# $Appendix \ H-\textbf{Contamination Assessment}$



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# **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
На	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<sub>10</sub>-C<sub>36</sub> 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	Туре	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					

		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

Potential Contaminants of

Description

Source

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	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.	<ul> <li>The objectives of the investigations were to:</li> <li>Understand the potential contamination issues within the proposal area</li> <li>Provide recommendations for management and/or remediation to be implemented during construction</li> </ul>
Step 3. Identify Information Inputs. Identify data and information needed to answer study questions.	<ul> <li>Data inputs for the proposal include:</li> <li>Previous investigations undertaken</li> <li>Desktop review of available information regarding the Site</li> <li>Soil sampling undertaken as part of this investigation</li> </ul>
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 ElLs.
- 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.

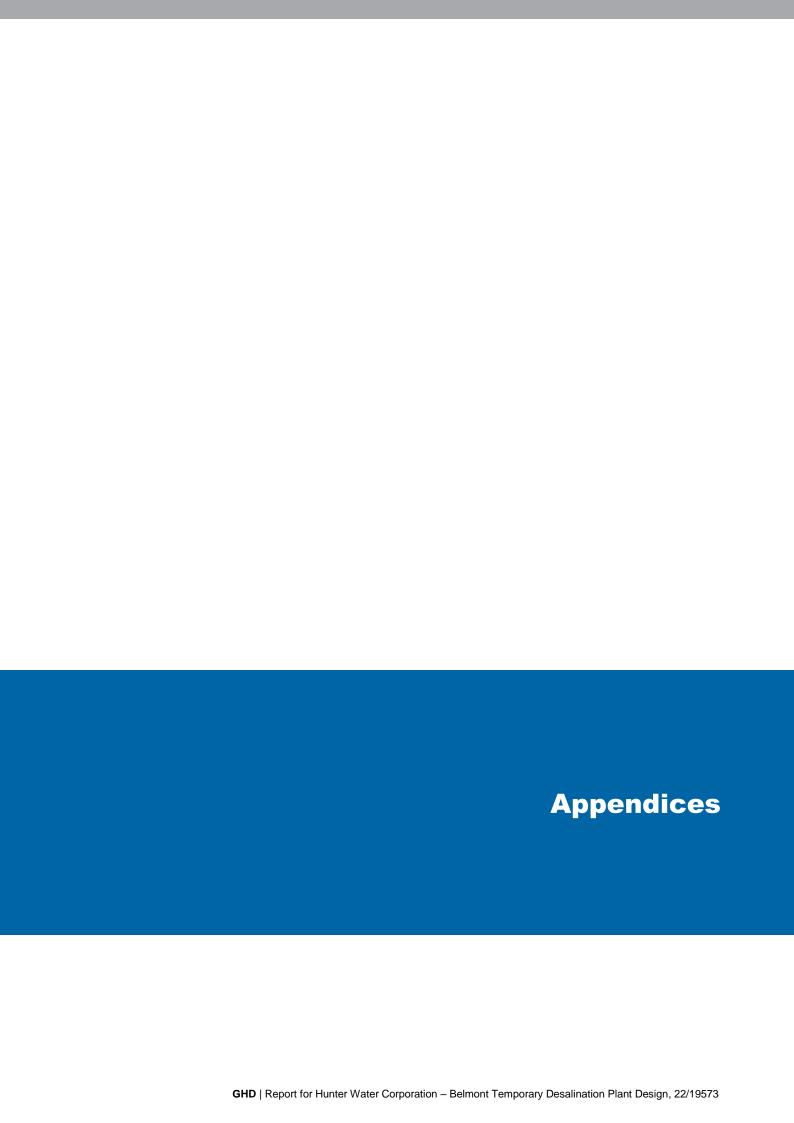
NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, 2015.

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.

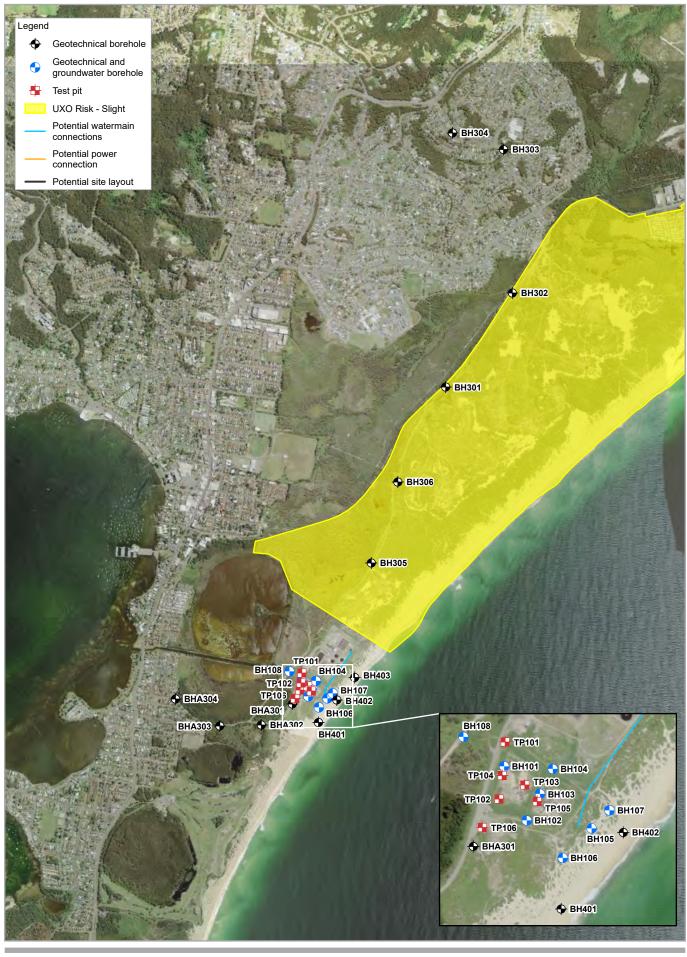
OEH (2011) Office of Environment and Heritage, Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.

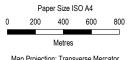
RCA, 2002, Upgrade of Belmont WWTW, Document Reference 566b-033/0.

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



# Appendix A – Figures





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



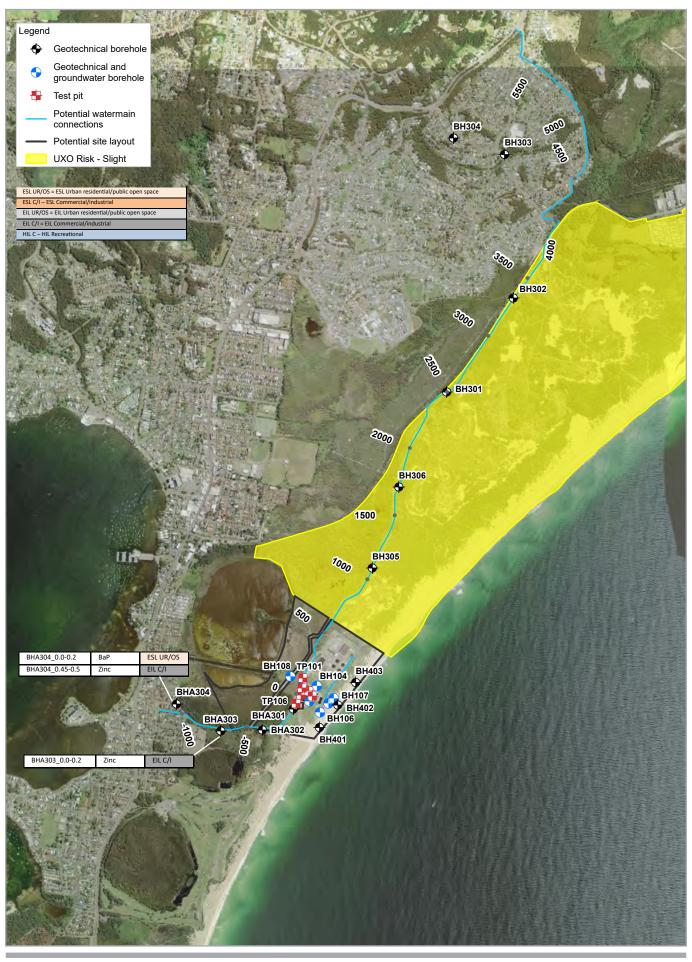
Hunter Water Corporation Belmont Temporary Desalination Plant Contamination Assessment Report

Geotechnical and contamination test locations

Project No. **22-19573** Revision No. **0** 

Date 01/10/2019

Figure 1





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





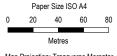
Hunter Water Corporation Belmont Temporary Desalination Plant Contamination Assessment Report

Potable water pipeline area Test locations with results above assessment criteria Project No. **22-19573** Revision No. **0** 

Date 01/10/2019

Figure 2a





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





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

# Appendix B - Borelogs

Client: **Hunter Water Corporation HOLE No. BH301** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 376642.0 E 6344656.0 N Surface RL: Angle from Horiz.: 90° Processed: RCO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 30/8/2018** Date Completed: 30/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, Silty SAND, dark grey, fine to coarse grained, with fine to coarse, sub-rounded to sub-angular gravel, trace coal D Dx3 D-M Dx2 fragments, (fill). 0.40m, becoming brown, gravel becoming fine to medium. Dx3 D 0.70 SPT 25 SW SAND, grey, fine to coarse grained, (marine/estuarine?). D-M VD GEO for 20mm N=ref Dx3 SPT 11/14/14 N=28 Ď 2 2.1m D W AD/T Ħ D MD 2.70 D SM Silty SAND, dark brown, fine to coarse grained, MD W SPT (marine/estuarine?). 2/4/7 3 N=11 3.50 SW SAND, grey, fine to coarse grained, trace of silt, W MD D (marine/estuarine?). D SPT 3/5/9 N=14 D 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions

Client: **Hunter Water Corporation HOLE No. BH302** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW TEMPLATE Position: 377119.0 E 6345329.0 N Surface RL: Angle from Horiz.: 90° Processed: RCO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 30/8/2018** Date Completed: 30/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO ote: \* indicates signatures on origin issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, weathering, strength FILL, Sandy GRAVEL, brown, fine to coarse grained, D Dx3 0.20 sub-rounded to sub-angular, sand is fine to coarse grained, D Dx2 with silt, (fill) 0.50 FILL, SAND, dark grey to black, fine to coarse grained, trace M Dx3 SW of fine to medium grained, sub-rounded to sub-angular D М gravel, trace of coal fragments, (fill). SAND, grey, fine to coarse grained, trace of dark brown GEO SPT clayey sand lenses (<10mm thick), (marine/estuarine?). 6/4/6 N=10 Dx2 D 1.30m, becoming pale grey, no clayey sand lenses. D-M SPT 1.45m, becoming dark grey, trace of silt. 6/9/9 N=18 1.90m, becoming grey, no silt. 2 ח AD/T \_<u>▽</u> 2.45m 2.40m, becoming pale grey, trace of silt. MD Ħ D W D SPT 3/3/4 3 2.95m, becoming grey. D D CL CLAY, dark grey, low plasticity, with fine to coarse grained D sand, (estuarine). SPT 2/3/4 4.45m, PP on SPT sample = 40 -D 100kPa 5.00 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Client: **Hunter Water Corporation HOLE No. BH303** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW TEMPLATE Position: 377056.0 E 6346354.0 N Surface RL: Angle from Horiz.: 90° Processed: RCO Rig Type: Mounting: Truck Contractor: Total Drilling Pty Ltd Driller: M. Sawyer Checked: Scout **Date Started: 3/9/2018** Date Completed: 3/9/2018 Logged by: D. Cooper Date: 20/09/2018 GEO te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, weathering, strength Water FILL, Sandy GRAVEL, brown, fine to coarse, sub-rounded to D-M Dx3 0.20 sub-angular, sand is fine to coarse grained, with silt, (fill). М Dx2 FILL, CLAY, mottled brown, grey and black, low plasticity (w>PL), (fill). Dx2 0.40m, becoming trace of fine to coarse grained sand. 0.5m, PP on SPT 0.70 Sample = 150 - 170 FILL, CLAY, brown mottled orange brown and black, low М GEO SPT plasticity, (w>PL), trace of fine to coarse grained, sub-rounded gravel, trace of fine to coarse grained sand, 4/4/4 N=8 trace charcoal, (fill). Dx3 D SPT 3/4/3 N=71.80 CL CLAY, dark grey, low plasticity, (w>PL), trace of fine, F-St D 2 sub-rounded gravel, trace fine to coarse grained sand, Dx2 AD/T Ħ D 2.5m, PP on SPT Sample = 70-120 kPa D 2.80-2.85m, Clayey SAND lens. SPT 3/3/4 3 N=7 3.5m 3.50m, becoming trace of Sandy GRAVEL bands, with silt, W VS D generally less than 20mm thick, w>LL. D 4.0m, PP on SPT Sample = 10-20 kPa D SPT 3/3/3 N=6 5.00 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Client: **Hunter Water Corporation HOLE No. BH304** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW Position: 376691.0 E 6346471.0 N Angle from Horiz.: 90° Processed: HAL Surface RL: Rig Type: Mounting: Truck Contractor: Total Drilling Pty Ltd Driller: M. Sawyer Checked: AWJ Scout **Date Started: 3/9/2018** Date Completed: 3/9/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, weathering, strength FILL, Silty SAND, grey, fine to coarse grained, (fill). 0.10 D Dx3 FILL, Sandy GRAVEL, orange brown, fine to coarse grained, D 0.30 Dx2 sub-rounded, with silt, sand is fine to coarse grained, trace SW VD D coal fragments, (fill/disturbed). 0 Dx3 Gravelly SAND, orange brown, fine to coarse grained, gravel is fine to coarse grained, sub-rounded, with clay, (residual). 0 AD/V ⋽ GEO SPT 0.90 GW Sandy GRAVEL, orange brown, fine to coarse, sub-rounded, D VD 16/15/25 00 sand is fine to coarse grained, with silt, trace of clay, 00 for (extremely weathered conglomerate). 145mm 000 DB 00 N=ref 00 SPT 10 for End of borehole at 1.65 metres. 50mm DB 2 8 blows N=ref 3 4 5 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations

& basis of descriptions



Client: **Hunter Water Corporation HOLE No. BH305** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 376112.0 E 6343400.0 N Surface RL: Angle from Horiz.: 90° Processed: HAL Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 14/8/2018** Date Completed: 14/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, Silty SAND, dark brown-black, fine to coarse grained, М Dx4 trace of fine to medium grained, sub-rounded gravel, (fill). Dx3 0.48 SW SAND, pale yellow brown, fine to coarse grained, (aeolian). MD Μ \_\_\_\_ 0.60m W GEO SPT 5/5/7 N=12 D SPT 3/3/4 N=7 170 ML SILT, dark brown, low plasticity, abundant organics, strong S organic odour, (peat). 1, 11, 2 D SW SAND, grey, fine to coarse grained, trace of silt, MD (marine/estuarine?). AD/T Ħ D 2.50m, becoming trace of shell fragments. SPT 3/4/6 3 N=10 D МD 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions

Client: **Hunter Water Corporation HOLE No. BH306** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW Position: 376301.0 E 6343979.0 N Surface RL: Angle from Horiz.: 90° Processed: HAL Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 30/8/2018** Date Completed: 30/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ ote: \* indicates signatures on origin issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, Sandy GRAVEL, brown to dark grey, fine to coarse D Dx3 0.20 grained, sub-rounded to sub-angular, with silt, sand is fine to SW 0.30 D Dx2 coarse grained, trace of coal fragments, (fill). SW D-M MD SAND, dark grey, fine to coarse grained, trace of silt Dx3 ,(topsoil). SAND, pale yellow brown, fine to coarse grained, (aeolian). GEO SPT 1.00 6/5/7 SW SAND, grey, fine to coarse grained, (marine/estuarine?). D-M MD N=12 D D SPT 4/4/5 N=9 2 D 2.40m AD/T W Ħ D 2.65 ML Sandy SILT, dark brown, low plasticity, abundant organics, W VS-D s (estuarine). SPT 1/1/0 3 N=1 SW SAND, grey to dark grey, fine to coarse grained, with silt, W MD-(marine/estuarine?). D D 4.30m, becoming grey, trace of silt. 6/10/11 N=21 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. BHA301** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375548.0 E 6342393.0 N Surface RL: Angle from Horiz.: 90° Processed: HAL Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 14/8/2018** Date Completed: 14/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, Silty SAND, brown to pale grey, fine to coarse grained, 0.03 D Dx3 trace fine to medium grained, sub-rounded gravel, trace coal D 0.30 Dx2 chitter, (fill). SW MD D-M SAND, pale grey to pale yellow brown, fine to coarse grained, trace rootlets, trace silt, (topsoil). Dx3 SAND, pale yellow to brown, fine to coarse grained, (aeolian). GEO SPT 2/4/3 N=7 D D SPT SW SAND, grey, fine to coarse grained, with silt, М MD 2/2/3 (marine/estuarine?) N=5 D 2 D 2.20m, becoming brown, trace of silt. W 2.40m AD/T Ħ D D SPT 2/3/3 3 N=6 3.50 SW D-VD SAND, pale grey, fine to coarse grained, trace of shells, W D (marine/estuarine?). D N=29 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. BHA302** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 TEMPLATE.GDT Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ ote: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, SAND, grey, fine to coarse grained, with fine to coarse grained, sub-rounded to sub-angular gravel, with silt, D Dx3 0.20 SW М MD Dx2 ∖(alluvium). 0.45 0.40m SAND, brown, fine to coarse grained, with silt, W Dx3 SW (marine/estuarine?). SAND, grey to brown, fine to coarse grained, trace of silt, GEO trace of fine grained, sub-rounded gravel, SPT (marine/estuarine?). 4/4/4 N=8 D D SPT 2/3/3 N=6 1.90m, becoming grey. 2 D AD/T Ħ D MD-D SPT 3/6/7 3 N=13 D D 4/8/7 N=15 D 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions

Client: **Hunter Water Corporation HOLE No. BHA303** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW Position: 375030.0 E 6342235.0 N Surface RL: Angle from Horiz.: 90° Processed: MAG Contractor: Total Drilling Pty Ltd Rig Type: Mounting: Truck Driller: M. Sawyer Checked: AWJ Scout **Date Started: 3/9/2018** Date Completed: 3/9/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ ote: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, Water weathering, strength FILL, Clayey SAND, brown, fine to coarse grained (fill). М Dx3 0.10m, becoming with fine to coarse grained, sub-rounded to sub-angular gravel. Dx2 0.40 0.20-0.30m, concrete across entirety of hole. SW MD 0.5m М Dx3 SAND, grey, fine to coarse grained, trace of silt, (marine/estuarine?). GEO 0.80m, becoming pale yellow brown to grey. SPT 4/3/4 N=7 D D SPT 3/3/4 1.50m, becoming grey. 2 D AD/T Ħ D D SPT 2/3/6 3 N=9 D D D 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. BHA304** Project: Belmont Temporary Desalination Plant SHEET 1 OF 1 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ te: \* indicates signatures on origi issue of log or last revision of log **DRILLING MATERIAL** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Observations SOIL TYPE, colour, structure, minor components (origin), **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log and SCALE (m) ROCK TYPE, colour, grain size, structure, weathering, strength Water FILL,, Silty SAND, brown, fine to coarse grained, with fine to D Dx3 coarse grained, sub-rounded to sub-angular gravel, trace coal Dx2 and concrete fragments, (fill). Dx3 0.70 Silty SAND, dark grey, fine to coarse grained, (marine/estuarine?). SM 0.8m GEO SPT 2/3/4 0.90 W SW MD SAND, grey, fine to coarse grained, (marine/estuarine?). W N=7 Dx3 D 1.40 SPT Sandy SILT, dark grey, low plasticity, sand is fine to coarse ML W VS-3/3/2 grained, abundant of organics, (estuarine). S N=5 1.80 D SW SAND, grey, fine to coarse grained, with silt, (estuarine). 2 D AD/T Ħ D 2.60m, becoming trace of silt. D 1/1/1 3 D D MD SPT 2/3/3 N=6 D 5 End of borehole at 5 metres. Target Depth 6 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573

Client: **Hunter Water Corporation HOLE No. GW101/BH101** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 Location: Belmont, WWTP, NSW TEMPLATE Position: 375613.0 E 6342563.0 N Angle from Horiz.: 90° Processed: MAG Surface RL: Rig Type: Hanjin D&B Mounting: Track Contractor: Total Drilling Pty Ltd Driller: M. Sawyer Checked: AWJ Date: 20/09/2018 **Date Started**: 29/8/2018 Date Completed: 29/8/2018 Logged by: D. Cooper GEO **DRILLING MATERIAL PIEZOMETER** BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure. weathering, strength SAND, dark grey, fine to coarse grained, with silt, (topsoil). Monument cover, well SW 0.02 D Dx3 cap @ 0.95m agl SW MD Dx2 SAND, pale yellow brown, fine to M coarse grained, (aeolian). Dx2 0.49-0.50m, dark grey, silty sand Μ layer. 0.50m, trace fine, sub-rounded GEO 0.90 SPT gravel. 0.95m 2/3/4 W Silty SAND, dark grey, fine to coarse grained, (fill/alluvium). N=7 1.20 Dx2 D SW W MD SAND, grey, fine to coarse grained, (marine?). SPT 3/3/5 N=8 AD/T 2 Ħ Backfill SPT 3/4/6 50mm PVC casing 3 N=10 D Bentonite 6/9/12 N=21 5 mm Specialised Sand Backfill 5 Hollow Flight Auger 2/7/10 VD SPT 10/20/25 N=45 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW101/BH101** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont, WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength 5 mm Specialised SW SAND, as previous. W VD Sand Backfill GEO 10 SPT 8/15/25 for 120mm Hollow Flight Auger 50mm PVC Screen Pipe 5 mm Specialised 13 Sand Backfill SPT 5/12/21 N=33 15

See standard sheets for details of abbreviations & basis of descriptions



**GHD GEOTECHNICS** 

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

22-19573

Client: **Hunter Water Corporation HOLE No. GW101/BH101** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 Location: Belmont, WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD D 16.30 SPT SW SAND, grey, fine to coarse W VD 7/16/25 grained, trace clay, for (estuarine/marine?). 135mm GEO N=ref 17 50 SW SAND, grey, fine to coarse grained, trace of fine grained, VD W Hollow Flight Auger sub-rounded gravel, (marine/estuarine?). 5 mm Specialised Sand Backfill 19 8/16/25 for 125mm N=ref Base of piezo @ 20m 20.00 End of borehole at 20 metres. 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for

See standard sheets for details of abbreviations & basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW102/BH102** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 Location: Belmont WWTP, NSW Position: 375661.0 E 6342448.0 N Angle from Horiz.: 90° Processed: MAG Surface RL: 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength FILL, SAND, brown to grey, fine to coarse grained, with silt, Monument cover, well D \_ cap @ 1.0 m agl Dx3 Dx2 abundant rootlets, trace plastic(band aid), (fill). Bentonite Dx2 0.80 GEO FILL, SAND, pale yellow brown, SW SPT D fine to coarse grained, trace 2/3/4 N=7 wire, (fill). D 1.30 D SW SAND, pale yellow brown, fine to D MD SPT coarse, (aeolian). 3/4/5 1.70 N=9 SAND, brown to grey, fine to coarse grained, with silt SW Dx2 M MD 2 (alluvium). AD/T Ē 2.3m W 2.70 SPT SW SAND, grey, fine to coarse W MD 3/3/4 grained, trace of shells N=7 50mm PVC casing 3 (marine?). Backfill MD D 3/5/7 5 Hollow Flight Auger 2/3/4 N=7 **Bentonite** 5 mm Specialised Sand Backfill VD 3/13/22 N=35 Job No. **GHD GEOTECHNICS** See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573 & basis of descriptions CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. GW102/BH102** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD D GEO 5 mm Specialised Sand Backfill 10 D 5/13/20 N = 33Hollow Flight Auger D 5 mm Specialised 13 Sand Backfill for 110mm N=ref 50mm PVC Screen Pipe D 15 Job No. **GHD GEOTECHNICS** See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573

Client: **Hunter Water Corporation HOLE No. GW102/BH102** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375661.0 E 6342448.0 N Surface RL: Angle from Horiz.: 90° Processed: MAG Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started:** 15/8/2018 Date Completed: 15/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD D SPT 7/18/25 for 90mm N=ref GEO D 5 mm Specialised 18 Sand Backfill Hollow Flight Auger 19.00 SAND, pale grey, fine to coarse grained, trace fines (clay), SW W VD (marine/estuarine?) SPT 14/24/25 for 120mm N=ref 20 21 Base of piezo @ 22.00 21.9m ba End of borehole at 22 metres. Target Depth 23 **GHD GEOTECHNICS** Job No. See standard sheets for

See standard sheets for details of abbreviations & basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 1 OF 6 Location: Belmont WWTP, NSW TEMPLATE Position: 375689.0 E 6342505.0 N Angle from Horiz.: 90° Processed: MAG Surface RL: 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 GEO **DRILLING MATERIAL PIEZOMETER** BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength Monument cover, well SW SAND, pale yellow brown, fine to D 🚤 cap @ 0.8m agl Dx3 coarse grained, (aeolian). Dx2 Concrete 0.50 SM Silty SAND, dark grey to brown, MD Μ Dx2 fine to coarse grained, organic odour, (alluvium). GEO SPT 0.70m, minor zones of sand, 2/1/3 trace of silt. N=4 Dx2 AD/T .<u>⊽</u> 1.3m Ē D SPT 2/3/3 W N=6 1.80 SAND, grey fine to coarse SW W MD grained, (marine?). 2 Backfill -50mm PVC casing 3 SPT 3/5/6 N=11 D 5/8/12 N=20 Bentonite Washboring 5.30-5.35m, trace of fine grained, sub-rounded to rounded gravel. SPT 5 mm Specialised Sand Backfill 6/9/12 N=21 6 SPT 7/11/17 N=28 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 2 OF 6 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD 5 mm Specialised Sand Backfill SPT 14/19/25 GEO N=44 10 SPT Washboring 13/21/25 for 145mm N=ref 5 mm Specialised 13 Sand Backfill 19/25 for 120mm N=ref 15 Job No. **GHD GEOTECHNICS** See standard sheets for

See standard sheets for details of abbreviations & basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 3 OF 6 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD GEO 24/25 for 110m N=ref 5 mm Specialised 18 Sand Backfill 50mm PVC Screen Pipe 19 Washboring 21 22 5 mm Specialised 23 Sand Backfill Job No. **GHD GEOTECHNICS** See standard sheets for

See standard sheets for details of abbreviations & basis of descriptions



22-19573

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 4 OF 6 Location: Belmont WWTP, NSW Position: 375689.0 E 6342505.0 N Surface RL: Angle from Horiz.: 90° Processed: MAG Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started:** 16/8/2018 Date Completed: 16/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL** PIEZOMETER Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD 25 26 27 Washboring 28 -5 mm Specialised Sand Backfill 29 30 Base of piezo @ 30.1 mbgl 31.00 31 CI-CH CLAY, grey, medium to high plasticity (w>PL), trace charcoal, VSt (estaurine?).

