0.5	1.5	<0.5
BH301_0.45-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	1.3	<0.5	2	<0.5
BH302_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.6	<0.5
BH302_0.2-0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.6	<0.5
BH302 4.0-4.45M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH303_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH303 2.5-2.95M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH304_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH304_0.45-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH304 0.5-0.95M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH305_0.9-1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH306_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.6	<0.5
BH306_0.2-0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
COMP 3 (BH301_0.0-0.2, BH302_0.0-0.2, BH306_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA301_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA301_0.5-0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA302_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA302_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA302_0.45-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA302 1.0-1.45M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA303_0.0-0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA303_0.45-0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BHA304_0.0-0.2	<0.5	<0.5	<0.5	0.5	0.8	1	<0.5	0.8	0.6	<0.5	1.7	<0.5	<0.5	0.5	0.6	1.6	8.1	1
BHA304_0.45-0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.6	<0.5	0.5	0.5	<0.5	1.2	<0.5	<0.5	<0.5	0.8	1.3	5.5	0.7
COMP 4 (TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 5 (TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7, TP106_0.6-0.7)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Field ID	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	PCBs (Total)
	OC Pesticides																									PCBs
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.1
NEPM 2013 EIL/ACL-Urban Residential- Public Open Space 0-2m											180	180														
NEPM 2013 EIL/ACL-Commerical/industrial 0-2m																										
NEPM 2013 Table 1B(6) ESL Urban residential/open space (coarse)																										
NEPM 2013 Table 1B(6) ESL Commercial/industrial (coarse)																										
NEPM 2013 Table 1A(1) HIL C Rec				10		70						400		340				20				10		10	400	1
NEPM 2013 Table 1A(1) HIL D Comm/Ind				45		530						3,600		2,000				100				50		80	2,500	7
CRC Care Table 4 Direct Contact HSL C Rec/open space																										
CRC Care Table 4 Direct Contact HSL D Commerical Industrial																										
Plant Site and Intake																										
BH101_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH101_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH102_0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH103_0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP101_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP101_0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP102_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP103_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP104_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP105_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP103 0.5-0.6M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP105_0.6-0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP103 1.0-1.1M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP106_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FD20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 1 (BH102_0.0-0.2, BH103_0.0-0.2)	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
COMP 2 (BH101_0.0-0.2, BH104_0.0-0.2)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
Water Connection																										
BH301_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH302 4.0-4.45M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH303_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH303 2.5-2.95M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH304_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH304_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH304 0.5-0.95M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH305_0.9-1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH306_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 3 (BH301_0.0-0.2, BH302_0.0-0.2, BH306_0.0-0.2)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BHA301_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA301_0.5-0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA302_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA302_0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA302_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA302 1.0-1.45M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA303_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA303_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA304_0.0-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHA304_0.45-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMP 4 (TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
COMP 5 (TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7, TP106_0.6-0.7)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1

Bold/Italic RPD % >30% inorganics or >50% organics
* Where one result is below the LOR, a value equal to the LOR has been used to calculate the RPD.
Note Samples were collected and analysed from locations BH201 and BH202 but were not reported as part of this project as they are outside the project area.

					Metals								BTEXN						TRH - NEPM 1999		PAHs		OCP	PCBs
			Moisture (%)	Asbestos Present	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	C6-C9 Fraction	C10-C36 (Sum of Total)	Benzo(a) pyrene	PAHs (Sum of total) - Lab calc	Endosulfan	PCBs (Total)
			%	Yes/ No	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	5	5	1	2	5	5	0.1	2	5	0.2	0.5	0.5	0.5	0.5	0.5	10	50	0.5	0.5	0.05	0.1
NSW EPA (2014) General Solid Waste CT1					100	20	100		100	4	40		10	288	600			1,000	650	10,000	0.8	200	60	50
NSW EPA (2014) Restricted Solid Waste CT2					400	80	400		400	16	160		40	1,152	2,400			4,000	2,600	40,000	3.2	800	240	50
Location Code	**Date**	**Field ID**																						
BH101	29/08/2018	BH101_0.0-0.2	<1.0	No	<5	<1	<2	<5	<5	<0.1	<2	32	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH101	29/08/2018	BH101_0.45-0.5	4.6	-	<5	<1	<2	<5	<5	<0.1	<2	16	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH102	17/08/2018	BH102_0.0-0.2	14.2	-	<5	<1	7	86	36	0.6	<2	106	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	500	<0.5	<0.5	-	-
BH102	17/08/2018	BH102_0.5-0.6	9.8	-	<5	<1	2	24	7	0.1	<2	43	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH103	17/08/2018	BH103_0.0-0.2	1.3	No	<5	<1	<2	<5	<5	<0.1	<2	19	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH103	17/08/2018	BH103_0.5-0.6	25.2	-	<5	<1	2	11	<5	<0.1	<2	16	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH104	31/07/2018	BH104_0.0-0.2	3.9	No	<5	<1	5	72	25	0.4	<2	108	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	420	<0.5	<0.5	-	-
BH104	31/07/2018	BH104_0.2-0.3	6.2	-	<5	1	7	120	36	0.6	2	166	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	710	<0.5	<0.5	-	-
BH108	22/08/2018	BH108_0.0-0.2	-	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH301	14/08/2018	BHA301_0.0-0.2	<1.0	-	<5	<1	<2	<5	8	<0.1	<2	30	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH301	14/08/2018	BHA301_0.5-0.7	2.4	-	<5	<1	<2	<5	<5	<0.1	<2	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH301	30/08/2018	BH301_0.0-0.2	6.3	-	<5	<1	2	7	8	<0.1	2	22	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	1.5	-	-
BH301	30/08/2018	BH301_0.45-0.5	9.2	-	9	<1	5	13	18	<0.1	6	21	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	2.0	-	-
BH302	30/08/2018	BH302_0.0-0.2	9.5	-	6	<1	3	14	9	<0.1	4	29	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	0.6	-	-
BH302	30/08/2018	BH302_0.2-0.3	5.6	-	<5	<1	5	10	11	<0.1	4	52	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	0.6	-	-
BH303	4/09/2018	BH303_0.0-0.2	12.6	-	8	<1	6	12	34	<0.1	3	125	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH304	4/09/2018	BH304_0.0-0.2	10.4	-	<5	1	4	6	87	<0.1	3	92	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH304	4/09/2018	BH304_0.45-0.5	9.7	-	6	2	4	<5	63	<0.1	<2	103	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH305	14/08/2018	BH305_0.0-0.2	6.4	No	<5	<1	3	<5	7	<0.1	3	11	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH305	14/08/2018	BH305_0.9-1.0	16.1	-	<5	<1	<2	<5	<5	<0.1	<2	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BH306	30/08/2018	BH306_0.0-0.2	5.6	-	7	<1	16	16	20	<0.1	13	69	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	0.6	-	-
BH306	30/08/2018	BH306_0.2-0.3	13.6	-	<5	<1	6	<5	<5	<0.1	<2	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BHA302	30/08/2018	BHA302_0.0-0.2	7.3	-	6	<1	4	18	23	<0.1	<2	168	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BHA302	30/08/2018	BHA302_0.45-0.5	24.7	-	6	<1	9	<5	<5	<0.1	3	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BHA303	4/09/2018	BHA303_0.0-0.2	26.8	-	9	<1	8	39	54	<0.1	8	289	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BHA303	4/09/2018	BHA303_0.45-0.5	21.3	-	<5	<1	2	<5	<5	<0.1	<2	7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
BHA304	30/08/2018	BHA304_0.0-0.2	6.8	No	7	<1	8	16	100	<0.1	6	144	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	0.8	8.1	-	-
BHA304	30/08/2018	BHA304_0.45-0.5	6.2	-	15	<1	6	33	148	<0.1	5	282	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	160	0.6	5.5	-	-
TP101	6/09/2018	TP101_0.0-0.2	3.0	-	<5	<1	<2	6	6	<0.1	<2	36	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
TP102	6/09/2018	TP102_0.0-0.2	11.0	-	<5	<1	4	61	16	0.3	<2	38	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
TP103	6/09/2018	TP103_0.0-0.2	5.9	-	<5	<1	<2	<5	<5	<0.1	<2	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
TP104	6/09/2018	TP104_0.0-0.2	<1.0	-	<5	<1	<2	10	<5	<0.1	<2	29	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
TP105	6/09/2018	TP105_0.0-0.2	<1.0	-	<5	<1	<2	<5	<5	<0.1	<2	21	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
TP106	6/09/2018	FD20 (TP106_0.0-0.2)	13.8	-	20	<1	5	206	287	<0.1	3	3,740	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<50	<0.5	<0.5	-	-
Comp. samples	17/08/2018	COMP 1	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.1
	30/08/2018	COMP 2	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.1
	31/08/2018	COMP 3	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.1
	18/09/2018	COMP 4	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.1
	18/09/2018	COMP 5	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.1

Result	General Solid Waste
Result	Restricted Solid Waste
Result	Hazardous Waste

Appendix E – Laboratory certificates

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1826927**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS ALISON MONKLEY	Contact	: Caroline Hill
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: 2219573	Date Samples Received	: 07-Nov-2018 10:46
Order number	:	Date Analysis Commenced	: 13-Nov-2018
C-O-C number	: ----	Issue Date	: 13-Nov-2018 16:21
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

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

General Comments

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

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

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

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

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

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

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

- **The samples in this work order have been re-batched from ES1826044**
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH201_3.0-3.1	BH201_4.9-5.0	BH202_2.45-2.5	BH202_3.9-4.0	----
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit	EB1826927-001	EB1826927-002	EB1826927-003	EB1826927-004	--------
				Result	Result	Result	Result	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.8	5.2	4.7	6.2	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	21	9	26	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.03	<0.02	0.04	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.032	0.017	0.191	0.046	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	11	119	29	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	0.06	0.03	0.23	0.05	----
Net Acidity (acidity units)	----	10	mole H+ / t	41	20	145	29	----
Liming Rate	----	1	kg CaCO3/t	3	1	11	2	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.03	0.23	0.05	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	41	20	145	29	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	1	11	2	----

QUALITY CONTROL REPORT

Work Order	: **EB1826927**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS ALISON MONKLEY	Contact	: Caroline Hill
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8662
Project	: 2219573	Date Samples Received	: 07-Nov-2018
Order number	:	Date Analysis Commenced	: 13-Nov-2018
C-O-C number	: ----	Issue Date	: 13-Nov-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

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

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 2032130)									
EB1826927-001	BH201_3.0-3.1	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.03	0.03	0.00	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	21	21	0.00	0% - 50%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.8	4.8	0.00	0% - 20%
EA033-B: Potential Acidity (QC Lot: 2032130)									
EB1826927-001	BH201_3.0-3.1	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.032	0.033	0.00	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	20	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 2032130)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.6 pH Unit	95.6	70	130
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	17.7 mole H+ / t	108	70	130
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 2032130)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.25483 % S	93.5	70	130
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1826927**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS ALISON MONKLEY	Telephone	: +61 7 3552 8662
Project	: 2219573	Date Samples Received	: 07-Nov-2018
Site	:	Issue Date	: 13-Nov-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 4
Order number	:	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							
80* dried soil (EA033)							
BH201_3.0-3.1, BH201_4.9-5.0, BH202_2.45-2.5, BH202_3.9-4.0	**04-Sep-2018**	**13-Nov-2018**	04-Sep-2019	✓	**13-Nov-2018**	11-Feb-2019	✓
EA033-B: Potential Acidity							
80* dried soil (EA033)							
BH201_3.0-3.1, BH201_4.9-5.0, BH202_2.45-2.5, BH202_3.9-4.0	**04-Sep-2018**	**13-Nov-2018**	04-Sep-2019	✓	**13-Nov-2018**	11-Feb-2019	✓
EA033-C: Acid Neutralising Capacity							
80* dried soil (EA033)							
BH201_3.0-3.1, BH201_4.9-5.0, BH202_2.45-2.5, BH202_3.9-4.0	**04-Sep-2018**	**13-Nov-2018**	04-Sep-2019	✓	**13-Nov-2018**	11-Feb-2019	✓
EA033-D: Retained Acidity							
80* dried soil (EA033)							
BH201_3.0-3.1, BH201_4.9-5.0, BH202_2.45-2.5, BH202_3.9-4.0	**04-Sep-2018**	**13-Nov-2018**	04-Sep-2019	✓	**13-Nov-2018**	11-Feb-2019	✓
EA033-E: Acid Base Accounting							
80* dried soil (EA033)							
BH201_3.0-3.1, BH201_4.9-5.0, BH202_2.45-2.5, BH202_3.9-4.0	**04-Sep-2018**	**13-Nov-2018**	04-Sep-2019	✓	**13-Nov-2018**	11-Feb-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Daniel Bradley

From: Julian Fowler [mailto:Julian.Fowler@ghd.com]
Sent: Wednesday, 7 November 2018 9:46 AM
To: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Cc: Helen Simpson <helen.simpson@alsglobal.com>; Tyler Cachia <tyler.cachia@ALSGlobal.com>
Subject: RE: ALS Workorder ES1826044, Client GHDSER, Project 2219573

Thanks everyone for helping out,

I have learnt now that its 2 months from receipt of samples not results when the soil samples get thrown out. Because our second batch (the one I'm asking for now) didn't come through until much later (more than 1 month) this time.

I would like to get the following samples done for "Chromium Suite – Complete" EA033:

BH201_3.0-3.1
BH201_4.9-5.0
BH202_2.45-2.5
BH202_3.9-4.0

Thanks

Regards

Julian Fowler
Environmental Technician

GHD
T: 61 2 4979 9999 | D: 61 2 4979 9910 | V: 229910 | M1: 0466 049 181 | M2: 0423 163 493 | F 61 2 4979 9988 | E: julian.fowler@gl
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle, NSW, 2300 | PO Box 5403 HRMC, NSW, 2310, Australia | www.ghd.com

Daniel Bradley
Sample Receipt Officer - Enviromental
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Environmental Division
Brisbane
Work Order Reference
EB1826927

Telephone : +61-7-3243 7222

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1823856**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 14-Aug-2018 16:51
Order number	:	Date Analysis Commenced	: 15-Aug-2018
C-O-C number	: ----	Issue Date	: 20-Aug-2018 21:22
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 25		
No. of samples analysed	: 21		

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

This Certificate of Analysis contains the following information:

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

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

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

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

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

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

- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA301_0.0-0.2	BHA301_0.5-0.7	BHA301_1.0-1.1	BHA301_1.4-1.5	BHA301_2.0-2.1
			Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1823856-001	ES1823856-003	ES1823856-004	ES1823856-005	ES1823856-006
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	----	7.3	8.0	8.1	6.5
pH (Fox)	----	0.1	pH Unit	----	4.6	5.4	4.9	1.4
Reaction Rate	----	1	Reaction Unit	----	2	2	3	3
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	<1.0	2.4	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	<2	<2	----	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	----	----	----
Lead	7439-92-1	5	mg/kg	8	<5	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	----	----	----
Zinc	7440-66-6	5	mg/kg	30	<5	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA301_0.0-0.2	BHA301_0.5-0.7	BHA301_1.0-1.1	BHA301_1.4-1.5	BHA301_2.0-2.1
				Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1823856-001	ES1823856-003	ES1823856-004	ES1823856-005	ES1823856-006
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**75.9**	**74.5**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**77.8**	**77.0**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**64.9**	**61.5**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**89.6**	**89.0**	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**83.3**	**82.7**	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA301_0.0-0.2	BHA301_0.5-0.7	BHA301_1.0-1.1	BHA301_1.4-1.5	BHA301_2.0-2.1
				Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1823856-001	ES1823856-003	ES1823856-004	ES1823856-005	ES1823856-006
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		73.3	72.8	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		92.4	100	----	----	----
Toluene-D8	2037-26-5	0.2	%		94.4	95.1	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		78.5	95.9	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA301_2.4-2.5	BHA301_3.0-3.1	BHA301_3.5-3.6	BHA301_3.9-4.0	BHA301_4.5-4.6
			Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1823856-007	ES1823856-008	ES1823856-009	ES1823856-010	ES1823856-011
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.8	6.9	7.0	7.0	6.8
pH (Fox)	----	0.1	pH Unit	2.5	2.3	2.3	2.3	2.2
Reaction Rate	----	1	Reaction Unit	3	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA301_4.9-5.0	BH305_0.0-0.2	BH305_0.9-1.0	BH305_1.5-1.6	BH305_2.0-2.1
			Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1823856-012	ES1823856-013	ES1823856-016	ES1823856-017	ES1823856-018
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	7.0	6.6	6.2	6.7	6.9
pH (Fox)	----	0.1	pH Unit	2.2	2.4	2.5	2.4	1.3
Reaction Rate	----	1	Reaction Unit	4	3	3	3	4
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	6.4	16.1	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	----	----	----
Asbestos Type	1332-21-4	-	--	----	-	----	----	----
Sample weight (dry)	----	0.01	g	----	163	----	----	----
APPROVED IDENTIFIER:	----	-	--	----	S.SPOONER	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	----	3	<2	----	----
Copper	7440-50-8	5	mg/kg	----	<5	<5	----	----
Lead	7439-92-1	5	mg/kg	----	7	<5	----	----
Nickel	7440-02-0	2	mg/kg	----	3	<2	----	----
Zinc	7440-66-6	5	mg/kg	----	11	<5	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA301_4.9-5.0	BH305_0.0-0.2	BH305_0.9-1.0	BH305_1.5-1.6	BH305_2.0-2.1
				Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1823856-012	ES1823856-013	ES1823856-016	ES1823856-017	ES1823856-018
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA301_4.9-5.0	BH305_0.0-0.2	BH305_0.9-1.0	BH305_1.5-1.6	BH305_2.0-2.1
				Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1823856-012	ES1823856-013	ES1823856-016	ES1823856-017	ES1823856-018
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
Phenol-d6	13127-88-3	0.5	%		----	73.5	72.7	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	76.4	76.0	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	68.7	64.6	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	87.4	87.6	----	----
Anthracene-d10	1719-06-8	0.5	%		----	80.8	80.1	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	71.5	70.9	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	92.6	93.2	----	----
Toluene-D8	2037-26-5	0.2	%		----	81.4	88.5	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	81.6	84.4	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH305_2.4-2.5	BH305_3.0-3.1	BH305_3.5-3.6	BH305_4.0-4.1	BH305_4.5-4.6
			Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1823856-019	ES1823856-020	ES1823856-021	ES1823856-022	ES1823856-023
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.7	6.6	6.6	6.3	5.6
pH (Fox)	----	0.1	pH Unit	2.0	2.2	3.2	2.3	2.2
Reaction Rate	----	1	Reaction Unit	4	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH305_4.9-5.0	-----	-----	-----	-----
			Client sampling date / time	14-Aug-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1823856-024	--------	--------	--------	--------
				Result	----	----	----	----
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.7**	----	----	----	----
pH (Fox)	----	0.1	pH Unit	**2.3**	----	----	----	----
Reaction Rate	----	1	Reaction Unit	**4**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH305_0.0-0.2 - 14-Aug-2018 00:00	Mid brown sandy soil.

Surrogate Control Limits

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1823856**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 14-Aug-2018
Order number	:	Date Analysis Commenced	: 15-Aug-2018
C-O-C number	: ----	Issue Date	: 20-Aug-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 25		
No. of samples analysed	: 21		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA003 :pH (field/fox) (QC Lot: 1881358)									
EB1819927-005	Anonymous	EA003: pH (F)	----	0.1	pH Unit	6.6	6.7	1.50	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	6.7	6.8	1.48	0% - 20%
ES1823856-006	BHA301_2.0-2.1	EA003: pH (F)	----	0.1	pH Unit	6.5	6.6	1.53	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	1.4	1.4	0.00	0% - 50%
EA003 :pH (field/fox) (QC Lot: 1881359)									
ES1823856-019	BH305_2.4-2.5	EA003: pH (F)	----	0.1	pH Unit	6.7	6.7	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.0	1.9	5.13	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1878025)									
EM1813001-004	Anonymous	EA055: Moisture Content	----	0.1	%	2.8	2.9	0.00	0% - 20%
ES1823871-002	Anonymous	EA055: Moisture Content	----	0.1	%	8.2	9.0	9.83	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1881150)									
ES1823667-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	78	87	10.1	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	2	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	18	21	11.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	18	18	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.00	No Limit
ES1823954-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	6	2	85.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	21	14	40.9	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	7	6	26.7	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	120	106	12.1	0% - 20%
		EG005T: Copper	7440-50-8	5	mg/kg	472	510	7.73	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	895	794	12.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1881150) - continued									
ES1823954-002	Anonymous	EG005T: Zinc	7440-66-6	5	mg/kg	785	708	10.3	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1881149)									
ES1823667-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1823954-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1873517)									
ES1823657-010	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	6.3	6.4	0.00	0% - 50%
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	0.6	0.6	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.9	0.8	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	7.8	7.8	0.00	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1873426)									
ES1823667-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1823856-001	BHA301_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1873518)									
ES1823657-010	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	330	310	5.82	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	550	540	0.00	0% - 50%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1873426)									
ES1823667-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1823856-001	BHA301_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1873518)									
ES1823657-010	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	160	160	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	670	650	2.68	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1873426)									
ES1823667-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1823856-001	BHA301_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1881150)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	102	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	101	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	120	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	102	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	102	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	111	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	114	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1881149)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	72.5	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1873517)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	108	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	106	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	106	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	107	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	107	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	107	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	111	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	112	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	97.5	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	96.8	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	90.5	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	104	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	100	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	95.5	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	94.4	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	96.6	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1873426)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	93.0	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1873518)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	117	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	114	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	105	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1873426)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1873426) - continued								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	101	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1873518)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	114	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	113	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	81.3	63	131
EP080: BTEXN (QCLot: 1873426)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	92.8	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	93.2	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	91.0	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	91.4	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	93.6	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	95.3	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 1881150)							
ES1823667-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	106	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	105	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	120	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	108	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	107	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	110	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1881149)							
ES1823667-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.6	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1873517)							
ES1823657-010	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	100	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	116	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1873426)							
ES1823667-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	119	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1873518)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1873518) - continued							
ES1823657-010	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	90.4	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	116	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	125	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1873426)							
ES1823667-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	121	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1873518)							
ES1823657-010	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	90.3	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	118	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	116	52	132
EP080: BTEXN (QCLot: 1873426)							
ES1823667-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	96.8	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	97.4	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	97.5	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	96.7	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	98.9	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	98.5	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1823856**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 14-Aug-2018
Site	:	Issue Date	: 20-Aug-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 25
Order number	:	No. of samples analysed	: 21

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA003 :pH (field/fox)							
Snap Lock Bag - frozen on receipt at ALS (EA003)							
BHA301_0.5-0.7, BHA301_1.0-1.1, BHA301_1.4-1.5, BHA301_2.0-2.1, BHA301_2.4-2.5, BHA301_3.0-3.1, BHA301_3.5-3.6, BHA301_3.9-4.0, BHA301_4.5-4.6, BHA301_4.9-5.0, BH305_0.0-0.2, BH305_0.9-1.0, BH305_1.5-1.6, BH305_2.0-2.1, BH305_2.4-2.5, BH305_3.0-3.1, BH305_3.5-3.6, BH305_4.0-4.1, BH305_4.5-4.6, BH305_4.9-5.0	**14-Aug-2018**	**20-Aug-2018**	09-May-2021	✓	**20-Aug-2018**	18-Nov-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**----**	----	----	**16-Aug-2018**	28-Aug-2018	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200)							
BH305_0.0-0.2	**14-Aug-2018**	**----**	----	----	**15-Aug-2018**	10-Feb-2019	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**17-Aug-2018**	10-Feb-2019	✓	**17-Aug-2018**	10-Feb-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**17-Aug-2018**	11-Sep-2018	✓	**20-Aug-2018**	11-Sep-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**15-Aug-2018**	28-Aug-2018	✓	**16-Aug-2018**	24-Sep-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**15-Aug-2018**	28-Aug-2018	✓	**16-Aug-2018**	28-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**15-Aug-2018**	28-Aug-2018	✓	**16-Aug-2018**	28-Aug-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BHA301_0.0-0.2, BHA301_0.5-0.7, BH305_0.0-0.2, BH305_0.9-1.0	**14-Aug-2018**	**15-Aug-2018**	28-Aug-2018	✓	**16-Aug-2018**	28-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH field/fox	EA003	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH field/fox	EA003	SOIL	In house: Referenced to Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
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☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☑NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
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☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler DATE/TIME: 14/8/18 1650
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	RECEIVED BY: DATE/TIME: 14/8/18 16:50
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY: DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		RECEIVED BY: MC DATE/TIME: 14/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEX PAH, 8 metals	Asbestos (presence/absence)	ASS screening					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BHA 301_ 0.0-0.2	14/8/18	S		3	X							
2	BHA 301_ 0.2-0.3				2								
3	BHA 301_ 0.5-0.7				3	X		X					
4	BHA 301_ 1.0-1.1				1			X					
5	BHA 301_ 1.4-1.5							X					
6	BHA 301_ 2.0-2.1							X					
7	BHA 301_ 2.4-2.5							X					
8	BHA 301_ 3.0-3.1							X					
9	BHA 301_ 3.5-3.6							X					
10	BHA 301_ 3.9-4.0							X					
11	BHA 301_ 4.5-4.6							X					
12	BHA 301_ 4.9-5.0							X					
13	BH305_ 0.0-0.2				3	X	X	X					
14	BH 305_ 0.2-0.3				3								
15	BH 305_ 0.5-0.6				3								
16	BH 305_ 0.9-1.0				3	X		X					
17	BH 305_ 1.5-1.6				1			X					
18	BH 305_ 2.0-2.1				1			X					
				TOTAL									

Environmental Division Sydney
Work Order Reference
ES1823856

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC: SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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☑NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD

OFFICE: Newcastle

PROJECT: 2219573

ORDER NUMBER:

PROJECT MANAGER: Alison Monkley — CONTACT PH: 49799999

SAMPLER: Julian Fowler — SAMPLER MOBILE: 0466049181

COC emailed to ALS? (YES / NO) — EDD FORMAT (or default): Esdat

Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car

Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)

COC: 1 (2) 3 4 5 6 7

OF: 1 (2) 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[signature]		MC
DATE/TIME: 14/8/18 1650	DATE/TIME: 14/8/18 16:55	DATE/TIME:	DATE/TIME: 14/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN PAH, 8 metals	Asbestos Presence/absence	ASS Screening						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	BH305 _ 2.4-2.5	14/8/18	S		1			X						
20	BH305 - 3.0-3.1	↓	↓		↓			X						
21	BH305 - 3.5-3.6	↓	↓		↓			X						
22	BH305 - 4.0-4.1	↓	↓		↓			X						
23	BH305 - 4.5-4.6	↓	↓		↓			X						
24	BH305 - 4.9-5.0	↓	↓		↓			X						
25	FD01	↓	↓		↓									
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1824374**	Page	: 1 of 6
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 17-Aug-2018 16:53
Order number	:	Date Analysis Commenced	: 20-Aug-2018
C-O-C number	: ----	Issue Date	: 23-Aug-2018 15:47
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 12		
No. of samples analysed	: 4		

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

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

This Certificate of Analysis contains the following information:

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

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

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

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

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

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

- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH102_0.0-0.2	BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	----
				Client sampling date / time	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	----
Compound	CAS Number	LOR	Unit		ES1824374-001	ES1824374-003	ES1824374-007	ES1824374-009	--------
					Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**14.2**	**9.8**	**1.3**	**25.2**	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		----	----	**No**	----	----
Asbestos (Trace)	1332-21-4	5	Fibres		----	----	**No**	----	----
Asbestos Type	1332-21-4	-	--		----	----	-	----	----
Sample weight (dry)	----	0.01	g		----	----	**355**	----	----
APPROVED IDENTIFIER:	----	-	--		----	----	**S.SPOONER**	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg		**7**	**2**	<2	**2**	----
Copper	7440-50-8	5	mg/kg		**86**	**24**	<5	**11**	----
Lead	7439-92-1	5	mg/kg		**36**	**7**	<5	<5	----
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg		**106**	**43**	**19**	**16**	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		**0.6**	**0.1**	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH102_0.0-0.2	BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	----
				Client sampling date / time	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	----
Compound	CAS Number	LOR	Unit		ES1824374-001	ES1824374-003	ES1824374-007	ES1824374-009	--------
					Result	Result	Result	Result	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		**240**	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		**260**	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		**500**	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		**420**	**130**	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		**180**	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**600**	**130**	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**92.2**	**93.3**	**101**	**103**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**83.1**	**83.5**	**81.5**	**81.2**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**75.2**	**71.0**	**63.7**	**70.7**	----
EP075(SIM)T: PAH Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH102_0.0-0.2	BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	----
				Client sampling date / time	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	17-Aug-2018 00:00	----
Compound	CAS Number	LOR	Unit		ES1824374-001	ES1824374-003	ES1824374-007	ES1824374-009	--------
					Result	Result	Result	Result	----
EP075(SIM)T: PAH Surrogates - Continued									
2-Fluorobiphenyl	321-60-8	0.5	%		**85.1**	**85.3**	**87.4**	**85.8**	**----**
Anthracene-d10	1719-06-8	0.5	%		**84.3**	**85.6**	**86.8**	**85.0**	**----**
4-Terphenyl-d14	1718-51-0	0.5	%		**84.4**	**88.0**	**81.1**	**92.8**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**92.6**	**88.0**	**95.4**	**88.0**	**----**
Toluene-D8	2037-26-5	0.2	%		**83.7**	**79.2**	**80.5**	**80.5**	**----**
4-Bromofluorobenzene	460-00-4	0.2	%		**88.5**	**82.9**	**84.8**	**84.7**	**----**

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH103_0.0-0.2 - 17-Aug-2018 00:00	Mid brown sandy soil.

Surrogate Control Limits

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1824374**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 17-Aug-2018
Order number	:	Date Analysis Commenced	: 20-Aug-2018
C-O-C number	: ----	Issue Date	: 23-Aug-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 12		
No. of samples analysed	: 4		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1887041)									
ES1824372-007	Anonymous	EA055: Moisture Content	----	0.1	%	48.2	51.4	6.34	0% - 20%
ES1824413-003	Anonymous	EA055: Moisture Content	----	0.1	%	7.6	7.3	4.79	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1889224)									
ES1824297-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	18	22	20.4	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	10	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	12	18.4	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	35	32	6.98	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	38	39	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	1150	1200	4.19	0% - 20%
ES1824321-008	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	56	55	1.95	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	13	14	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	8	17.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	18	7.11	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	15	16	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	34	34	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1889225)									
ES1824297-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1824321-008	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1883707)									
ES1824321-003	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1883707) - continued									
ES1824321-003	Anonymous	EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1883260)									
ES1824258-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1824443-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1883706)									
ES1824321-003	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	120	<100	17.2	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1883260)									
ES1824258-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1824443-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1883706)									
ES1824321-003	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	130	<100	27.5	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1883260)									
ES1824258-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1883260) - continued									
ES1824443-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1889224)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	104	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	99.0	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	101	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	103	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.5	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	106	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	111	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1889225)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	79.3	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1883707)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	93.7	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	94.8	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	95.0	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	95.0	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	98.2	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	91.5	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	97.6	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	92.7	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	98.2	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	93.4	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	97.1	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	94.0	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	90.5	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	83.7	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	92.3	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	88.9	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1883260)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	83.7	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1883706)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	114	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	116	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	102	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1883260)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1883260) - continued								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	88.3	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1883706)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	115	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	111	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	120	63	131
EP080: BTEXN (QCLot: 1883260)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	90.8	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	85.2	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	84.1	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	84.1	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	88.2	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	92.3	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 1889224)							
ES1824297-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	106	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	108	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	112	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	108	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	# Not Determined	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1889225)							
ES1824297-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.6	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1883707)							
ES1824321-003	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	91.8	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	91.8	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1883260)							
ES1824258-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	80.1	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1883706)							
ES1824321-003	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	111	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	124	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	82.9	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1883260)							
ES1824258-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	80.8	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1883706)							
ES1824321-003	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	115	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	104	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	73.1	52	132
EP080: BTEXN (QCLot: 1883260)							
ES1824258-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	76.1	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	75.4	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	77.1	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	75.6	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	79.5	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	81.3	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1824374**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 17-Aug-2018
Site	:	Issue Date	: 23-Aug-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 12
Order number	:	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	ES1824297--002	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH102_0.0-0.2,	BH102_0.5-0.6,	**17-Aug-2018**	**----**	----	----	**21-Aug-2018**	31-Aug-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag: Separate bag received (EA200)								
BH103_0.0-0.2		**17-Aug-2018**	**----**	----	----	**20-Aug-2018**	13-Feb-2019	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH102_0.0-0.2,	BH102_0.5-0.6,	**17-Aug-2018**	**22-Aug-2018**	13-Feb-2019	✓	**22-Aug-2018**	13-Feb-2019	✓
BH103_0.0-0.2,	BH103_0.5-0.6							
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH102_0.0-0.2,	BH102_0.5-0.6,	**17-Aug-2018**	**22-Aug-2018**	14-Sep-2018	✓	**22-Aug-2018**	14-Sep-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH102_0.0-0.2,	BH102_0.5-0.6,	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**21-Aug-2018**	29-Sep-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
BH102_0.0-0.2, BH102_0.5-0.6, BH103_0.0-0.2, BH103_0.5-0.6	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**21-Aug-2018**	29-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH102_0.0-0.2, BH102_0.5-0.6, BH103_0.0-0.2, BH103_0.5-0.6	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**22-Aug-2018**	31-Aug-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071)							
BH102_0.0-0.2, BH102_0.5-0.6, BH103_0.0-0.2, BH103_0.5-0.6	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**21-Aug-2018**	29-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH102_0.0-0.2, BH102_0.5-0.6, BH103_0.0-0.2, BH103_0.5-0.6	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**22-Aug-2018**	31-Aug-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BH102_0.0-0.2, BH102_0.5-0.6, BH103_0.0-0.2, BH103_0.5-0.6	**17-Aug-2018**	**20-Aug-2018**	31-Aug-2018	✓	**22-Aug-2018**	31-Aug-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ALS Environmental

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☑NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Wey Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody seal intact? Yes / No
PROJECT: 2219573	ALS QUOTE NO.:	Cooling Method: Ice / Ice Pack / None
ORDER NUMBER:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999 OF: 1 2 3 4 5 6 7	Cooling Initiated
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	455pm		MC
DATE/TIME: 17/08/18 1650	DATE/TIME: 17-8-18	DATE/TIME: 17/8/18 17:00	DATE/TIME: 17/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: As, Cd Cr, Cu, Hg, Ni, Pb, Zn

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH, BTEX/N PAH, 8 metals	Asbestos Presence/Absence	Hold						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH102_0.0-0.2		S		2	X		X						
2	BH102_0.2-0.3				2			X						
3	BH102_0.5-0.6				2	X		X						
4	BH102_1.0-1.1				2			X						
5	BH102_1.5-1.6				2			X						
6	FD2				1									
7	BH103_0.0-0.2				2	X	X							
8	BH103_0.2-0.3				2			X						
9	BH103_0.5-0.6				2	X		X						
10	BH103_1.0-1.1				2			X						
11	BH103_1.5-1.6				2			X						
12	FD3				1									
				TOTAL										

E-MAILED

Environmental Division Sydney
Work Order Reference
ES1824374

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1825384**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 28-Aug-2018 10:00
Order number	: ----	Date Analysis Commenced	: 30-Aug-2018
C-O-C number	: ----	Issue Date	: 03-Sep-2018 13:27
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 3		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- EP068: Positive result has been confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMP 1	-----	-----	-----	-----
				Client sampling date / time	[17-Aug-2018]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1825384-001	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**5.2**	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		**0.06**	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		**0.06**	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg		<0.05	----	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**96.0**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**97.6**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMP 1	-----	-----	-----	-----
				Client sampling date / time	[17-Aug-2018]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1825384-001	--------	--------	--------	--------	
				Result	----	----	----	----	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	**96.8**	**----**	**----**	**----**	**----**	

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

QUALITY CONTROL REPORT

Work Order	: **ES1825384**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 28-Aug-2018
Order number	: ----	Date Analysis Commenced	: 30-Aug-2018
C-O-C number	: ----	Issue Date	: 03-Sep-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 3		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1906689)									
ES1825334-007	Anonymous	EA055: Moisture Content	----	0.1	%	47.0	46.3	1.54	0% - 20%
ES1825343-011	Anonymous	EA055: Moisture Content	----	0.1	%	11.7	11.3	3.32	0% - 20%
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1904951)									
ES1825384-001	COMP 1	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1904950)									
ES1825384-001	COMP 1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	0.06	0.07	25.5	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1904950) - continued									
ES1825384-001	COMP 1	EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1904951)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	97.0	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1904950)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	98.5	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	101	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	102	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	103	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	103	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	103	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	102	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	104	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	108	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	102	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.6	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	90.3	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	101	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	84.7	54	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1904951)							
ES1825384-001	COMP 1	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	106	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1904950)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 1904950) - continued							
ES1825384-001	COMP 1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	94.9	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	89.4	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	91.4	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	107	70	130
		EP068: Endrin	72-20-8	2 mg/kg	89.3	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	81.1	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1825384**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 28-Aug-2018
Site	:	Issue Date	: 03-Sep-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
COMP 1	**17-Aug-2018**	**----**	----	----	**30-Aug-2018**	31-Aug-2018	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
COMP 1	**17-Aug-2018**	**30-Aug-2018**	31-Aug-2018	✓	**31-Aug-2018**	09-Oct-2018	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068)							
COMP 1	**17-Aug-2018**	**30-Aug-2018**	31-Aug-2018	✓	**31-Aug-2018**	09-Oct-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Pesticides by GCMS	EP068	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Pesticides by GCMS	EP068	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Pesticides by GCMS	EP068	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)

Preparation Methods	Method	Matrix	Method Descriptions
Sample Compositing	* EN020	SOIL	Equal weights of each original soil are taken, then mixed and homogenised. The combined mixture is labelled as a new sample.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

Fadi Soro

Fadi 28/8/18 10am

From: Julian Fowler <Julian.Fowler@ghd.com>
Sent: Tuesday, 28 August 2018 9:37 AM
To: Samples Sydney
Subject: additional analysis for ES1824374

$650
#1,7

Good morning,

For work order ES1824374, I would like to request an analysis of a composite of 2 samples:
2 BH102_0.0-0.2
3 BH103_0.0-0.2
For OCP's and PCB 1. Comp 1

Let me know if there will be any issues.