See standard sheets for details of abbreviations & basis of descriptions

GEO



BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 5 OF 6 Location: Belmont WWTP, NSW 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:** 20/09/2018 Date Completed: 16/8/2018 Logged by: D. Cooper BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and ROCK TYPE, colour, grain size, structure, weathering, strength CI-CLAY, as previous. М VSt VSt СH PP on SPT sample =320-380 kPa SPT 8/12/15 N=27 GEO 33 35 Washboring 37 38 39

See standard sheets for details of abbreviations & basis of descriptions



### **GHD GEOTECHNICS**

Job No.

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW103/BH103** Project: Belmont Temporary Desalination Plant SHEET 6 OF 6 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL** PIEZOMETER Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and ROCK TYPE, colour, grain size, structure, weathering, strength CI-CLAY, as previous. VSt VSt Μ ĊН Washboring 41.10 End of borehole at 41.1 metres. Target Depth 42 43 44 46 47

See standard sheets for details of abbreviations & basis of descriptions

GEO



Client: **Hunter Water Corporation HOLE No. GW104/BH104** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 Location: Belmont WWTP, NSW TEMPLATE Position: 375716.0 E 6342557.0 N Angle from Horiz.: 90° Processed: SBO Surface RL: 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength Monument cover, well FILL, Silty SAND, dark grey, fine 0.10 D cap @ 1.1m agl Dx3 to coarse grained, (fill). D Dx2 FILL, SAND, brown, fine to coarse grained, trace of silt, (fill). Dx2 0.70 SAND, pale yellow brown, fine to SW D MD-GEO SPT coarse grained, (aeolian). 3/4/6 N=10 Dx2 D SPT . ∑ 1.5m 5/5/5 W 1 70 N=10 SW SAND, brown, fine to coarse W MD grained, with silt, D AD/T 2.00 2 Ħ 50mm PVC casing (estuarine/marine?) SW W MD-Backfill SAND, grey, fine to coarse D grained, trace of silt, trace of fine grained, sub-rounded gravel, (marine?). SPT 3/4/6 3 N=10 Bentonite 4/5/7 5 Hollow Flight Auger 4/4/5 N=9 3/10/18 N=28 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW104/BH104** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. MD-W GEO 5 mm Specialised Sand Backfill 10 3/9/14 N = 23Hollow Flight Auger 50mm PVC Screen 13 VD 6/15/25 for 140mm N=ref 14 15

See standard sheets for details of abbreviations & basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW104/BH104** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. MD-W SPT 7/9/15 N=24 GEO 5 mm Specialised Sand Backfill Hollow Flight Auger 19 VD SPT 10/17/25 fo 130mm N=ref Base of piezo @ 20.00 20.0m End of borehole at 20 metres. Target Depth 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for

details of abbreviations & basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW105/BH105** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375798.0 E 6342432.0 N Angle from Horiz.: 90° Processed: SBO Surface RL: 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength Monument cover, well SW SAND, pale yellow brown, fine to D MD cap @ 0.9m agl coarse grained, (aeolian). М GEO SPT 4/5/5 N=10 D SPT 3/2/5 N= 2 Backfill 3/4/4 3 50mm PVC casing N=8 AD/T Ħ 4.1m W MD 2/3/3 N=6 5 Bentonite 2/2/3 6 SAND, grey, fine to coarse SPT 2/2/4 grained, trace of clayey sand N=6 lenses, (marine/estuarine?). Job No. **GHD GEOTECHNICS** See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW105/BH105** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **JSC Symbol** Graphic Log components (origin), SCALE (m) and ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W 8.5m, becoming dark grey, trace D GEO 9.5m, becoming grey, no silt. 5 mm Specialised Sand Backfill 10 VD SPT 7/17/25 for 140mm N=ref AD/T Ħ 50mm PVC Screen 10/19/25 Pipe for 100mm N=ref 14 5 mm Specialised 14.5m, trace of fine grained, Sand Backfill sub-rounded to rounded gravel. 15

See standard sheets for details of abbreviations & basis of descriptions



### **GHD GEOTECHNICS**

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. GW105/BH105** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD SPT 9/20/25 for 110mm N=ref GEO 5 mm Specialised Sand Backfill 18 AD/T Ħ 19 6/18/25 for 100mm N=ref 20 20.50 Base of piezo @ End of borehole at 20.5 metres. Target Depth 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573

CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. GW106/BH106** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375737.0 E 6342369.0 N Surface RL: Angle from Horiz.: 90° Processed: SBO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 27/8/2018** Date Completed: 27/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength Monument cover, well SW SAND, pale yellow brown, fine to М MD cap @ 1.0m agl coarse grained, (aeolian). GEO SPT 3/3/3 N=6 D SPT 2/5/4 N=7 AD/T 2 Ħ SAND, grey, fine to coarse grained, (marine?). Backfill 3/4/5 50mm PVC casing 3 4.1m W 1/1/2 N=3 5 MD Hollow Flight Auger Bentonite 5.8m, trace silt/clay. 3/3/4 N=7 7.0m, without fines. D 4/7/10 N=17 Job No. **GHD GEOTECHNICS** See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW106/BH106** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW Position: 375737.0 E 6342369.0 N Surface RL: Angle from Horiz.: 90° Processed: SBO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 27/8/2018** Date Completed: 27/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W D 10 SW 10.0m, trace shell fragments. VD SPT 4/14/25 for 140mm N=ref Hollow Flight Auger 13 SPT 9/21/25 for 50mm PVC Screen 80mm Pipe N=ref 5 mm Specialised Sand Backfill 15

See standard sheets for details of abbreviations & basis of descriptions

TEMPLATE.GDT

GEO



**GHD GEOTECHNICS** 

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22-19573

Client: **Hunter Water Corporation HOLE No. GW106/BH106** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375737.0 E 6342369.0 N Surface RL: Angle from Horiz.: 90° Processed: SBO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 27/8/2018** Date Completed: 27/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD SPT 8/25 for 135mm N=ref GEO 5 mm Specialised Sand Backfill Hollow Flight Auger 19 SPT 19/25 for 100mm N=ref 20 20.40 CLAY, grey, medium to high plasticity, trace fine to medium Base of piezo @ 20.50 CI-М CH grained sand, (estuarine?). End of borehole at 20.5 metres. Target Depth 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations

& basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW107/BH107** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD GEO **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SAND, yellow-brown, fine to Monument cover, well SW D D cap @ 0.9m agl coarse grained (aeolian). D-M GEO SPT 3/5/7 N=12 D SPT 5/6/8 N = 142 2.88 SPT Backfill SW SAND, grey, fine to coarse М 4/6/7 50mm PVC casing 3 grained, trace of silt, (marine?). N=13 AD/T Ħ MD . 2 4.3m W 3/5/4 N=9 5 5.5m, trace of clayey sand zones, dark grey. Bentonite 5.8m, becoming yellow brown, 3/4/5 trace silt, trace coal/charcoal 6 N=9 fragments. 5 mm Specialised Sand Backfill 7.0m, becoming pale grey, SPT 2/3/4 N=7**GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW107/BH107** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. M W D GEO 10 SPT 1/8/19 N=27 Hollow Flight Auger 13 VD 50mm PVC Screen SPT Pipe 8/16/25 for 130mm N=ref 14 5 mm Specialised Sand Backfill 15

See standard sheets for details of abbreviations & basis of descriptions



**GHD GEOTECHNICS** 

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.

22-19573

Client: **Hunter Water Corporation HOLE No. GW107/BH107** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW 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 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. Μ VD SPT 7/15/25 for 130mm GEO N=ref 5 mm Specialised Sand Backfill Hollow Flight Auger 19 SPT 3/10/21 N=31 20 Base of piezo @ 20.5m bgl 20.10 End of borehole at 20.1 metres. Target Depth 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations

& basis of descriptions



Client: **Hunter Water Corporation HOLE No. GW108/BH108** Project: Belmont Temporary Desalination Plant SHEET 1 OF 3 Location: Belmont WWTP, NSW TEMPLATE. Position: 375527.0 E 6342625.0 N Angle from Horiz.: 90° Processed: SBO Surface RL: 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 GEO **DRILLING MATERIAL PIEZOMETER** BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests Observations Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support **JSC Symbol** Graphic Log components (origin), SCALE (m) and Casing Water ROCK TYPE, colour, grain size, structure, weathering, strength Monument cover, well FILL, Sandy GRAVEL, brown, D Dx3 cap @ 0.8m agl fine to coarse grained, Dx2 sub-rounded to sub-angular, sand is fine to to coarse grained, М with silt, trace of slag (fill). 0.70 AD/T Ħ SM SAND, brown, fine to coarse MD Μ 0.≹m GEO SPT grained, with silt (estuarine?). W 5/6/6 N=12 D 1.20 Backfill SW SAND, grey, fine to coarse W SPT grained (marine?). MD 5/6/8 50mm PVC casing N=14 2 - Bentonite SPT 2/3/3 5 mm Specialised 3 Sand Backfill N=6 4 Hollow Flight Auger 3/4/5 N=9 3/4/7 6 N=11 7.0m, becoming trace of brown D zones, trace silt. SPT 4/11/16 N=27 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

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BOREHOLE LOG SHEET WITH STANDPIPE PIEZOMETER Client: **Hunter Water Corporation HOLE No. GW108/BH108** Project: Belmont Temporary Desalination Plant SHEET 2 OF 3 Location: Belmont WWTP, NSW Position: 375527.0 E 6342625.0 N Surface RL: Angle from Horiz.: 90° Processed: SBO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 22/8/2018** Date Completed: 22/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Samples & Tests Components **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Hole Support \ Casing Consistency / Density Index **USC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W D GEO 10 10.20 SW SAND, brown, fine to coarse D SPT grained, trace of silt (marine). 8/13 20 N=33 Hollow Flight Auger 50mm PVC Screen 11.90 Pipe SW SAND, grey, fine to coarse D grained, (marine). 13 SPT 6/13/21 N = 3415

See standard sheets for details of abbreviations & basis of descriptions



Job No.

& basis of descriptions

Client: **Hunter Water Corporation HOLE No. GW108/BH108** Project: Belmont Temporary Desalination Plant SHEET 3 OF 3 TEMPLATE.GDT Location: Belmont WWTP, NSW Position: 375527.0 E 6342625.0 N Surface RL: Angle from Horiz.: 90° Processed: SBO Contractor: Total Drilling Pty Ltd Rig Type: Hanjin D&B Mounting: Track Driller: M. Sawyer Checked: AWJ **Date Started: 22/8/2018** Date Completed: 22/8/2018 Logged by: D. Cooper Date: 20/09/2018 BOREHOLE 221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_ **DRILLING MATERIAL PIEZOMETER** Depth / (RL) metres Description Comments/ Moisture Condition Components Samples & Tests **Observations** Piezometer Log SOIL TYPE, colour, structure, minor **Drilling Method** Consistency / Density Index Hole Support \ Casing **JSC Symbol** Graphic Log components (origin), SCALE (m) and Water ROCK TYPE, colour, grain size, structure, weathering, strength SW SAND, as previous. W VD SPT 9/22/25 16.4m, trace of orange-brown for clayey sand bands. 105mm N=ref GEO Hollow Flight Auger 19 19.23 SPT SW SAND, grey with black speckles, 20/25 for fine to medium grained, trace of 130mm clay, (marine/estuarine?). N=ref 20 20.50 Base of piezo @ End of borehole at 20.5 metres. 20.5m Target Depth 21 22 23 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com details of abbreviations 22-19573

CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

### **TEST PIT LOG SHEET**

Client: **Hunter Water Corporation HOLE No. TP101 Project:** Belmont Temporary Desalination Plant SHEET OF Location: Belmont WWTP, NSW Position: Surface RL: **RCO** 375615.20 E 6342614.00 N Processed: **Method of Exploration:** 5T Excavator with 450mm bucket Hole Size: 4.0 m x 0.45m Checked: AWJ Date: 06/09/18 D. Cooper Date: 20/09/2018 Logged by: ote: \* indicates signatures on origin issue of log or last revision of log **Material Description** Moisture Condition Consistency / Density Index [COBBLES / BOULDERS / FILL / TOPSOIL] then Depth / (RL) metres Graphic Log SOIL NAME: plasticity / primary particle characteristics, colour, Comments Scale (m) USC Symbol secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions **Observations** Water or minor components, durability, strength, weathering / alteration, defects FILL, Silty SAND, brown, fine to coarse grained, trace D fine to coarse grained, sub-rounded to sub-angular Dx2 gravel, trace fibro (possible asbestos) fragments, (fill). SP SAND, yellow brown, fine to coarse grained (aeolian). D VL-Dx2 В M Dx2 MD 1.40 SP SAND, dark grey, fine to coarse grained, with silt VL-М (marine?). 1.60 SP SAND, grey, fine to coarse grained (marine?). В MD 2.00 End of test pit at 2 metres. Collapsing to 1.50m. **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

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Hunter Water Corporation
Belmont Temporary Desalination Plant
GEOTECHNICAL INVESTIGATION
TESTPIT PHOTOGRAPHS – TP101

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

### **TEST PIT LOG SHEET**

Client: **Hunter Water Corporation HOLE No. TP102 Project:** Belmont Temporary Desalination Plant SHEET OF Location: Belmont WWTP, NSW 1 Position: Surface RL: **RCO** 375602.19 E 6342493.34 N Processed: **Method of Exploration:** 5T Excavator with 450mm bucket **Hole Size:** 4.0 m x 0.45m Checked: AWJ Date: 06/09/18 D. Cooper Date: 20/09/2018 Logged by: ote: \* indicates signatures on origin issue of log or last revision of log **Material Description** Moisture Condition Consistency / Density Index [COBBLES / BOULDERS / FILL / TOPSOIL] then Depth / (RL) metres Graphic Log SOIL NAME: plasticity / primary particle characteristics, colour, Comments Scale (m) USC Symbol secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions **Observations** Water or minor components, durability, strength, weathering / alteration, defects FILL, SAND, brown to grey, fine to coarse grained, with silt (fill/disturbed). Dx2 FILL, CLAY, brown, low to medium plasticity, with fine to Dx2 coarse grained sand, abundant rootlets (fill/disturbed). SW SAND, grey, fine to coarse grained, trace of silt, organic VL-M odour (marine?). W B D 0.60m, pale grey, becoming trace of silt. MD 0.90m, becoming grey. 1.50m, becoming brown to grey. D 2.00 End of test pit at 2 metres. Hole collapsing. **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

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Hunter Water Corporation
Belmont Temporary Desalination Plant
GEOTECHNICAL INVESTIGATION
TESTPIT PHOTOGRAPHS – TP102

job no | 22/19573 file ref scale | N/A

date 06/09/18

### **TEST PIT LOG SHEET**

Client: **Hunter Water Corporation HOLE No. TP103** Project: Belmont Temporary Desalination Plant SHEET OF Location: Belmont WWTP, NSW 1 Position: Surface RL: 375657.00 E 6342523.00 N **RCO** Processed: **Method of Exploration:** 5T Excavator with 450mm bucket **Hole Size:** 4.0 m x 0.45m Checked: AWJ Date: 06/09/18 D. Cooper Date: 20/09/2018 Logged by: Note: \* indicates signatures on origin issue of log or last revision of log **Material Description** Moisture Condition Consistency / Density Index [COBBLES / BOULDERS / FILL / TOPSOIL] then Depth / (RL) metres Graphic Log SOIL NAME: plasticity / primary particle characteristics, colour, Comments Scale (m) USC Symbol secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions **Observations** Water or minor components, durability, strength, weathering / alteration, defects SW SAND, pale yellow brown, fine to coarse grained VL D (aeolian). Dx2 М Dx2 M-W 0.50 SW SAND, dark grey to black, fine to coarse grained, with M-W VL Dx2 silt, trace clay (estuarine?) 0.70 SW SAND, grey to dark grey, fine to coarse grained, trace of VL W Dx2 W MD 1.90 End of test pit at 1.9 metres. Hole caving in to 0.50m. -2 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

221957302 BELMONT TEMP DP.GPJ GHD\_GEO\_TEMPLATE.GDT 3/10/18

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## TEST PIT LOG SHEET

	ien			orporation		HOLE	No.	. т	P104
	oje Scat		nt Tempoi nt WWTP	rary Desa	lination P		SHEE	ΞT	1 <b>OF</b> 1
				342544.0	0 N	Surface RL:			Processed: RCO
M	ethe	od of Explor	ation:	5T Exc	cavator w	ith 450mm bucket <b>Hole Size:</b> 4.0 m x 0.45m			Checked: AWJ
Da	ate:	06/09/18	8			Logged by: D. Cooper			<b>Date</b> : 20/09/2018
Scale (m)	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Note: * indicates signatures on original issue of log or last revision of log  Comments Observations
- - - -		Dx3 Dx2 B D	0.02		SW	FILL, Silty SAND, dark grey, fine to coarse grained (fill/topsoil).  SAND, pale yellow brown, fine to coarse grained (aeolian).  SAND, grey, fine to coarse grained, trace silt, (marine?).	D	VL- L	-
- - -1 - -	GNE	D					W	L- MD	- - - - -
- - - - -2		D B	2 20					MD	- - -
- - - - - - -			2.20			End of test pit at 2.2 metres. Hole collapsed to 1.20m.			
de	tails	andard sheets of abbreviati is of description	ons	GHD	Level 3 T: 61 2	GEOTECHNICS  , GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com  ULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS		Job	No. 22-19573

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Hunter Water Corporation Belmont Temporary Desalination Plant GEOTECHNICAL INVESTIGATION **TESTPIT PHOTOGRAPHS – TP104**  job no file ref scale

22/19573

N/A

date 06/09/18

### **TEST PIT LOG SHEET**

Client: **Hunter Water Corporation HOLE No. TP105 Project:** Belmont Temporary Desalination Plant SHEET OF Location: Belmont WWTP, NSW 1 Position: Surface RL: **RCO** 375683.00 E 6342488.00 N Processed: **Method of Exploration:** 5T Excavator with 450mm bucket **Hole Size:** 4.0 m x 0.45m Checked: AWJ Date: 06/09/18 D. Cooper Date: 20/09/2018 Logged by: Note: \* indicates signatures on origin issue of log or last revision of log **Material Description** Moisture Condition Consistency / Density Index [COBBLES / BOULDERS / FILL / TOPSOIL] then Depth / (RL) metres **3raphic Log** SOIL NAME: plasticity / primary particle characteristics, colour, Comments Scale (m) USC Symbol secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions **Observations** Water or minor components, durability, strength, weathering / alteration, defects SW SAND, pale yellow brown, fine to coarse grained VL D (aeolian). Dx3 М Dx2 0.45m, becoming grey. W 0.60 SW SAND, dark grey to black, fine to coarse grained, with VL W Dx2 silt, trace clay (marine/estuarine?). 0.80 SW SAND, grey, fine to coarse grained (marine?). V١ W L \_<u>√</u> 1.3n MD 1.60 End of test pit at 1.6 metres. MD Hole collapsing. -2 **GHD GEOTECHNICS** Job No. See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

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### **TEST PIT LOG SHEET**

Client: **Hunter Water Corporation HOLE No. TP106 Project:** Belmont Temporary Desalination Plant SHEET Location: Belmont WWTP, NSW OF Position: Surface RL: **RCO** 375567.00 E 6342433.00 N Processed: **Method of Exploration:** 5T Excavator with 450mm bucket Hole Size: 4.0 m x 0.45m Checked: AWJ Date: 06/09/18 D. Cooper Date: 20/09/2018 Logged by: ote: \* indicates signatures on origin issue of log or last revision of log **Material Description** Moisture Condition Consistency / Density Index [COBBLES / BOULDERS / FILL / TOPSOIL] then Depth / (RL) metres Graphic Log SOIL NAME: plasticity / primary particle characteristics, colour, Comments Scale (m) USC Symbol secondary and minor components, zoning (origin) and ROCK NAME: Grain size, colour, fabric and texture, inclusions **Observations** Water or minor components, durability, strength, weathering / alteration, defects FILL, Silty SAND, dark grey, fine to coarse grained, with D fine to coarse grained, sub-rounded to sub-angular Dx3 gravel (gravel comprises fragments of asphalt, concrete, bricks and rock) (fill). FILL. CLAY, mottled orange brown and green, medium Dx2 plasticity, with fine to coarse, sub-rounded to sub-angular D gravel (fill). FILL, SAND, grey to brown, fine to coarse grained, with D Dx2 fine to coarse, sub-rounded to sub-angular gravel, trace 0.75 cobbles up to 180mm diameter (fill). SW VL-SAND, pale yellow brown, with brown striations, fine to M coarse grained, trace of silt (aeolian). 1.10m, becoming grey. L D 1.25m, becoming yellow brown. 1.50-1.65m, becoming grey. MD D 1.80 End of test pit at 1.8 metres. Hole collapsing. -2 Job No. **GHD GEOTECHNICS** See standard sheets for Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle 2300 Australia T: 61 2 4979 9999 F: 61 2 4979 9988 E: ntlmail@ghd.com GHD details of abbreviations 22-19573 & basis of descriptions

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## 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.