Thanks

Environmental Division
Sydney
Work Order Reference
ES1825384

Telephone : +61-2-8784 8555

Regards

Julian Fowler
Environmental Technician

GHD
T: 61 2 4979 9999 | D: 61 2 4979 9910 | V: 229910 | M1: 0466 049 181 | M2: 0423 163 493 | F 61 2 4979 9988 | E: julian.fowler@ghd.com
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle, NSW, 2300 | PO Box 5403 HRMC, NSW, 2310, Australia | www.ghd.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1825728**	Page	: 1 of 31
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 31-Aug-2018 13:08
Order number	:	Date Analysis Commenced	: 05-Sep-2018
C-O-C number	: ----	Issue Date	: 10-Sep-2018 17:07
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 80		
No. of samples analysed	: 60		

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

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

This Certificate of Analysis contains the following information:

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

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

Signatories

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

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

General Comments

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

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

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

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

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

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

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

- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: COMPOSITE (Matrix: SOIL)			Client sample ID	COMP 2	COMP 3	-----	-----	-----
			Client sampling date / time	30-Aug-2018 00:00	31-Aug-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1825728-079	ES1825728-080	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**2.8**	**6.0**	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg	<0.05	<0.05	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**75.3**	**113**	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**106**	**134**	----	----	----

Analytical Results

Sub-Matrix: **COMPOSITE** (Matrix: **SOIL**)				Client sample ID	**COMP 2**	**COMP 3**	-----	-----	-----
				Client sampling date / time	30-Aug-2018 00:00	31-Aug-2018 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES1825728-079**	**ES1825728-080**	--------	--------	--------
					Result	Result	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**97.7**	**107**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH108_0.0-0.2	BH101_0.0-0.2	BH101_0.45-0.5	BH301_0.0-0.2	BH301_0.45-0.5
				Client sampling date / time	22-Aug-2018 00:00	29-Aug-2018 00:00	29-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-001	ES1825728-004	ES1825728-006	ES1825728-010	ES1825728-012
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		----	<1.0	4.6	6.3	9.2
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		No	No	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres		No	No	----	----	----
Asbestos Type	1332-21-4	-	--		-	-	----	----	----
Sample weight (dry)	----	0.01	g		373	406	----	----	----
APPROVED IDENTIFIER:	----	-	--		G.MORGAN	G.MORGAN	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		----	<5	<5	<5	9
Cadmium	7440-43-9	1	mg/kg		----	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		----	<2	<2	2	5
Copper	7440-50-8	5	mg/kg		----	<5	<5	7	13
Lead	7439-92-1	5	mg/kg		----	<5	<5	8	18
Nickel	7440-02-0	2	mg/kg		----	<2	<2	2	6
Zinc	7440-66-6	5	mg/kg		----	32	16	22	21
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	<0.5	1.0	1.3
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	<0.5	0.5	0.7
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH108_0.0-0.2	BH101_0.0-0.2	BH101_0.45-0.5	BH301_0.0-0.2	BH301_0.45-0.5
				Client sampling date / time	22-Aug-2018 00:00	29-Aug-2018 00:00	29-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-001	ES1825728-004	ES1825728-006	ES1825728-010	ES1825728-012
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	1.5	2.0
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		----	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	<100	100
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	<50	100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	81.1	76.1	75.3	73.6
2-Chlorophenol-D4	93951-73-6	0.5	%		----	86.6	81.4	80.4	78.9
2.4.6-Tribromophenol	118-79-6	0.5	%		----	64.2	60.6	64.4	64.9
EP075(SIM)T: PAH Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH108_0.0-0.2	BH101_0.0-0.2	BH101_0.45-0.5	BH301_0.0-0.2	BH301_0.45-0.5
				Client sampling date / time	22-Aug-2018 00:00	29-Aug-2018 00:00	29-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-001	ES1825728-004	ES1825728-006	ES1825728-010	ES1825728-012
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
2-Fluorobiphenyl	321-60-8	0.5	%		----	101	95.0	94.1	91.6
Anthracene-d10	1719-06-8	0.5	%		----	96.0	90.2	87.0	86.6
4-Terphenyl-d14	1718-51-0	0.5	%		----	81.2	76.8	76.9	74.7
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	89.8	94.8	114	103
Toluene-D8	2037-26-5	0.2	%		----	89.9	93.2	115	99.3
4-Bromofluorobenzene	460-00-4	0.2	%		----	96.2	95.0	116	98.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH301_0.95-1.0	BH301_1.45-1.5	BH301_2.0-2.1	BH301_2.45-2.5	BH301_3.0-3.1
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-013	ES1825728-014	ES1825728-015	ES1825728-016	ES1825728-017
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.2	7.1	7.2	7.2	6.5
pH (Fox)	----	0.1	pH Unit	2.9	4.4	4.6	4.0	3.4
Reaction Rate	----	1	Reaction Unit	2	2	2	2	2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH301_3.5-3.6	BH302_0.0-0.2	BH302_0.2-0.3	BH302_0.95-1.0	BH302_1.45-1.5
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-018	ES1825728-023	ES1825728-024	ES1825728-026	ES1825728-027
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.5	----	----	7.7	6.8
pH (Fox)	----	0.1	pH Unit	3.6	----	----	3.4	4.0
Reaction Rate	----	1	Reaction Unit	2	----	----	3	2
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	9.5	5.6	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	6	<5	----	----
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	----	3	5	----	----
Copper	7440-50-8	5	mg/kg	----	14	10	----	----
Lead	7439-92-1	5	mg/kg	----	9	11	----	----
Nickel	7440-02-0	2	mg/kg	----	4	4	----	----
Zinc	7440-66-6	5	mg/kg	----	29	52	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	0.6	0.6	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH301_3.5-3.6	BH302_0.0-0.2	BH302_0.2-0.3	BH302_0.95-1.0	BH302_1.45-1.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-018	ES1825728-023	ES1825728-024	ES1825728-026	ES1825728-027
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	74.0	74.8	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	79.2	79.8	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	70.3	65.7	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	91.6	92.5	----	----
Anthracene-d10	1719-06-8	0.5	%		----	86.7	86.6	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH301_3.5-3.6	BH302_0.0-0.2	BH302_0.2-0.3	BH302_0.95-1.0	BH302_1.45-1.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-018	ES1825728-023	ES1825728-024	ES1825728-026	ES1825728-027
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	74.8	74.6	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	98.4	99.1	----	----
Toluene-D8	2037-26-5	0.2	%		----	97.8	103	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	100	102	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH302_2.0-2.1	BH302_2.45-2.5	BH302_2.95-3.0	BH302_3.5-3.6	BH302_3.95-4.0
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-028	ES1825728-029	ES1825728-030	ES1825728-031	ES1825728-032
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**6.8**	**6.3**	**6.6**	**6.4**	**6.7**
pH (Fox)	----	0.1	pH Unit	**2.2**	**2.3**	**4.4**	**4.3**	**2.1**
Reaction Rate	----	1	Reaction Unit	**4**	**4**	**2**	**2**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH302_4.45-4.5	BH302_4.9-5.0	BH306_0.0-0.2	BH306_0.2-0.3	BH306_0.45-0.5
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-033	ES1825728-034	ES1825728-036	ES1825728-037	ES1825728-038
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.2	6.8	----	----	5.2
pH (Fox)	----	0.1	pH Unit	4.1	2.4	----	----	2.9
Reaction Rate	----	1	Reaction Unit	4	3	----	----	3
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	5.6	13.6	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	7	<5	----
Cadmium	7440-43-9	1	mg/kg	----	----	<1	<1	----
Chromium	7440-47-3	2	mg/kg	----	----	16	6	----
Copper	7440-50-8	5	mg/kg	----	----	16	<5	----
Lead	7439-92-1	5	mg/kg	----	----	20	<5	----
Nickel	7440-02-0	2	mg/kg	----	----	13	<2	----
Zinc	7440-66-6	5	mg/kg	----	----	69	<5	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	----	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	0.6	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	----	----	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	----	----	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	----	0.6	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	----	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH302_4.45-4.5	BH302_4.9-5.0	BH306_0.0-0.2	BH306_0.2-0.3	BH306_0.45-0.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-033	ES1825728-034	ES1825728-036	ES1825728-037	ES1825728-038
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		----	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		----	----	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		----	----	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		----	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		----	----	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		----	----	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		----	----	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		----	----	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		----	----	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		----	----	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	**74.8**	**77.6**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	**79.6**	**83.1**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	**67.4**	**70.9**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	**92.5**	**96.1**	----
Anthracene-d10	1719-06-8	0.5	%		----	----	**87.0**	**90.9**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH302_4.45-4.5	BH302_4.9-5.0	BH306_0.0-0.2	BH306_0.2-0.3	BH306_0.45-0.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-033	ES1825728-034	ES1825728-036	ES1825728-037	ES1825728-038
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	75.2	78.2	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	96.1	104	----
Toluene-D8	2037-26-5	0.2	%		----	----	88.2	106	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	90.8	111	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH306_0.95-1.0	BH306_1.45-1.5	BH306_2.0-2.1	BH306_2.45-2.5	BH306_3.0-3.1
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-039	ES1825728-040	ES1825728-041	ES1825728-042	ES1825728-043
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	5.4	5.2	5.0	5.2	6.5
pH (Fox)	----	0.1	pH Unit	2.9	2.8	2.8	3.1	1.4
Reaction Rate	----	1	Reaction Unit	3	3	2	2	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH306_3.5-3.6	BH306_3.9-4.0	BH306_4.45-4.5	BHA302_0.0-0.2	BHA302_0.2-0.3
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-044	ES1825728-045	ES1825728-046	ES1825728-048	ES1825728-049
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.4	6.5	6.2	----	7.7
pH (Fox)	----	0.1	pH Unit	1.8	2.4	2.2	----	4.7
Reaction Rate	----	1	Reaction Unit	3	3	4	----	3
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	7.3	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	6	----
Cadmium	7440-43-9	1	mg/kg	----	----	----	<1	----
Chromium	7440-47-3	2	mg/kg	----	----	----	4	----
Copper	7440-50-8	5	mg/kg	----	----	----	18	----
Lead	7439-92-1	5	mg/kg	----	----	----	23	----
Nickel	7440-02-0	2	mg/kg	----	----	----	<2	----
Zinc	7440-66-6	5	mg/kg	----	----	----	168	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	----	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	----	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	----	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	----	----	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	----	----	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH306_3.5-3.6	BH306_3.9-4.0	BH306_4.45-4.5	BHA302_0.0-0.2	BHA302_0.2-0.3
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-044	ES1825728-045	ES1825728-046	ES1825728-048	ES1825728-049
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	----	<10	----
C10 - C14 Fraction	----	50	mg/kg		----	----	----	<50	----
C15 - C28 Fraction	----	100	mg/kg		----	----	----	<100	----
C29 - C36 Fraction	----	100	mg/kg		----	----	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	----	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg		----	----	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg		----	----	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg		----	----	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	----	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	----	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg		----	----	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		----	----	----	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		----	----	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg		----	----	----	<1	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	----	**74.8**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	----	**79.8**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	----	**64.7**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	----	**92.1**	----
Anthracene-d10	1719-06-8	0.5	%		----	----	----	**88.5**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH306_3.5-3.6	BH306_3.9-4.0	BH306_4.45-4.5	BHA302_0.0-0.2	BHA302_0.2-0.3
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-044	ES1825728-045	ES1825728-046	ES1825728-048	ES1825728-049
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	----	75.3	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	----	98.3	----
Toluene-D8	2037-26-5	0.2	%		----	----	----	98.9	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	----	105	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA302_0.45-0.5	BHA302_0.95-1.0	BHA302_1.45-1.5	BHA302_2.0-2.1	BHA302_2.45-2.5
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-050	ES1825728-051	ES1825728-052	ES1825728-053	ES1825728-054
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	9.3	5.9	6.6	6.5	7.0
pH (Fox)	----	0.1	pH Unit	4.5	2.2	2.2	4.4	4.1
Reaction Rate	----	1	Reaction Unit	3	4	2	2	2
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	24.7	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	6	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	9	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg	3	----	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA302_0.45-0.5	BHA302_0.95-1.0	BHA302_1.45-1.5	BHA302_2.0-2.1	BHA302_2.45-2.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-050	ES1825728-051	ES1825728-052	ES1825728-053	ES1825728-054
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**75.1**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**80.6**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**65.6**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**93.2**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**88.5**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA302_0.45-0.5	BHA302_0.95-1.0	BHA302_1.45-1.5	BHA302_2.0-2.1	BHA302_2.45-2.5
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-050	ES1825728-051	ES1825728-052	ES1825728-053	ES1825728-054
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		76.2	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		86.6	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		80.7	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		85.2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA302_3.0-3.1	BHA302_3.5-3.6	BHA302_3.9-4.0	BHA302_4.45-4.5	BHA302_4.9-5.0
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-055	ES1825728-056	ES1825728-057	ES1825728-058	ES1825728-059
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**7.1**	**7.0**	**6.6**	**7.1**	**6.1**
pH (Fox)	----	0.1	pH Unit	**2.3**	**2.1**	**4.2**	**2.9**	**3.8**
Reaction Rate	----	1	Reaction Unit	**4**	**3**	**2**	**2**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA304_0.0-0.2	BHA304_0.45-0.5	BHA304_0.95-1.0	BHA304_1.5-1.6	BHA304_2.0-2.1
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-061	ES1825728-063	ES1825728-064	ES1825728-065	ES1825728-066
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	----	----	7.2	5.6	5.7
pH (Fox)	----	0.1	pH Unit	----	----	3.9	2.5	1.9
Reaction Rate	----	1	Reaction Unit	----	----	3	4	4
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	6.8	6.2	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	----	----	----	----
Asbestos Type	1332-21-4	-	--	-	----	----	----	----
Sample weight (dry)	----	0.01	g	262	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	G.MORGAN	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	15	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	8	6	----	----	----
Copper	7440-50-8	5	mg/kg	16	33	----	----	----
Lead	7439-92-1	5	mg/kg	100	148	----	----	----
Nickel	7440-02-0	2	mg/kg	6	5	----	----	----
Zinc	7440-66-6	5	mg/kg	144	282	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	0.6	0.8	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	1.7	1.2	----	----	----
Pyrene	129-00-0	0.5	mg/kg	1.6	1.3	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	0.6	0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.0	0.6	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA304_0.0-0.2	BHA304_0.45-0.5	BHA304_0.95-1.0	BHA304_1.5-1.6	BHA304_2.0-2.1
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-061	ES1825728-063	ES1825728-064	ES1825728-065	ES1825728-066
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**0.8**	**0.6**	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		**0.5**	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		**0.8**	**0.5**	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**8.1**	**5.5**	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		**1.0**	**0.7**	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**1.3**	**1.0**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.6**	**1.3**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	**160**	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	**160**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	**170**	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	**150**	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	**320**	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA304_0.0-0.2	BHA304_0.45-0.5	BHA304_0.95-1.0	BHA304_1.5-1.6	BHA304_2.0-2.1
				Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit		ES1825728-061	ES1825728-063	ES1825728-064	ES1825728-065	ES1825728-066
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
Phenol-d6	13127-88-3	0.5	%		75.7	75.4	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		80.7	81.2	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		68.1	71.2	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		93.8	93.4	----	----	----
Anthracene-d10	1719-06-8	0.5	%		88.5	88.5	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		74.5	75.1	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		96.1	99.8	----	----	----
Toluene-D8	2037-26-5	0.2	%		94.9	98.9	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		99.4	102	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA304_2.45-2.5	BHA304_3.0-3.1	BHA304_3.5-3.6	BHA304_3.95-4.0	BHA304_4.5-4.6
			Client sampling date / time	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1825728-067	ES1825728-068	ES1825728-069	ES1825728-070	ES1825728-071
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**6.0**	**5.9**	**5.8**	**5.9**	**5.9**
pH (Fox)	----	0.1	pH Unit	**2.2**	**2.1**	**2.2**	**2.2**	**2.2**
Reaction Rate	----	1	Reaction Unit	**4**	**4**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	----	----
			Client sampling date / time	30-Aug-2018 00:00	31-Jul-2018 00:00	31-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1825728-072	ES1825728-074	ES1825728-075	--------	--------
				Result	Result	Result	----	----
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.1	----	----	----	----
pH (Fox)	----	0.1	pH Unit	2.1	----	----	----	----
Reaction Rate	----	1	Reaction Unit	3	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	3.9	6.2	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	----	----	----
Asbestos Type	1332-21-4	-	--	----	-	----	----	----
Sample weight (dry)	----	0.01	g	----	155	----	----	----
APPROVED IDENTIFIER:	----	-	--	----	G.MORGAN	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg	----	<1	1	----	----
Chromium	7440-47-3	2	mg/kg	----	5	7	----	----
Copper	7440-50-8	5	mg/kg	----	72	120	----	----
Lead	7439-92-1	5	mg/kg	----	25	36	----	----
Nickel	7440-02-0	2	mg/kg	----	<2	2	----	----
Zinc	7440-66-6	5	mg/kg	----	108	166	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	0.4	0.6	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	----	----
				Client sampling date / time	30-Aug-2018 00:00	31-Jul-2018 00:00	31-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1825728-072	ES1825728-074	ES1825728-075	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		----	180	340	----	----
C29 - C36 Fraction	----	100	mg/kg		----	240	370	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	420	710	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	350	600	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	140	200	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	490	800	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	----	----
				Client sampling date / time	30-Aug-2018 00:00	31-Jul-2018 00:00	31-Jul-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1825728-072	ES1825728-074	ES1825728-075	--------	--------
					Result	Result	Result	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
Phenol-d6	13127-88-3	0.5	%		----	**80.4**	**80.6**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**85.2**	**83.1**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**68.8**	**71.9**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**85.5**	**85.4**	----	----
Anthracene-d10	1719-06-8	0.5	%		----	**86.1**	**87.1**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	**84.0**	**92.2**	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	**96.4**	**109**	----	----
Toluene-D8	2037-26-5	0.2	%		----	**97.8**	**106**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	**99.0**	**109**	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH108_0.0-0.2 - 22-Aug-2018 00:00	Mid brown sandy soil.
EA200: Description	BH101_0.0-0.2 - 29-Aug-2018 00:00	Mid brown sandy soil.
EA200: Description	BHA304_0.0-0.2 - 30-Aug-2018 00:00	Mid brown sandy soil.
EA200: Description	BH104_0.0-0.2 - 31-Jul-2018 00:00	Mid brown sandy soil.