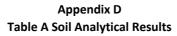
Table C-2 Laboratory QA/QC Exceedance Summary - Soils

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, BH201_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





					Asbestos				Metals				RTI	EXN		т	RH - NEPM 2	013								PAHs															OC Pesticide:	ec								PCBs
			(%) (p)	geable Calcium	os (Trace)		Ę	um (III+VI)				9	2 .	nzene	-C10 minus BTEX)	) Fraction 10-C16 minus Naphthalene)	316 Fraction	16-C34 Fraction) 34-C40 Fraction)	340 (Sum of Total)	irithene irithylene	on no	antiracene	a) pyrene b+j}lluoramhene	k)fluoranthene	g h.j)perylene	(a,h)amhracene	thene	alene	re (1,2,3-c,d)pyrene	Hirene	Sum of total) - Lab cafe	PAHs (as BaP TEQ)(zero LOR) - to	9		- Dieldrin	916	ane (cis)		Q	T DE+DDD - Lab Calc		lifan	ilfan I (alpha) Ilfan II (befa)	ilfan Sulfato	aldehyde	ketone	(Undane)	hbr epadde	lorob en zene	Total)
			Moistur pH (Lal	Exchar	Asbess Asbess	Arsenic	Cadmit	Chrom	Copper	Mercur	Nickel	Zinc	Toluen	Ethytbe	F1 (C6	C6-C1(	26	F3 (>C F4 (>C	26	Acena	Anthrax	Benz(a	)ozueg Bertzol	Berzo(	Benzo( Chryse	Dibenz	Florar	Naphth	Fluorer	Phenar	Pyrene PAHs (	Total 8	4,4-DD	a-BHC Aldrin	Aldrin 4	Chlord	CHords	d-BHC	4,4 DD	4,4 DD DDT+C	Dieldrir	Endos	Endosu	Endos	Endrin	Endrin	g-BHC Heptac	Heptac	Hexact	PCBs (
EQL		(	% pH Uni 0.1 0.1	0.1	Fibres g 5 0.1	mg/kg 5	mg/kg m	ng/kg mg	ng/kg mg/k 5 5	kg mg/kg 0.1	mg/kg 2	mg/kg mg/ 5 0:	/kg mg/kg 2 0.5	mg/kg mg/ 0.5 0.	kg mg/kg 1	mg/kg mg/l 10 50	ig mg/kg 50	mg/kg mg/kg 100 100	mg/kg i	ng/kg mg/l 0.5 0.5	ig mg/kg 0.5	mg/kg m	g/kg mg/k 1.5 0.5	ng mg/kg	mg/kg mg/ 0.5 0.	kg mg/kg 5 0.5	mg/kg 0.5	mg/kg m	g/kg mg/kg 0.5 0.5	mg/kg 0.5	mg/kg mg/ 0.5 0.	/kg mg/kg 5 0.5	mg/kg m	g/kg mg/kg 1.05 0.05	mg/kg mg	g/kg mg/kg 05 0.05	mg/kg mg/ 0.05 0.0	kg mg/kg 5 0.05	mg/kg n	ng/kg mg/kg 0.2 0.05	1 mg/kg 0.05	mg/kg mg	g/kg mg/kg 0.05 0.05	mg/kg m	ng/kg mg/k 0.05 0.05	) mg/kg n	ng/kg mg/k 0.05 0.0	ıg mg/kg J5 0.05	mg/kg mg/	кд mg/kg 2 0.1
NEPM 2013 EIL/A NEPM 2013 EIL/A	L-Urban Residential-Public Open L-Commerical/industrial 0-2m	Space 0-2m				160		420 0	140 1000	0																		170												180 180						$\blacksquare$				
NEPM 2013 Table NEPM 2013 Table	EL-Commerical/industrial 0-2m (B(6) ESL Urban residential/open : (B(6) ESL Commercial/industrial (c	space (coarse) coarse)										78	0 85 5 135	70 10 165 18	180 0 215	120	)	300 2800 1700 3300				-	.4																											
NEPM 2013 Table NEPM 2013 Table	A(1) HIL D Comm/Ind					3,000	900 3	3,600 240	0,000 1,50	0 730	6,000	400,000	40.000	5000 450		- 400															4,0	00 3			10 45	70 530				400 3,600		340 2,000			20 100		10 50		10 40 80 2,5	00 7
CRC Care Table 4	Direct Contact HSL C Rec/open sp Direct Contact HSL D Commerical	pace Industrial										43	30 99,000	5,300 15,0 27,000 81,0	100 2	6,000	20,000	27,000 38,00										1,900																						
	Fleid ID	Sample Type																																																
Plant Site and in 29/08/2018	BH101_0.0-0.2	Normal <	1.0 -		No No	<5	<1	<2	<5 <5	i <0.1	<2	32 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-				-		T - T	-				$\top$				
29/08/2018 17/08/2018	BH101_0.45-0.5	Normal 4	4.6	-		<5	<1	<2 <	<5 <5			16 <0	<0.5	<0.5 <0	.5 <10	<10 <50	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		-	-		-	-			_		-
17/08/2018			4.2 -						24 7			106 <0 43 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <50		420 180 130 <100	130	<0.5 <0.	5 <0.5	<0.5 <	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	1.5 <0.5	-		-						+++			rit		+	-	-		
17/08/2018	BH103_0.0-0.2	Normal 1	1.3 -	-	No No	<5	<1	<2 <	<5 <5	<0.1	<2	19 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		-	-				-				
17/08/2018			5.2		No No			2 1		<0.1		16 <0 108 <0	1.2 <0.5	<0.5 <0	5 <10	<10 <50	<50	<100 <100 350 140	<50 490	<0.5 <0.	5 <0.5	<0.5 <	0.5 <0.5	5 <0.5	<0.5 <0	5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5 <0.5	-		-			-			+	-				+				
31/07/2018			8.2						120 36				1.2 <0.5		.5 <10	<10 <50		600 200		<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	1.5 <0.5								-	+	-			-	+-	_	-		
22/08/2018		Normal		-	No No		-	-	-	-	-		-		-		-		-		-	-		-		-	-	-		-			-		-			-	-		-	-						-		-
6/09/2018 6/09/2018		Normal Normal	3 6 - 6.5	0.4		<5	<1	-2	6 6	<0.1	<2	36 <0		<0.5 <0		<10 <5	- <50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.9	5 <0.5	<0.5	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	. <0.5	-		-			-			$+$ $\dot{-}$			-		+-+		++		_
6/09/2018	TP102_0.0-0.2	Normal	11 -	-		<5					<2	38 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		-	-				-		-		
6/09/2018			5.9	-		<5	<1		<5 <5	<0.1	<2	<5 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		-	-	-			-		-		-
6/09/2018 6/09/2018			1.0 -			<5 <5	<1	<2 1		<0.1		29 <0 21 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <51	) <50 ) <50	<100 <100 <100 <100	<50	<0.5 <0. <0.5 <0.	5 <0.5	<0.5 <	0.5 <0.5	5 <0.5 5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	1.5 <0.5									+					+	-	+	<del>Li L</del> i	
6/09/2018	TP103 0.5-0.6M	Normal 2	8.4 6.5	-		-	-	-		-	-				-		-		-		-	-		-		-	-	-		-			-		-			-	-		-	-		1 - 1		-		-		-
6/09/2018		Normal 1	- 6.7	8.4		-	-	-		-	-				-		-		-		-	-		-		-	-	-		-			-		-			-	-			-								
6/09/2018			4.6 5.7 4.9 -		No No	25	<1	5 1	194 246	8 <0.1	<2*	3,130 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-						$\pm \pm$			rit.		+	-	+++		
6/09/2018	FD20		3.8	-		20	<1	5 2	206 287 6 15	7 <0.1	3	3,740 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <50	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		-	-				-				
	RPD COMP 1 (BH102_0.0-0.2,	Composite (2	8 -	-		22	-	0	6 15	-	40	18 -			-		-		-		-	-		-		-	-	-		-		-	-		-			-	-		+-	-								
17/08/2018	BH103_0.0-0.2)	Samples) 5 Composite (2	5.2 -	-		-	-			-	-				-		-		-		-	-		-			-	-		-			<0.05 <	0.05 <0.05	0.06 <	.05 <0.05	<0.05 <0.0	0.05	<0.05	<0.2 <0.05	5 0.06	<0.05 <0	0.05 <0.05	<0.05 <	0.05 <0.05	5 <0.05	<0.05 <0.0	J5 <0.05	<0.05 <0	.2 <0.1
30/08/2018	BH104_0.0-0.2)	Samples) 2	2.8 -	-		-	-	-		-					-				-		-			-				-		-	-   -		<0.05 <	0.05 <0.05	<0.05 <0	.05 <0.05	<0.05 <0.0	05 <0.05	<0.05	<0.2 <0.05	5 <0.05	<0.05 <0	0.05 <0.05	<0.05 <	0.05 <0.05	5 <0.05	<0.05 <0.0	05 <0.05	<0.05 <0	.2 <0.1
Water Connection 30/08/2018	BH301 0.0-0.2	Normal 6	8.3	1 -	I - I -	<5	<1	2	7 8	<0.1	2	22 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5	5 <0.5	<0.5 <0	5 <0.5	0.5	<0.5	0.5 <0.5	1	<0.5	5 <0.5			I - I		-   -	1.		- 1 -	Т.Т	- 1								
30/08/2018			9.2 -	-		9	<1	5 1	13 18	<0.1				<0.5 <0		<10 <5	<50	100 <100	100	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	0.7	<0.5	0.5 <0.5	1.3	<0.5 2	<0.5	-		-			-	-		-	-				-		-		
30/08/2018 30/08/2018			9.5 -	-		6			14 9 10 11		4	29 <0 52 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <50	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5 <	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	0.6	<0.5 <b>0</b> .5		-		-	-   -		-	-		+	-				+			$\vdash$	
30/08/2018	BH302 4.0-4.45M		2.6 5.6			-	-	-		-0.1	-								-		-	-		-		-	-	-		-			-		-	-					+					+		_	-	
4/09/2018		Normal 1	2.6 6	14		8	<1	6 1	12 34	<0.1	3	125 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-			-				1 - 1				
3/09/2018 4/09/2018			8.8 6.2 0.4 -			<5	1	4	6 87	<0.1	3	92 <0		<0.5 <0		<10 <5	- <50	100 <100	100	<0.5 <0.	5 <0.5	<0.5	0.5	5 <0.5	<0.5 <0		<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0		-								+					+	-	+	<del>Li L</del> i	
4/09/2018	BH304_0.45-0.5	Normal 9	9.7 -			6					<2	103 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-			-								
3/09/2018 14/08/2018			7.8 5.6 3.4 -	-	No No			3 4		-0.1	3				5 (40											5 -0-		- ×0.5							-			-	-		$+$ $\overline{-}$	-	-   -			+		+		41
14/08/2018			6.1			<5	<1	<2 4	< <	<0.1	<2	<5 <0	1.2 <0.5	<0.5 <0	5 <10	<10 <51	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	1.5 <0.5									+					+	-	+=	ri F	-
30/08/2018	BH306_0.0-0.2		5.6	-		7			16 20		13		1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	0.6	<0.5	6 <0.5	-		-	-		-	-			-						-		
30/08/2018	COMP 3 (BH301_0.0-0.2,		3.6	-		<5	<1	6	<5 <5	<0.1	<2	<5 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	<0.5	<0.5 <	1.5 <0.1	<0.5	<0.5	<0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	1.5 <0.5	-		-	-		-	-		+	-				+		+		-
31/08/2018	BH302_0.0-0.2, BH306_0.0-	Composite (3 Samples)	6 .					.			١		.   .							.   .		.	.   .	1.1				.		1			<0.05	0.05 <0.05	<0.05 <0	05 <0.05	<0.05 <0.0	05 <0.05	<0.05	<0.2 <0.05	5 <0.05	<0.05 <0	0.05 <0.05	<0.05	:0.05 <0.09	5 <0.05	<0.05 <0:	05 <0.05	<0.05 <	12 <0.1
14/08/2018	BHA301_0.0-0.2	Normal <	1.0 -	-		<5	<1	<2 -	<5 8	<0.1	<2	30 <0	.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-	-	-	-				-		-		
14/08/2018 30/08/2018			7.3	-		<5 6	<1	<2 <	<5 <5 18 23		<2	<5 <0 168 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <50	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5 <	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-	-		+	-				+			$\vdash$	
30/08/2018						-	-	-			-						-		-		-	-		-			-	-		-										-	+			$\leftarrow$		+	+	+	H	+
30/08/2018			4.7 -	-		6	<1	9 <	<5 <5	<0.1	3	<5 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-	-		-	-			-						-		
30/08/2018 4/09/2018			8.1 4.5 6.8 -	-		9	<1	8 3	39 54	<0.1	- 8	289 <0	1.2 <0.5	<0.5 <0	.5 <10	<10 <5	- <50	<100 <100	<50	<0.5 <0.	- 5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5 <	0.5 <0.5	<0.5	<0.5 <0	0.5	-		-			-			+	-				+++		+		-
4/09/2018	BHA303_0.45-0.5	Normal 2	1.3 -	1		<5	<1	2 <	<5 <5	<0.1	<2	7 <0	1.2 <0.5	<0.5 <0	5 <10	<10 <5	<50	<100 <100	<50	<0.5 <0.	5 <0.5	<0.5	0.5 <0.5	5 <0.5	<0.5 <0	.5 <0.5	<0.5	<0.5	0.5 <0.5	<0.5	<0.5 <0	0.5						_	_		世	-				+-+	===			
30/08/2018 30/08/2018			8.8 -	1 -	No No	7		8 1	16 100 33 148		6	144 <0 282 <0	1.2 <0.5	<0.5 <0	5 <10	<10 <51	<50	<100 <100	<50 320	<0.5 <0.	5 <0.5	0.5	16 0.6		0.8 0.0		1.7	<0.5	0.5 0.5	0.6	1.6 8.	1 1		-   -	-	-   -		-			4-7	-			-   -	1				
•				-	+++	10		0 2	J 148	<0.1	-	202	<0.0	~0.0 <0	<10	-10 <51	. <50	110 150	320	-J.D 40.	VU.0	-0.0	U.6	-0.5	J.J 0.	<0.5	1.2	V0.0 <	-U.5	0.5	1.0 5.	0.7	+	-				-		-	+		-	$\vdash$	-	+++	-	+	H	+
18/09/2018	COMP 4 (TP101_0.0-0.2, TP103_0.0-0.2, TP105_0.0-0.2, TP108_0.0-0.2)	Samples)	5.3	-	-   -	-	-	-	-   -	-	-	-   -	.   -		-	-   -	[ - ]	-   -	-	-   -	-	-	-   -	-	-   -	-	-	-	-   -	-	-   -	-	<0.05	0.05 <0.05	<0.05 <0	<0.05	<0.05 <0.0	<0.05	<0.05	<0.2 <0.05	<0.05	<0.05 <0	0.05 <0.05	<0.05 <	:0.05 <0.05	i <0.05	<0.05 <0.0	J5 <0.05	<0.05 <0	.2 <0.1
18/09/2018	COMP 5 (TP101_0.5-0.6, TP103_0.5-0.6, TP105_0.6-0.7,	Composite (4	5.1 -																														<0.05	0.05 <0.05	<0.05 -0	05 ×0.05	<0.05	05 ×0.05	<0.05	<0.2 ~0.00	5 <0.05	<0.05	0.05 <0.05	<0.05	:0.05	5 <0.05	<0.05	05 <0.05	<0.05 ~	12 -04
33/2010	TP108_0.6-0.7)	Samples)																																-0.00	0.00	-0.00	3.00	-0.00	-0.00	-5.00	-0.00		-0.30		-0.0	-0.00	-0.0	-0.00		



## Appendix D Table B Indicative Waste Classification

								indica	ative W	aste C	iassific	ation							TDU	- NEPM				
								Ma	tala						BTE	VNI				- <u>INEPIVI</u> 999	D.	۸ ا	OCP	PCBs
								Me	tais T		1	1		1	BIE	:XIN		1	- 1	999 T		AHs I	UCP	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) Gener	al 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) Restric	cted 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	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
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	- 1	-
<u> </u>	17/08/2018	COMP 1	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.05	< 0.1
	30/08/2018	COMP 2	2.8	-	-	_	-	-	-	-	<del> </del> -	-	-	-	-	-		-	-	-	-	-	< 0.05	<0.1
Comp.	31/08/2018	COMP 3	6.0	-	-	_	-	-	-	-	<del> </del>	-	-	-	-	-		-	-	-	-	-	< 0.05	<0.1
samples	18/09/2018	COMP 4	5.3	-	-	_	-	_	-	-	<del> </del> -	-	-	-	-	-		-	-	-	-	-	< 0.05	<0.1
	18/09/2018	COMP 5	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	< 0.05	<0.1
	1 . 2. 00, 20 . 0	1																					0.00	Ų.,

Result	General Solid Waste
Result	Restricted Solid Waste
Result	Hazardous Waste

# Appendix E – Laboratory certificates



## **CERTIFICATE OF ANALYSIS**

Work Order : EB1826927

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received 4

No. of samples analysed 4

Page : 1 of 3

Laboratory : Environmental Division Brisbane

Contact : Caroline Hill

Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8662

Date Samples Received : 07-Nov-2018 10:46

Date Analysis Commenced : 13-Nov-2018

Issue Date : 13-Nov-2018 16:21



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

 Page
 : 2 of 3

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



### **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'.

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 : 3 of 3

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH201_3.0-3.1	BH201_4.9-5.0	BH202_2.45-2.5	BH202_3.9-4.0	
	CI	ient sampli	ng 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 KCI (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		10	mole H+/t	20	11	119	29	
(a-22B)								
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

: GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ----

Project : 2219573

Order number

Client

C-O-C number : ---

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 3

Laboratory : Environmental Division Brisbane

Contact : Caroline Hill

Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61 7 3552 8662
Date Samples Received : 07-Nov-2018

Date Samples Received : 07-Nov-2018

Date Analysis Commenced : 13-Nov-2018

Issue Date 13-Nov-2018



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

 Page
 : 2 of 3

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



### **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 D	uplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA033-A: Actual Aci	dity (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 A	cidity (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		10	mole H+ / t	20	20	0.00	No Limit
		(a-22B)							

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 : 3 of 3

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



## 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)	Laboratory Control Spike (LCS) Report						
				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.



# 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.

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 : 2 of 4

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



# **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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: \* = Holding time breach:  $\checkmark$  = Within holding time.

Matrix: SOIL					Evaluation	i: 🔻 = Holding time	breach ; ✓ = vvithi	n holding tim
Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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,	04-Sep-2018	13-Nov-2018	04-Sep-2019	✓	13-Nov-2018	11-Feb-2019	✓
BH202_2.45-2.5,	BH202_3.9-4.0							
EA033-B: Potential Acidity								
80* dried soil (EA033)								
BH201_3.0-3.1,	BH201_4.9-5.0,	04-Sep-2018	13-Nov-2018	04-Sep-2019	✓	13-Nov-2018	11-Feb-2019	✓
BH202_2.45-2.5,	BH202_3.9-4.0							
EA033-C: Acid Neutralising Capacity								
80* dried soil (EA033)								
BH201_3.0-3.1,	BH201_4.9-5.0,	04-Sep-2018	13-Nov-2018	04-Sep-2019	✓	13-Nov-2018	11-Feb-2019	✓
BH202_2.45-2.5,	BH202_3.9-4.0							
EA033-D: Retained Acidity								
80* dried soil (EA033)								
BH201_3.0-3.1,	BH201_4.9-5.0,	04-Sep-2018	13-Nov-2018	04-Sep-2019	✓	13-Nov-2018	11-Feb-2019	✓
BH202_2.45-2.5,	BH202_3.9-4.0							
EA033-E: Acid Base Accounting								
80* dried soil (EA033)								
BH201_3.0-3.1,	BH201_4.9-5.0,	04-Sep-2018	13-Nov-2018	04-Sep-2019	✓	13-Nov-2018	11-Feb-2019	✓
BH202_2.45-2.5,	BH202_3.9-4.0							

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 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



# **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.

						mar or moderation in	or main openious, quanty control nequency main openious
Quality Control Sample Type		Co	ount		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Reaular	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

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 : 4 of 4

 Work Order
 : EB1826927

 Client
 : GHD PTY LTD

 Project
 : 2219573



# **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,

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

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

T: 61 2 4979 9999 | D: Level 3, GHD Tower, 24 61 2 4979 9910 | V: 229910 | M1: 0466 049 181 | M2: Honeysuckle Drive, Newcastle, NSW, 2300 | PO Box 54 1 | M2: 0423 163 493 | F Box 5403 HRMC, NSW, 2 61 2 4979 4979 9988 | E: julian.fowler@gh Australia | www.ghd.com

Daniel Bradley

Sample Receipt Officer - Enviromental Brisbane



Stafford QLD 4053 daniel.bradley@als AUSTRALIA 2 Byth Street (cnr S <u>T</u>+61 7 3243 7222

Subscribe in 🐷 🖪 🖸

Environmental Division Brisbane Work Order Reference EB1826927



# **CERTIFICATE OF ANALYSIS**

Work Order : **ES1823856** 

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 25
No. of samples analysed : 21

Page : 1 of 12

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 14-Aug-2018 16:51

Date Analysis Commenced : 15-Aug-2018

Issue Date : 20-Aug-2018 21:22



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

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#### **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.