Surrogate Control Limits

Sub-Matrix: **COMPOSITE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1825728**	Page	: 1 of 11
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 31-Aug-2018
Order number	:	Date Analysis Commenced	: 05-Sep-2018
C-O-C number	: ----	Issue Date	: 10-Sep-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 80		
No. of samples analysed	: 60		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

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

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA003 :pH (field/fox) (QC Lot: 1919242)									
ES1825728-013	BH301_0.95-1.0	EA003: pH (F)	----	0.1	pH Unit	6.2	6.2	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.9	2.9	0.00	0% - 20%
ES1825728-029	BH302_2.45-2.5	EA003: pH (F)	----	0.1	pH Unit	6.3	6.4	1.57	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.3	2.2	4.44	0% - 20%
EA003 :pH (field/fox) (QC Lot: 1919243)									
ES1825728-043	BH306_3.0-3.1	EA003: pH (F)	----	0.1	pH Unit	6.5	6.5	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	1.4	1.4	0.00	0% - 50%
ES1825728-054	BHA302_2.45-2.5	EA003: pH (F)	----	0.1	pH Unit	7.0	6.9	1.44	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	4.1	4.2	2.41	0% - 20%
EA003 :pH (field/fox) (QC Lot: 1919244)									
ES1825728-069	BHA304_3.5-3.6	EA003: pH (F)	----	0.1	pH Unit	5.8	5.8	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.2	2.2	0.00	0% - 20%
ES1826106-009	Anonymous	EA003: pH (F)	----	0.1	pH Unit	7.4	7.3	1.36	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	3.4	3.4	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1916932)									
ES1825728-010	BH301_0.0-0.2	EA055: Moisture Content	----	0.1	%	6.3	6.9	9.59	No Limit
ES1825728-075	BH104_0.2-0.3	EA055: Moisture Content	----	0.1	%	6.2	4.7	28.4	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1919079)									
ES1825728-004	BH101_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1919079) - continued									
ES1825728-004	BH101_0.0-0.2	EG005T: Zinc	7440-66-6	5	mg/kg	32	28	12.7	No Limit
ES1825728-061	BHA304_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	6	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	7	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	16	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	100	120	18.5	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	144	158	9.12	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1919239)									
ES1825728-074	BH104_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	6	18.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	72	82	13.2	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	25	30	19.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	108	101	6.72	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1919080)									
ES1825728-004	BH101_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1919240)									
ES1825728-074	BH104_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.4	0.5	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1917223)									
ES1825728-079	COMP 2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1917222)									
ES1825728-079	COMP 2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1917222) - continued									
ES1825728-079	COMP 2	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1914407)									
ES1825728-004	BH101_0.0-0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	0.6	0.8	26.3	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.7	2.3	31.9	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.6	2.2	31.8	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.5	0.8	37.4	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.6	1.0	41.1	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.0	1.4	38.3	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	0.6	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1914407) - continued									
ES1825728-061	BHA304_0.0-0.2	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.8	1.2	37.5	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.5	0.8	43.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.8	1.1	41.2	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	8.1	# 12.2	40.4	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.0	1.6	43.7	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1915278)									
ES1826014-007	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1914408)									
ES1825728-004	BH101_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1914563)									
ES1825728-004	BH101_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1915277)									
ES1826014-007	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1915277) - continued									
ES1826014-007	Anonymous	EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1914408)									
ES1825728-004	BH101_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1914563)									
ES1825728-004	BH101_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1915277)									
ES1826014-007	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	120	100	16.9	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1914563)									
ES1825728-004	BH101_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1825728-061	BHA304_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1919079)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	112	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	89.7	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	106	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	110	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	95.0	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.9	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	109	80	122
EG005T: Total Metals by ICP-AES (QCLot: 1919239)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	95.0	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	92.7	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	95.0	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	101	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	104	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	110	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1919080)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	73.2	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1919240)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	72.0	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1917223)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	102	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1917222)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	95.5	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.9	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.0	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	98.2	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	101	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	66	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 1917222) - continued								
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.7	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	99.1	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	94.9	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.7	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	90.1	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	82.3	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1914407)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	123	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	123	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	118	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	122	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	120	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	120	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	123	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	125	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	109	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	120	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	108	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	124	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	116	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	117	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	118	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	113	63	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1915278)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	96.2	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	94.6	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	92.7	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	98.4	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	95.6	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	97.8	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	98.5	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	99.4	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	95.1	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	92.1	75	127

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1915278) - continued								
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	94.4	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	93.7	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	89.9	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	97.0	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	96.0	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	97.1	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914408)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	91.3	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	92.6	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	92.5	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914563)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	89.8	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1915277)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	102	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	106	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	93.6	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914408)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	94.6	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	90.8	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	96.4	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914563)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	94.1	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1915277)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	107	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	108	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	81.0	63	131
EP080: BTEXN (QCLot: 1914563)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	93.4	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	83.1	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	85.0	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	84.1	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	89.9	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	81.4	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1919079)							
ES1825728-004	BH101_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	122	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	94.4	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	108	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	98.0	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	95.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	110	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1919239)							
ES1825728-074	BH104_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	96.5	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	100	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	103	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	92.1	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	99.5	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	100	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	101	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1919080)							
ES1825728-004	BH101_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	73.7	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1919240)							
ES1825728-074	BH104_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	75.7	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1917223)							
ES1825728-079	COMP 2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	95.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1917222)							
ES1825728-079	COMP 2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	95.6	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	86.3	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	87.7	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	99.2	70	130
		EP068: Endrin	72-20-8	2 mg/kg	90.2	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	93.3	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1914407)							
ES1825728-004	BH101_0.0-0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	95.2	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	112	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1915278)							
ES1826014-007	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	93.0	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	90.1	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914408)							
ES1825728-004	BH101_0.0-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	106	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	118	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	127	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914563)							
ES1825728-004	BH101_0.0-0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	87.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1915277)							
ES1826014-007	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	82.2	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	114	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	125	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914408)							
ES1825728-004	BH101_0.0-0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	109	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	122	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	118	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914563)							
ES1825728-004	BH101_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	90.9	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1915277)							
ES1826014-007	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	95.3	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	120	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	107	52	132
EP080: BTEXN (QCLot: 1914563)							
ES1825728-004	BH101_0.0-0.2	EP080: Benzene	71-43-2	2.5 mg/kg	82.9	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	82.2	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	81.7	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.2	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.1	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	71.2	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1825728**	Page	: 1 of 10
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 31-Aug-2018
Site	:	Issue Date	: 10-Sep-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 80
Order number	:	No. of samples analysed	: 60

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	ES1825728--061	BHA304_0.0-0.2	**Sum of polycyclic aromatic hydrocarbons**	----	40.4 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	----	----	----	06-Sep-2018	14-Aug-2018	**23**
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	06-Sep-2018	28-Aug-2018	**9**	07-Sep-2018	28-Aug-2018	**10**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	----	----	----
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	----	----	----
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	06-Sep-2018	14-Aug-2018	**23**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	----	----	----
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	06-Sep-2018	14-Aug-2018	**23**
EP080: BTEXN							
Soil Glass Jar - Unpreserved							
BH104_0.0-0.2,	BH104_0.2-0.3	05-Sep-2018	14-Aug-2018	**22**	06-Sep-2018	14-Aug-2018	**23**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA003 :pH (field/fox)							
Snap Lock Bag - frozen on receipt at ALS (EA003)							
BH301_0.95-1.0, BH301_1.45-1.5, BH301_2.0-2.1, BH301_2.45-2.5, BH301_3.0-3.1, BH301_3.5-3.6, BH302_0.95-1.0, BH302_1.45-1.5, BH302_2.0-2.1, BH302_2.45-2.5, BH302_2.95-3.0, BH302_3.5-3.6, BH302_3.95-4.0, BH302_4.45-4.5, BH302_4.9-5.0, BH306_0.45-0.5, BH306_0.95-1.0, BH306_1.45-1.5, BH306_2.0-2.1, BH306_2.45-2.5, BH306_3.0-3.1, BH306_3.5-3.6, BH306_3.9-4.0, BH306_4.45-4.5, BHA302_0.45-0.5, BHA302_0.95-1.0, BHA302_1.45-1.5, BHA302_2.0-2.1, BHA302_2.45-2.5, BHA302_3.0-3.1, BHA302_3.5-3.6, BHA302_3.9-4.0, BHA302_4.45-4.5, BHA302_4.9-5.0, BHA304_0.95-1.0, BHA304_1.5-1.6, BHA304_2.0-2.1, BHA304_2.45-2.5, BHA304_3.0-3.1, BHA304_3.5-3.6, BHA304_3.95-4.0, BHA304_4.5-4.6, BHA304_4.9-5.0	**30-Aug-2018**	**07-Sep-2018**	25-May-2021	✓	**07-Sep-2018**	06-Dec-2018	✓
Soil Glass Jar - Frozen on receipt (EA003)							
BHA302_0.2-0.3	**30-Aug-2018**	**07-Sep-2018**	25-May-2021	✓	**07-Sep-2018**	06-Dec-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH101_0.0-0.2,	BH101_0.45-0.5	**29-Aug-2018**	**----**	----	----	**06-Sep-2018**	12-Sep-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
BH301_0.0-0.2,	BH301_0.45-0.5,	**30-Aug-2018**	**----**	----	----	**06-Sep-2018**	13-Sep-2018	✓
BH302_0.0-0.2,	BH302_0.2-0.3,							
BH306_0.0-0.2,	BH306_0.2-0.3,							
BHA302_0.0-0.2,	BHA302_0.45-0.5,							
BHA304_0.0-0.2,	BHA304_0.45-0.5,							
COMP 2								
Soil Glass Jar - Unpreserved (EA055)								
COMP 3		**31-Aug-2018**	**----**	----	----	**06-Sep-2018**	14-Sep-2018	✓
Soil Glass Jar - Unpreserved (EA055)								
BH104_0.0-0.2,	BH104_0.2-0.3	**31-Jul-2018**	**----**	----	----	**06-Sep-2018**	14-Aug-2018	×
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag - ACM/Asbestos Grab Bag (EA200)								
BH108_0.0-0.2		**22-Aug-2018**	**----**	----	----	**05-Sep-2018**	18-Feb-2019	✓
Snap Lock Bag - ACM/Asbestos Grab Bag (EA200)								
BH101_0.0-0.2		**29-Aug-2018**	**----**	----	----	**05-Sep-2018**	25-Feb-2019	✓
Snap Lock Bag - ACM/Asbestos Grab Bag (EA200)								
BHA304_0.0-0.2		**30-Aug-2018**	**----**	----	----	**05-Sep-2018**	26-Feb-2019	✓
Snap Lock Bag - ACM/Asbestos Grab Bag (EA200)								
BH104_0.0-0.2		**31-Jul-2018**	**----**	----	----	**05-Sep-2018**	27-Jan-2019	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH101_0.0-0.2,	BH101_0.45-0.5	**29-Aug-2018**	**06-Sep-2018**	25-Feb-2019	✓	**06-Sep-2018**	25-Feb-2019	✓
Soil Glass Jar - Unpreserved (EG005T)								
BH301_0.0-0.2,	BH301_0.45-0.5,	**30-Aug-2018**	**06-Sep-2018**	26-Feb-2019	✓	**06-Sep-2018**	26-Feb-2019	✓
BH302_0.0-0.2,	BH302_0.2-0.3,							
BH306_0.0-0.2,	BH306_0.2-0.3,							
BHA302_0.0-0.2,	BHA302_0.45-0.5,							
BHA304_0.0-0.2,	BHA304_0.45-0.5							
Soil Glass Jar - Unpreserved (EG005T)								
BH104_0.0-0.2,	BH104_0.2-0.3	**31-Jul-2018**	**06-Sep-2018**	27-Jan-2019	✓	**06-Sep-2018**	27-Jan-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH101_0.0-0.2,	BH101_0.45-0.5	**29-Aug-2018**	**06-Sep-2018**	26-Sep-2018	✓	**07-Sep-2018**	26-Sep-2018	✓
Soil Glass Jar - Unpreserved (EG035T)								
BH301_0.0-0.2,	BH301_0.45-0.5,	**30-Aug-2018**	**06-Sep-2018**	27-Sep-2018	✓	**07-Sep-2018**	27-Sep-2018	✓
BH302_0.0-0.2,	BH302_0.2-0.3,							
BH306_0.0-0.2,	BH306_0.2-0.3,							
BHA302_0.0-0.2,	BHA302_0.45-0.5,							
BHA304_0.0-0.2,	BHA304_0.45-0.5							
Soil Glass Jar - Unpreserved (EG035T)								
BH104_0.0-0.2,	BH104_0.2-0.3	**31-Jul-2018**	**06-Sep-2018**	28-Aug-2018	×	**07-Sep-2018**	28-Aug-2018	×
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
COMP 2		**30-Aug-2018**	**06-Sep-2018**	13-Sep-2018	✓	**07-Sep-2018**	16-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP066)								
COMP 3		**31-Aug-2018**	**06-Sep-2018**	14-Sep-2018	✓	**07-Sep-2018**	16-Oct-2018	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
COMP 2		**30-Aug-2018**	**06-Sep-2018**	13-Sep-2018	✓	**07-Sep-2018**	16-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP068)								
COMP 3		**31-Aug-2018**	**06-Sep-2018**	14-Sep-2018	✓	**07-Sep-2018**	16-Oct-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH101_0.0-0.2,	BH101_0.45-0.5	**29-Aug-2018**	**05-Sep-2018**	12-Sep-2018	✓	**06-Sep-2018**	15-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH301_0.0-0.2,	BH301_0.45-0.5,	**30-Aug-2018**	**05-Sep-2018**	13-Sep-2018	✓	**06-Sep-2018**	15-Oct-2018	✓
BH302_0.0-0.2,	BH302_0.2-0.3,							
BH306_0.0-0.2,	BH306_0.2-0.3,							
BHA302_0.0-0.2,	BHA302_0.45-0.5,							
BHA304_0.0-0.2,	BHA304_0.45-0.5							
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH104_0.0-0.2,	BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**05-Sep-2018**	15-Oct-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
BH101_0.0-0.2, BH101_0.45-0.5	**29-Aug-2018**	**05-Sep-2018**	12-Sep-2018	✓	**06-Sep-2018**	12-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH301_0.0-0.2, BH301_0.45-0.5, BH302_0.0-0.2, BH302_0.2-0.3, BH306_0.0-0.2, BH306_0.2-0.3, BHA302_0.0-0.2, BHA302_0.45-0.5, BHA304_0.0-0.2, BHA304_0.45-0.5	**30-Aug-2018**	**05-Sep-2018**	13-Sep-2018	✓	**06-Sep-2018**	13-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
BH104_0.0-0.2	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**05-Sep-2018**	15-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH104_0.0-0.2	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**06-Sep-2018**	14-Aug-2018	×
Soil Glass Jar - Unpreserved (EP071)							
BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**05-Sep-2018**	15-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**06-Sep-2018**	14-Aug-2018	×
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BH101_0.0-0.2, BH101_0.45-0.5	**29-Aug-2018**	**05-Sep-2018**	12-Sep-2018	✓	**06-Sep-2018**	12-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH301_0.0-0.2, BH301_0.45-0.5, BH302_0.0-0.2, BH302_0.2-0.3, BH306_0.0-0.2, BH306_0.2-0.3, BHA302_0.0-0.2, BHA302_0.45-0.5, BHA304_0.0-0.2, BHA304_0.45-0.5	**30-Aug-2018**	**05-Sep-2018**	13-Sep-2018	✓	**06-Sep-2018**	13-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
BH104_0.0-0.2	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**05-Sep-2018**	15-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH104_0.0-0.2	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**06-Sep-2018**	14-Aug-2018	×
Soil Glass Jar - Unpreserved (EP071)							
BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**05-Sep-2018**	15-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080)							
BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**06-Sep-2018**	14-Aug-2018	×

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH101_0.0-0.2,	BH101_0.45-0.5	**29-Aug-2018**	**05-Sep-2018**	12-Sep-2018	✓	**06-Sep-2018**	12-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP080)								
BH301_0.0-0.2,	BH301_0.45-0.5,	**30-Aug-2018**	**05-Sep-2018**	13-Sep-2018	✓	**06-Sep-2018**	13-Sep-2018	✓
BH302_0.0-0.2,	BH302_0.2-0.3,							
BH306_0.0-0.2,	BH306_0.2-0.3,							
BHA302_0.0-0.2,	BHA302_0.45-0.5,							
BHA304_0.0-0.2,	BHA304_0.45-0.5							
Soil Glass Jar - Unpreserved (EP080)								
BH104_0.0-0.2,	BH104_0.2-0.3	**31-Jul-2018**	**05-Sep-2018**	14-Aug-2018	×	**06-Sep-2018**	14-Aug-2018	×

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	3	20	**15.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH field/fox	EA003	6	56	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH field/fox	EA003	SOIL	In house: Referenced to Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Sample Compositing	* EN020	SOIL	Equal weights of each original soil are taken, then mixed and homogenised. The combined mixture is labelled as a new sample.
Drying only	EN020D	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY

ALS Environmental — ALS Laboratory: please tick →

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☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circled)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact ☐ Yes ☐ No ☐ N/A; Temperature on Receipt (°C); Cooling Method; Random Sample Temperature Check (°C); Other comments
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7 OF: 1 2 3 4 (5) 6 7	
ORDER NUMBER:			
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car			
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	Kjoner		MC
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:06pm	DATE/TIME:	DATE/TIME: 31/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S), WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		
1	BH108_0.0-0.2	22/8/18	S	B	1		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. Please hold all samples.
2	BH108_0.2-0.3	↓	S	B	1		
3	BH108_0.5-0.6	↓	S	B	1		
4	BH101_0.0-0.2	29/8/18		Jar, B	2		
5	BH101_0.2-0.3				2		
6	BH101_0.45-0.5				2		
7	BH101_0.95-1.0				2		
8	BH101_1.45-1.5				1		
9	FOG				1		
10	BH301_0.0-0.2	30/8/18		B	2		
11	BH301_0.2-0.3			B	2		
12	BH301_0.45-0.5			, ASS	3		
13	BH301_0.95-1.0			, ASS	3		
14	BH301_1.45-1.5				1		
15	BH301_2.0-2.1				1		
16	BH301_2.45-2.5				1		
17	BH301_3.0-3.1				1		
18	BH301_3.5-3.6				1		
				TOTAL			

LAB OF ORIGIN: NEWCASTLE

E-MAILED

Environmental Division Sydney
Work Order Reference
ES1825728

Telephone: +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

client requested - ASB bags @ EN

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0690 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
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TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:		OF: 1 2 3 4 5 6 7
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[illegible]		MC
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1806	DATE/TIME:	DATE/TIME: 31/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	BH301_3.95-4.0	30/8/18	S	ASS	1		
20	BH301_4.45-4.5				1		
21	BH301_4.9-5.0				1		
22	[redacted] FD8			Jar	1		
23	BH302_0.0-0.2			B	2		
24	BH302_0.2-0.3			[redacted]	2		
25	BH302_0.45-0.5			ASS	3		
26	BH302_0.95-1.0				2		
27	BH302_1.45-1.5				1		
28	BH302_2.0-2.1				1		
29	BH302_2.45-2.5				1		
30	BH302_2.95-3.0				1		
31	BH302_3.45-3.6				1		
32	BH302_3.95-4.0				1		
33	BH302_4.45-4.5				1		
34	BH302_4.9-5.0				1		
35	[redacted] FD7				1		
36	BH306_0.0-0.2			Jar B	2		
				TOTAL			

LAB OF ORIGIN: [redacted]

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes / No / N/A
Cooler Temperature (°C):
Random Sample Temperature on Receipt (°C):

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	Kjones		[illegible]
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1085pm	DATE/TIME:	DATE/TIME: 31/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH306_0.2-0.3	30/8/18	S	Jar, B	2		
38	BH306_0.45-0.5			↓, ↓, ASS	3		
39	BH306_0.95-1.0				1		
40	BH306_1.45-1.5				1		
41	BH306_2.0-2.1				1		
42	BH306_2.45-2.5				1		
43	BH306_3.0-3.1				1		
44	BH306_3.5-3.6				1		
45	BH306_3.9-4.0				1		
46	BH306_4.45-4.5				1		
47	FD9			Jar	1		
48	BHA302_0.0-0.2			Jar, B	2		
49	BHA302_0.2-0.3				2		
50	BHA302_0.45-0.5			↓, ↓, ASS	3		
51	BHA302_0.95-1.0				1		
52	BHA302_1.45-1.5				1		
53	BHA302_2.0-2.1				1		
54	BHA302_2.45-2.5				1		
				TOTAL			

LAB OF ORIGIN: NEWCASTLE

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samplee.brisbane@alsglobal.com
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☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
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☑NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
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☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):
PROJECT: 2219573	ALS QUOTE NO.:	
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 (4) 5 6 7
OF: 1 2 3 4 (5) 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes / No / N/A
Preservation/Container Quality Received? Yes / No / N/A
Random Sample Temperature on Receipt
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[illegible]		MC
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:06pm	DATE/TIME:	DATE/TIME: 31/8/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS — MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS									
55	BHA302_3.0-3.1	30/8/18	S	ASS	1									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
56	BHA302_3.5-3.6				1									
57	BHA302_3.9-4.0				1									
58	BHA302_4.45-4.5				1									
59	BHA302_4.9-5.0				1									
60	FD10			Jar	1									
61	BHA304_0.0-0.2			B	2									
62	BHA304_0.2-0.3				2									
63	BHA304_0.45-0.5				3									
64	BHA304_0.95-1.0			ASS	3									
65	BHA304_1.5-1.6				1									
66	BHA304_2.0-2.1				1									
67	BHA304_2.45-2.5				1									
68	BHA304_3.0-3.1				1									
69	BHA304_3.5-3.6				1									
70	BHA304_3.95-4.0				1									
71	BHA304_4.5-4.6				1									
72	BHA304_4.9-5.0				1									
				TOTAL										