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ient 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
	Cli	ient sampl	ing date / time	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-AE	S							
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 Mer	cury by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1			
EP075(SIM)B: Polynuclear Arom	natic 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 hydro	carbons	0.5	mg/kg	<0.5	<0.5			
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5			

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ient sampli	ing date / time	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 - Cont	inued						
^ 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 Hydroc	arbons							
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 Hydro	ocarbons - NEPM 201	3 Fract <u>io</u>	ns					
C6 - C10 Fraction	C6 C10	10	mg/kg	<10	<10			
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg	<10	<10			
(F1)	_							
>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 Naphthaler	ne	50	mg/kg	<50	<50			
(F2)								
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			

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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			

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	С	lient sampli	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ient sampl	ing date / time	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 Identificat	tion 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	s							
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 Merc	cury by FIMS							
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1		
EP075(SIM)B: Polynuclear Aroma	atic 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		

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	Clie	ent 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
Clie	ent samplii	ng 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
CAS Number	LOR	Unit	ES1823856-012	ES1823856-013	ES1823856-016	ES1823856-017	ES1823856-018
			Result	Result	Result	Result	Result
ocarbons - Conti	inued						
50-32-8	0.5	mg/kg		<0.5	<0.5		
193-39-5	0.5	mg/kg		<0.5	<0.5		
53-70-3	0.5	mg/kg		<0.5	<0.5		
191-24-2	0.5	mg/kg		<0.5	<0.5		
	0.5	mg/kg		<0.5	<0.5		
	0.5	mg/kg		<0.5	<0.5		
	0.5	mg/kg		0.6	0.6		
	0.5	mg/kg		1.2	1.2		
s							
	10	mg/kg		<10	<10		
	50	mg/kg		<50	<50		
	100	mg/kg		<100	<100		
	100	mg/kg		<100	<100		
	50	mg/kg		<50	<50		
ons - NEPM 201	3 Fraction	าร					
C6_C10	10	mg/kg		<10	<10		
C6_C10-BTEX	10	mg/kg		<10	<10		
	50	mg/kg		<50	<50		
	100			<100	<100		
	100			<100	<100		
	50	mg/kg		<50	<50		
	50	mg/kg		<50	<50		
71-43-2	0.2	mg/kg		<0.2	<0.2		
108-88-3	0.5	mg/kg		<0.5	<0.5		
100-41-4	0.5	mg/kg		<0.5	<0.5		
	0.5	mg/kg		<0.5	<0.5		
95-47-6	0.5	mg/kg		<0.5	<0.5		
	0.2	mg/kg		<0.2	<0.2		
	0.5	mg/kg		<0.5	<0.5		
91-20-3	1	mg/kg		<1	<1		
	CAS Number  COCArbons - Cont  50-32-8  193-39-5  53-70-3  191-24-2   SS   ONS - NEPM 201  C6_C10  C6_C10-BTEX  71-43-2  108-88-3  100-41-4  08-38-3 106-42-3  95-47-6        71-46-3	Client samplii  CAS Number LOR  **Cocarbons - Continued**  50-32-8 0.5  193-39-5 0.5  53-70-3 0.5  191-24-2 0.5  0.5  0.5  **S**  100  50  100  50  **Ons - NEPM 2013 Fraction**  C6_C10 10  C6_C10-BTEX 10  50  100  50	Client sampling date / time	Client sampling date / time   14-Aug-2018 00:00	Client sampling date / time	Client sampling date / time	Cleent sampling date / time

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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
	Cli	ent sampli	ng date / time	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 Surr	ogates - 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		

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	С	lient sampli	ng date / time	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

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# Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		BH305_4.9-5.0	 	 
	CI	ient sampli	ng 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.

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# 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



#### QUALITY CONTROL REPORT

Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

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Client : GHD PTY LTD Laboratory : Environmental Division Sydney

Contact : MS ALISON MONKLEY Contact : Brenda Hong

Address : PO BOX 5403 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NEWCASTLE WEST NSW, AUSTRALIA 2302

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 : 20-Aug-2018

Sampler : JULIAN FOWLER

Site :
Quote number : EN/005/18

No. of samples analysed : 21

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

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#### Signatories

No. of samples received

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 FelgendrejerisSenior Acid Sulfate Soil ChemistBrisbane Acid Sulphate Soils, Stafford, QLDEdwandy FadjarOrganic CoordinatorSydney Inorganics, Smithfield, NSWEdwandy FadjarOrganic CoordinatorSydney Organics, Smithfield, NSWIvan TaylorAnalystSydney Inorganics, Smithfield, NSWShaun SpoonerAsbestos IdentifierNewcastle - Asbestos, Mayfield West, NSW

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#### **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 I	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/fo	k) (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/fo	k) (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 Co	ontent (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 Meta	Is 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%

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Sub-Matrix: SOIL						Laboratory L	Duplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metal	s 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 Reco	verable Mercury by FII	MS (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: Polyn	uclear Aromatic Hydro	carbons (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		0.5	mg/kg	7.8	7.8	0.00	0% - 50%
		hydrocarbons							
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Pet	troleum 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 Pet	troleum 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 Re	coverable Hydrocarboi	ns - 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 Re	coverable Hydrocarbo	ns - 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%

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Sub-Matrix: <b>SOIL</b>				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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit			
			106-42-3									
		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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit			
			106-42-3									
		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			

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### 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)	Laboratory Control Spike (LCS) Report				
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EG005T: Total Metals by ICP-AES (QCLot: 1881	150)								
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(C	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 Hydrocarbo	ons (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(S <b>I</b> M): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	107	75	127	
EP075(S <b>I</b> M): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	107	77	127	
EP075(S <b>I</b> M): 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(S <b>I</b> M): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	6 mg/kg	90.5	68	116	
	205-82-3								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	104	74	126	
EP075(S <b>I</b> M): 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(S <b>I</b> M): 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(QCI	Lot: 1873426)								
EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	93.0	68	128	
EP080/071: Total Petroleum Hydrocarbons(QCI	Lot: 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 - N	EBM 2012 Fractions -/OCL	4, 4072426\							

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Sub-Matrix: <b>SOIL</b>			Method Blank (MB)		Laboratory Control Spike (LC	S) Report					
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	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	0.5	mg/kg	<0.5	2 mg/kg	91.4	66	118			
	106-42-3										
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: <b>SOIL</b>		Ma	atrix Spike (MS) Report				
				Spike	SpikeRecovery(%)	Recovery L	imits (%)
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Met	als 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 Red	coverable Mercury by FIMS (QCLot: 1881149)						
ES1823667-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.6	70	130
EP075(SIM)B: Poly	nuclear 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 P	etroleum Hydrocarbons (QCLot: 1873426)						
ES1823667-001	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	119	70	130
EP080/071: Total P	etroleum Hydrocarbons (QCLot: 1873518)						

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

95-47-6

91-20-3

2.5 mg/kg

2.5 mg/kg

98.9

98.5

70

70

130

130

EP080: ortho-Xylene

EP080: Naphthalene



# QA/QC Compliance Assessment to assist with Quality Review

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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.

- <u>NO</u> 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.

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## **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 <u>VOC in soils</u> 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		Sample Date	Ex	traction / Preparation		Analysis		
Container / Client Sample ID(s)			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,	14-Aug-2018	20-Aug-2018	09-May-2021	✓	20-Aug-2018	18 <b>-N</b> ov-2018	✓
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							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BHA301_0.0-0.2,	BHA301_0.5-0.7,	14-Aug-2018				16-Aug-2018	28-Aug-2018	✓
BH305_0.0-0.2,	BH305_0.9-1.0							
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)		44 4 2040	47 4 0040	40 F-h 0040		47 4 0040	40 F-h 0040	
BHA301_0.0-0.2,	BHA301_0.5-0.7,	14-Aug-2018	17-Aug-2018	10-Feb-2019	✓	17-Aug-2018	10-Feb-2019	✓
BH305_0.0-0.2,	BH305_0.9-1.0							
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)				44.0			44.0	
BHA301_0.0-0.2,	BHA301_0.5-0.7,	14-Aug-2018	17-Aug-2018	11-Sep-2018	✓	20-Aug-2018	11-Sep-2018	✓
BH305_0.0-0.2,	BH305_0.9-1.0							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BHA301_0.0-0.2,	BHA301_0.5-0.7,	14-Aug-2018	15-Aug-2018	28-Aug-2018	✓	16-Aug-2018	24-Sep-2018	✓
BH305_0.0-0.2,	BH305_0.9-1.0							

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 : GHD PTY LTD

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 : 2219573



Matrix: **SOIL** Evaluation: ★ = Holding time breach ; ✓ = Within holding time.

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

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# **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: <b>×</b> = Quality Control frequency not within specification ; <b>√</b> = Quality Control frequency within spec							
Quality Control Sample Type		Co	ount		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Reaular	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(S <b>I</b> M)	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(S <b>I</b> M)	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(S <b>IM</b> )	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(S <b>I</b> M)	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	

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# **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.



Enuronmental

ALS Laboratory:

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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 N SW 2650 Ph: 02 6372 6736 E: mudgee.mail@alsglobal.com EWCASTLE 5/585 Mariland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples newcastle@aleglobal.com CINOWRA 4/13 Geary Piece North Nowra NSW 2541 Ph: 024423 2063 E: nowr@aleglobal.com

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Ph: 07 4798 0500 E: townsville onwirtermental@aleglobal.com
DWOLLONGONG 98 Kermy Streat Wolfongong NSW 2500
Ph: 02 4275 4275 E: row/Kernble@aleglobal.com

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# CHAIN OF CUSTODY

QADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@aftglichat.com BBRISSANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com DIMACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

DMELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph; 03 8549 9500 E: samples melbourne@alsglobal.com DMUDGEE 27 Sydney Road Mudgee NSW 2850 Ph; 02 6372 6735 E: mudgee.mai@alsglobal.com LINEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph; 02 4014 2500 E: samples newcastle@alegiobal.com LINOWRA 4/13 Geary Place North Novra NSW 2541 Ph; 024423 2063 E: nown@alegiobal.com

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Ph: 02 4225 3125 E: portkembla@aisplobal.com

€ Frank	ALS Laboratory:  please fick   Ph: 07 7471 5600 E: gladstons@alsglobal.com				Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com  Ph: 08 9209 7655 E: samples.perth@alsglobal.com						90 Isglobal.com	DWOLLONGONG 99 Kenny Street Wollongong NSW 2500 com Ph; 02 4225 3125 E; portkembla@alsglobal.com		
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# **CERTIFICATE OF ANALYSIS**

Work Order : ES1824374

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 12

No. of samples analysed : 4

Page : 1 of 6

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 17-Aug-2018 16:53

Date Analysis Commenced : 20-Aug-2018

Issue Date : 23-Aug-2018 15:47



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

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#### **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 vinvl 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.

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Sub-Matrix: SOIL (Matrix: SOIL)					BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	
	Cli	ent sampli	ng 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 Identificat	ion 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 Merc	cury by FIMS							
Mercury	7439-97-6	0.1	mg/kg	0.6	0.1	<0.1	<0.1	
EP075(SIM)B: Polynuclear Aroma	atic 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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH102_0.0-0.2	BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	
	Cli	ent samplii	ng 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 H	ydrocarbons - Cont	inued						
^ Sum of polycyclic aromatic hydrocarbon	s	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 Hydrocarl	bons							
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 Hydroc	arbons - NEPM 201	3 Fra <u>ctio</u>	าร					
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		50	mg/kg	<50	<50	<50	<50	
(F2)								
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 Su	rrogates							
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								

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# Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH102_0.0-0.2	BH102_0.5-0.6	BH103_0.0-0.2	BH103_0.5-0.6	
	Cli	ent sampli	ng 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	d							
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

OUR HIGHTAL COLL										
Method: Compound	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.								

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# 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



## **QUALITY CONTROL REPORT**

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Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

Work Order : ES1824374 Page

Client : GHD PTY LTD Laboratory : Environmental Division Sydney

Contact : MS ALISON MONKLEY Contact : Brenda Hong

Address : PO BOX 5403 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NEWCASTLE WEST NSW, AUSTRALIA 2302

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 :

No. of samples analysed : 4

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.

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

: EN/005/18

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This Quality Control Report contains the following information:

#### Signatories

Quote number

No. of samples received

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 ConceicaoSenior SpectroscopistSydney Inorganics, Smithfield, NSWEdwandy FadjarOrganic CoordinatorSydney Inorganics, Smithfield, NSWEdwandy FadjarOrganic CoordinatorSydney Organics, Smithfield, NSW

Shaun Spooner Asbestos Identifier Newcastle - Asbestos, Mayfield West, NSW

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#### **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 Co	ontent (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 Meta	Is 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 Rec	overable Mercury by FI	MS (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: Polyr	nuclear Aromatic Hydro	carbons (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		

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	Sub-Matrix: SOIL						Laboratory I	Ouplicate (DUP) Report		
Part	Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Part	EP075(SIM)B: Polyr	nuc <mark>l</mark> ear Aromatic Hy	drocarbons (QC Lot: 1883707) - continued							
EPOTS(SIM), Purpus   120-127   0.5 mg/kg   -0.5 mg/kg	ES1824321-003	Anonymous	EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EPUT/SIGNITy Fluorenthene   209-440   0.5   mg/kg   40.5   40.5   0.00   No Limit			EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
Per			EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
PP075/SIMP   Betzio anthrincene   Se5-53   0.5   mg/kg   <0.5   <0.5   <0.0   No. Limit			EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SMI): Chrysene			EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
PROFISEM			EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
Post			EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM): Benzoi(s)fuoramhene   207-06-9   0.5   mg/kg   <0.5   <0.5   <0.00   No Limit			EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM), Benzo(a)pyrene   50-32-8   0.5   mg/kg   4.0.5   4.0.5   4.0.0   0.00   No Limit				205-82-3						
EP075(SIM)   Indemot() 2.3 cd)pyrene			EP075(SIM): Benzo(k)fluoranthene		0.5	mg/kg			0.00	No Limit
EP075(SIM): Diberaz(a, h)sentifracene   S3-70-3  0.8   mg/kg   <0.5   <0.5   <0.0   No Limit			EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	0.00	No Limit
EP075(SIM): Benzo(g.h.)penylene			EP075(SIM): Indeno(1.2.3.cd)pyrene			mg/kg				No Limit
EP075(SM). Sum of polycyclic aromatic   No.5   mg/kg   <0.5   <0.5   0.00   No Limit			EP075(SIM): Dibenz(a.h)anthracene			mg/kg				No Limit
Professional Pro			EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM): Benzo(a)pyrene TEQ (zero)			EP075(SIM): Sum of polycyclic aromatic		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			hydrocarbons							
E51824258-001   Anonymous   EP080: C6 - C9 Fraction			EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES182443-001	EP080/071: Total Pe	etroleum Hydrocarbo	ons (QC Lot: 1883260)							
EP080/071: Total Potroleum Hydrocarbons (QC Lot: 1883706)   EP071: C15 - C28 Fraction	ES1824258-001	Anonymous	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.00	No Limit
E981824321-003	ES1824443-001	Anonymous	EP080: C6 - C9 Fraction		10	mg/kg	<10	<10	0.00	No Limit
EP071: C29 - C36 Fraction	EP080/071: Total Pe	etroleum Hydrocarbo	ons (QC Lot: 1883706)							
EP071: C10 - C14 Fraction	ES1824321-003	Anonymous	EP071: C15 - C28 Fraction		100	mg/kg	<100	<100	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)   EP071: >C16 - C34 Fraction   C6_C10   C74 Fraction			EP071: C29 - C36 Fraction		100	mg/kg	120	<100	17.2	No Limit
ES1824258-001   Anonymous   EP080: C6 - C10 Fraction   C6_C10   10   mg/kg   <10   <10   0.00   No Limit			EP071: C10 - C14 Fraction		50	mg/kg	<50	<50	0.00	No Limit
ES182443-001 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	EP080/071: Total Re	ecoverable Hydrocai	rbons - NEPM 2013 Fractions (QC Lot: 1883260)							
ES182443-001   Anonymous   EP080: C6 - C10 Fraction   C6_C10   10   mg/kg   <10   <10   0.00   No Limit	ES1824258-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1824321-003 Anonymous EP071: >C16 - C34 Fraction EP071: >C34 - C40 Fraction EP071: >C10 - C16 Fraction EP071: >C10 - C16 Fraction EP080: BTEXN (QC Lot: 1883260)  EP080: Benzene EP080: Toluene EP080: Ethylbenzene EP080: Ethylbenzene EP080: meta- & para-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: meta- & para-Xylene EP080: meta- & para-Xylene EP080: ortho-Xylene EP080: orth	ES1824443-001	Anonymous		C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1824321-003 Anonymous EP071: >C16 - C34 Fraction EP071: >C34 - C40 Fraction EP071: >C10 - C16 Fraction EP071: >C10 - C16 Fraction EP080: BTEXN (QC Lot: 1883260)  EP080: Benzene EP080: Toluene EP080: Ethylbenzene EP080: Ethylbenzene EP080: meta- & para-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: ortho-Xylene EP080: meta- & para-Xylene EP080: meta- & para-Xylene EP080: ortho-Xylene EP080: orth	EP080/071: Total Re	ecoverable Hydrocai	rbons - NEPM 2013 Fractions (QC Lot: 1883706)							
EP071: >C34 - C40 Fraction 100 mg/kg <100 <100 0.00 No Limit EP080: BTEXN (QC Lot: 1883260)  EP080: Benzene FP080: Benzene FP080: Toluene FP080: Ethylbenzene FP080: Ethylbenzene FP080: meta- & para-Xylene FP080: ortho-Xylene FP080: ortho-Xylene FP080: ortho-Xylene FP080: ortho-Xylene FP080: ortho-Xylene FP080: ortho-Xylene FP080: mg/kg <10.5 mg/kg					100	mg/kg	130	<100	27.5	No Limit
EP080: BTEXN (QC Lot: 1883260)    EP080: BTEXN (QC Lot: 1883260)   EP080: Benzene   T1-43-2   0.2   mg/kg   <0.2   <0.2   0.00   No Limit					100		<100	<100	0.00	No Limit
EP080: BTEXN (QC Lot: 1883260)  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 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					50	mg/kg	<50	<50	0.00	No Limit
ES1824258-001  Anonymous  EP080: Benzene  EP080: Toluene  EP080: Ethylbenzene  EP080: Ethylbenzene  EP080: meta- & para-Xylene  EP080: ortho-Xylene  EP080: ortho-Xylene  100-41-4  0.2 mg/kg  <0.2 <0.2 0.00 No Limit  108-88-3  0.5 mg/kg  <0.5 <0.5 0.00 No Limit  EP080: mg/kg  <0.5 0.5 0.00 No Limit  EP080: mg/kg  <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: ortho-Xylene  EP080: ortho-Xylene  95-47-6  EP080: ortho-Xylene  EP080: ortho-Xylene  PF080: ortho-Xylene  EP080: ortho-Xylene  PF080: ortho-Xylene  EP080: ortho-Xylene  EP080: ortho-Xylene  PF080: ortho-Xylene  EP080: ortho-Xylene  PF080: ortho-Xylene  EP080: ortho-Xylene	EP080: BTEXN (QC	Lot: 1883260)								
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 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: ortho-Xylene 95-47-6 0.5 mg/kg <0.5 <0.5 0.00 No Limit	,		FP080: Benzene	71-43-2	0.2	ma/ka	<0.2	<0.2	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 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: meta- & para-Xylene 108-38-3 0.5 mg/kg <0.5 <0.5 0.00 No Limit 106-42-3 EP080: ortho-Xylene 95-47-6 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: ortho-Xylene 95-47-6 0.5 mg/kg <0.5 <0.5 0.00 No Limit			2. 555. mota a para Aylono		-	33				
			EP080: ortho-Xylene		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			EP080: Naphthalene			mg/kg		<1		

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Sub-Matrix: SOIL	p-Matrix: <b>SOIL</b>					Laboratory E	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC	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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		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

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## 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)		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: 1889)	224)							
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(C	CLot: 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 Hydrocarbo	ns (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(S <b>I</b> M): 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(S <b>I</b> M): 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(S <b>I</b> M): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	6 mg/kg	97.1	68	116
· ,	205-82-3							
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	94.0	74	126
EP075(S <b>I</b> M): 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(S <b>I</b> M): 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(QCI	_ot: 1883260)							
EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	83.7	68	128
EP080/071: Total Petroleum Hydrocarbons(QCI	ot: 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 - N	EDM 0040 E 41 4001							

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Sub-Matrix: SOIL				Method Blank (MB)		Laboratory Control Spike (LC	S) Report	
				Report	Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Recoverable Hydrocarbons - NE	PM 2013 Fractions (QCL	.ot: 1883260) - co	ntinued					
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	88.3	68	128
EP080/071: Total Recoverable Hydrocarbons - NE	PM 2013 Fractions (QCL	ot: 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	0.5	mg/kg	<0.5	2 mg/kg	84.1	66	118
	106-42-3							
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			M-	atrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery L	imits (%)
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Met	tals 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	70	130
					Determined		
EG035T: Total Re	coverable Mercury by FIMS (QCLot: 1889225)						
ES1824297-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.6	70	130
EP075(SIM)B: Poly	ynuclear 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 F	Petroleum Hydrocarbons (QCLot: 1883260)						
ES1824258-001	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	80.1	70	130

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

91-20-3

2.5 mg/kg

81.3

70

130

EP080: ortho-Xylene

EP080: Naphthalene



# QA/QC Compliance Assessment to assist with Quality Review

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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.

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#### **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	ES1824297002	Anonymous	Zinc	7440-66-6	Not		MS recovery not determined,
					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	i: 🗴 = Holding time	breach ; ✓ = Withi	n holding tim
Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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							

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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,	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							
Soil Glass Jar - Unpreserved (EP080)								
BH102_0.0-0.2,	BH102_0.5-0.6,	17-Aug-2018	20-Aug-2018	31-Aug-2018	✓	22-Aug-2018	31-Aug-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							
EP080/071: Total Recoverable Hydrocarbons	- NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071)								
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							
Soil Glass Jar - Unpreserved (EP080)								
BH102_0.0-0.2,	BH102_0.5-0.6,	17-Aug-2018	20-Aug-2018	31-Aug-2018	✓	22-Aug-2018	31-Aug-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH102_0.0-0.2,	BH102_0.5-0.6,	17-Aug-2018	20-Aug-2018	31-Aug-2018	✓	22-Aug-2018	31-Aug-2018	✓
BH103_0.0-0.2,	BH103_0.5-0.6							

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# **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 specifi						
Quality Control Sample Type		Co	ount		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(S <b>I</b> M)	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(S <b>I</b> M)	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(S <b>I</b> M)	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(S <b>I</b> M)	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

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 Work Order
 : ES1824374

 Client
 : GHD PTY LTD

 Project
 : 2219573



## **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(S <b>I</b> M)	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	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and
sediments and sludges			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	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior
and Trap			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: CIADELAIDE 21 Burma Road Poorake SA 5095 Ph: 08 8359 0850 E: adealde@alaglobal.com ELBRIGBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples brisbane@alaglobal.com LIGLADSTONE 46 Callemondah Drive Cilmton QLD 4680 Ph: 07 3747 5500 E: haldenoogalasichal.com DMACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E; mackay@alsglobal.com

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Ph: 07 4796 0500 E: townsWills.ammonmental@alsglobal.com
DWOLLONGONG 98 Keriny Street Wollongung NSW 2500
Ph: 02 4275 4375 E: podiferani@alsglobal.com

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## **CERTIFICATE OF ANALYSIS**

Work Order : ES1825384

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number : ----

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 3
No. of samples analysed : 1

Page : 1 of 5

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 28-Aug-2018 10:00

Date Analysis Commenced : 30-Aug-2018

Issue Date : 03-Sep-2018 13:27



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

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 Client
 : GHD PTY LTD

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 : 2219573



#### **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

 $\emptyset$  = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

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

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	COMP 1	 		
	Cli	ent samplii	ng date / time	[17-Aug-2018]	 		
Compound	CAS Number	LOR	Unit	ES1825384-001	 	******	
				Result	 		
EA055: Moisture Content (Dried @ 105-1	I10°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	72-54-8/72-55-9/5	0.05	mg/kg	<0.05	 		
	0-2						
EP066S: PCB Surrogate							
Decachlorobiphenyl	2051-24-3	0.1	%	96.0	 		
EP068S: Organochlorine Pesticide Surre	ogate						
Dibromo-DDE	21655-73-2	0.05	%	97.6	 		

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 : GHD PTY LTD

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 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)			COMP 1	 	 	
	Cli	ent samplir	ng date / time	[17-Aug-2018]	 	 
Compound	ompound CAS Number LOR Unit		ES1825384-001	 	 	
				Result	 	 
EP068T: Organophosphorus Pest	ticide Surrogate					
DEF	78-48-8	0.05	%	96.8	 	 

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# Surrogate Control Limits

Sub-Matrix: <b>SOIL</b>		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

: GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

**NEWCASTLE WEST NSW. AUSTRALIA 2302** 

Telephone : ----

Project : 2219573

Order number : ----

C-O-C number : --

Sampler : JULIAN FOWLER

Site

Client

Quote number : EN/005/18

No. of samples received : 3
No. of samples analysed : 1

Page : 1 of 5

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 28-Aug-2018

Date Analysis Commenced : 30-Aug-2018

Issue Date : 03-Sep-2018



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

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 Work Order
 : ES1825384

 Client
 : GHD PTY LTD

 Project
 : 2219573



#### **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 I	Duplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Co	ntent (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: Polychlorina	ated 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: Organochi	orine 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

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 Work Order
 : ES1825384

 Client
 : GHD PTY LTD

 Project
 : 2219573



Sub-Matrix: SOIL						Laboratory D	ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochio	orine Pesticides (OC) (QC Lo	ot: 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

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 : GHD PTY LTD

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## 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: <b>SOIL</b>				Method Blank (MB)		Laboratory Control Spike (LC	S) Report	
				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 Li	imits (%)
Laboratory sample ID	Client sample ID	Method: Compound C	CAS Number	Concentration	MS	Low	High
EP066: Polychlorin	nated Biphenyls (PCB) (QCLot: 1904951)						
ES1825384-001	COMP 1	EP066: Total Polychlorinated biphenyls		1 mg/kg	106	70	130
EP068A: Organoch	lorine Pesticides (OC) (QCLot: 1904950)						

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Matrix Spike (MS) Report Sub-Matrix: SOIL SpikeRecovery(%) Spike Recovery Limits (%) Laboratory sample ID Client sample ID CAS Number Concentration MS Low High Method: Compound 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 76-44-8 0.5 mg/kg 89.4 70 130 EP068: Heptachlor 309-00-2 130 0.5 mg/kg 91.4 70 EP068: Aldrin 60-57-1 0.5 mg/kg 107 70 130 EP068: Dieldrin 72-20-8 2 mg/kg 89.3 70 130 EP068: Endrin EP068: 4.4`-DDT 50-29-3 2 mg/kg 81.1 70 130



# 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.

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## **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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

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

Method	Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)		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	<b>√</b>
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	<b>√</b>

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# **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.

Matrix: SOIL				Lvaluatio	ii. * = Quality Oc	intion nequency i	iot within specification, V = Quality Control frequency within specification
Quality Control Sample Type		Co	ount		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

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## **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

From:

Julian Fowler < Julian.Fowler@ghd.com>

Sent:

Tuesday, 28 August 2018 9:37 AM

To:

Samples Sydney

Subject:

additional analysis for ES1824374

ريي

\*1,3

Good morning,

For work order ES1824374, I would like to request an analysis of a composite of 2 samples:

- **7** BH102\_0.0-0.2
- **3** BH103\_0.0-0.2

For OCP's and PCB

1. Comp 7

Let me know if there will be any issues.

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: <u>julian.fowler@ghd.com</u> Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle, NSW, 2300 | PO Box 5403 HRMC, NSW, 2310, Australia | <u>www.ghd.com</u>

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Environmental Division
Sydney
Work Order Reference
ES1825384



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## **CERTIFICATE OF ANALYSIS**

Work Order : ES1825728

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 80
No. of samples analysed : 60

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Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 31-Aug-2018 13:08

Date Analysis Commenced : 05-Sep-2018

Issue Date : 10-Sep-2018 17:07



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

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#### **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.

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Sub-Matrix: COMPOSITE (Matrix: SOIL)		Client sample ID			COMP 3	 	
	Cli	ient sampli	ng date / time	30-Aug-2018 00:00	31-Aug-2018 00:00	 	
Compound	CAS Number LOR Unit		Unit	ES1825728-079	ES1825728-080	 	
·				Result	Result	 	
EA055: Moisture Content (Dried @ 1	05-110°C)						
Moisture Content		1.0	%	2.8	6.0	 	
EP066: Polychlorinated Biphenyls (F	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	72-54-8/72-55-9/5	0.05	mg/kg	<0.05	<0.05	 	
	0-2						
EP066S: PCB Surrogate							
Decachlorobiphenyl	2051-24-3	0.1	%	75.3	113	 	
EP068S: Organochlorine Pesticide S	urrogate						
Dibromo-DDE	21655-73-2	0.05	%	106	134	 	

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Sub-Matrix: COMPOSITE (Matrix: SOIL)		Clie	ent sample ID	COMP 2	COMP 3	 	
	Cli	ent samplir	ng 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 Pestici	de Surrogate						
DEF	78-48-8	0.05	%	97.7	107	 	

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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
	Cli	ent sampli	ng 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 Identifica	tion 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-AE	s							
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 Mer	curv by FIMS							
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Arom	atic 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

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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 Hyd	lrocarbons - Cont	inued						
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 Hydrocarbo	ns							
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 Hydrocarb	oons - NEPM 201	3 Fraction	ns					
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		50	mg/kg		<50	<50	<50	<50
(F2)								
P080: 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
	08-38-3 106-42-3	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 Surro	ogates							
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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing 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 - C	ontinued							
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	S							
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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	C	lient sampli	ing date / time	30-Aug-2018 00:00				
Compound	CAS Number	CAS Number LOR Unit			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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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 Mercur								
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1		
EP075(SIM)B: Polynuclear Aromatic			g.r.ig					
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5		
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5		
Acenaphthylene	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 hydrocarb		0.5	mg/kg		0.6	0.6		
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg		<0.5	<0.5		

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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		
	Cli	ent sampli	ng date / time	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 I	Hydrocarbons - Cont	inued								
^ 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 Hydrocai	rbons									
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	C6_C10-BTEX	10	mg/kg		<10	<10				
(F1)										
>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		50	mg/kg		<50	<50				
(F2)										
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 S	urrogates									
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				

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ng date / time	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		

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	С	lient sampli	ing date / time	30-Aug-2018 00:00				
Compound	CAS Number	CAS Number LOR Unit			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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	BH302_4.45-4.5	BH302_4.9-5.0	ВН306_0.0-0.2	BH306_0.2-0.3	BH306_0.45-0.5
	Cli	ient sampli	ing date / time	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 @ 1	05-110°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								
Mercury	7439-97-6	0.1	mg/kg			<0.1	<0.1	
EP075(SIM)B: Polynuclear Aromatic			97.1.9					
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 hydrocarb		0.5	mg/kg			0.6	<0.5	
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg			<0.5	<0.5	

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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
·	Cli	ent sampli	ng date / time	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 Hy	drocarbons - Cont	inued						
^ 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 Hydrocarb	ons							
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 Hydroca	rbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg			<10	<10	
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg			<10	<10	
(F1) >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		50	mg/kg			<50	<50	
(F2)			mg/kg			100	100	
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 Sur	rogates							
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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	C	lient sampli	ing date / time	30-Aug-2018 00:00				
Compound	CAS Number	CAS Number LOR Unit			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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ient 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
	Cli	ient sampl	ing date / time	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-AE	·s							
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 Mei								
Mercury	7439-97-6	0.1	mg/kg				<0.1	
EP075(SIM)B: Polynuclear Arom								
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 hydro	carbons	0.5	mg/kg				<0.5	
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg				<0.5	

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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
	Cli	ent sampli	ng date / time	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 Hy	drocarbons - Cont	inued						
^ 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 Hydrocarb	ons							
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 Hydroca	rbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg				<10	
^ C6 - C10 Fraction minus BTEX	C6 C10-BTEX	10	mg/kg				<10	
(F1)	_							
>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		50	mg/kg				<50	
(F2)								
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 Sur	rogates							
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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ient 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
	Cl	ient sampl	ing date / time	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-AE								
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				
			mg/kg					
EG035T: Total Recoverable Mer		0.1	malka	<0.1			I	I
Mercury	7439-97-6	0.1	mg/kg	<0.1				
EP075(SIM)B: Polynuclear Arom				2.5				
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 hydro	carbons	0.5	mg/kg	<0.5				
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5				

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ng date / time	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 - Cont	inued						
^ 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 Hydroca	arbons							
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 Hydro	ocarbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10				
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg	<10				
(F1)								
>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 Naphthalen	е	50	mg/kg	<50				
(F2)								
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 S	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				

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampl	ing date / time	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				

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	С	lient sampli	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampl	ing date / time	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 Identificat	tion 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	S							
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 Merc	cury by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1			
EP075(SIM)B: Polynuclear Aroma	atic 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			

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			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
Clie	ent samplii	ng 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
CAS Number	LOR	Unit	ES1825728-061	ES1825728-063	ES1825728-064	ES1825728-065	ES1825728-066
			Result	Result	Result	Result	Result
ocarbons - Conti	inued						
50-32-8	0.5	mg/kg	0.8	0.6			
193-39-5	0.5	mg/kg	0.5	<0.5			
53-70-3	0.5	mg/kg	<0.5	<0.5			
191-24-2	0.5	mg/kg	0.8	0.5			
	0.5	mg/kg	8.1	5.5			
	0.5	mg/kg	1.0	0.7			
	0.5	mg/kg	1.3	1.0			
	0.5	mg/kg	1.6	1.3			
5							
	10	mg/kg	<10	<10			
	50	mg/kg	<50	<50			
	100	mg/kg	<100	<100			
	100	mg/kg	<100	160			
	50	mg/kg	<50	160			
ons - NEPM 201:	3 Fraction	าร					
C6_C10	10	mg/kg	<10	<10			
C6_C10-BTEX	10	mg/kg	<10	<10			
	50	mg/kg	<50	<50			
	100	mg/kg	<100	170			
	100	mg/kg	<100	150			
	50	mg/kg	<50	320			
	50	mg/kg	<50	<50			
71-43-2	0.2	mg/kg	<0.2	<0.2			
108-88-3	0.5	mg/kg	<0.5	<0.5			
100-41-4	0.5	mg/kg	<0.5	<0.5			
8-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5			
95-47-6	0.5	mg/kg	<0.5	<0.5			
	0.2	mg/kg	<0.2	<0.2			
	0.5	mg/kg	<0.5	<0.5			
91-20-3	1	mg/kg	<1	<1			
	CAS Number  CAS Number  50-32-8  193-39-5  53-70-3  191-24-2    S   DIS - NEPM 201  C6_C10  C6_C10-BTEX  71-43-2  108-88-3  100-41-4  8-38-3 106-42-3  95-47-6       95-47-6	CAS Number         LOR           ocarbons - Continued         50-32-8         0.5           193-39-5         0.5         53-70-3         0.5           191-24-2         0.5          0.5            0.5          0.5            0.5          0.5           s          100          100            100          50          100          50          100          50          100          50          50          50          50          50          50          50          50          50          50          50          50          50          50          50          50          50          50	So-32-8   0.5   mg/kg     193-39-5   0.5   mg/kg     191-24-2   0.5   mg/kg       10   mg/kg       50   mg/kg	CAS Number         LOR         Unit         ES1825728-061           Result           cocarbons - Continued           50-32-8         0.5         mg/kg         0.8           193-39-5         0.5         mg/kg         0.5           53-70-3         0.5         mg/kg         0.8            0.5         mg/kg         1.0            0.5         mg/kg         1.0            0.5         mg/kg         1.6           S            0.5         mg/kg         <10	CAS Number   LOR   Unit   ES1825728-061   ES1825728-063     Result   Result   Result     S0-32-8   0.5   mg/kg   0.8   0.6     193-39-5   0.5   mg/kg   0.5   <0.5     55-70-3   0.5   mg/kg   0.8   0.5     191-24-2   0.5   mg/kg   0.8   0.5       0.5   mg/kg   1.0   0.7       0.5   mg/kg   1.3   1.0       0.5   mg/kg   1.3   1.0       0.5   mg/kg   1.6   1.3       10   mg/kg   <10   <10   <10       100   mg/kg   <100   <100       100   mg/kg   <100   <100       100   mg/kg   <100   <160       50   mg/kg   <50   <50       100   mg/kg   <100   <160       50   mg/kg   <50   <50       100   mg/kg   <100   <170       100   mg/kg   <100   <170       100   mg/kg   <50   <50       50   mg/kg   <0.5   <0.5       5	CAS Number   LOR	CAS Number   LOR   Unit   ES1825728-061   ES1825728-063   ES1825728-064   ES1825728-065     Result   Result   Result   Result   Result     S0-32-8

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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 Sur	rogates - 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			

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	C	ient sampli	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	 
	Cli	ent sampl	ing 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	on 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 Mercu							
Mercury	7439-97-6	0.1	mg/kg		0.4	0.6	 
EP075(SIM)B: Polynuclear Aromat	ic 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	 

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	 
	Cli	ient sampli	ng 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 Hyd	rocarbons - Cont	inued					
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 Hydrocarboi	ns						
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 Hydrocark	oons - NEPM 201	3 Fraction	ns				
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 1	08-38-3 106-42-3	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 Surro	ogates						

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# Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BHA304_4.9-5.0	BH104_0.0-0.2	BH104_0.2-0.3	 
	Cli	ent sampli	ng 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 Surro	ogates - 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.

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#### Surrogate Control Limits

Surroguto Sontroi Eminto			
Sub-Matrix: COMPOSITE		Recovery L	imits (%)
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 Surrogat	е		
DEF	78-48-8	35	143
Sub-Matrix: <b>SOIL</b>		Recovery L	_imits (%)
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Dhonel dC	42407.00.2	62	400

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



#### QUALITY CONTROL REPORT

Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

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 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : ---- Telephone : (02) 8784 8504

Project: 2219573Date Samples Received: 31-Aug-2018Order number: 05-Sep-2018

C-O-C number : 10-Sep-2018

Sampler : JULIAN FOWLER

No. of samples analysed : 60

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

**NEWCASTLE WEST NSW. AUSTRALIA 2302** 

Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits

Matrix Spike (MS) Report; Recovery and Acceptance Limits

: EN/005/18

: 80

#### Signatories

No. of samples received

Site Quote number

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 FelgendrejerisSenior Acid Sulfate Soil ChemistBrisbane Acid Sulphate Soils, Stafford, QLDCeline ConceicaoSenior SpectroscopistSydney Inorganics, Smithfield, NSWEdwandy FadjarOrganic CoordinatorSydney Inorganics, Smithfield, NSWEdwandy FadjarOrganic CoordinatorSydney Organics, Smithfield, NSW

Gerrad Morgan Asbestos Identifier Newcastle - Asbestos, Mayfield West, NSW

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#### **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 I	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 Co	ontent (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 Meta	s 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

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Sub-Matrix: SOIL			Ī			Laboratory l	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Meta	Is by ICP-AES (QC Lot:								
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 Meta	Is 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 Rec	overable Mercury by FI	MS (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 Reco	overable Mercury by FII	,							
ES1825728-074	BH104 0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.4	0.5	0.00	No Limit
	ated Biphenyls (PCB) (		1100 01 0	<b>9.</b> 1	9/1.9	0.1	0.0	0.00	TTO EITHE
ES1825728-079	COMP 2			0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EP066: Total Polychlorinated biphenyls		0.1	IIIg/kg	<b>~0.1</b>	<b>\0.1</b>	0.00	NO LIIIII
	orine Pesticides (OC) (								
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

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Sub-Matrix: SOIL						Laboratory L	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochl	orine 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: Polyn	uclear Aromatic Hydro	carbons (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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			205-82-3						
		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		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		hydrocarbons							
		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	0.5	mg/kg	1.0	1.4	38.3	No Limit
			205-82-3						
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	0.6	0.00	No Limit

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Sub-Matrix: SOIL			Ī			Laboratory l	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method; Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polyn	uclear Aromatic Hydro	carbons (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		0.5	mg/kg	8.1	# 12.2	40.4	0% - 20%
		hydrocarbons							
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	1.0	1.6	43.7	No Limit
EP075(SIM)B: Polyn	uc <mark>l</mark> ear Aromatic Hydro	carbons (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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			205-82-3						
		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		0.5	mg/kg	<0.5	0.5	0.00	No Limit
		hydrocarbons							
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Pe	troleum 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 Pe	tro <mark>l</mark> eum 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 Pe	troleum Hydrocarbons	(QC Lot: 1915277)							
ES1826014-007	Anonymous	EP071: C15 - C28 Fraction		100	mg/kg	<100	<100	0.00	No Limit
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Sub-Matrix: SOIL						Laboratory L	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Pe	etroleum 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 Re	ecoverable Hydrocarbon	s - 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 Re	ecoverable Hydrocarbon	s - 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 Re	ecoverable Hydrocarbor	s - 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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		ED000, anth a Vulana	106-42-3 95-47-6	0.5	ma/ka	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	91-20-3	1	mg/kg				
		EP080: Naphthalene	91-20-3	7	mg/kg	<1	<1	0.00	No Limit

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#### 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)		Laboratory Control Spike (LCS	6) Report	
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1919	9079)							
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: 1919	9239)							
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) (QCL	ot: 1917223)							
EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	1 mg/kg	102	62	126
EP068A: Organochlorine Pesticides (OC) (QCL	.ot: 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

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Sub-Matrix: <b>SOIL</b>				Method Blank (MB)		Laboratory Control Spike (LC	S) Report	
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 191	7222) - 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 (Q	CLot: 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	0.5	mg/kg	<0.5	6 mg/kg	108	68	116
	205-82-3							
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 (Q								
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

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Method: Compound	Method Blank (MB)	Method Blank (MB) Laboratory Control Spike (LCS) Repo					
			Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1915278) -	continued						
EP075(SIM): Benzo(b+j)fluoranthene 205-99-2	0.5	mg/kg	<0.5	6 mg/kg	94.4	68	116
205-82-3							
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)							
	10	mg/kg	<10	26 mg/kg	89.8	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1915277)							
	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 (Q	CLot: 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 (Q	CLot: 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 (Q	CLot: 1915277)						
·		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	0.5	mg/kg	<0.5	2 mg/kg	84.1	66	118
106-42-3							
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

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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.

ub-Matrix: SOIL				IM:	atrix Spike (MS) Report		
				Spike	SpikeRecovery(%)	Recovery L	imits (%)
aboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
G005T: Total Met	als by ICP-AES (QCLot: 1919079)						
S1825728-004	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
G005T: Total Met	als by ICP-AES (QCLot: 1919239)						
S1825728-074	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
G035T: Total Red	coverable Mercury by FIMS (QCLot: 1919080)						
S1825728-004	BH101 0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	73.7	70	130
G035T: Total Rec	coverable Mercury by FIMS (QCLot: 1919240)						
S1825728-074	BH104_0.0-0.2	EC025Ti Moroum	7439-97-6	5 mg/kg	75.7	70	130
		EG035T: Mercury	7439-97-0	3 Hig/kg	75.7	70	130
	ated Biphenyls (PCB) (QCLot: 1917223)						
S1825728-079	COMP 2	EP066: Total Polychlorinated biphenyls		1 mg/kg	95.0	70	130
P068A: Organoch	Iorine Pesticides (OC) (QCLot: 1917222)						
S1825728-079	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
P075(SIM)B: Poly	nuclear Aromatic Hydrocarbons (QCLot: 1914407)						
S1825728-004	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
P075(SIM)B: Poly	nuclear Aromatic Hydrocarbons (QCLot: 1915278)						
S1826014-007	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

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Matrix Spike (MS) Report Sub-Matrix: SOIL Spike SpikeRecovery(%) Recovery Limits (%) Laboratory sample ID Client sample ID CAS Number MS Concentration Low High Method: Compound EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914408) BH101 0.0-0.2 ES1825728-004 523 mg/kg 106 73 137 EP071: C10 - C14 Fraction 118 53 131 2319 mg/kg EP071: C15 - C28 Fraction 127 52 132 EP071: C29 - C36 Fraction 1714 mg/kg EP080/071: Total Petroleum Hydrocarbons (QCLot: 1914563) BH101 0.0-0.2 ES1825728-004 32.5 mg/kg 87.7 70 130 EP080: C6 - C9 Fraction EP080/071: Total Petroleum Hydrocarbons (QCLot: 1915277) ES1826014-007 Anonymous 523 mg/kg 82.2 73 137 EP071: C10 - C14 Fraction 114 53 131 2319 mg/kg EP071: C15 - C28 Fraction ----1714 mg/kg 125 52 132 EP071: C29 - C36 Fraction EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914408) ES1825728-004 BH101 0.0-0.2 860 mg/kg 109 73 137 EP071: >C10 - C16 Fraction 122 EP071: >C16 - C34 Fraction ----3223 mg/kg 53 131 1058 mg/kg 118 52 132 EP071: >C34 - C40 Fraction EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1914563) ES1825728-004 BH101 0.0-0.2 C6 C10 37.5 mg/kg EP080: C6 - C10 Fraction 90.9 70 130 EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1915277) ES1826014-007 137 Anonymous 860 mg/kg 95.3 73 EP071: >C10 - C16 Fraction 131 EP071: >C16 - C34 Fraction 3223 mg/kg 120 53 1058 mg/kg 107 52 132 EP071: >C34 - C40 Fraction ----EP080: BTEXN (QCLot: 1914563) ES1825728-004 BH101 0.0-0.2 71-43-2 2.5 mg/kg 82.9 70 130 EP080: Benzene 108-88-3 82 2 130 EP080: Toluene 2.5 mg/kg 70 100-41-4 81.7 70 130 2.5 mg/kg EP080: Ethylbenzene 2.5 mg/kg 81.2 70 130 EP080: meta- & para-Xylene 108-38-3 106-42-3 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



# QA/QC Compliance Assessment to assist with Quality Review

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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.

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#### 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	ES1825728061	BHA304_0.0-0.2	Sum of polycyclic		40.4 %	0% - 20%	RPD exceeds LOR based limits
			aromatic				
			hydrocarbons				

#### Outliers : Analysis Holding Time Compliance

Matrix: SOIL					1		
Method			traction / Preparation			Analysis	
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days	Date analysed	Due for analysis	Days
				overdue			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 FIM	s en la companya de						
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 Hydroc	arbons						
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	s - 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

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#### **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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: \* = Holding time breach:  $\checkmark$  = Within holding time.