LAB OF ORIGIN: NEWCASTLE

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Asb # 1, 4, 61, 74
ASS 13-18, 26-34, 38-46, 49-57, 64-72

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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CLIENT: GHD
OFFICE: Newcastle
PROJECT: 2219573
ORDER NUMBER:
PROJECT MANAGER: Alison Monkley — CONTACT PH: 49799999
SAMPLER: Julian Fowler — SAMPLER MOBILE: 0466049181
COC emailed to ALS? (YES / NO) — EDD FORMAT (or default): Esdat
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, nll,car
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle): COC: (1) 2 3 4 5 6 7 — OF: 1 2 3 4 (5) 6 7

FOR LABORATORY USE ONLY (Circle)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	KJones		
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:06pm	DATE/TIME:	DATE/TIME:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH/BTEXN PAH, 8 metals	Asbestos Presence/absence	ASS Screening	Comp 2 (OCPs, PCBs)	Comp 3 (OCPs PCB)				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. Please hold all samples. ASS Brisbane
1	BH108_0.0-0.2	22/8/18	S	B	1		X							
2	BH108_0.2-0.3	↓	S	B	↓									
3	BH108_0.5-0.6	↓	S	B										
4	BH101_0.0-0.2	29/8/18		Jar, B	2	X	X		X					
5	BH101_0.2-0.3	↓		↓	2									
6	BH101_0.45-0.5				2	X								
7	BH101_0.95-1.0				2									
8	BH101_1.45-1.5				1									
9	FD6	↓		↓	1									
10	BH301_0.0-0.2	30/8/18		B	2	X				X				
11	BH301_0.2-0.3			B	2	X								
12	BH301_0.45-0.5			↓, ASS	3	X								
13	BH301_0.95-1.0			, ASS	3			X						
14	BH301_1.45-1.5				1			X						
15	BH301_2.0-2.1				1			X						
16	BH301_2.45-2.5				1			X						
17	BH301_3.0-3.1				1			X						
18	BH301_3.5-3.6	↓	↓	↓	1			X						
				TOTAL										

Subcon / Forward Lab / Split WO
Lab / Analysis:
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No:
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1825728
Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
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Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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☐ NOWRA 4/19 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

☐ PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐ SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐ TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / N/A
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 (2) 3 4 5 6 7	Free ice / frozen ice bricks present upon arrival? Yes / No / N/A
ORDER NUMBER:		OF: 1 2 3 4 (5) 6 7	Random Sample Temperature on Receipt: C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		Other comments:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY: KJong
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1306
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlabreports, ntl.car		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS (MATRIX: SOLID (S) WATER (W))			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price). Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH / BTEXN	PAH / Phenols	Asbestos (presence/absence)	ASS Screening	Comp 2 (OPP's, PCB)	Comp 3 (OPP's, PCB)	
19	BH301_3.95-4.0	30/8/18	S	ASS	1							
20	BH301_4.45-4.5				1							
21	BH301_4.9-5.0				1							
22	[redacted] FD8			Jar	1							
23	BH302_0.0-0.2			Jar, B	2	X	-				X	
24	BH302_0.2-0.3				2	X	-					
25	BH302_0.45-0.5			Jar, B, [redacted] ASS	3							
26	BH302_0.95-1.0				2				X	-		
27	BH302_1.45-1.5				1				X	-		
28	BH302_2.0-2.1				1				X	-		
29	BH302_2.45-2.5				1				X	-		
30	BH302_2.95-3.0				1				X	-		
31	BH302_3.[redacted]-3.6				1				X	-		
32	BH302_3.95-4.0				1				X	-		
33	BH302_4.45-4.5				1				X	-		
34	BH302_4.9-5.0				1				X	-		
35	[redacted] FD7				1							
36	BH306_0.0-0.2			Jar, B	2	X	-				X	
				TOTAL								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
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☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD

OFFICE: Newcastle

PROJECT: 2219573

ORDER NUMBER:

PROJECT MANAGER: Alison Monkley — CONTACT PH: 49799999

SAMPLER: Julian Fowler — SAMPLER MOBILE: 0466049181

COC emailed to ALS? (YES / NO) — EDD FORMAT (or default): Esdat

Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car

Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC: 1 2 (3) 4 5 6 7
OF: 1 2 3 4 (5) 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 6
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	K Jones		
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:08pm	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE | SAMPLE DETAILS MATRIX: SOLID (S) WATER (W) | CONTAINER INFORMATION | ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). | Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH/BTEXN PAH, 8 metals	Asbestos presence/absence	ASS screening	Comp 2 (OCP's, PCB)	Comp 3 (OCP's, PCB)			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH306_0.2-0.3	30/8/18	S	Jar, B	2	X	✓						
38	BH306_0.45-0.5	↓	↓	↓, ↓, ASS	3			X					
39	BH306_0.95-1.0				1			X					
40	BH306_1.45-1.5				1			X					
41	BH306_2.0-2.1				1			X		✓			
42	BH306_2.45-2.5				1			X					
43	BH306_3.0-3.1				1			X					
44	BH306_3.5-3.6				1			X					
45	BH306_3.9-4.0				1			X					
46	BH306_4.45-4.5			↓	1			X					
47	FD9			Jar	1								
48	BHA302_0.0-0.2			Jar, B	2	X	✓						
49	BHA302_0.2-0.3			↓, ↓	2			X	✓				
50	BHA302_0.45-0.5			↓, ↓, ASS	3	X	✓	X	✓				
51	BHA302_0.95-1.0				1			X					
52	BHA302_1.45-1.5				1			X					
53	BHA302_2.0-2.1				1			X					
54	BHA302_2.45-2.5	↓	↓	↓	1			X					
				TOTAL									

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 (4) 5 6 7 OF: 1 2 3 4 (5) 6 7
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fas@ghd.com		

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Cooler Temperature (°C) on Receipt: Yes No N/A
Random Sample Temperature on Receipt: °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[illegible]		
DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:06pm	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH/BTEX N	PAH, Metals	Asbestos	Presence/absence	ASS Screening	Comp 2 (OCP, PCB)	Comp 3 (OCP, PCB)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
55	BHA302_3.0-3.1	30/8/18	S	ASS	1					X			
56	BHA302_3.5-3.6				1					X			
57	BHA302_3.9-4.0				1					X			
58	BHA302_4.45-4.5				1					X			
59	BHA302_4.9-5.0				1					X			
60	FD10			Jar	1								
61	BHA304_0.0-0.2			B	2	X	X						
62	BHA304_0.2-0.3				2								
63	BHA304_0.45-0.5				3	X							
64	BHA304_0.95-1.0			ASS	3					X			
65	BHA304_1.5-1.6				1					X			
66	BHA304_2.0-2.1				1					X			
67	BHA304_2.45-2.5				1					X			
68	BHA304_3.0-3.1				1					X			
69	BHA304_3.5-3.6				1					X			
70	BHA304_3.95-4.0				1					X			
71	BHA304_4.5-4.6				1					X			
72	BHA304_4.9-5.0				1					X			
				TOTAL									

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OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody seal intact? Yes No N/A
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / Wet Ice present on receipt? Yes No N/A
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	OF: 1 2 3 4 5 6 7	Other Comments:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY: [signature]
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 31/8/18 1305	DATE/TIME: 31/8/18 1:06 pm
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH/BTEXN PAH, Metals	Asbestos Presence/absence	ASS screening	Comp 2 (OCP's, PCB)	Comp 3 (OCP's, PCB)				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
73	FD11	30/8/18	S	Jar	1									
74	BH104_0.0-0.2	31/8/18	S	"	2	X	X		X					
75	BH104_0.2-0.3	"	S	"	2	X								
76	BH104_0.45-0.5	"	S	"	2									
77	BH104_0.95-1.0	"	S	"	2									
78	FD12	"	S	"	1									
					TOTAL									

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1826044**	Page	: 1 of 19
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 04-Sep-2018 16:28
Order number	:	Date Analysis Commenced	: 18-Sep-2018
C-O-C number	: ----	Issue Date	: 24-Sep-2018 18:26
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 56		
No. of samples analysed	: 28		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA303_0.0-0.2	BHA303_0.45-0.5	BH201_0.0-0.2	BH201_0.45-0.5	BH201_0.95-1.0
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826044-001	ES1826044-003	ES1826044-014	ES1826044-016	ES1826044-017
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	----	----	6.3	----	----
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	----	----	----	----	6.7
pH (Fox)	----	0.1	pH Unit	----	----	----	----	2.8
Reaction Rate	----	1	Reaction Unit	----	----	----	----	2
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	26.8	21.3	33.8	18.5	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	4.6	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	2.7	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	0.4	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	7.9	----	----
Exchangeable Sodium Percent	----	0.1	%	----	----	5.7	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	9	<5	13	15	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	8	2	11	18	----
Copper	7440-50-8	5	mg/kg	39	<5	21	10	----
Lead	7439-92-1	5	mg/kg	54	<5	44	14	----
Nickel	7440-02-0	2	mg/kg	8	<2	10	4	----
Zinc	7440-66-6	5	mg/kg	289	7	95	23	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA303_0.0-0.2	BHA303_0.45-0.5	BH201_0.0-0.2	BH201_0.45-0.5	BH201_0.95-1.0
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-001	ES1826044-003	ES1826044-014	ES1826044-016	ES1826044-017
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	----	<0.05	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	----	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	----	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	----	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	----	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		----	----	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	----	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg		----	----	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	----	<0.05	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	----	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		----	----	<0.2	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	----	<0.05	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	**1.0**	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	**1.0**	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	**0.6**	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	**0.8**	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	**0.6**	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA303_0.0-0.2	BHA303_0.45-0.5	BH201_0.0-0.2	BH201_0.45-0.5	BH201_0.95-1.0
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-001	ES1826044-003	ES1826044-014	ES1826044-016	ES1826044-017
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	**4.0**	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	**0.7**	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**1.0**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.3**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	**104**	**127**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	**129**	**130**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BHA303_0.0-0.2	BHA303_0.45-0.5	BH201_0.0-0.2	BH201_0.45-0.5	BH201_0.95-1.0
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-001	ES1826044-003	ES1826044-014	ES1826044-016	ES1826044-017
					Result	Result	Result	Result	Result
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	96.3	98.2	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		74.5	77.8	78.4	75.4	----
2-Chlorophenol-D4	93951-73-6	0.5	%		77.5	81.5	81.7	79.1	----
2.4.6-Tribromophenol	118-79-6	0.5	%		68.4	67.3	66.7	63.8	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		79.9	83.7	85.1	81.0	----
Anthracene-d10	1719-06-8	0.5	%		83.3	86.0	86.2	82.8	----
4-Terphenyl-d14	1718-51-0	0.5	%		76.1	78.6	78.7	76.1	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		74.4	96.7	94.0	95.4	----
Toluene-D8	2037-26-5	0.2	%		81.0	98.7	95.4	97.7	----
4-Bromofluorobenzene	460-00-4	0.2	%		95.0	102	99.8	102	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH201_1.5-1.6	BH201_2.0-2.1	BH201_2.45-2.5	BH201_3.0-3.1	BH201_3.5-3.6
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826044-018	ES1826044-019	ES1826044-020	ES1826044-021	ES1826044-022
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**6.3**	**6.1**	**6.2**	**6.2**	**6.2**
pH (Fox)	----	0.1	pH Unit	**2.9**	**2.6**	**2.6**	**1.8**	**2.5**
Reaction Rate	----	1	Reaction Unit	**2**	**2**	**2**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH201_3.9-4.0	BH201_4.5-4.6	BH201_4.9-5.0	BH202_0.02-0.2	BH202_0.45-0.5
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826044-023	ES1826044-024	ES1826044-025	ES1826044-027	ES1826044-029
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.3	6.2	6.0	----	----
pH (Fox)	----	0.1	pH Unit	2.3	2.4	2.2	----	----
Reaction Rate	----	1	Reaction Unit	2	2	2	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	22.0	13.3
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	34	9
Cadmium	7440-43-9	1	mg/kg	----	----	----	2	<1
Chromium	7440-47-3	2	mg/kg	----	----	----	13	4
Copper	7440-50-8	5	mg/kg	----	----	----	170	60
Lead	7439-92-1	5	mg/kg	----	----	----	395	73
Nickel	7440-02-0	2	mg/kg	----	----	----	10	3
Zinc	7440-66-6	5	mg/kg	----	----	----	2360	896
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	----	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	----	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	----	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	----	----	----	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	----	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	----	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	----	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	----	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	----	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	----	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	----	<0.05	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH201_3.9-4.0	BH201_4.5-4.6	BH201_4.9-5.0	BH202_0.02-0.2	BH202_0.45-0.5
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-023	ES1826044-024	ES1826044-025	ES1826044-027	ES1826044-029
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	----	----	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	----	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	----	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	----	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	----	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	----	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	----	----	<0.2	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	----	----	<0.05	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	----	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	----	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	----	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	----	----	**4.3**	**3.2**
Anthracene	120-12-7	0.5	mg/kg		----	----	----	**1.0**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	----	----	**12.1**	**1.9**
Pyrene	129-00-0	0.5	mg/kg		----	----	----	**11.0**	**1.4**
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	----	**5.1**	**0.8**
Chrysene	218-01-9	0.5	mg/kg		----	----	----	**5.6**	**0.8**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	----	----	**8.0**	**0.6**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	----	**3.0**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	----	**6.0**	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	----	**3.3**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	----	**0.9**	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	----	**4.1**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	----	**64.4**	**8.7**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	----	**8.9**	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	**8.9**	**0.7**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	----	**8.9**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg		----	----	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg		----	----	----	**220**	**500**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH201_3.9-4.0	BH201_4.5-4.6	BH201_4.9-5.0	BH202_0.02-0.2	BH202_0.45-0.5
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-023	ES1826044-024	ES1826044-025	ES1826044-027	ES1826044-029
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	100	mg/kg		----	----	----	210	230
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	----	430	730
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	----	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		----	----	----	<50	90
>C16 - C34 Fraction	----	100	mg/kg		----	----	----	350	620
>C34 - C40 Fraction	----	100	mg/kg		----	----	----	190	160
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	----	540	870
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	----	<50	90
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		----	----	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	----	----	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	----	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		----	----	----	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	----	112	116
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	----	130	92.5
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	----	101	68.7
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	----	78.5	77.0
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	----	81.2	79.6
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	----	71.6	70.0
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	----	83.0	83.5
Anthracene-d10	1719-06-8	0.5	%		----	----	----	83.7	79.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH201_3.9-4.0	BH201_4.5-4.6	BH201_4.9-5.0	BH202_0.02-0.2	BH202_0.45-0.5
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-023	ES1826044-024	ES1826044-025	ES1826044-027	ES1826044-029
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	----	76.5	76.2
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	----	93.8	86.8
Toluene-D8	2037-26-5	0.2	%		----	----	----	93.5	90.8
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	----	97.4	84.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH202_0.95-1.0	BH202_1.5-1.6	BH202_2.0-2.1	BH202_2.45-2.5	BH202_3.0-3.1
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826044-030	ES1826044-031	ES1826044-032	ES1826044-033	ES1826044-034
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.4	6.7	6.6	6.5	6.8
pH (Fox)	----	0.1	pH Unit	3.2	2.0	1.6	1.5	2.3
Reaction Rate	----	1	Reaction Unit	3	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826044-035	ES1826044-036	ES1826044-037	ES1826044-038	ES1826044-039
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	6.8	6.9	6.8	6.9	----
pH (Fox)	----	0.1	pH Unit	2.1	2.1	2.3	2.2	----
Reaction Rate	----	1	Reaction Unit	4	4	2	2	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	----	25.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	----	----	54
Cadmium	7440-43-9	1	mg/kg	----	----	----	----	1
Chromium	7440-47-3	2	mg/kg	----	----	----	----	11
Copper	7440-50-8	5	mg/kg	----	----	----	----	143
Lead	7439-92-1	5	mg/kg	----	----	----	----	287
Nickel	7440-02-0	2	mg/kg	----	----	----	----	9
Zinc	7440-66-6	5	mg/kg	----	----	----	----	1610
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	----	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	3.5
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	0.6
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	8.6
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	7.9
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	3.7
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	4.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	----	5.7
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	1.8
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	4.2
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	2.0
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	0.6
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	2.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	----	----	----	45.1
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	----	----	----	6.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-035	ES1826044-036	ES1826044-037	ES1826044-038	ES1826044-039
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	----	6.2
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	----	----	6.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	----	----	<10
C10 - C14 Fraction	----	50	mg/kg		----	----	----	----	<50
C15 - C28 Fraction	----	100	mg/kg		----	----	----	----	300
C29 - C36 Fraction	----	100	mg/kg		----	----	----	----	220
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	----	----	520
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	----	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	----	----	<10
>C10 - C16 Fraction	----	50	mg/kg		----	----	----	----	<50
>C16 - C34 Fraction	----	100	mg/kg		----	----	----	----	430
>C34 - C40 Fraction	----	100	mg/kg		----	----	----	----	190
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	----	----	620
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	----	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg		----	----	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	----	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	----	----	----	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	----	----	----	<0.5
Naphthalene	91-20-3	1	mg/kg		----	----	----	----	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	----	----	77.0
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	----	----	80.1
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	----	----	73.7
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	----	----	81.7
Anthracene-d10	1719-06-8	0.5	%		----	----	----	----	82.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826044-035	ES1826044-036	ES1826044-037	ES1826044-038	ES1826044-039
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	----	----	75.8
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	----	----	87.1
Toluene-D8	2037-26-5	0.2	%		----	----	----	----	87.8
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	----	----	90.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH304_0.0-0.2	BH304_0.45-0.5	BH303_0.0-0.2	----	----
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1826044-040	ES1826044-042	ES1826044-045	--------	--------
					Result	Result	Result	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		----	----	6.0	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		10.4	9.7	12.6	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	6.8	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	6.0	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	0.6	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	0.6	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	14.0	----	----
Exchangeable Sodium Percent	----	0.1	%		----	----	4.5	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	6	8	----	----
Cadmium	7440-43-9	1	mg/kg		1	2	<1	----	----
Chromium	7440-47-3	2	mg/kg		4	4	6	----	----
Copper	7440-50-8	5	mg/kg		6	<5	12	----	----
Lead	7439-92-1	5	mg/kg		87	63	34	----	----
Nickel	7440-02-0	2	mg/kg		3	<2	3	----	----
Zinc	7440-66-6	5	mg/kg		92	103	125	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH304_0.0-0.2	BH304_0.45-0.5	BH303_0.0-0.2	----	----
			Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1826044-040	ES1826044-042	ES1826044-045	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	**100**	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**100**	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**77.6**	**77.8**	**78.8**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH304_0.0-0.2	BH304_0.45-0.5	BH303_0.0-0.2	----	----
				Client sampling date / time	04-Sep-2018 00:00	04-Sep-2018 00:00	04-Sep-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1826044-040	ES1826044-042	ES1826044-045	--------	--------
					Result	Result	Result	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2-Chlorophenol-D4	93951-73-6	0.5	%		81.2	81.7	81.2	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		77.2	69.7	68.6	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		83.0	83.6	83.3	----	----
Anthracene-d10	1719-06-8	0.5	%		86.4	86.5	86.2	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		77.6	77.9	77.6	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		102	95.8	96.6	----	----
Toluene-D8	2037-26-5	0.2	%		98.7	95.6	95.9	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		106	99.6	101	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1826044**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 04-Sep-2018
Order number	:	Date Analysis Commenced	: 18-Sep-2018
C-O-C number	: ----	Issue Date	: 24-Sep-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 56		
No. of samples analysed	: 28		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1936505)									
ES1826044-014	BH201_0.0-0.2	EA002: pH Value	----	0.1	pH Unit	6.3	6.2	0.00	0% - 20%
ES1827443-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	5.9	5.8	0.00	0% - 20%
EA003 :pH (field/fox) (QC Lot: 1939661)									
EM1814915-001	Anonymous	EA003: pH (F)	----	0.1	pH Unit	7.8	7.8	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	4.8	4.8	0.00	0% - 20%
ES1826044-021	BH201_3.0-3.1	EA003: pH (F)	----	0.1	pH Unit	6.2	6.1	1.63	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	1.8	1.8	0.00	0% - 50%
EA003 :pH (field/fox) (QC Lot: 1939662)									
ES1826044-036	BH202_3.9-4.0	EA003: pH (F)	----	0.1	pH Unit	6.9	6.9	0.00	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.1	2.2	4.65	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1937107)									
ES1826044-003	BHA303_0.45-0.5	EA055: Moisture Content	----	0.1	%	21.3	20.3	4.94	0% - 20%
ES1826547-007	Anonymous	EA055: Moisture Content	----	0.1	%	5.9	5.7	3.00	No Limit
ED007: Exchangeable Cations (QC Lot: 1941868)									
ES1826044-014	BH201_0.0-0.2	ED007: Exchangeable Sodium Percent	----	0.1	%	5.7	5.7	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	4.6	4.5	0.00	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.7	2.6	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	7.9	7.8	0.00	0% - 20%
ES1827443-004	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	5.7	5.4	5.40	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED007: Exchangeable Cations (QC Lot: 1941868) - continued									
ES1827443-004	Anonymous	ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	1.0	1.0	0.00	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1940870)									
ES1826044-001	BHA303_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	9	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	8	7	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	8	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	39	31	22.6	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	54	47	12.1	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	289	258	11.4	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1940871)									
ES1826044-001	BHA303_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1935865)									
ES1826044-014	BH201_0.0-0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1935864)									
ES1826044-014	BH201_0.0-0.2	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1935862)									
ES1826044-014	BH201_0.0-0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1935862) - continued									
ES1826044-014	BH201_0.0-0.2	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.0	1.5	43.5	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.0	1.5	41.9	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	0.6	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.6	0.8	31.4	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.8	1.2	32.6	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.6	0.8	30.6	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	0.6	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	4.0	# 7.0	54.5	0% - 50%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	0.7	1.0	36.7	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1935863)									
ES1826044-014	BH201_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1936161)									
ES1826044-001	BHA303_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1826044-045	BH303_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1935863)									
ES1826044-014	BH201_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1936161)									
ES1826044-001	BHA303_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1826044-045	BH303_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 1936161)									
ES1826044-001	BHA303_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1936161) - continued									
ES1826044-001	BHA303_0.0-0.2	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1826044-045	BH303_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED007: Exchangeable Cations (QCLot: 1941868)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	93.0	76	120
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	94.0	75	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	94.7	80	120
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	92.0	80	120
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1940870)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	96.2	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	95.2	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	89.4	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	96.0	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	94.2	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.2	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	107	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1940871)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	76.6	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1935865)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	125	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1935864)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	101	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	99.3	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.1	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	102	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	107	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	108	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	104	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	107	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	108	69	115