Matrix: SOIL			_		: × = Holding time breach ; ✓ = Within holding			
Method		Sample Date	Ex	traction / Preparation	ı		Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA003 :pH (field/fox)								
Snap Lock Bag - frozen on receipt at ALS (EA0	•							
BH301_0.95-1.0,	BH301_1.45-1.5,	30-Aug-2018	07-Sep-2018	25-May-2021	✓	07-Sep-2018	06-Dec-2018	✓
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								
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	✓

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method		Sample Date	Ex	traction / Preparation		Analysis			
Container / Client Sample ID(s)			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)		24 4 2242				00.0 0040	14 5 2012	,	
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 Asbesto						- CO COP 2010	777.00		
Snap Lock Bag - ACM/Asbestos Grab Bag (EA20									
BH108_0.0-0.2	·~,	22-Aug-2018				05-Sep-2018	18-Feb-2019	✓	
Snap Lock Bag - ACM/Asbestos Grab Bag (EA20 BH101 0.0-0.2	00)	29-Aug-2018				05-Sep-2018	25-Feb-2019	_	
 Snap Lock Bag - ACM/Asbestos Grab Bag (EA20	00)	-				-			
BHA304_0.0-0.2		30-Aug-2018				05-Sep-2018	26-Feb-2019	✓	
Snap Lock Bag - ACM/Asbestos Grab Bag (EA20 BH104 0.0-0.2	00)	31-Jul-2018				05-Sep-2018	27-Jan-2019	<b>✓</b>	
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)	<del>-</del>								
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	<b>✓</b>	

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method	Sample Date	F	xtraction / Preparation		Analysis				
Container / Client Sample ID(s)		Sample Bate	Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
			Date extracted	Bue for extraction	Lvaladion	Date unaryseu	Buc for analysis	Lvalaalion	
EG035T: Total Recoverable Mercury by FIMS							I		
Soil Glass Jar - Unpreserved (EG035T) BH101 0.0-0.2,	BH101 0.45-0.5	29-Aug-2018	06-Sep-2018	26-Sep-2018	<b>√</b>	07-Sep-2018	26-Sep-2018	<b>✓</b>	
Soil Glass Jar - Unpreserved (EG035T)	BITTOT_0.43-0.3	20 Aug 2010	00 0cp 2010	20 00p 2010		07 GCP 2010	20 000 2010	<b>V</b>	
BH301 0.0-0.2,	BH301 0.45-0.5,	30-Aug-2018	06-Sep-2018	27-Sep-2018	1	07-Sep-2018	27-Sep-2018	<b>✓</b>	
BH302 0.0-0.2,	BH302 0.2-0.3,		· ·	,	_	i i	'	<b>,</b>	
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)		24 Avr. 2040	00 0 0040	14 Com 2010	,	07.0 0040	10.0-4.0010		
COMP 3		31-Aug-2018	06-Sep-2018	14-Sep-2018	✓	07-Sep-2018	16-Oct-2018	✓	
EP075(SIM)B: Polynuclear Aromatic Hydrocar	bons								
Soil Glass Jar - Unpreserved (EP075(SIM))				10.0			45.0.1.0040		
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))	DU004 0 45 0 5	20 Aug 2049	05 Con 2040	13-Sep-2018		00 Com 2049	15-Oct-2018		
BH301_0.0-0.2,	BH301_0.45-0.5,	30-Aug-2018	05-Sep-2018	13-3ep-2016	✓	06-Sep-2018	15-001-2016	✓	
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))	DU404 0 0 0 0	31-Jul-2018	05-Sep-2018	14-Aug-2018		05-Sep-2018	15-Oct-2018		
BH104_0.0-0.2,	BH104_0.2-0.3	31-Jul-2018	05-5ep-2018	14-Aug-2016	<u>*</u>	00-3ep-2018	15-001-2016	✓	

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Matrix: **SOIL** Evaluation: ★ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	E	xtraction / Preparation		Analysis			
Container / Client Sample ID(s)			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,	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 (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	<b>√</b>	06-Sep-2018	12-Sep-2018	<b>✓</b>	
Soil Glass Jar - Unpreserved (EP080)	BITTO 1_0.40 0.0	2011.009 2010		1		от сор деле	12 23p 2111		
BH301 0.0-0.2,	BH301 0.45-0.5,	30-Aug-2018	05-Sep-2018	13-Sep-2018	1	06-Sep-2018	13-Sep-2018	1	
BH302 0.0-0.2,	BH302 0.2-0.3,	50 / Mg 20 / 6	00 00p =0.10			00 00p 2010		<b>Y</b>	
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,	BHA302_0.45-0.5 BHA304_0.45-0.5								
_ ,	БПАЗ04_0.45-0.5								
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	1	
Soil Glass Jar - Unpreserved (EP080)		01-5ui-2010	00-0cp-2010	117 tag 2010		00-оср-2010	10 000 2010	<b>-</b>	
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)			<u> </u>						
BH104_0.2-0.3		31-Jul-2018	05-Sep-2018	14-Aug-2018	×	05-Sep-2018	15-Oct-2018	1	
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	×	

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method				traction / Preparation		Analysis				
Container / Client Sample ID(s)			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	<b>32</b>	06-Sep-2018	14-Aug-2018	<b>x</b>		

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#### **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.

Matrix: SOIL				Evaluatio	n: 🗴 = Quality Co	ntrol frequency	not within specification; ✓ = Quality Control frequency within specificatio
Quality Control Sample Type		С	ount		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Reaular	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(S <b>I</b> M)	3	20	15.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	50.00	10.00	<b>√</b>	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	<b>√</b>	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(S <b>i</b> M)	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(S <b>i</b> M)	2	20	10.00	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	50.00	5.00	<u>√</u>	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	50.00	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	25	8.00	5.00	<b>√</b>	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	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(S <b>I</b> M)	2	20	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	50.00	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	50.00	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	25	8.00	5.00	<u>√</u>	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	8.00	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	22	9.09	5.00	<b>√</b>	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	<u>√</u>	NEPM 2013 B3 & ALS QC Standard
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#### **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
Debugble signated Dischaustle (DOD)	- FDage	0011	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)
Pesticides by GCMS	EP068	SOIL	Schedule B(3) (Method 504)  In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is
resticities by GCIVIS	EPUOO	SOIL	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
Trans Commonation Faction		00.2	quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(S <b>I</b> M)	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

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Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and
sediments and sludges			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	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior
and Trap			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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Ervi	ronnenta: "	please tick ->	Ph: 07 7471	5600 E: gladsto	ne@alsglobal.com	Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com Ph: 08 9209 7655 E: samples.perth@alsglobal.com				LIWOLLONGUNG 99 Kerny Street Wollongong NSW 2500 Ph; 02 4225 3125 E; portkembla@alsglobal.com						
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18	BU 30 [ 3.	5-3.6	V	V	V										<del></del>	
						TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Socium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V= VOA Vial HCI Preserved; VB = VOA Vial Sodium Bisuphrate Preserved; VS = VOA Vial Sodium Bisuphrate Preserved Vial Sodium Bisuphra Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle: ASS = Plastc Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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DWOLLONGONG 98 Kerny Street Wollongong NSW 2500

	please tick →			0 •		F11. 00 a	2205 / 000	c. oanpes.;	hermithara	giopancom	FII. 02 4225 5125 E	. portkernbia@aisglobai.com	
CLIENT: GHD		TURNAROUND REQUIREMENTS :	Standard TAT (L	ist due date):						FOR LARGE	Africia distribution	(civali)	
OFFICE: Newcastle		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Non Standard or	urgent TAT (List due	date):					Garage St. III			No.
PROJECT: 2219573		ALS QUOTE NO.:	_		(	COC SEQU	ENCE N	JMBER	(Circle)		per briefs was strong		
ORDER NUMBER:					COC:	1 2	3	4 5	6	7 Jenum samp			
PROJECT MANAGER: Alison Monkley	CONTACT P	H: <b>49799999</b>			OF:	1 2	3	4 75	Б	7 Oliver connition	4 25 E		
SAMPLER: Julian Fowler	SAMPLER M	OBILE: 0466049181	RELINQUISHED BY:	~ .	RECEIV	/ED BY:				RELINQUISHED BY	r:	RECEIVED BY:	
COC emailed to ALS? ( YES / NO)	EDD FORMA	T (or default): Esdat	rutito	500	1		17-U	/				mo	
Email Reports to (will default to PM if no other	er addresses are listed): Alison, ghdlab	reports, ntl.car	DATE/TIME:		DATE/	TIME:	, .			DATE/TIME:	•	DATE/TIME:	_
Email Invoice to (will default to PM if no othe	r addresses are listed): ap-fss@ghd.co	m	31/8/17	1305	B//	8/18	1.6	56∤ <i>i</i>	1			31/8/08 7	:50pm
COMMENTO/ODECIAL LIANDU INC/OTODAC	E OR DIODOSAL .		17		-11	9		•					

ALS USE	SAMPLE DETA MATRIX SOLIDIS), W	ILS ATER (V)		GONTAINER NEORMAI/ION	120	ANA Where Met	LYSIS REQUIR als are required,	ED including specify Total	SUITES (NB. I (unfiltered bot	Suite Codes r tle required) o	nust be listed r Dissolved (	to attract suite	e price) ottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL	*								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	BH 301_3.95-4.0 BH 301_4.45-4.5 BH 301_4.9-5.0	30/8/18	- 5	A55	1									
20	BH 301-4.45-45	7/	1		ţ									
21	BH301 _ 4.9-5.6			<b>,</b>	1					-				
22	BHINGS FIB.			Jur	1									
23	BH302 00-0.2 BH302 0.2-0.3 CH302 0.45-0.5			t, B.	2									
24	BH302 0.2-0.3			A MANUAL PROPERTY OF THE PARTY	7			i						
25	CH 302_045-0.5			JAS	3									
26	BH 302 _ 0-95-1,0			W P	2									
27	BH 302_ 0-95-1.0 BH 302_ 1.45-1.5				1									
28	BH 302 20-21 BH 302 245-25				1						ΙΛ		ODIC	NIAL
29	BU 302 _ 245-25				1							ł	OP'	
30	BU 302 295-20				- 1						F.	13 24 8 2 A	Contract !	- 194
31	BU 302 3-4-3-6				1									
32	GU 302 - 3.95-40				ş						Mark Street		m es es	
3.3	64 302 - 3.95-40 64 302 - 4.45-4.5				1									7.0
34	BM 302-49-50				1									
35	BU 302-49-50			V	i									
36	BH306 - 0.0-0.2	1	J	Jun B	2									
				TOTAL				_						



# CHAIN OF CUSTODY

ALS Laboratory:

DADELAIDE 21 Burma Road Pooraka SA 5095
Ph. 08 8359 0830 E: adelaide@alsglobal.com
DBRISBANE 32 Shand Street Stafford QLD 4053
Ph: 07 3243 7722 E: samples birisbane@alsglobal.com
UGLADSTONE 46 Callemondah Drive Clinton QLD 4680

□MACKAY 78 Harbour Road Mackay QLD 4740 Ph; 07 4944 0177 E; mackay@alsglobal.com

LIMELBOURNE 2.4 Westall Road Springvale VIC 3171
Ph. 03 8549 9800 E. samples. melbourne@alsglobal.com
Ph. 024423 2063 E. novra@alsglobal.com
Characteristics of the Control of the Control

EMEWCASTLE 5/565 Mailand Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: sampes newcastle@alsglobal com DNOWPA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2053 E: norta@alsglobal com □SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Pht 02 8784 9555 E; samples sydney@arisglobal.com □TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: warnsville environmenta@arisglobal.com □WOLLONGONG 98 (Kenny Street Wollongong NSW 2600 Ph: 02 4795 4795 E. seeffrond)

	please tick ->	2022 C. Gistarol legistrogroun.com	THE DE GIVE OF CO. E. HANGGER HUNGGONG CONTROL	Ph: 06 9209 7656 E. saintes.perth@ais	Jional.com Pn: 02 4225 3125 E:	poffkembla@alsglobal.com
CLIENT: GHD		TURNAROUND REQUIREMENTS:	Standard TAT (List due date):		FOR MATORIAN (OLYANISE ONE)	Gider Maria
OFFICE: Newcastle		(Standard TAT may be longer for some tests e.g Ultra Trace Organics)	Non Standard or urgent TAT (List du	e date):	Officer Seattpart 198	
PROJECT: 2219573		ALS QUOTE NO.:		COC SEQUENCE NUMBER (Circle)		
ORDER NUMBER:				COC: 1 2 6 4 5 6	7 Febbenssample Vergesalberen Rea	
PROJECT MANAGER: Alison Monkley	CONTACT P	H: 49799999		OF: 1 2 3 4 5 6	7 Charsonnair	
SAMPLER: Julian Fowler	SAMPLER M	OBILE: 0466049181	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? ( YES / NO)	EDD FORMA	T (or default): Esdat	July Fall	I KNONES		7 MC
Email Reports to (will default to PM if no	other addresses are listed); Alison, ghdlab	reports, ntl.car	DATE/TIME:	DATE/TIME: C / 10 1000	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no o	ther addresses are listed); ap-fss@ghd.co	om	31/8/18 1305	3/18/18 108pm		31/8/L8 7:30pm
COMMENTS/SPECIAL HANDLING/STOR	AGE OR DISPOSAL:		( ,	,		

ALS VISE	SAMPLE DE LA MATRIX SOLIDIS, W	Iles and the second sec		ASE CONTAINER NEORMATION E				UITES (NB. Suite Co				Additional information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL	4						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH 306 _ 0.45-0.5	30/8/18	S	Jur. B	_2							
38 39	BH 306 _ 0.45-0.5		1	V V ASS	3			 				
39	B4306 145-1.5			,	1							
40	SH306 145-1-5				)							
41	B4306 - 2.0-2.1			·	1				$\angle$	-		
42	CH 306_ 2.45-2.5	_					ļ			.		
43	e4306 80-3·1							 				
44	24306_35-3.6		+		1	<del> </del>	-	_   _	-		_	
45	SH306_3-9-4.0 BH306_48-45								<del>-</del>	-		
12	FD 9		+ }	Jar	1.			 	+-	AB OF	ORI	GIN:
47 48 49 50 51 52	B44302_0.0-0.L		<del>                                     </del>	Jur, B	2				- ks-	NOVA (		
49	BHA302_0.2-0.3		1	1 1	2				+	1 to grown in 1	27.7 1.740. 7	1200 (120)
50	BUA302 0145-0-5			V V. ASS	3							
51	BUA 302_0-45-0-5 BUA 302_0-95-10		1		(						All	0.50
	BHA 302_1.45-15				1							
53	BUA 302 2:0-21				1				L_			
54	BUA 302 _ 2-0-21 BUA 302 _ 245-2-5	<b>V</b>	V		1							
				TOTAL								



# CHAIN OF CUSTODY

ALS Laboratory: please tick → DADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8389 (1990 E: redeblais@basglobal.com
DBRISBANE 22 Shand Street Stafford QLD 4653
Ph: 07 3243 7222 E: samples brisbane@alsglobal.com
DGLADSTONE 46 Galemondéh Drive Cinton QLD 4650
Ph: 07 7471 5000 E: gladstone@alsglobal.com

DMACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

CIMELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples melbourne@alsglobal.com CIMUDGEE 27 Sydney Road Mudgee NSW 2650 Ph: 02 6372 6736 E: mudgee.mail@alsglobal.com WEWCASTLE 5/585 Mailand Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E. sampes.newcastle@alsglobal.com

UNOWRA 4/13 Geary Place North Nowrs NSW 2541 Ph: 024423 2063 E: nowa@assjobal.com UPERTH 10 Hod Way Milaga WA 5090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com LISYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples sydney@alsglobal.com LTOWNSVILLE 14-15 Dearn Court Bohle DLD 4818 Ph: 07 4796 0800 E: townsville.anvironmental@alsglobal.com LTOWNSVILLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4205 2125 E: potkenbal@alsglobal.com

CLIENT:				ROUND REQUIREMENTS: I TAT may be longer for some tests e.g	Standard TAT (List				FOR LABORA	10:37 USE (0N	N/ (el(dia)	
	Newcastle		Ultra Trac	e Organics)	☐ Non Standard or urg	ent TAT (List due		with the column	Gustarry S. (3) [pt.	er vir Kilplesen		
ORDER N	: 2219573		ALS QU	JOTE NO.:				NUMBER (Circle)	record 7 Randonis Simile			
	MANAGER: Alison Monkley	CONTACT P	H: 497999	999			OF: 1 2 3	4 (5) 6	7 Other comment			
	ে Julian Fowler	SAMPLER M	OBILE: (	0466049181	RELINQUISHED BY:		RECEIVED BY:	7.	RELINQUISHED BY:		RECEIVED BY:	
COC emai	iled to ALS? ( YES / NO)	EDD FORMA	T (or def	ault): Esdat	July Es	مهله	KONG				MC	
Email Rep	orts to (will default to PM if no other addresses	are listed): Alison, ghdlab	reports, r	ntl.car	DATE/TIME: 18	ب. سب	DATESTIME	1.06,00	DATE/TIME:		DATE/TIME: 31/8/18 7:30 pw	_
Email Invo	pice to (will default to PM if no other addresses a	re listed): ap-fss@ghd.co	m .		1 21/8/18	1505	PATE/TIME: 31/8/18/	OGIN			31/8/V8 7: 50 fav	<u>`</u>
COMMEN.	TS/SPECIAL HANDLING/STORAGE OR DISPO	SAL:			/							
ALS USE	SAMPLE DETA SA MATRIX SOUD (S) W	ILS AS ASTERIOR AND ASTER		CONTAINER INFOR	RMATION	ANALYSIS Where Metals are	REQUIRED including SUITE required, specify Total (unfilte	ES (NB. Suite Codes r ered bottle required) or	nust be listed to aftract s Dissolved (field filtered	uite price) I bottle required).	Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIV (refer to codes below)	m TOTAL CONTAINERS						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
55	BUANO 30-31	30/8/14	S	ASS	1							
54	BHA302_30-31 BHA302_3-5-3-6		1		1			-				
57 58	347302 _ 39-40 BUA 302 _ 445-45				1					1		
58	BUA 302 4.45-8.5			·	1							
59	QUA 302 _ 4.9-50			V	1							
60	FDIO	,		Jar	1						_	
61	BHA 304 00-0.2			1 8	2							
62	SHA 304 _ 0.2-03 BHA 304 _ 0.45-05			1,1	2							
63	OUA 304_ 0.45-05			, A	55 3							
63 64	BHA 304_0.95-1.0			1.1	3							
65	BHA 304_1.5-1.6				1				LAB OF	ORIGI	٠ <u>-</u>	
66	BUA 304-2.0-2.1				(				NIEW/C			
67	3HA 3U4 - 2.95-2.5		q		1							
68	BHA 304_ 1.0-3.1		7.		ſ							
68 69	SHA 304_ 3.5-3.6				1				Z= 4			
70	BUA 304 _ 3.95-4.0				ſ				<b>12.</b> 10. 10. 10. 10. 10. 10. 10. 10. 10. 10.			
71	BUA 304 _ 4.5-46				1				L			
12	BUA 304 _ 49-50	V	*	4	• ] [							
					TOTAL							

									,						Ash #	1,4,6	1,
enui	CHAIN OF CUSTODY  Als Laboratory: please tick →	Ph: 06 8359 0 GBRISBANE Ph: 07 3243 7 DGLADSTOR	0090 E: adelak 32 Shand Skr 7222 E: sampli 8E 46 Callemo	ad Pooraka S.A.5005 (e@akglobal com sel Stafford OLD 4053 it, bristoane@aksglobal.com roath Drive Cherto OLD 4630 one@aksglobal.com	DMACKAY 78 Hinto Ph: 07 4944 0177 E GMELBOURNE 2-4 Ph: 03 8549 9600 E DMUOGGE 27 Syd Ph: 02 6372 5735 E	mackay@al Westell Roa samples.rea hev Road N	isglobal.com ki Springvale VIC J Nibourne@akglobal Audore HSW 2850	f.com	⊡NOW Ph; 024	ASTLE 5/585 Mai 14 2500 E: samp RA 4/13 Geary F 6423 2063 E: nov H 10 Hod Way M 209 7855 E: sam	Place North Nove wa@utsglobal.co			DSYONEY 27* Pr. 02 8764 85 DTOWNSVALL Ph. 07 4796 06	7-289 Woodpark Royd Smith 35 E: Earspies sydney@origi E: 14-15 Desma Court Bohie 00 E: towarsite environmentali NG 96 Kenny Street Wolczy 25 E: portkemble@atspiobal	QLD 4818 <b>@≓</b> splobel.com	8
JENT:				ROUND REQUIREMENTS:	្រើ Standard 1	TAT (List	due date):					<u>্রের</u>	1000 M	কৈ টেন্ড জ			
	Vewcastle		UKra Trace	TAT may be longer for some testa e.g Organics)	☐ Non Stand	ard or urg	geni TAT (List				·		Contraction of	insk errens	200	166 150	
ROJECT:			ALS QU	OTE NO.:					7	ENCE NUMBE		1500	,		a.c.	Ob W	
	MANAGER: Alison Monkley	CONTACT P	H- 497999	99		-		(	1 2	3 4	5 6 /5) 6		recinier ur Biritari	וויט דר דיינון			
	Julian Fowler	SAMPLER M			RELINGUISHE	D BY:		_ <del> </del>	VED BY:		<u> </u>	RELINQUISI	and the second	see washing in	RECEIVED BY		
	d to ALS? ( YES / NO)	EDD FORMA			Jala	1	Endo	· []	AN	2					11203400 01	•	
nail Repo	rts to (will default to PM if no other addresses a	are listed): Allson, ghdlab	reports, n	ll,car	DATE/TIME:	7.		DATE	TIME 1.	1 / 1/		DATE/TIME:			DATE/TIME:		
nail Invoi	ce to (will default to PM if no other addresses a	are listed): ap-fss@ghd.co	on)		3/8	<u>[/8</u>	1303	3/3	18/18	TUCY	m						
DMMENT	S/SPECIAL HANDLING/STORAGE OR DISPO	SAL:			(1) 7					/							
©3 <u>1</u> ©75	ration of the same	ns Mer(V)		<b>લ્ટામાં ગામ</b> કાર માં ક્ર	anaron.		ANALY: Where Metals	SIS REQUIRE are required, !	ED including Specify Total	SUITES (NB. (unfiltered bot	Suite Codes r tie required) o	must be listed to r Dissalved (&	o attract suite cid filtered be	price) itte required).	Additional I	Information	
LAB ID	SAMPLE ID	DATE / YIMÉ	MATRIX	TYPE & PRESERVATIV (refer to codes below)	Æ.	TOTAL	TPU/STEXN CAH, 8mch	Ashestes fickemec/obs	<b>A</b> SS Soreening	Comp 2 (OCPS, PCB)	Comp 3				comments on likely conditions, or amples requandysis etc.	aminant levels, using specific QC	
1 .	64/08 0.0-0.2	22/8/18	S	В		1		><7						422	Kember 5	からかん	4
2	BUIDS 0-1-0.3	7,7	5	b		1						A	ubco	7 50	/32   12	<u> </u>	
3	111100	· · · · · · · · · · · · · · · · · · ·	5	<u>k</u>		J-						<del>                                     </del>			ward Lab	/ Split W	40
2	D4108_ 0.5-0.6		ر ر	<u> </u>										nalys			
4	BH101_0.0-0.2	29/8/18		Jur B		2_				$\geq <$					/ / Date:	<u></u>	
5	CU101 0.2-0.3	ľ	1	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		2		1				( )	umq	uished	By / Date	;;	_L_
1.	BU101 _ 0.45- 05					2	$\times$	/					onno:	e, Co	urier:		
7						2	7						<u> </u>				
	BH101- 0.95-10		+	<u> </u>		-							<u>ild Cli</u>	ByPC	Interna	Sheet:	<u> </u>
8	BH(10) - 1-45- 1.5			7		<u>,                                    </u>											
9	E66	V		Y		I	_							I			
10	1847d 00-02	30/8/18		8		2					$\times$	F	nviron	mente	l Division		
11	011751	10/10		ß		2	7						ydney		DIVISION		
11	0117-1-07-01		++-		ICC	3	- True	7				ļ <sup>-</sup>	Work	Order R	eference		$\dashv$
16	1501 - 10.45-0.5		+		155			/	< <i>&gt;</i>			<del> </del>	ES	182	5728		
13	BU301 - 0.95 - \$.0			V V A	55	<u> 2</u>	<u> </u>		$\times$			<u> </u>					
14	B17301- 1.45-1.5			ĺ	i	1		:	$>\!\!<$			ĺ					
	B4301- 20-21					ĺ			X								7
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15	(3112) AND 20					1		ř	$\overline{}$			Market State (See		1.0		875836A	1
وا	134311- 245-25					!			$\leq$			la escala de la					4
	BH 301 - 3.0 - 3.1 BH 301 - 3.5 - 3.6		1			1			$\gtrsim$				enhora	- 61-2- <del>8</del> 78	1 2555		

Water Cantainer Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; GH = Sodium Hydroxide/Cd Preserved, S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airlieight Unpreserved Plastic; F = Formaldchyde Preserved Via: GG = Sulturic Preserved Amber Glass; H = HCI preserved Plastic; HS = HCI preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldchyde Preserved Glass; Z = Zinc Acetate Preserved Buttle; E = FDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acrd Sulphate Soils; B = Unpreserved Bag.



#### CHAIN OF CUSTODY

ALS Laboratory: please tick → CADELAIDE 21 Burns Road Poorate SA 5095
Ph 06 8339 0900 E isdalack@aleghols com
DBRISBANE 32 Shand Street Stationd QLD 4355
Ph 07 3243 7222 E isamples bitchans@alegholsy.com
DGLDSTONE 46 Cabenopolish Drive Christin QLD 4690
Ph 07 7247 9000 E indefendablesholship.

DMACKAY 78 Harbour Road Mackay QLD 4740 Ph; 97 4944 0177 E: mackay ∰also/lobal com

CIMEL BOURNE 2-4 Westaff Haad Springvale VIC 3171 Ph; 03 8549 9600 E; samples melliourne@effection CIMIDDGE 27 Syriner Road Muldge NSW 2650 Ph 02 6372 6735 E; mildge mad@effection CIMIDGE 2572 6735 E; mildge mad@effection

ONEWCASTLE 5565 Mailand Rd Mayfield West NSW 2304
PN 02-4014 2500 E: samples news at legisly blobs com
ENOUGH A 4/14 Garry Place North March 15041 7541

EINOWRA 4/12 Geary Place North Nowra NSW 2541 Ph: 024423:2063 E: nowra@alsglobal.com DPERTH 10 Hod Way Malegs WA 6000 LISYDNEY 277-269 Woodpark Road Smithfeld NSW 2164 Ph. 02 8784 8555 Et amples sydney@sightbit dam LIYOWISVILLE 14-15 Osema Court Bolte 0.14 818 Ph. 07 4785 0500 Et Inventio ammonteriol@shipdobal com CINOCLLONGONG DR Kenny Street Wolkengong NSW 2500

	please tick →	Fri (// 14/)	SOUSE, gassac	riegga-registrations	PH 02 0572 0735 E. F	renda a tutus Elemento	Ph: O	9209 7655 E samples parth@al		5 3125 E; portkembia@ntsplotest.com
CLIENT:	GHD			OUND REQUIREMENTS :	Standard TA	「(List due date):			FOR LABORATORY (ISE)	NA (Graci)
OFFICE:	Newcastle		(Standard Tince	FAT may be longer for some tests e.g., Organica)	C Non Standar	f or urgent TAT (Li	st due date):		gingel/sculturely	VC1 (% 69%
PROJECT:	2219573		ALS QU					LENCE NUMBER (Circle	Erenden/spozenski stratigore) (editore	AC BY
ORDER NU	MBER:		<u> </u>				COC: 1 (2	; 3 4 5 <b>6</b>	ក្នុងដែលមួយប្រើការក្រោយ√	ndreth c
PROJECT	MANAGER: Alison Monkley	CONTACT	H: 4979999	99			OF: 1 2	3 4 /5 6		
SAMPLER:	Julian Fowler	SAMPLER N	OBILE: 04	166049181	RELINQUISHED	BY:	RECEIVED BY:	<b>3</b> 5-0	RELINQUISHED BY:	RECEIVED BY:
	ed to ALS? ( YES / NO)	EDD FORMA			July	, 6204	KI	)/9/		1
	orts to (will default to PM if no other addresses			Lear	DATE/TIME:		DATE/TIME:	079 81.06pn	DATE/TIME:	DATE/TIME:
Email Invoi	ice to (will default to PM if no other addresses a	are listed): ap-fss@ghd.c	.m		1 31/2/13		> B// <i>X//</i>	1.0000	<u> </u>	
COMMENT	S/SPECIAL HANDLING/STORAGE OR DISPO	SAL:								
A <u>16</u> USE	ALEIG SALLING) SVETAS SALLING)	(MER(CM)		CONTAINERINE	ন্দেক্ত্য	ANA Where Mats	YSIS REQUIRED includits are required, specify To	ng SUITES (NB. Suite Code al (un@lered bottle required)	s must be listed to attract suite price) or Dissolved (keld litered bottle require	d). Additional information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATI (refer to codes below)	/E IATOT	CONTAINERS TRIJ/STEXN	1 3 3	Conf 2 (one 3)		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
19	B4201 295-40	30/8/18	S	A55						
20	BH301_3.95-4.0 BH301-4.45-4.5	70/1/50	1	1						
21	BH301 - 49-5.0									
22	Community FOR:			Jur_						
23	BU302_ 00-0.2			T , B -	•	2 ><		$\rightarrow$		
24	BH302 0.2-0.3			1 1		2				
25	CH 302 , 045-05				ASS :	3				
76	84 302 _ 0-95-1,0					2	$\rightarrow$			
27	SH 302_ 1.45-1.5					î	$\rightarrow$			
.28	BH 302_ 20-21					ſ	$\sim$			
15	BU 302 _ 245-29		$\top$			1	$\sim$			
30	BU 302 _ 295-3.0					1	$\sim$	<b>1</b> -		
31	BU 307 3-4-3-6					1	$\overline{}$			
32	141 301 - 295-40					ı	$\times$			
35	BH 300 - 4-18-16							1/		
34	BH 302-49-50						$\square$			
45	PART FD7			\		I				
36	BH306- 00-02		7	Jar B	1	Z_><		$\times$		
	The second secon				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 - Airtreight Unpreserved Plastic; Preserved Plastic; V = VOA Vial HCI Preserved; VB = VOA Vial Sodium Bisuphate Preserved Plastic; F = Formaldabyde Preserved Vial SG = Sodium Container Preserved Plastic; HS = HCI preserved Plastic; HS = HCI preserved Plastic; SP = Suffuic Preserved Plastic; F = Formaldabyde Preserved Glass; Z = Zinc Acetate Preserved Bottles; E = EDTA Preserved Bottles; ST = Sterile Bottles; ASS = Pleatic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory: please tick → CADELAIDE 21 Borns. Road Pooraka SA 50/5 Ph: 08 8350/800 E. aktuake@alagichal.com DBRSBANE 32 Stepts Steel Stellord 01,0 -003 Ph: 07 3243 7222 Er sanjake brisbane@aksglobal.com CGLADSTOFE 66 Obtemondari Direc Cinhon 01,0 -4660 Pt: 07 747 15/60 Creditional Stellord 10,0 -4660 Pt: 07 747 15/60 Creditional Stellord 10,0 -4660 LINACKAY 78 Harbour Road Markey OLD 4740 Ph 67 4944 9177 6 mackey@atsglobal.com

LIMELBOURNE 2-4 Wester Road Springvale VIC 3171 Ph. 03 8540 9600 E. samples methourne@alsploted con-UMUDGEE 27 Springry Road Mudges NSW 2850 Ph. 02 6772 6735 E: mudges.mail@alsploted.com CMEWCASTLE 5/55 Mail and R.J. Wayfield West NSW 2304 Ph. UZ 4014 2500 E. samples, percastle@asiglobat.com UNOWER 4/13 Geary Place North Novice NSW 2541 Ph. 024423 20/3 E. now againg lobal com

CIPERTH 10 Hool Way Mataga, WA 6090 Ph. 09 0000 2655 Fr samples perforbances GYOWNS Ph: 07 479 OWOULD Ph: 02 47

OSYDNEY 277-289 Woodpark Road Smithfield NSW2164 Ph. O2 8784 6555 E. samples sydney@alsgobal.com DYOWNSYILLE 14-15 Desma Court Boble OLD 4318 Ph. O7 4795 0500 E. townswise mineral @alsgirbal.com DWOLLONGONG 99 Kenny Sitest Wolfengong NSW 2500

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Email Invol	ce to (will default to PM if r	no other addresses ar-	e listed): ap-fs.	s@ghd.com				31/8	3/18	1503	)   3	<u> 178/i</u>	10 10	10/1/1					
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57	B4306	0.2-0.3	30/8	118	5	Ju	в		2										
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40		145-1-5							i			> <							,
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54	SHA 302 -		1	<b>-</b>	7			1	1	†	4								
								TOTAL											



**CHAIN OF** CUSTODY CIADELAIDE 21 Burna Road Pooraka SA 5095 Ph 08 8359 8890 F. adelarie@alsglobal.com DBRISBANE 32 Strand Street Stafford 04.0 4053
Ph 07 3243 7222 E: samples brisbane@alsglobal.com CIGEADSTONE 46 Callemondah Drive Christon GLO 4680 DMACKAY 73 Harbour Road Mackay QLD 4740\(\) Pit 07 4944 0177 E: markay@atsplosas.com EMELSOURNE 2-4 Westall Road Springwale VIC 3171 Ph: 03 8549 9500 E: samples and pour et elsylobet.com

THEWCASTLE 5/585 Mailland Rd Mayfield West NSW 2304 Fh: 92 4014 2500 E: samples newcastle@airgloba:.com DNOWRA #/13 Geary Place North Novia NSW 2541 Ph: 024423 2063 E, novia@#sglobal.com DPERTH 10 Hod Way Malage, WA 6090

CISYONEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8565 E: samples sydney@alsglobal.com OTOWNSVILLE: 4-15 Desma Court Bobie QLD 4818
Ph: 07 4796 0600 E. townsville pretronmental@atsglobal.com CIWOLLOHGONG 99 Kenny Street Wollangong NSW 2500

€E FILES	reamenta:	ALS Laboratory:	DGLADSTO Ph 07 747	ONE 46 Callemond 1 9500 E gladstone	ah Drive Christon GLO 4580 @alsglobal.com	EMUDGEE 27 Sydney R- Fh 02 6372 6735 E: mud	ed Mudgee NSW 2850 ee mat@atsplobal.com	□PERT Ph: 08 9	H 10 Hod Way Malaga WA 6090 209 7655 E. samples porth@alsp	D CHWOL Ships	LONGONG 99 Kenny Street Wollangong NSW 2500 4225 3125 E. portkembla@akglobal.com
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	ice to (will default to PM i					DATE/TIME: 31/8/18	1305	377877	81.06pm	J. C.	DOLL TIME.
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57 58	BHA302 944302 34A302 GHA302	4.45-85		1.		1					
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62	SHA 304.	- 0.2-03				2	1				
63 64	BHA 304	_ 0.45-0.5			, , A		$\sim$			:	
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						TOTAL					

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitri: Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AS = Annoer Glass Unpreserved Plastic; H = HCI preserved Plastic; N = Nitric Preserved Plastic; Preserved Plastic; H = HCI preserved Plastic; H = HCI preserved Plastic; ST = String Boulder; ST = Unpreserved Boulder; ST = Unpreserved Boulder; ST = Unpreserved Boulder; ST = String Boulder; ST = String Boulder; ST = String Boulder; ST = Unpreserved Boulder; ST = String Bould



#### CHAIN OF CUSTODY ALS Laboratory:

UADELAIDE 21 Berna Road Potraka S.A.5095
Pir: 08 85500900 E. adelaide@adejabal.com
UBRISBANG 32 Shand Sued Salford OLD 4053
Phr.07 32437522 E. samples britishne@adejabal.com
UBLADSTONIE 46 Calemondah Dime Cindon OLD 4500

CIMACKAY 78 Hartetur Road Mackey CLD 4740 Ph: 07 4944 0177 E: mackay@alegiobal.com

InteWOASTLE 5/505 Med and Rd Mayfield West NSW 2301 Ph: 02-4014-2500 E: samples revocasile@alsolobal.com

EINOWRA 4/13 Geary Place North Novra NSW 2541 Ph. 024423 2053 Et novraigatigiobal com UPERTH10 Hog! Way Malegs WA 5000 USYDHEY 277-296 Wordpark Road Sheithield NSW2164 Ph: O2 8784 6555 E. sasples sydney@atspibal.com UTOWNSZII.LE 14-15 Desma Cost I Bolia QLD 4316 Ph: 07 4790 0500 E; Jevnishell convenimental (Patipilization UWQLD-0400HG 59 (Jevnishell convenimental (Patipilization)

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CLIENT: (	GHD			OUND REQUIREMENTS :	Standard TAT (	.ist due date):					FOR LABORATO		W (Grad)	
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LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATION (refer to codes below)		- S	-\$	455 Scening	(ars, RB)	comp 3			Comments on likely contaminant le distitions, or samples requiring spec- analysis etc.	evels. cific QC
73	FDII	30/8/18	5	Ja~	1									
74	34104_0.0-02 34104_0.2-0.3 34104_0.45-0.5 34104_0.43-1.0	31/8/18	S	1.8	2	X	$\times$		<					
75	BU 104_0.2-6.3	1	5		2									
76	34 104-0.45-0.5		5		2									
77	94104043-1.0	V	5	1, 1	2								·	
78	FD 12	V	S	1										
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	<del></del>													
					TOTAL									



#### **CERTIFICATE OF ANALYSIS**

Work Order : ES1826044

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 56
No. of samples analysed : 28

Page : 1 of 19

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 04-Sep-2018 16:28

Date Analysis Commenced : 18-Sep-2018

Issue Date : 24-Sep-2018 18:26



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

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 : 2 of 19

 Work Order
 : ES1826044

 Client
 : GHD PTY LTD

 Project
 : 2219573



#### **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 KCI Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

 Page
 : 3 of 19

 Work Order
 : ES1826044

 Client
 : GHD PTY LTD

 Project
 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)		CI	ient 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
	Clie	ent sampi	ling date / time	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 @ 10	)5-110°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 (P	CB)							
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	

 Page
 : 4 of 19

 Work Order
 : ES1826044

 Client
 : GHD PTY LTD

 Project
 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ng date / time	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 Pestici	des (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	72-54-8/72-55-9/5	0.05	mg/kg			<0.05	<0.05	
	0-2							
EP075(SIM)B: Polynuclear Arom	atic 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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ng date / time	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 H	lydrocarbons - Conti	inued						
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	
^ Sum of polycyclic aromatic hydrocarbon	ıs	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 Hydrocar	bons							
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 Hydroc	arbons - NEPM 201	3 Fractio	ns					
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 Su	rrogate							
Dibromo-DDE	21655-73-2	0.05	%			129	130	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampli	ing date / time	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 Pestic	ide 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	

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	C	lient sampli	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Clie	ent sampl	ing date / time	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 @ 10	05-110°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 (P	(CB)							
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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
·	Cli	ient sampli	ing date / time	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 Pestici	des (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	72-54-8/72-55-9/5	0.05	mg/kg				<0.05	<0.05
	0-2							
EP075(SIM)B: Polynuclear Aroma	atic 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 hydrod	carbons	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 Hydi	rocarbons							
C6 - C9 Fraction		10	mg/kg				<10	<10
C10 - C14 Fraction		50	mg/kg				<50	<50
C15 - C28 Fraction		100	mg/kg				220	500

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ient sampli	ing date / time	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 Hydrocark	ons - Continued							
C29 - C36 Fraction		100	mg/kg				210	230
^ C10 - C36 Fraction (sum)		50	mg/kg				430	730
EP080/071: Total Recoverable Hydroca	arbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg				<10	<10
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg				<10	<10
(F1)	_							
>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		50	mg/kg				<50	90
(F2)								
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 Sur	rrogate							
Dibromo-DDE	21655-73-2	0.05	%				130	92.5
EP068T: Organophosphorus Pesticide								
DEF Coor. Organiophiosphioras i esticias	78-48-8	0.05	%				101	68.7
EP075(SIM)S: Phenolic Compound Su								
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	110 75-0							
2-Fluorobiphenyl	321-60-8	0.5	%				83.0	83.5
Anthracene-d10		0.5	%				83.7	79.6
Анилгасепе-ати	1719-06-8	0.5	70				გე./	/9.6

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	Cli	ent sampl	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
	С	lient sampli	ing date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ient sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
	Cli	ent sampl	ling date / time	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	S							
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 Merc	cury by FIMS							
Mercury	7439-97-6	0.1	mg/kg					<0.1
EP075(SIM)B: Polynuclear Aroma	atic 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 hydroc	arbons	0.5	mg/kg					45.1
^ Benzo(a)pyrene TEQ (zero)		0.5	mg/kg					6.2

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
	Cli	ent sampli	ng date / time	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 - Cont	inued						
^ 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 Hydroc	arbons							
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 Hydr	ocarbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg					<10
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg					<10
(F1)	_							
>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 Naphthale	ne	50	mg/kg					<50
(F2)								
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

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent sample ID	BH202_3.5-3.6	BH202_3.9-4.0	BH202_4.5-4.6	BH202_4.9-5.0	FD15
	Cli	ent sampli	ng date / time	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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	BH304_0.0-0.2	BH304_0.45-0.5	BH303_0.0-0.2	 
,	Cli	ent sampli	ng 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 @ 10	5-110°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 H	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	 

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Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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 Hyd	drocarbons - Cont	inued								
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 Hydrocarbo	ons									
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 Hydrocar	bons - NEPM 201	3 Fractio	ns							
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10				
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg	<10	<10	<10				
(F1)										
>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		50	mg/kg	<50	<50	<50				
(F2)										
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				

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Sub-Matrix: SOIL (Matrix: SOIL)	Client sample ID			BH304_0.0-0.2	BH304_0.45-0.5	BH303_0.0-0.2	 
(MELLIA: GOIL)	Cli	ent sampli	ing 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 Surr	rogates - 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	 

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# Surrogate Control Limits

Sub-Matrix: <b>SOIL</b>		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
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



### QUALITY CONTROL REPORT

Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

**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 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : ---- Telephone : (02) 8784 8504

Project: 2219573Date Samples Received: 04-Sep-2018Order number: 18-Sep-2018

C-O-C number | Saue Date | 24-Sep-2018

Sampler : JULIAN FOWLER

Site ·

Position

**NEWCASTLE WEST NSW. AUSTRALIA 2302** 

No. of samples analysed : 28

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

: EN/005/18

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### Signatories

Signatories

Quote number

No. of samples received

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.

0.9/10.00		, i.e., canadien, 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

Accreditation Category

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### **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 E	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	s) (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 Co	ntent (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: Exchangeab	le Cations (QC Lot: 194186	3)							
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

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Sub-Matrix: SOIL						Laboratory I	Duplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED007: Exchangeab	le Cations (QC Lot: 194	11868) - 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 Metal	s 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 Reco	verable Mercury by FIN	IS (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: Polychlorina	ted Biphenyls (PCB) (C								
ES1826044-014	BH201_0.0-0.2	EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochic	orine Pesticides (OC) (0	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: Polyni	uclear Aromatic Hydrod	carbons (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

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Sub-Matrix: SOIL						Laboratory L	Ouplicate (DUP) Report	:	
Laboratory sample ID	Client sample ID	Method; Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polyr	nuclear Aromatic Hydro	carbons (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	0.5	mg/kg	0.8	1.2	32.6	No Limit
			205-82-3						
		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		0.5	mg/kg	4.0	# 7.0	54.5	0% - 50%
		hydrocarbons							
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	0.7	1.0	36.7	No Limit
EP080/071: Total Pe	etro <mark>l</mark> eum 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 Pe	etroleum 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 Re	ecoverable Hydrocarbo	ns - 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
201020011011	5,1201 <u>-</u> 010 012	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 Re	acovershie Hydrocarbo	ns - NEPM 2013 Fractions (QC Lot: 1936161)			99				
ES1826044-001	BHA303 0.0-0.2		C6_C10	10	ma/ka	<10	<10	0.00	No Limit
ES1826044-045	BH303_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg mg/kg	<10	<10	0.00	No Limit
		EP080: C6 - C10 Fraction	C0_C10	10	ilig/kg	<b>~10</b>	<b>~10</b>	0.00	NO LIIIII
EP080: BTEXN (QC									N
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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3	0.5		40.5	10.5	0.00	NI- 11 11
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

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Sub-Matrix: SOIL						Laboratory I	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) - continu	ued							
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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		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

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### 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)		Laboratory Control Spike (LC	S) Report	
				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: 19408	370)							
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 (C	CLot: 1940871)							
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	76.6	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLo	t: 1935865)							
EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	1 mg/kg	125	62	126
EP068A: Organochlorine Pesticides (OC) (QCLc	t: 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

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PERSEA A - 1 DE   1975   197	Sub-Matrix: SOIL				Method Blank (MB)		Laboratory Control Spike (LC	S) Report	
PB68A Organochlorine Pesticides (OC) (QCLot: 1935864) - continued   Po98 4.4-D0D					Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Person   P	Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
P088   Endrin alderlyde	EP068A: Organochlorine Pesticides (OC) (QCLot	: 1935864) - continued							
POBS. Endosulfan sufate	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.3	69	121
PROB. 4.4-DOT	EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	92.2	56	120
P086: Endin ketone	EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	104	62	124
PD086 Methoxychior   72-43-5	EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	104	66	120
### PO75(SIM): Polynuclear Aromatic Hydrocarbons (QCLot: 1935882) #### PO75(SIM): Apathslalen ### 91-20-3	EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	104	64	122
EPO75(SIM) Abpthalene	EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	101	54	130
### P075(SIM): Acenaphthylene	EP075(SIM)B: Polynuclear Aromatic Hydrocarbon	s (QCLot: 1935862)							
PO75(SIM): Acenaphthene	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	111	77	125
PO75(SIM): Fluorene	EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	106	72	124
## Separation	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	107	73	127
PD075(SIM): Anthracene   120-12-7   0.5   mg/kg   <0.5   6 mg/kg   113   77   127	EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	108	72	126
### 206-44-0	EP075(SIM): Phenanthrene	85-01-8		mg/kg	<0.5	6 mg/kg	110		
## 128-00-0	EP075(SIM): Anthracene	120-12-7		mg/kg	<0.5	6 mg/kg	113		127
### POPTS(SIM): Benza(a)anthracene	EP075(SIM): Fluoranthene			mg/kg		6 mg/kg	1 1 1		
### 218-01-9	EP075(SIM): Pyrene			mg/kg		6 mg/kg			
### 205-99-2	EP075(SIM): Benz(a)anthracene	56-55-3		mg/kg	<0.5	6 mg/kg	98.9		
205-82-3 EPO75(SIM): Benzo(k)fluoranthene 207-08-9 0.5 mg/kg <0.5 6 mg/kg 101 74 126 EPO75(SIM): Benzo(a)pyrene 50-32-8 0.5 mg/kg <0.5 6 mg/kg 101 70 126 EPO75(SIM): Indeno(1.2.3.cd)pyrene 193-39-5 0.5 mg/kg <0.5 6 mg/kg 77.7 61 121 EPO75(SIM): Dibenz(a,h)anthracene 53-70-3 0.5 mg/kg <0.5 6 mg/kg 80.8 62 118 EPO75(SIM): Benzo(g,h.i)perylene 191-24-2 0.5 mg/kg <0.5 6 mg/kg 73.5 63 121 EPO80/071: Total Petroleum Hydrocarbons (QCLot: 1935863) EPO71: C15 - C28 Fraction 100 mg/kg <100 300 mg/kg 102 75 129 EPO80/071: Total Petroleum Hydrocarbons (QCLot: 1936161) EPO80/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1935863)	EP075(SIM): Chrysene	218-01-9							
EP075(SIM): Benzo(a)pyrene 50-32-8 0.5 mg/kg <0.5 6 mg/kg 77.7 61 121 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)	EP075(SIM): Benzo(b+j)fluoranthene		0.5	mg/kg	<0.5	6 mg/kg	92.9	68	116
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 <100 300 mg/kg 102 75 129  EP071: C29 - C36 Fraction 100 mg/kg <100 300 mg/kg 104 71 129  EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)  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)	EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	101	74	126
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) EP080/071: 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)	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	101	70	126
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)	EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	77.7	61	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1935863)  EP071: C10 - C14 Fraction	EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	80.8	62	118
## FP071: C10 - C14 Fraction	EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	73.5	63	121
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)	EP080/071: Total Petroleum Hydrocarbons (QCLo	ot: 1935863)							
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 - C14 Fraction		50	mg/kg	<50	300 mg/kg	102	75	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161)  EP080: C6 - C9 Fraction	EP071: C15 - C28 Fraction		100	mg/kg	<100	450 mg/kg	106	77	131
EP080: C6 - C9 Fraction        10       mg/kg       <10	EP071: C29 - C36 Fraction		100	mg/kg	<100	300 mg/kg	104	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1935863)	EP080/071: Total Petroleum Hydrocarbons (QCLo	ot: 1936161)							
	EP080: C6 - C9 Fraction		10	mg/kg	<10	26 mg/kg	86.2	68	128
FP071: >C10 - C16 Fraction 50 mg/kg <50 375 mg/kg 104 77 125	EP080/071: Total Recoverable Hydrocarbons - NE	PM 2013 Fractions (QCL	ot: 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: >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	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)	EP080/071: Total Recoverable Hydrocarbons - NE	PM 2013 Fractions (QCL	ot: 1936161)						
EP080: C6 - C10 Fraction C6_C10 10 mg/kg <10 31 mg/kg 90.3 68 128	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	90.3	68	128
EP080: BTEXN (QCLot: 1936161)	EP080: BTEXN (QCLot: 1936161)								
	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	93.5	62	116