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 1935864) - continued								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.3	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	92.2	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	104	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	104	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	104	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	101	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1935862)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	111	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	106	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	107	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	108	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	110	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	113	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	114	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	117	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	98.9	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	103	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	92.9	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	101	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	101	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	77.7	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	80.8	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	73.5	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1935863)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	102	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	106	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	104	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	86.2	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1935863)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	104	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	106	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	92.9	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1936161)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	90.3	68	128
EP080: BTEXN (QCLot: 1936161)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	93.5	62	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 1936161) - continued								
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	93.2	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	94.2	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	91.5	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	93.6	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	96.1	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 1940870)							
ES1826044-001	BHA303_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	97.8	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.3	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	96.6	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	94.5	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	95.0	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	97.0	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	97.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1940871)							
ES1826044-001	BHA303_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	76.6	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1935865)							
ES1826044-014	BH201_0.0-0.2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	104	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1935864)							
ES1826044-014	BH201_0.0-0.2	EP068: gamma-BHC	58-89-9	0.5 mg/kg	107	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	94.6	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	89.9	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	96.2	70	130
		EP068: Endrin	72-20-8	2 mg/kg	99.2	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	96.3	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1935862)							
ES1826044-014	BH201_0.0-0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.0	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	112	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1935863)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1935863) - continued							
ES1826044-014	BH201_0.0-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	112	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	124	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	128	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)							
ES1826044-001	BHA303_0.0-0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	75.4	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1935863)							
ES1826044-014	BH201_0.0-0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	103	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	116	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	118	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1936161)							
ES1826044-001	BHA303_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.1	70	130
EP080: BTEXN (QCLot: 1936161)							
ES1826044-001	BHA303_0.0-0.2	EP080: Benzene	71-43-2	2.5 mg/kg	77.6	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	78.7	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	82.2	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	79.9	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.7	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	81.2	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1826044**	Page	: 1 of 10
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 04-Sep-2018
Site	:	Issue Date	: 24-Sep-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 56
Order number	:	No. of samples analysed	: 28

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	ES1826044--014	BH201_0.0-0.2	**Sum of polycyclic aromatic hydrocarbons**	----	54.5 %	0% - 50%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
BH201_0.0-0.2,	BH303_0.0-0.2	19-Sep-2018	11-Sep-2018	**8**	----	----	----
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved							
BHA303_0.0-0.2,	BHA303_0.45-0.5,	----	----	----	19-Sep-2018	18-Sep-2018	**1**
BH201_0.0-0.2,	BH201_0.45-0.5,						
BH202_0.02-0.2,	BH202_0.45-0.5,						
FD15,	BH304_0.0-0.2,						
BH304_0.45-0.5,	BH303_0.0-0.2						
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved							
BHA303_0.0-0.2,	BHA303_0.45-0.5,	----	----	----	19-Sep-2018	18-Sep-2018	**1**
BH201_0.0-0.2,	BH201_0.45-0.5,						
BH202_0.02-0.2,	BH202_0.45-0.5,						
FD15,	BH304_0.0-0.2,						
BH304_0.45-0.5,	BH303_0.0-0.2						
EP080: BTEXN							
Soil Glass Jar - Unpreserved							
BHA303_0.0-0.2,	BHA303_0.45-0.5,	----	----	----	19-Sep-2018	18-Sep-2018	**1**
BH201_0.0-0.2,	BH201_0.45-0.5,						
BH202_0.02-0.2,	BH202_0.45-0.5,						
FD15,	BH304_0.0-0.2,						
BH304_0.45-0.5,	BH303_0.0-0.2						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
BH201_0.0-0.2,	BH303_0.0-0.2	**04-Sep-2018**	**19-Sep-2018**	11-Sep-2018	×	**19-Sep-2018**	19-Sep-2018	✓
EA003 :pH (field/fox)								
Snap Lock Bag - frozen on receipt at ALS (EA003)								
BH201_0.95-1.0,	BH201_1.5-1.6,	**04-Sep-2018**	**20-Sep-2018**	30-May-2021	✓	**20-Sep-2018**	19-Dec-2018	✓
BH201_2.0-2.1,	BH201_2.45-2.5,							
BH201_3.0-3.1,	BH201_3.5-3.6,							
BH201_3.9-4.0,	BH201_4.5-4.6,							
BH201_4.9-5.0,	BH202_0.95-1.0,							
BH202_1.5-1.6,	BH202_2.0-2.1,							
BH202_2.45-2.5,	BH202_3.0-3.1,							
BH202_3.5-3.6,	BH202_3.9-4.0,							
BH202_4.5-4.6,	BH202_4.9-5.0							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BHA303_0.0-0.2,	BHA303_0.45-0.5,	**04-Sep-2018**	**----**	----	----	**18-Sep-2018**	18-Sep-2018	✓
BH201_0.0-0.2,	BH201_0.45-0.5,							
BH202_0.02-0.2,	BH202_0.45-0.5,							
FD15,	BH304_0.0-0.2,							
BH304_0.45-0.5,	BH303_0.0-0.2							
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
BH201_0.0-0.2,	BH303_0.0-0.2	**04-Sep-2018**	**20-Sep-2018**	02-Oct-2018	✓	**20-Sep-2018**	02-Oct-2018	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BHA303_0.0-0.2,	BHA303_0.45-0.5,	**04-Sep-2018**	**20-Sep-2018**	03-Mar-2019	✓	**20-Sep-2018**	03-Mar-2019	✓
BH201_0.0-0.2,	BH201_0.45-0.5,							
BH202_0.02-0.2,	BH202_0.45-0.5,							
FD15,	BH304_0.0-0.2,							
BH304_0.45-0.5,	BH303_0.0-0.2							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BHA303_0.0-0.2,	BHA303_0.45-0.5,	**04-Sep-2018**	**20-Sep-2018**	02-Oct-2018	✓	**20-Sep-2018**	02-Oct-2018	✓
BH201_0.0-0.2,	BH201_0.45-0.5,							
BH202_0.02-0.2,	BH202_0.45-0.5,							
FD15,	BH304_0.0-0.2,							
BH304_0.45-0.5,	BH303_0.0-0.2							
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
BH201_0.0-0.2,	BH201_0.45-0.5,	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
BH202_0.02-0.2,	BH202_0.45-0.5							
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
BH201_0.0-0.2,	BH201_0.45-0.5,	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
BH202_0.02-0.2,	BH202_0.45-0.5							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BHA303_0.0-0.2,	BHA303_0.45-0.5,	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
BH201_0.0-0.2,	BH201_0.45-0.5,							
BH202_0.02-0.2,	BH202_0.45-0.5,							
FD15,	BH304_0.0-0.2,							
BH304_0.45-0.5,	BH303_0.0-0.2							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071) BHA303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BHA303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BHA303_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BHA303_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH201_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH201_0.0-0.2, BH201_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH201_0.45-0.5, BH202_0.02-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH202_0.02-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH202_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH202_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) FD15	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) FD15	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH304_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH304_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH304_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH304_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071) BHA303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BHA303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BHA303_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BHA303_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH201_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH201_0.0-0.2, BH201_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH201_0.45-0.5, BH202_0.02-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH202_0.02-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH202_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH202_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) FD15	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) FD15	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH304_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH304_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH304_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH304_0.45-0.5	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071) BH303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) BHA303_0.0-0.2, BHA303_0.45-0.5, BH201_0.0-0.2, BH201_0.45-0.5, BH202_0.02-0.2, BH202_0.45-0.5, FD15, BH304_0.0-0.2, BH304_0.45-0.5, BH303_0.0-0.2	**04-Sep-2018**	**18-Sep-2018**	18-Sep-2018	✓	**19-Sep-2018**	18-Sep-2018	×

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations	ED007	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH field/fox	EA003	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Exchangeable Cations	ED007	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Exchangeable Cations	ED007	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
pH field/fox	EA003	SOIL	In house: Referenced to Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Drying only	EN020D	SOIL	In house

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

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PROJECT: 2219573	ALS QUOTE NO.:	
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

COC SEQUENCE NUMBER (Circle)
COC: (1) 2 3 4 5 6 7
OF: 1 2 3 (4) 5 6 7

FOR LABORATORY USE ONLY (Circle)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 4/9/18 1628	DATE/TIME: 4/9/18 4:28pm	DATE/TIME:	DATE/TIME: 9/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS — MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	BHA 303_0.0-0.2		S		2		
	BHA 303_0.2-0.3				2		
	BHA 303_0.45-0.5				3		
	BHA 303_0.95-1.0				1		
	BHA 303_1.5-1.6				1		
	BHA 303_2.0-2.1				1		
	BHA 303_2.45-2.5				1		
	BHA 303_3.0-3.1				1		
	BHA 303_3.5-3.6				1		
	BHA 303_3.9-4.0				1		
	BHA 303_4.5-4.6				1		
	BHA 303_4.9-5.0				1		
	FD17				1		
	BH201_0.0-0.2				2		
	BH201_0.2-0.3				2		
	BH201_0.45-0.5				3		
	BH201_0.95-1.0				2		
	BH201_1.5-1.6				1		
				TOTAL			

EMAILED

LAB OF ORIGIN: [illegible]

Environmental Division
Sydney
Work Order Reference
ES1826044

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	
ORDER NUMBER:		COC: 1 (2) 3 4 5 6 7	
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	OF: 1 2 3 (4) 5 6 7	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Fowler	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 4/9/18 1628	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY:	RECEIVED BY: MC
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME: 4/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	BH201 - 2.0-2.1		S		1		
	BH201 - 2.45-2.5				1		
	BH201 - 3.0-3.1				1		
	BH201 - 3.5-3.6				1		
	BH201 - 3.9-4.0				1		
	BH201 - 4.5-4.6				1		
	BH201 - 4.9-5.0				1		
	FD16				1		
	BH202 - 0.02-0.2				2		
	BH202 - 0.2-0.3				2		
	BH202 - 0.45-0.5				3		
	BH202 - 0.95-1.0				2		
	BH202 - 1.5-1.6				1		
	BH202 - 2.0-2.1				1		
	BH202 - 2.45-2.5				1		
	BH202 - 3.0-3.1				1		
	BH202 - 3.5-3.6				1		
	BH202 - 3.9-4.0				1		
				TOTAL			

E-MAILED

LAB OF ORIGIN: NEWCASTLE

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COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 4/4/18 1628	DATE/TIME:	DATE/TIME:	DATE/TIME: 4/4/18 1630

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)		CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	BH202 _ 4.5-4.6		S	ASS	1	
	BH202 _ 4.9-5.6			↓	1	
	FD15				1	
	BH304 _ 0.0-0.2				2	
	BH304 _ 0.2-0.3				2	
	BH304 _ 0.45-0.5				3	
	BH304 _ 0.95-1.0				1	
	~~BH304~~ FD14				1	
	BH303 _ 0.0-0.2				2	
	BH303 _ 0.2-0.3				2	
	BH303 _ 0.45-0.5				3	
	BH303 _ 0.95-1.0				3	
	BH303 _ 1.5-1.6				2	
	BH303 _ 1.8-1.9			Jar	1	
	BH303 _ 2.0-2.1			ASS	1	
	BH303 _ 2.45-2.5				1	
	BH303 _ 2.95-3.0				1	
	BH303 _ 3.5-3.6				1	
				TOTAL		

LAB OF ORIGIN: NEWCASTLE

EMAILED

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SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 4/9/18 1620	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY:	RECEIVED BY: MC
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME: 4/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS (SOIL (S) WATER (W))			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		
	BH303 _ 3.9-4.0		S	ASS	1		
	BH303 _ 4.45-4.5		S	ASS	1		
	BH303 _ 4.9-5.0		S	ASS	1		
	FD3		S	Jar ASS	1		
				TOTAL			

E-MAILED

LAB OF ORIGIN: NEWCASTLE

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Updated COC's 17/9/18 17:00 PT

ALS ENVIRONMENTAL

CHAIN OF CUSTODY

ALS Laboratory: please tick →

- ☐ ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
- ☐ BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
- ☐ GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
- ☐ MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
- ☐ MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
- ☐ MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
- ☑ NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
- ☐ NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
- ☐ PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
- ☐ SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
- ☐ TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
- ☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD

OFFICE: Newcastle

PROJECT: 2219573

ORDER NUMBER:

PROJECT MANAGER: Alison Monkley CONTACT PH: 49799999

SAMPLER: Julian Fowler SAMPLER MOBILE: 0466049181

COC emailed to ALS? (YES / NO) EDD FORMAT (or default): Esdat

Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car

Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

- ☑ Standard TAT (List due date):
- ☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7 OF: 1 2 3 (4) 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[signature]		
DATE/TIME: 4/9/18 1628	DATE/TIME: 4/9/18 4:28pm	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN PAH, Phenols	Asbestos presence/absence	ASS Screen	Comp 6 (OCPs & PCB)	Comp 7 (OCPs & PCB)	pH, CEC			ASS / Brisbane. Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. Split WO
1	BHA 303_0.0-0.2		S		2	X								
2	BHA 303_0.1-0.3				2									
3	BHA 303_0.45-0.5				3	X								
4	BHA 303_0.95-1.0				1									
5	BHA 303_1.5-1.6				1									
6	BHA 303_2.0-2.1				1									
7	BHA 303_2.45-2.5				1									
8	BHA 303_3.0-3.1				1									
9	BHA 303_3.5-3.6				1									
10	BHA 303_3.9-4.0				1									
11	BHA 303_4.5-4.6				1									
12	BHA 303_4.9-5.0				1									
13	FD17				1									
14	BH201_0.0-0.2				2	X			X		X			
15	BH201_0.2-0.3				2									
16	BH201_0.45-0.5				3	X				X				
17	BH201_0.95-1.0				2			X						
18	BH201_1.5-1.6				1			X						
				TOTAL										

Environmental Division
Sydney
Work Order Reference
ES1826044

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Updated COCs
17/7/18
17:00

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 / BRISBANE 32 Shand Street Stafford QLD 4053 / GLADSTONE 46 Callemondah Drive Clinton QLD 4680

MACKAY 78 Harbour Road Mackay QLD 4740 / MELBOURNE 2-4 Westall Road Springvale VIC 3171 / MUDGEE 27 Sydney Road Mudgee NSW 2850

☑ NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 / NOWRA 4/13 Geary Place North Nowra NSW 2541 / PERTH 10 Hod Way Malaga WA 6090

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 / TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 / WOLLONGONG 99 Kenny Street Wollongong NSW 2500

CLIENT: GHD	TURNAROUND REQUIREMENTS :	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 1 (2) 3 4 5 6 7	Random Sample Temperature on Receipt:
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	OF: 1 2 3 (4) 5 6 7	Other comment:

SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Fowler	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 4/9/18 1628	DATE/TIME:	DATE/TIME:	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car					
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEX PAH, 8 metals	Asbestos Presence/absence	ASS & Screening	Comp 6 (OCP PCB)	Comp 7 (OCP PCB)	pH, EC			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	BH201 - 2.0-2.1		S		1			X						
20	BH201 - 2.45-2.5				1			X						
21	BH201 - 3.0-3.1				1			X						
22	BH201 - 3.5-3.6				1			X						
23	BH201 - 3.9-4.0				1			X						
24	BH201 - 4.5-4.6				1			X						
25	BH201 - 4.9-5.0				1			X						
26	FD16				1			X						
27	BH202 - 0.02-0.2				2	X			X					
28	BH202 0.2-0.3				2				X					
29	BH202 0.45-0.5				3	X				X				
30	BH202 0.95-1.0				2			X						
31	BH202 1.5-1.6				1			X						
32	BH202 2.0-2.1				1			X						
33	BH202 2.45-2.5				1			X						
34	BH202 3.0-3.1				1			X						
35	BH202 3.5-3.6				1			X						
36	BH202 3.9-4.0				1			X						
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

updated coc's
P.T
17/9/18
17:07

CHAIN OF CUSTODY

ALS Laboratory: (Please tick →)

ALS BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

ALS GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5504 E: gladstone@alsglobal.com

ALS MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

ALS TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: samples.townsville@alsglobal.com

ALS NEWCASTLE 5/25 Mailboat Rd Mayfield West NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

ALS PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

ALS SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

ALS WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: samples.wollongong@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact: Yes / No / N/A
PROJECT: 2219573	ALS QUOTE NO.:		Free Ice / Frozen Ice Packs present upon receipt: Yes / No / N/A
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		Other comments:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 4/9/18 1626	DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlabreports. nsl.car		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS — MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price). Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEX/N PAH	Asbestos Presence/Absence	ASS Screening	pH (CEC)			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH202 — 4.5-4.6		S	ASS	1			X				Subcon / Forward Lab / Split WO
38	BH202 — 4.9-5.6			↓	1			X				Lab / Analysis:
39	FD15				1	X						Organised By: Date:
40	BH304 — 0.0-0.2				2	X						Relinquished By: Date:
41	BH304 — 0.2-0.3				2							Concrete / Coarse:
42	BH304 — 0.45-0.5				3	X						WO No:
43	BH304 — 0.95-1.0	Sample	not	received	1							Attach By PO / Internal Sheet:
44	~~[illegible]~~ FD14				1							
45	BH303 — 0.0-0.2				2	X				X		
46	BH303 — 0.2-0.3				2							
47	BH303 — 0.45-0.5				3							
48	BH303 — 0.95-1.0				3							
49	BH303 — 1.5-1.6				2							
50	BH303 — 1.8-1.9			Jar	1							
51	BH303 — 2.0-2.1			ASS	1							
52	BH303 — 2.45-2.5				1							
53	BH303 — 2.95-3.0	Received	labelled	as	1	BH303 — 3.0-3.1						
54	BH303 — 3.5-3.6				1							
				TOTAL								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

Updated COC's
RT
17/9/18
17:00

CHAIN OF CUSTODY
ALS Laboratory: please tick →

✓ NEWCASTLE

CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle			Custody Seal Intact? Yes No N/A
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 (4) 5 6 7 OF: 1 2 3 (4) 5 6 7	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:			Random Sample Temperature on Receipt:
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		Other comment:

		RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	Julian Fowler			
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat				
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		DATE/TIME: 4/9/18 1620	DATE/TIME:	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).									Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN PAH, 8 metals	Asbestos Presence / Absence	ASS Screening		pH, CEC					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
55	BH303_3.9-4.0		S	ASS	1										
56	BH303_4.45-4.5		S	ASS	1										
57	BH303_4.9-5.0	Sample not received		ASS	1										
58	FD13		S	Jar ~~ASS~~	1										
					TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1826547**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 07-Sep-2018 16:18
Order number	:	Date Analysis Commenced	: 18-Sep-2018
C-O-C number	: ----	Issue Date	: 22-Sep-2018 11:49
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 28		
No. of samples analysed	: 11		

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

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

This Certificate of Analysis contains the following information:

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

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- EG035: Positive Hg result for ES1826547 #4 has been confirmed by reanalysis.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity ($H^+ + Al^{3+}$).
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP101_0.0-0.2	TP101_0.5-0.6	TP102_0.0-0.2	TP103_0.0-0.2	TP104_0.0-0.2
			Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826547-001	ES1826547-003	ES1826547-004	ES1826547-007	ES1826547-011
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.0	6.5	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	3.0	----	11.0	5.9	<1.0
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	2.0	0.3	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	0.4	<0.1	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	2.5	0.4	----	----	----
Exchangeable Sodium Percent	----	0.1	%	1.4	2.4	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	<2	----	4	<2	<2
Copper	7440-50-8	5	mg/kg	6	----	61	<5	10
Lead	7439-92-1	5	mg/kg	6	----	16	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	----	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	36	----	38	<5	29
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	0.3	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP101_0.0-0.2	TP101_0.5-0.6	TP102_0.0-0.2	TP103_0.0-0.2	TP104_0.0-0.2
				Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826547-001	ES1826547-003	ES1826547-004	ES1826547-007	ES1826547-011
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	----	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	----	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	----	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**85.2**	----	**79.7**	**78.0**	**77.9**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP101_0.0-0.2	TP101_0.5-0.6	TP102_0.0-0.2	TP103_0.0-0.2	TP104_0.0-0.2
				Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826547-001	ES1826547-003	ES1826547-004	ES1826547-007	ES1826547-011
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2-Chlorophenol-D4	93951-73-6	0.5	%		89.3	----	82.5	82.6	81.9
2.4.6-Tribromophenol	118-79-6	0.5	%		75.9	----	76.7	72.8	65.4
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		99.0	----	90.8	91.0	91.3
Anthracene-d10	1719-06-8	0.5	%		94.1	----	86.5	88.0	87.2
4-Terphenyl-d14	1718-51-0	0.5	%		82.6	----	76.1	75.9	75.9
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		95.1	----	109	103	109
Toluene-D8	2037-26-5	0.2	%		94.6	----	108	98.5	104
4-Bromofluorobenzene	460-00-4	0.2	%		95.9	----	110	103	106

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP105_0.0-0.2	TP105_0.6-0.7	TP106_0.0-0.2	FD20	COMP 4
			Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	18-Sep-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826547-014	ES1826547-016	ES1826547-018	ES1826547-022	ES1826547-027
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.6	6.7	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	<1.0	----	14.9	13.8	5.3
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	No	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	----	----	No	----	----
Asbestos Type	1332-21-4	-	--	----	----	-	----	----
Sample weight (dry)	----	0.01	g	----	----	348	----	----
APPROVED IDENTIFIER:	----	-	--	----	----	C.OWLER	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	0.5	6.9	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	0.2	1.4	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.2	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	0.8	8.4	----	----	----
Exchangeable Sodium Percent	----	0.1	%	3.8	2.0	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	25	20	----
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	----
Chromium	7440-47-3	2	mg/kg	<2	----	5	5	----
Copper	7440-50-8	5	mg/kg	<5	----	194	206	----
Lead	7439-92-1	5	mg/kg	<5	----	246	287	----
Nickel	7440-02-0	2	mg/kg	<2	----	<2	3	----
Zinc	7440-66-6	5	mg/kg	21	----	3130	3740	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP105_0.0-0.2	TP105_0.6-0.7	TP106_0.0-0.2	FD20	COMP 4
				Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	18-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826547-014	ES1826547-016	ES1826547-018	ES1826547-022	ES1826547-027
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Heptachlor	76-44-8	0.05	mg/kg		----	----	----	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		----	----	----	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	----	----	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg		----	----	----	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		----	----	----	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	----	----	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		----	----	----	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		----	----	----	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		----	----	----	----	<0.05
Endrin	72-20-8	0.05	mg/kg		----	----	----	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	----	----	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	----	----	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	----	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	----	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	----	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	----	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	----	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		----	----	----	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	----	----	----	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	----	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP105_0.0-0.2	TP105_0.6-0.7	TP106_0.0-0.2	FD20	COMP 4
				Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	18-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826547-014	ES1826547-016	ES1826547-018	ES1826547-022	ES1826547-027
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	----	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	----	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	----	----	**105**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP105_0.0-0.2	TP105_0.6-0.7	TP106_0.0-0.2	FD20	COMP 4
				Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	06-Sep-2018 00:00	18-Sep-2018 00:00
Compound	CAS Number	LOR	Unit		ES1826547-014	ES1826547-016	ES1826547-018	ES1826547-022	ES1826547-027
					Result	Result	Result	Result	Result
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	----	----	81.8
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	----	----	80.3
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		78.5	----	74.8	74.1	----
2-Chlorophenol-D4	93951-73-6	0.5	%		82.0	----	78.7	77.7	----
2.4.6-Tribromophenol	118-79-6	0.5	%		65.2	----	66.0	65.3	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		91.2	----	87.8	86.8	----
Anthracene-d10	1719-06-8	0.5	%		86.8	----	83.8	81.4	----
4-Terphenyl-d14	1718-51-0	0.5	%		75.7	----	73.2	71.7	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		126	----	113	112	----
Toluene-D8	2037-26-5	0.2	%		119	----	109	104	----
4-Bromofluorobenzene	460-00-4	0.2	%		124	----	108	105	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMP 5	-----	-----	-----	-----
				Client sampling date / time	18-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1826547-028	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**15.1**	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-3	0.05	mg/kg		<0.05	----	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**118**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**87.1**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	COMP 5	-----	-----	-----	-----
				Client sampling date / time	18-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1826547-028	--------	--------	--------	--------	
				Result	----	----	----	----	
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%	**89.9**	----	----	----	----	

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	TP106_0.0-0.2 - 06-Sep-2018 00:00	Mid brown sandy soil

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1826547**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 07-Sep-2018
Order number	:	Date Analysis Commenced	: 18-Sep-2018
C-O-C number	: ----	Issue Date	: 22-Sep-2018
Sampler	: JULIAN FOWLER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 28		
No. of samples analysed	: 11		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1936505)									
ES1826044-014	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.3	6.2	0.00	0% - 20%
ES1827443-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	5.9	5.8	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1937107)									
ES1826044-003	Anonymous	EA055: Moisture Content	----	0.1	%	21.3	20.3	4.94	0% - 20%
ES1826547-007	TP103_0.0-0.2	EA055: Moisture Content	----	0.1	%	5.9	5.7	3.00	No Limit
ED007: Exchangeable Cations (QC Lot: 1941868)									
ES1826044-014	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	5.7	5.7	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	4.6	4.5	0.00	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.7	2.6	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	7.9	7.8	0.00	0% - 20%
ES1827443-004	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	5.7	5.4	5.40	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	1.0	1.0	0.00	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1941966)									
ES1826547-001	TP101_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	7	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 1941966) - continued									
ES1826547-001	TP101_0.0-0.2	EG005T: Lead	7439-92-1	5	mg/kg	6	6	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	36	39	8.69	No Limit
ES1827574-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	11	32.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	9	6	35.1	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	15	17	13.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	7	28.8	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1941965)									
ES1826547-001	TP101_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1827574-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1937046)									
ES1827553-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1937045)									
ES1827553-001	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1937041)									
ES1826547-001	TP101_0.0-0.2	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1937041) - continued									
ES1826547-001	TP101_0.0-0.2	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1936161)									
ES1826044-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1826044-045	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1937040)									
ES1826547-001	TP101_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1936161)									
ES1826044-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1826044-045	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1937040)									
ES1826547-001	TP101_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1936161)									
ES1826044-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1936161) - continued									
ES1826044-001	Anonymous	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1826044-045	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED007: Exchangeable Cations (QCLot: 1941868)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	93.0	76	120
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	94.0	75	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	94.7	80	120
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	92.0	80	120
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1941966)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	96.3	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.7	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	81.5	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	97.3	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	95.5	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	95.1	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	106	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1941965)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	74.3	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1937046)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	103	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1937045)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	87.3	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	89.0	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	101	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.5	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	98.2	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	93.5	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	104	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	106	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	97.3	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	69	115

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 1937045) - continued								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	104	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	104	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	103	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1937041)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	83.2	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	80.8	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	80.6	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	80.8	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	83.3	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	83.3	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	82.3	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	83.1	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	86.0	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	89.9	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	83.9	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	93.7	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	81.6	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	80.0	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	77.7	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	80.5	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	86.2	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1937040)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	104	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	116	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	100	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1936161)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	90.3	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1937040)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	104	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	112	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	105	63	131
EP080: BTEXN (QCLot: 1936161)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	93.5	62	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 1936161) - continued								
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	93.2	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	94.2	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	91.5	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	93.6	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	96.1	63	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 1941966)							
ES1826547-001	TP101_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	101	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	103	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	109	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1941965)							
ES1826547-001	TP101_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	75.7	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1937046)							
ES1827553-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	100.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1937045)							
ES1827553-001	Anonymous	EP068: gamma-BHC	58-89-9	0.5 mg/kg	85.6	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	73.9	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	107	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	107	70	130
		EP068: Endrin	72-20-8	2 mg/kg	93.4	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	80.0	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1937041)							
ES1826547-001	TP101_0.0-0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	105	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	126	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161) - continued							
ES1826044-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	75.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1937040)							
ES1826547-001	TP101_0.0-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	115	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	127	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	129	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1936161)							
ES1826044-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.1	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1937040)							
ES1826547-001	TP101_0.0-0.2	EP071: >C10 - C16 Fraction	----	860 mg/kg	119	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	124	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	118	52	132
EP080: BTEXN (QCLot: 1936161)							
ES1826044-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	77.6	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	78.7	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	82.2	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	79.9	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	84.7	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	81.2	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1826547**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS ALISON MONKLEY	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 07-Sep-2018
Site	:	Issue Date	: 22-Sep-2018
Sampler	: JULIAN FOWLER	No. of samples received	: 28
Order number	:	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
TP101_0.0-0.2, TP101_0.5-0.6, TP105_0.0-0.2, TP105_0.6-0.7	19-Sep-2018	13-Sep-2018	**6**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
TP101_0.0-0.2, TP101_0.5-0.6, TP105_0.0-0.2, TP105_0.6-0.7	**06-Sep-2018**	**19-Sep-2018**	13-Sep-2018	×	**19-Sep-2018**	19-Sep-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
TP101_0.0-0.2, TP102_0.0-0.2, TP103_0.0-0.2, TP104_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2, FD20	**06-Sep-2018**	**----**	----	----	**18-Sep-2018**	20-Sep-2018	✓
Soil Glass Jar - Unpreserved (EA055)							
COMP 4, COMP 5	**18-Sep-2018**	**----**	----	----	**18-Sep-2018**	02-Oct-2018	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag - ACM/Asbestos Grab Bag (EA200)							
TP106_0.0-0.2	**06-Sep-2018**	**----**	----	----	**19-Sep-2018**	05-Mar-2019	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
TP101_0.0-0.2, TP101_0.5-0.6, TP105_0.0-0.2, TP105_0.6-0.7	**06-Sep-2018**	**20-Sep-2018**	04-Oct-2018	✓	**20-Sep-2018**	04-Oct-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
TP101_0.0-0.2,	TP102_0.0-0.2,	**06-Sep-2018**	**20-Sep-2018**	05-Mar-2019	✓	**20-Sep-2018**	05-Mar-2019	✓
TP103_0.0-0.2,	TP104_0.0-0.2,							
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20								
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
TP101_0.0-0.2,	TP102_0.0-0.2,	**06-Sep-2018**	**20-Sep-2018**	04-Oct-2018	✓	**21-Sep-2018**	04-Oct-2018	✓
TP103_0.0-0.2,	TP104_0.0-0.2,							
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20								
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
COMP 4,	COMP 5	**18-Sep-2018**	**18-Sep-2018**	02-Oct-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
COMP 4,	COMP 5	**18-Sep-2018**	**18-Sep-2018**	02-Oct-2018	✓	**19-Sep-2018**	28-Oct-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
TP101_0.0-0.2,	TP102_0.0-0.2,	**06-Sep-2018**	**19-Sep-2018**	20-Sep-2018	✓	**20-Sep-2018**	29-Oct-2018	✓
TP103_0.0-0.2,	TP104_0.0-0.2,							
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
TP101_0.0-0.2,	TP102_0.0-0.2,	**06-Sep-2018**	**18-Sep-2018**	20-Sep-2018	✓	**19-Sep-2018**	20-Sep-2018	✓
TP103_0.0-0.2,	TP104_0.0-0.2,							
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20								
Soil Glass Jar - Unpreserved (EP071)								
TP101_0.0-0.2,	TP102_0.0-0.2,	**06-Sep-2018**	**19-Sep-2018**	20-Sep-2018	✓	**20-Sep-2018**	29-Oct-2018	✓
TP103_0.0-0.2,	TP104_0.0-0.2,							
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
TP101_0.0-0.2, TP102_0.0-0.2, TP103_0.0-0.2, TP104_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2, FD20	**06-Sep-2018**	**18-Sep-2018**	20-Sep-2018	✓	**19-Sep-2018**	20-Sep-2018	✓
Soil Glass Jar - Unpreserved (EP071)							
TP101_0.0-0.2, TP102_0.0-0.2, TP103_0.0-0.2, TP104_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2, FD20	**06-Sep-2018**	**19-Sep-2018**	20-Sep-2018	✓	**20-Sep-2018**	29-Oct-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
TP101_0.0-0.2, TP102_0.0-0.2, TP103_0.0-0.2, TP104_0.0-0.2, TP105_0.0-0.2, TP106_0.0-0.2, FD20	**06-Sep-2018**	**18-Sep-2018**	20-Sep-2018	✓	**19-Sep-2018**	20-Sep-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Exchangeable Cations	ED007	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Exchangeable Cations	ED007	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Exchangeable Cations	ED007	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.

Preparation Methods	Method	Matrix	Method Descriptions
Sample Compositing	* EN020	SOIL	Equal weights of each original soil are taken, then mixed and homogenised. The combined mixture is labelled as a new sample.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	
ORDER NUMBER:			Random Sample Temperature on Receipt: 2 °C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		Other comments:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 7/9/18 1620	DATE/TIME: 7/9/18 4:17pm
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY:	RECEIVED BY: MC
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME: 7/9/18 7:50p

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	LAB OF ORIGIN: NEWCASTLE	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP101	6/9/18	S	Jar, B	2		Please hold
2	TP101				2		
3	TP101				2		
4	TP102				2		
5	TP102				2		
6	TP102			Jar	1		
7	TP103			Jar, B	2		
8	TP103				2		
9	TP103			Jar	1		
10	TP103			Jar	1		
11	TP104			Jar, B	2		
12	TP104			Jar, B	2		
13	TP104			Jar	1		
14	TP105			Jar, B	2		
15	TP105				2		
16	TP105				2		
17	TP105			Jar	1		
18	TP106			Jar, B	2		
				TOTAL			

E-MAILED

Environmental Division
Sydney
Work Order Reference
ES1826547

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE: Newcastle		
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:		
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes / No / N/A
Preservation Requirements Received? Yes / No / N/A
Receipt Sample Temperature on Receipt: °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler			AM
DATE/TIME: 7/9/18 1620	DATE/TIME:	DATE/TIME:	DATE/TIME: 7/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	TP106	6/9/18	S	Jar, B	2		Please hold
20	TP106			Jar, B	2		
21	TP106			Jar	1		
22	FD20			Jar	1		
23	FD21			Jar	1		
24	FD22			Jar	1		
25	TP106-0.75-0.8			Extra			
26	TP106-1.2-1.25						
					TOTAL		

E-MAIL

LAB OF ORIGIN: NEWCASTLE

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circled)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999		
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	RELINQUISHED BY: Julian Fowler	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	DATE/TIME: 7/9/18 1620	DATE/TIME: 7/9/18 4:17pm
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		DATE/TIME:	DATE/TIME: 7/9/18 7:50pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	LAB OF ORIGIN: NEWCASTLE	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP101 -0.0-0.2	6/9/18	S	Jar, B	2		Please hold
2	TP101 -0.2-0.3				2	E-MAILED	
3	TP101 -0.5-0.6				2		
4	TP102 -0.0-0.2				2		
5	TP102 -0.2-0.3				2		
6	TP102 -0.5-0.6			Jar	1		
7	TP103 -0.0-0.2			Jar, B	2		
8	TP103 -0.2-0.3				2		
9	TP103 -0.5-0.6			Jar	1		
10	TP103 -1.0-1.1			Jar	1		
11	TP104 -0.0-0.2			Jar, B	2		
12	TP104 -0.2-0.3			Jar, B	2		
13	TP104 -0.55-0.6			Jar	1		
14	TP105 -0.0-0.2			Jar, B	2		
15	TP105 -0.2-0.3				2		
16	TP105 -0.6-0.7				2		
17	TP105 -1.0-1.1			Jar	1		
18	TP106 -0.0-0.2			Jar, B	2		
				TOTAL			

Environmental Division Sydney
Work Order Reference
ES1826547

Telephone : +61-2-8784 8555

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : ☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY: (Circle)
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Security Seal Intact: Yes / No / N/A
PROJECT: 2219573	ALS QUOTE NO.:	Free ice / frozen ice bricks present upon receipt: Yes / No
ORDER NUMBER:		Initial cooler temperature on Receipt: °C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	Final cooler temperature on Receipt: °C
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181	Other Comments:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat	
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, ntl.car		
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com		

COC SEQUENCE NUMBER (Circle)
COC: 1 (2) 3 4 5 6 7
OF: 1 (2) 3 4 5 6 7

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler			ML
DATE/TIME: 7/9/18 1620	DATE/TIME:	DATE/TIME:	DATE/TIME: 7/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	TP106 0.2_0.5	6/9/18	S	Jar, B	2		Please hold
20	TP106_0.5_0.6			Jar, B	2		
21	TP106 _0.6-0.7			Jar	1		
22	FD20			Jar	1		
23	FD21			Jar	1		
24	FD22			Jar	1		
25	TP106 - 0.75_0.8			Extra			
26	TP106_1.2_1.25						
				TOTAL			

E-MAILED

LAB OF ORIGIN: NEWCASTLE

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Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

updated COC's 17/9/18 17:00

P. 1

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CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE: Newcastle	
PROJECT: 2219573	ALS QUOTE NO.:
ORDER NUMBER:	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7 OF: 1 (2) 3 4 5 6 7
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, nll.car	
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com	

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No (N/A)
Free ice / frozen ice bricks present upon receipt? Yes No (N/A)
Random Sample Temperature on Receipt: 2 °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler	[signature]		
DATE/TIME: 7/9/18 1620	DATE/TIME: 7/9/18 4:17pm	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Asbestos / Newcastle

ALS USE: LAB ID	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W): SAMPLE ID	DATE / TIME	MATRIX	CONTAINER INFORMATION: TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN, PAH, 8 metals	Asbestos / presence/absence	[scribbled out]	Comp 4 (OCP, PCB)	Comp 5 (OCP, PCB)	pH, CEC			Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP101_0.0-0.2	6/9/18	S	Jar, B	2	X			X		X			Please hold
2	TP101 0.2-0.3	↓	↓	↓	2									
3	TP101_0.5-0.6				2					X	X			
4	TP102_0.0-0.2				2	X			[scribbled out]					
5	TP102 0.2-0.3				2									
6	TP102_0.5-0.6			Jar	1									
7	TP103_0.0-0.2			Jar, B	2	X			X					
8	TP103 0.2-0.3			↓	2									
9	TP103_0.5-0.6			Jar	1					X				
10	TP103_1.0-1.1			Jar	1									
11	TP104_0.0-0.2			Jar, B	2	X								
12	TP104_0.2-0.3			Jar, B	2									
13	TP104_0.55-0.6			Jar	1									
14	TP105_0.0-0.2			Jar, B	2	X			X		X			
15	TP105_0.2-0.3			↓	2					[scribbled out]				
16	TP105_0.6-0.7			↓	2					X	X			
17	TP105_1.0-1.1			Jar	1									
18	TP106_0.0-0.2	↓	↓	Jar, B	2	X	X		X					
				TOTAL										

Subcon / Forward Lab / Split WO
Lab / Analysis: ______
Organised By / Date: ______
Relinquished By / Date: ______
Connote / Courier: ______
WO No: ______
Attach By PO / Internal Sheet ______

Environmental Division
Sydney
Work Order Reference
ES1826547

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

21/9 Updated COCS 17/9/18 17:02

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE: Unit 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: samples.adelaide@alsglobal.com

BRISBANE: 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

MACKAY: 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE: 24 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

NEWCASTLE: 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

ORANGE: 4/13 Gray Place North Orange NSW 2800 Ph: 02 4302 2061 E: orange@alsglobal.com

PERTH: 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY: 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE: Unit 15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG: 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: 2219573	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 1 (2) 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Alison Monkley	CONTACT PH: 49799999	OF: 1 (2) 3 4 5 6 7	Other comments:
SAMPLER: Julian Fowler	SAMPLER MOBILE: 0466049181		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to (will default to PM if no other addresses are listed): Alison, ghdlab reports, nill car			
Email Invoice to (will default to PM if no other addresses are listed): ap-fss@ghd.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Julian Fowler			
DATE/TIME: 7/9/18 1620	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEX/N, PAH / 8 metals	Asbestos/Presence/Absence		"Comp 4" (OCP & PCB)	"Comp 5" (OCP & PCB)	pH, CEC		
19	TP106_0.2-0.3	6/9/18	S	Jar, B	2								Please hold
20	TP106_0.6-0.7			Jar, B	2					X			
21	TP106_0.75-0.8			Jar	1								
22	FD20			Jar	1	X							
23	FD21			Jar	1								
24	FD22			Jar	1								
20	TP106_0.5-0.6												
25	TP106_0.75-0.8			Ex trm									
26	TP106_1.2-1.25												
					TOTAL								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1826738**	Page	: 1 of 4
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BRIAN OBERDORF	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 11-Sep-2018 08:37
Order number	: 2219573	Date Analysis Commenced	: 12-Sep-2018
C-O-C number	: ----	Issue Date	: 26-Sep-2018 18:38
Sampler	: D.COOPER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP103 0.5-0.6M	TP103 1.0-1.1M	BH303 2.5-2.95M	BH304 0.5-0.95M	BH302 4.0-4.45M
			Client sampling date / time	06-Sep-2018 00:00	06-Sep-2018 00:00	03-Sep-2018 00:00	03-Sep-2018 00:00	30-Aug-2018 00:00
Compound	CAS Number	LOR	Unit	ES1826738-001	ES1826738-002	ES1826738-003	ES1826738-004	ES1826738-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.5	5.7	6.2	5.6	5.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	41	106	116	24	60
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	28.4	14.6	18.8	7.8	32.6
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	460	130	60	10	80
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	30	20	320	20	130

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BHA302 1.0-1.45M	BH201 4.0-4.45M	-----	-----	-----
			Client sampling date / time	30-Aug-2018 00:00	03-Sep-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1826738-006	ES1826738-008	--------	--------	--------
				Result	Result	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**4.5**	**5.8**	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**84**	**21**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**18.1**	**18.7**	----	----	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**100**	**20**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**40**	**20**	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1826738**	Page	: 1 of 3
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BRIAN OBERDORF	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 11-Sep-2018
Order number	: 2219573	Date Analysis Commenced	: 12-Sep-2018
C-O-C number	: ----	Issue Date	: 26-Sep-2018
Sampler	: D.COOPER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1926568)									
ES1826782-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.3	6.3	0.00	0% - 20%
ES1826738-001	TP103 0.5-0.6M	EA002: pH Value	----	0.1	pH Unit	6.5	6.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 1926570)									
ES1826782-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	50	53	6.41	0% - 20%
ES1826738-001	TP103 0.5-0.6M	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	41	40	4.44	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1927153)									
ES1826724-024	Anonymous	EA055: Moisture Content	----	0.1	%	4.7	5.1	8.58	No Limit
ES1826738-008	BH201 4.0-4.45M	EA055: Moisture Content	----	0.1	%	18.7	18.6	0.00	0% - 20%
ED040S: Soluble Major Anions (QC Lot: 1926569)									
ES1826782-003	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	20	30	0.00	No Limit
ES1826738-001	TP103 0.5-0.6M	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	460	500	9.28	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 1926571)									
ES1826807-003	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	620	620	0.00	0% - 20%
ES1826738-001	TP103 0.5-0.6M	ED045G: Chloride	16887-00-6	10	mg/kg	30	40	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010: Conductivity (1:5) (QCLot: 1926570)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	96.4	92	108
ED040S: Soluble Major Anions (QCLot: 1926569)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	150 mg/kg	98.5	80	120
ED045G: Chloride by Discrete Analyser (QCLot: 1926571)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	50 mg/kg	110	75	125
				<10	5000 mg/kg	101	79	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 1926571)							
ES1826738-001	TP103 0.5-0.6M	ED045G: Chloride	16887-00-6	1250 mg/kg	118	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1826738**	Page	: 1 of 5
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR BRIAN OBERDORF	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 11-Sep-2018
Site	:	Issue Date	: 26-Sep-2018
Sampler	: D.COOPER	No. of samples received	: 7
Order number	: 2219573	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Snap Lock Bag BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	12-Sep-2018	10-Sep-2018	**2**	----	----	----
Snap Lock Bag BH302 4.0-4.45M,	BHA302 1.0-1.45M	12-Sep-2018	06-Sep-2018	**6**	----	----	----
EA010: Conductivity (1:5)							
Snap Lock Bag BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	12-Sep-2018	10-Sep-2018	**2**	----	----	----
Snap Lock Bag BH302 4.0-4.45M,	BHA302 1.0-1.45M	12-Sep-2018	06-Sep-2018	**6**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Snap Lock Bag (EA002) BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	**03-Sep-2018**	**12-Sep-2018**	10-Sep-2018	×	**12-Sep-2018**	12-Sep-2018	✓
Snap Lock Bag (EA002) TP103 0.5-0.6M,	TP103 1.0-1.1M	**06-Sep-2018**	**12-Sep-2018**	13-Sep-2018	✓	**12-Sep-2018**	12-Sep-2018	✓
Snap Lock Bag (EA002) BH302 4.0-4.45M,	BHA302 1.0-1.45M	**30-Aug-2018**	**12-Sep-2018**	06-Sep-2018	×	**12-Sep-2018**	12-Sep-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010: Conductivity (1:5)								
Snap Lock Bag (EA010) BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	**03-Sep-2018**	**12-Sep-2018**	10-Sep-2018	×	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (EA010) TP103 0.5-0.6M,	TP103 1.0-1.1M	**06-Sep-2018**	**12-Sep-2018**	13-Sep-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (EA010) BH302 4.0-4.45M,	BHA302 1.0-1.45M	**30-Aug-2018**	**12-Sep-2018**	06-Sep-2018	×	**12-Sep-2018**	10-Oct-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Snap Lock Bag (EA055) BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	**03-Sep-2018**	**----**	----	----	**12-Sep-2018**	17-Sep-2018	✓
Snap Lock Bag (EA055) TP103 0.5-0.6M,	TP103 1.0-1.1M	**06-Sep-2018**	**----**	----	----	**12-Sep-2018**	20-Sep-2018	✓
Snap Lock Bag (EA055) BH302 4.0-4.45M,	BHA302 1.0-1.45M	**30-Aug-2018**	**----**	----	----	**12-Sep-2018**	13-Sep-2018	✓
ED040S : Soluble Sulfate by ICPAES								
Snap Lock Bag (ED040S) BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	**03-Sep-2018**	**12-Sep-2018**	01-Oct-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (ED040S) TP103 0.5-0.6M,	TP103 1.0-1.1M	**06-Sep-2018**	**12-Sep-2018**	04-Oct-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (ED040S) BH302 4.0-4.45M,	BHA302 1.0-1.45M	**30-Aug-2018**	**12-Sep-2018**	27-Sep-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
ED045G: Chloride by Discrete Analyser								
Snap Lock Bag (ED045G) BH303 2.5-2.95M, BH201 4.0-4.45M	BH304 0.5-0.95M,	**03-Sep-2018**	**12-Sep-2018**	01-Oct-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (ED045G) TP103 0.5-0.6M,	TP103 1.0-1.1M	**06-Sep-2018**	**12-Sep-2018**	04-Oct-2018	✓	**12-Sep-2018**	10-Oct-2018	✓
Snap Lock Bag (ED045G) BH302 4.0-4.45M,	BHA302 1.0-1.45M	**30-Aug-2018**	**12-Sep-2018**	27-Sep-2018	✓	**12-Sep-2018**	10-Oct-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chloride Soluble By Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chloride Soluble By Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride Soluble By Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride Soluble By Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: Belmont Temporary Desalination Plant	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 2219573		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 12.1°C
PROJECT MANAGER: Brian Oberdorf	CONTACT PH:	OF: 1 2 3 4 5 6 7	Other comments:
SAMPLER: D. Cooper	SAMPLER MOBILE:0402 375 525	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	*Demetrius Cooper*	
Email Reports to demetrius.cooper@ghd.com		DATE/TIME: 11/09/18	DATE/TIME: 11/9/18 8-36am
Email Invoice to (will default to PM if no other addresses are listed):			

RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	Aggressivity Suite (EC, PH, Sulphur, Cl	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	TP103, 0.5 - 0.6m,	6/09/2018	S	B	1	x	
	TP103, 1.0 - 1.1 m	6/09/2018	S	B	1	x	
	BH303, [redacted] 2.5-2.95	3/09/2018	S	B	1	x	
	BH304, 0.5 - 0.95m	3/09/2018	S	B	1	x	
	BH302, 4.0 - 4.45 m, [redacted]	30/08/2018	S	B	1	x	
	BHA302, 1.0-1.45 m	30/08/2018	S	B	1	x	
	BH202, 2.5 - 2.95 m	3/09/2018	S	B	1	x	
	BH201, 4.0 - 4.45 m	3/09/2018	s	B	1	x	
				TOTAL	8	8	

Environmental Division
Sydney
Work Order Reference
ES1826738

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE: Newcastle		
PROJECT: Belmont Temporary Desalination Plant	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER: 2219573		
PROJECT MANAGER: Brian Oberdorf	CONTACT PH:	
SAMPLER: D. Cooper	SAMPLER MOBILE:0402 375 525	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	
Email Reports to demetrius.cooper@ghd.com		
Email Invoice to (will default to PM if no other addresses are listed):		

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 13.0 °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Demetrius Cooper			MC
DATE/TIME: 11/09/18	DATE/TIME: 11/9/18 8-36am	DATE/TIME:	DATE/TIME: 11/9/18

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Aggressivity Suite (EC, PH, Sulphur, Cl	
1	TP103, 0.5 - 0.6m,	6/09/2018	S	B	1	x	
2	TP103, 1.0 - 1.1 m	6/09/2018	S	B	1	x	
3	BH303, [redacted] 2.5-2.95	3/09/2018	S	B	1	x	
4	BH304, 0.5 - 0.95m	3/09/2018	S	B	1	x	
5	BH302, 4.0 - 4.45 m, [redacted]	30/08/2018	S	B	1	x	
6	BHA302, 1.0-1.45 m	30/08/2018	S	B	1	x	
7	BH202, 2.5 - 2.95 m -SNR P.T 11/9/18	3/09/2018	S	B	1	x	
8	BH201, 4.0 - 4.45 m	3/09/2018	s	B	1	x	
				TOTAL	8	8	

E-MAILED

LAB OF ORIGIN: NEWCASTLE

Environmental Division Sydney
Work Order Reference
ES1826738

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1827112**	Page	: 1 of 2
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DEMETRIUS COOPER	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 13-Sep-2018 13:23
Order number	: 2219573	Date Analysis Commenced	: 14-Sep-2018
C-O-C number	: ----	Issue Date	: 26-Sep-2018 18:36
Sampler	: DEMETRIUS COOPER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH202 2.5-2.95M	----	----	----	----
				Client sampling date / time	03-Sep-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1827112-001	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**5.0**	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**90**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**21.2**	----	----	----	----
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**120**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**20**	----	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1827112**	Page	: 1 of 3
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DEMETRIUS COOPER	Contact	: Brenda Hong
Address	: PO BOX 5403 NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 13-Sep-2018
Order number	: 2219573	Date Analysis Commenced	: 14-Sep-2018
C-O-C number	: ----	Issue Date	: 26-Sep-2018
Sampler	: DEMETRIUS COOPER		
Site	:		
Quote number	: EN/005/18		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 1938769)									
ES1827179-010	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.6	7.5	1.32	0% - 20%
ES1826826-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.9	7.8	1.65	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 1938770)									
ES1827179-010	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	531	438	19.2	0% - 20%
ES1826826-002	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	279	328	16.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1931161)									
ES1827143-001	Anonymous	EA055: Moisture Content	----	0.1	%	26.8	26.7	0.394	0% - 20%
ED040S: Soluble Major Anions (QC Lot: 1938771)									
ES1827490-002	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	70	70	0.00	No Limit
ES1827105-001	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	50	70	31.3	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 1938772)									
WN1805183-003	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	2.09 %	21000	0.354	0% - 20%
ES1827105-001	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	70	70	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010: Conductivity (1:5) (QCLot: 1938770)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	105	92	108
ED040S: Soluble Major Anions (QCLot: 1938771)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	750 mg/kg	94.6	80	120
ED045G: Chloride by Discrete Analyser (QCLot: 1938772)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	50 mg/kg	99.5	75	125
				<10	5000 mg/kg	104	79	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 1938772)							
ES1827105-001	Anonymous	ED045G: Chloride	16887-00-6	1250 mg/kg	117	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1827112**	Page	: 1 of 4
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DEMETRIUS COOPER	Telephone	: (02) 8784 8504
Project	: 2219573	Date Samples Received	: 13-Sep-2018
Site	:	Issue Date	: 26-Sep-2018
Sampler	: DEMETRIUS COOPER	No. of samples received	: 1
Order number	: 2219573	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Snap Lock Bag BH202 2.5-2.95M	19-Sep-2018	10-Sep-2018	**9**	----	----	----
EA010: Conductivity (1:5)						
Snap Lock Bag BH202 2.5-2.95M	19-Sep-2018	10-Sep-2018	**9**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Snap Lock Bag (EA002) BH202 2.5-2.95M	**03-Sep-2018**	**19-Sep-2018**	10-Sep-2018	×	**19-Sep-2018**	19-Sep-2018	✓
EA010: Conductivity (1:5)							
Snap Lock Bag (EA010) BH202 2.5-2.95M	**03-Sep-2018**	**19-Sep-2018**	10-Sep-2018	×	**19-Sep-2018**	17-Oct-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Snap Lock Bag (EA055) BH202 2.5-2.95M	**03-Sep-2018**	**----**	----	----	**14-Sep-2018**	17-Sep-2018	✓
ED040S : Soluble Sulfate by ICPAES							
Snap Lock Bag (ED040S) BH202 2.5-2.95M	**03-Sep-2018**	**19-Sep-2018**	01-Oct-2018	✓	**19-Sep-2018**	17-Oct-2018	✓
ED045G: Chloride by Discrete Analyser							
Snap Lock Bag (ED045G) BH202 2.5-2.95M	**03-Sep-2018**	**19-Sep-2018**	01-Oct-2018	✓	**19-Sep-2018**	17-Oct-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chloride Soluble By Discrete Analyser	ED045G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chloride Soluble By Discrete Analyser	ED045G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride Soluble By Discrete Analyser	ED045G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride Soluble By Discrete Analyser	ED045G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☒ Standard TAT (List due date):
OFFICE: Newcastle, NSW		☐ Non Standard or urgent TAT (List due date):
PROJECT: 2219573 - Belmont Temporary Desalination Plant	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER: 2219573		
PROJECT MANAGER:	CONTACT PH:	
SAMPLER: D. Cooper	SAMPLER MOBILE: 0402 375 525	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	
Email Reports to demetrius.cooper@ghd.com		
Email Invoice to (will default to PM if no other addresses are listed):		

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / Frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 4.2 °C

Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
D.Cooper			MC
DATE/TIME: 13/09/18	DATE/TIME: 13/9/18 1.22pm	DATE/TIME:	DATE/TIME: 13/9/18 7:30pm

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Aggressivity Suite (EC, PH, CL Sulfate)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	BH202, 2.5 - 2.95m	3/09/2018	S	B	1	1							
				TOTAL	1	1							

E-MAILED

LAB OF ORIGIN: NEWCASTLE

Environmental Division Sydney

Work Order Reference

ES1827112

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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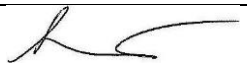
https://projects.ghd.com/oc/newcastle1/cs0865hwctemporaryde/Delivery/Documents/2219573_REP_Contamination Assessment Report.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E Griffin	A Monkley		N Malcolm		11/10/2019
1	E Griffin	A Monkley		N Malcolm		05/11/2019

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