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Sub-Matrix: SOIL	Sub-Matrix: SOIL						Laboratory Control Spike (LCS) Report					
				Report	Spike	Spike Recovery (%)	Recovery Limits (%)					
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	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	0.5	mg/kg	<0.5	2 mg/kg	91.5	66	118				
	106-42-3											
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.

ub-Matrix: SOIL				M	atrix Spike (MS) Report		
				Spike	SpikeRecovery(%)	Recovery L	imits (%)
aboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Met	tals 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 Re	coverable Mercury by FIMS (QCLot: 1	940871)					
ES1826044-001	BHA303_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	76.6	70	130
EP066: Polychlori	nated Biphenyls (PCB) (QCLot: 19358	65)					
ES1826044-014	BH201_0.0-0.2	EP066: Total Polychlorinated biphenyls		1 mg/kg	104	70	130
EP068A: Organoc	hlorine Pesticides (OC) (QCLot: 19358	364)					
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
P075(SIM)B: Poly	nuclear Aromatic Hydrocarbons (QC	Lot: 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

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Matrix Spike (MS) Report Sub-Matrix: SOIL Spike SpikeRecovery(%) Recovery Limits (%) Laboratory sample ID Client sample ID CAS Number Concentration MS Low High Method: Compound EP080/071: Total Petroleum Hydrocarbons (QCLot: 1935863) - continued ES1826044-014 BH201\_0.0-0.2 523 mg/kg 112 73 137 EP071: C10 - C14 Fraction 2319 mg/kg 124 53 131 EP071: C15 - C28 Fraction 128 52 132 EP071: C29 - C36 Fraction 1714 mg/kg \_\_\_\_ EP080/071: Total Petroleum Hydrocarbons (QCLot: 1936161) ES1826044-001 BHA303 0.0-0.2 130 EP080: C6 - C9 Fraction 32.5 mg/kg 75.4 70 EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1935863) ES1826044-014 BH201\_0.0-0.2 860 mg/kg 103 73 137 EP071: >C10 - C16 Fraction \_\_\_\_ 3223 mg/kg 116 53 131 EP071: >C16 - C34 Fraction ----1058 mg/kg 118 52 132 EP071: >C34 - C40 Fraction EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1936161) ES1826044-001 BHA303 0.0-0.2 C6 C10 37.5 mg/kg 74.1 70 130 EP080: C6 - C10 Fraction EP080: BTEXN (QCLot: 1936161) ES1826044-001 BHA303\_0.0-0.2 71-43-2 2.5 mg/kg 77.6 70 130 EP080: Benzene 108-88-3 78.7 70 130 2.5 mg/kg EP080: Toluene 100-41-4 2.5 mg/kg 82.2 70 130 EP080: Ethylbenzene 2.5 mg/kg 79.9 70 130 EP080: meta- & para-Xylene 108-38-3 106-42-3 95-47-6 2.5 mg/kg 84.7 70 130 EP080: ortho-Xylene EP080: Naphthalene 91-20-3 2.5 mg/kg 81.2 70 130



# QA/QC Compliance Assessment to assist with Quality Review

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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 : 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.

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### 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	ES1826044014	BH201_0.0-0.2	Sum of polycyclic		54.5 %	0% - 50%	RPD exceeds LOR based limits
			aromatic				
			hydrocarbons				

### Outliers : Analysis Holding Time Compliance

Method		Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)		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 Hydrocarbon	s - 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						

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## **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 <u>VOC in soils</u> 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:  $\checkmark$  = Within holding time.

Matrix: SOIL					Evaluation	i: * = Holding time	breach; ✓ = VVithi	n nolaing tir	
Method		Sample Date	Ex	traction / Preparation		Analysis			
Container / Client Sample ID(s)			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 (EA00	03)								
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)		04.00040	00.0	02-Oct-2018		00.0	00.0-+ 0040		
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)		04.0 0040	00.0 0040	00 M 0040		00.0 0040	00 M 0040		
BHA303_0.0-0.2,	BHA303_0.45-0.5,	04-Sep-2018	20-Sep-2018	03-Mar-2019	✓	20-Sep-2018	03 <b>-M</b> ar-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								

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method		Sample Date	Ex	traction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG035T: Total Recoverable Mercury by F	IMS								
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 Hydro	ocarbons								
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								

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Matrix: SOIL

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

Matrix: SOIL				Evaluation	ı: 🗴 = Holding time	breach ; ✓ = Withi	n holding tim
Method	Sample Date	E	ktraction / Preparation			Analysis	
Container / Client Sample ID(s)		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)	04-Sep-2018	18-Sep-2018	18-Sep-2018		19-Sep-2018	18-Sep-2018	
BHA303_0.0-0.2	04-Sep-2018	10-5ep-2010	10-3ep-2010	✓	19-3ep-2016	16-3ep-2016	×
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	1	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)	04-Sep-2018	18-Sep-2018	18-Sep-2018	1	19-Sep-2018	18-Sep-2018	
BH202_0.45-0.5	04-3ep-2018	10-3ep-2016	10-3ep-2010	<b>√</b>	19-3ep-2016	10-3ep-2010	*
Soil Glass Jar - Unpreserved (EP071)  FD15	04-Sep-2018	18-Sep-2018	18-Sep-2018	<b>√</b>	19-Sep-2018	28-Oct-2018	1
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)			40.0 0040				
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	<b>√</b>	19-Sep-2018	18-Sep-2018	x
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)	04.0	40.0	40.0 0040		40.00045	00 0-+ 0040	
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)	04 80= 2040	19 Son 2049	18-Sep-2018		10 Son 2019	18-Sep-2018	
BH303_0.0-0.2	04-Sep-2018	18-Sep-2018	10-3ep-2016	✓	19-Sep-2018	10-3ep-2018	×

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Matrix: SOIL

Evaluation:	= Holding	a time breach ; 🔻	= Within	holding time
-------------	-----------	-------------------	----------	--------------

Matrix: SOIL					Evaluation	i. * - Holding time	breach ; ✓ = Withi	n nolaing tim
Method		Sample Date	E	traction / Preparation			Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEI	PM 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	<b>✓</b>	19-Sep-2018	18-Sep-2018	4.
Soil Glass Jar - Unpreserved (EP071)		04-0ср-2010	10-0ср-2010	10 OCP 2010		13-3cp-2010	10 OCP 2010	*
BHA303_0.45-0.5		04-Sep-2018	18-Sep-2018	18-Sep-2018	✓	19-Sep-2018	28-Oct-2018	<b>✓</b>
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)		04 Sam 2040	40 Com 2040	10 Can 2010		40 Cam 2040	28-Oct-2018	
BH201_0.0-0.2		04-Sep-2018	18-Sep-2018	18-Sep-2018	✓	19-Sep-2018	20-001-2010	✓
Soil Glass Jar - Unpreserved (EP080) BH201 0.0-0.2,	BH201 0.45-0.5	04-Sep-2018	18-Sep-2018	18-Sep-2018	1	19-Sep-2018	18-Sep-2018	×
Soil Glass Jar - Unpreserved (EP071)	B11201_0.10 0.0	7.1.2.3p 2.1.12						
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	<b>✓</b>	19-Sep-2018	28-Oct-2018	<b>✓</b>
Soil Glass Jar - Unpreserved (EP080)		2123p 2212			•			
BH202_0.45-0.5		04-Sep-2018	18-Sep-2018	18-Sep-2018	✓	19-Sep-2018	18-Sep-2018	x
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)		04-Sep-2016	10-3ep-2016	10-3ep-2010	✓	19-3ep-2016	10-3ер-2010	×
BH304 0.0-0.2		04-Sep-2018	18-Sep-2018	18-Sep-2018	1	19-Sep-2018	28-Oct-2018	1
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	<b>✓</b>	19-Sep-2018	18-Sep-2018	4.5
Soil Glass Jar - Unpreserved (EP071)		04-3ер-2010	10-3ep-2010	10-Зер-2010	<b>-</b>	13-Зер-2010	10-3ер-2010	x
BH303 0.0-0.2		04-Sep-2018	18-Sep-2018	18-Sep-2018	✓	19-Sep-2018	28-Oct-2018	1
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)			40.0 00:-	10.0 0045		40.0 00:-	40.0 004.0	
BHA303_0.0-0.2,	BHA303_0.45-0.5,	04-Sep-2018	18-Sep-2018	18-Sep-2018	✓	19-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							

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# **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.

Quality Control Sample Type     Count     Rate (%)     Quality Control Specification       Analytical Methods     Method     QC     Reaular     Actual     Expected     Evaluation       Laboratory Duplicates (DUP)       Exchangeable Cations     ED007     2     17     11.76     10.00     ✓     NEPM 2013 B3 & ALS QC Standard	
Laboratory Duplicates (DUP)	
Exchangeable Cations FD007 2 17 11.76 10.00 / NEPM 2013 R3 & ALS OC Standard	
EDUOT E TITO DO CATE O CO CIATAGO	
Moisture Content         EA055         2         20         10.00         10.00         ✓         NEPM 2013 B3 & ALS QC Standard	
PAH/Phenols (SIM)	
Pesticides by GCMS	
pH (1:5) EA002 2 20 <b>10.00 10.00 V</b> 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 V NEPM 2013 B3 & ALS QC Standard	
Total Mercury by FIMS	
Total Metals by ICP-AES	
TRH - Semivolatile Fraction EP071 1 10 10.00 10.00 ✓ NEPM 2013 B3 & ALS QC Standard	
TRH Volatiles/BTEX EP080 2 19 <b>10.53 10.00</b> ✓ NEPM 2013 B3 & ALS QC Standard	
Laboratory Control Samples (LCS)	
Exchangeable Cations ED007 1 17 5.88 5.00 V NEPM 2013 B3 & ALS QC Standard	
PAH/Phenols (SIM)	
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Polychlorinated Biphenyls (PCB) EP066 1 4 25.00 5.00 V NEPM 2013 B3 & ALS QC Standard	
Total Mercury by FIMS	
Total Metals by ICP-AES	
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TRH Volatiles/BTEX EP080 1 19 <b>5.26 5.00</b> ✓ NEPM 2013 B3 & ALS QC Standard	
Method Blanks (MB)	
Exchangeable Cations ED007 1 17 5.88 5.00 V NEPM 2013 B3 & ALS QC Standard	
PAH/Phenols (SIM)	
Pesticides by GCMS	
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	
TRH - Semivolatile Fraction	
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Matrix Spikes (MS)	
PAH/Phenols (SIM)	
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TRH - Semivolatile Fraction EP071 1 10 <b>10.00 5.00</b> ✓ NEPM 2013 B3 & ALS QC Standard	

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 : GHD PTY LTD

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Matrix: SOIL			Evaluation: × = Quality Control frequency not within specification; ✓ = Quality Control frequency within specification.					
Quality Control Sample Type		Co	unt	Rate (%)			Quality Control Specification	
Analytical Methods	Method	QC	Reaular	Actual	Expected	Evaluation		
Matrix Spikes (MS) - Continued								
TRH Volatiles/BTEX	EP080	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard	

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### **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/Phenois (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

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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.

**CHAIN OF** CUSTODY DADELAIDE 21 Burma Road Pooraka SA 5096 Ph: 08 8359 0890 E: adelaide@alsglobal.com DBRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com DMACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com DMELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph; 03 8549 9600 E; samples.multourne@alsglobal.com ☐MUDGĘE 27 Sydney Road Mudgee NSW 2850

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USYDNEY: 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com ☐TOWNSVILLE 14-15 Desma Court Boble QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com TIMOLI ONGONO OD Karani Strast Wallanama NGW 2500

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LISYDNEY 277-289 Woodpark Road Southfield NSW 2164 Ph 02 8784 8555 E: samples sydney@olsglobal.com ENTOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph. 07 4796 0600 E. townsvillo.orvironmental@atoglebal.com □WOLLONGONG 99 Kenny Street Wolfongong NSW 2500

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Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Solium Hydroxide/Cd Preserved; S = Solium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; N = Nitric Preserved Plastic; ORC = Nitric Preserved Plastic; F = Formaldehyde Preserved 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 Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



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LADELANDE 21 Burna Road Pecraka SA 5095-Ph 30 8359 0900 E adebide@pidgibhal norn DERISRANE 32 Shand Street Statisty OLD 4053-Ph 07 8243 7222 E samples brisbane@alsglobel.com DGLADSTONE 45 Calemondah Drive Christon OLD 4680-Ph 07 7417 5000 E gladstone@pidgibbol.com LIMACKAY 78 Harbour Road Mackay QLD 4740 Ph 07 4944 0177 El mackay@alsglobat.com

□MELBOURHE 2-4 Westall Road Springuale VIC 2171 Ph 03 8549 9600 E samples melhousne@alsglobal com □MUDGEE 27 Systeey Road Mudgee NSW 2850 Ph 02 632 6736 E mudgee mad@alsglobal com ChewCASTLE 5/565 Madland Rd Mayleed West INSW 2304 Ph: 02 4014 2500 E. samples neoccastic@dsg.dob.com UNOWRA 4/13 Gesty Place Halft Nowa NSW 2541 Ph. 024423 2063 E. nowa@alaglotal.com

Ph 024423 2063 E. nowa@alsglobal.com

CPERTH 10 Hod Way Malaga WA 6090

Ph 08 9209 7655 E. samples beith@alsglobal.com

LISYDHEY 277-299 Woodpark Road Smithtlert NSW 2164 Ph 02 8784 8056 E samples sydney@assjolopi com LTCWNSVILLE 14-15 Desma Court Bothe QLO 4810 Ph. 07 4789 0000 E townswitz avenumswitz@assjolopi com CWOLLONGONG 90 femny Street Wollongong NSW 2500 Ph 02 4225 3125 E porthembly@assjolopis.com

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LIMELECURNE 2-4 Westan Road Symptote VIC 3175 Ph 03 6549 9500 6 samples melbourne@alsglobal.com CMUDGEE 27 Sydney Road Murlace NSV/ 2850

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UISYDMEY: 277-PA9 Woodpark Road Smithheld NSW2164 Pb: 02 6784 6555 Et samples sydneys@aisgobal.com GTOWNSVILLE IA-15 Desira Court Bobie QLD 4818 Ph; 07 4796 0300 Et townsville, invergemental@staplebalcom

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Water Confainer Codes: P = Unpreserved Plastic; N = Nútric Preserved Plastic; ORC = Kildric Preserved GRC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide/Cd Preserved Plastic; AS = Amber Glass Unpreserved; AP - Afficight Unpreserved Plastic; Preserved Plastic; AS = Amber Glass Unpreserved Plastic; AS = Afficight Unpreserved Plastic; F = Formoldchyde Preserved Glass; V = VOA Vial Fiction Preserved Plastic; HS = HCI preserved Speciation boiltie; SP = Sulfuric Preserved Plastic; F = Formoldchyde Preserved Glass; Z = Zinc Acotale Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Barg for Acid Sulphate Solts; B = Unpreserved Barg.

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Water Container Codes: P = Unpreserved Plastic; N = Nitro Preserved Plastic; ORC \* Nitro Preserved ORC; St = Sodium Endougled Preserved. S = Sodium Endougled Preserved Plastic; AS = Amber Glass Unpreserved Plastic; H = HCl preserved Plas

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LIENT: GHD		TURNAROUND REQUIREMENTS:	Standard TAT (List due date):		FOR LABOR	ATORY/USE ONLY (Circle)s
FFICE: Newcastle		(Standard TAT may be longer for some tests of Ulita Trace Grypnics)	o.g   Non Standard or utgent TAT (List du	ie dale):	Cuttody Saalin	action and the fact of the first party
ROJEGT: 2219573		ALS QUOTE NO.:		COC SEQUENCE NUMB	ER (Circle) Free (Circle)	Marginistica de la companya de la co
ROER NUMBER:				GGC: 1 2 3 🙆	5 6 7 Raidom Banco	AND CONTRACTOR OF COMPANY CONTRACTOR OF CO
ROJECT MANAGER: Alison Mon	kley	CONTACT PH: 49799999		OF: 1 2 3 (4)	5 6 7 Other comment	
AMPLER: Julian Fowler		SAMPLER MOBILE: 0466049181	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY	Y: RECEIVED BY:
OC emailed to ALS? ( YES / NO	))	EDD FORMAT (or default): Esdat	John Fowl			
mail Reports to (will default to PM i	no other addresses are lis	sied): Alison, ghdlab reports, ntl.car	DATE/TIME: /	DATECTIME:	DATE/TIME:	DATE/TIME:
mail Invoice to (will default to PM if	no other addresses are list	ted): ap-fss@glid.com	4/9/16 1628			
OMMENTS/SPECIAL HANDLING/S	TORAGE OR DISPOSAL:					

ESAMPLE DETAILS BOOK OF THE SAMPLE DETAILS BOOK ANALYSIS REQUIRED including SWITES (ND, Side Codes must be Isted to attract suite price)
Where Metals are required, specify Total (unfiltered bodic required) or Dissolved (field Merod bodic required) Additional information Scann TOTAL CONTAINERS Comments on likely contaminant levels. TYPE & PRESERVATIVE LABID SAMPLEID DATE / TIME dibitions, or samples requiring specific CIC (refer to codes below) 455 ASS 5 Jur

Water Container Godes: P = Uppeartvert Plastic: N × Natic Preserved Plastic: ORC = Nide Plasterved ORC: SH = Sedam Hydrodde/Cd Plasarved; S = Sodam Hydrodde Preserved Plastic: AS = Amber Glass Unpreserved: AP - Entreight Uppreserved Plastic: N × Natic Preserved Plastic: ORC = Nide Interest ORC: SH = Sedam Hydrodde/Cd Plasarved; S = Sodam Hydrodde Preserved Plastic: AS = Amber Glass Unpreserved: AP - Entreight Uppreserved Plastic: N × Natic Preserved Plastic: N × Natic Preserv



### **CERTIFICATE OF ANALYSIS**

Work Order : ES1826547

Client : GHD PTY LTD

Contact : MS ALISON MONKLEY

Address : PO BOX 5403

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---

Project : 2219573

Order number

C-O-C number : ----

Sampler : JULIAN FOWLER

Site

Quote number : EN/005/18

No. of samples received : 28
No. of samples analysed : 11

Page : 1 of 12

Laboratory : Environmental Division Sydney

Contact : Brenda Hong

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : (02) 8784 8504

Date Samples Received : 07-Sep-2018 16:18

Date Analysis Commenced : 18-Sep-2018

Issue Date : 22-Sep-2018 11:49



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.

Accreditation Category
Sydney Inorganics, Smithfield, NSW
Newcastle - Asbestos, Mayfield West, NSW
Sydney Inorganics, Smithfield, NSW
Sydney Organics, Smithfield, NSW
Sydney Inorganics, Smithfield, NSW
Sydney Inorganics, Smithfield, NSW

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### **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 KCI Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- 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.

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 Work Order
 : ES1826547

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 : GHD PTY LTD

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 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
·	Cli	Client sampling date / time			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 Mercu								
Mercury	7439-97-6	0.1	mg/kg	<0.1		0.3	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromat								
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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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				
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 H	ydrocarbons - Cont	inued						
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 hydrocarbon	s	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 Hydrocarl	bons							
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 Hydroc	arbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10		<10	<10	<10
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg	<10		<10	<10	<10
(F1)	_							
>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		50	mg/kg	<50		<50	<50	<50
(F2)								
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 Su	rrogates							
Phenol-d6	13127-88-3	0.5	%	85.2		79.7	78.0	77.9

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 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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
(Mathix: GGIL)	Cli	ent sampli	ing date / time	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 Sur	rogates - 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

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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 @ 1	05-110°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	y by FIMS							
Mercury	7439-97-6	0.1	mg/kg	<0.1		<0.1	<0.1	
EP066: Polychlorinated Biphenyls (I	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

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 : GHD PTY LTD

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Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent 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 Pestic	ides (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	72-54-8/72-55-9/5	0.05	mg/kg					<0.05
	0-2							
EP075(SIM)B: Polynuclear Arom	natic 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	

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 Client
 : GHD PTY LTD

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 : 2219573



Sub-Matrix: SOIL (Matrix: SOIL)		Clie	ent 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 Hy	drocarbons - Cont	inued						
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 Hydrocarbo	ons							
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 Hydrocal	rbons - NEPM 201	3 Fractio	ns					
C6 - C10 Fraction	C6_C10	10	mg/kg	<10		<10	<10	
^ C6 - C10 Fraction minus BTEX	C6_C10-BTEX	10	mg/kg	<10		<10	<10	
(F1)								
>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		50	mg/kg	<50		<50	<50	
(F2)								
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	
	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

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# Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Cli	ent sample ID	TP105_0.0-0.2	TP105_0.6-0.7	TP106_0.0-0.2	FD20	COMP 4
	Cli	ient sampli	ing 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 Pesticid	e Surrogate							
Dibromo-DDE	21655-73-2	0.05	%					81.8
EP068T: Organophosphorus Pest	ticide Surrogate							
DEF	78-48-8	0.05	%					80.3
EP075(SIM)S: Phenolic Compoun	d 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	

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# Analytical Results

Sub-Matrix: SOIL		Clie	ent sample ID	COMP 5	 	 
(Matrix: SOIL)	Cli	ient sampli	ng date / time	18-Sep-2018 00:00	 	 
Compound	CAS Number	LOR	Unit	ES1826547-028	 	 
Compound	OAG Namber			Result	 	 
EA055: Moisture Content (Dried @ 1	05-110°C)					
Moisture Content		1.0	%	15.1	 	 
EP066: Polychlorinated Biphenyls (I	PCB)					
Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	 	 
EP068A: Organochlorine Pesticides						
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	72-54-8/72-55-9/5	0.05	mg/kg	<0.05	 	 
	0-2					
EP066S: PCB Surrogate						
Decachlorobiphenyl	2051-24-3	0.1	%	118	 	 
EP068S: Organochlorine Pesticide S						
Dibromo-DDE	21655-73-2	0.05	%	87.1	 	 

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# Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		COMP 5	 	 
	Cli	ent sampli	ng date / time	18-Sep-2018 00:00	 	 
Compound	CAS Number	LOR	Unit	ES1826547-028	 	 
				Result	 	 
EP068T: Organophosphorus Pestici	de Surrogate					
DEF	78-48-8	0.05	%	89.9	 	 

# Analytical Results Descriptive Results

Sub-Matrix: SOIL

Oub Matrix: OOIL						
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				

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# 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
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



#### QUALITY CONTROL REPORT

Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

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Client **GHD PTY LTD** Laboratory **Environmental Division Sydney** 

: MS ALISON MONKLEY Contact Contact Brenda Hong

Address Address 277-289 Woodpark Road Smithfield NSW Australia 2164 : PO BOX 5403

**NEWCASTLE WEST NSW. AUSTRALIA 2302** Telephone Telephone : (02) 8784 8504

Project Date Samples Received 2219573 : 07-Sep-2018 **Date Analysis Commenced** Order number

: 18-Sep-2018 22-Sep-2018

**Issue Date** C-O-C number JULIAN FOWLER

: 28 No. of samples analysed : 11

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

: EN/005/18

#### Signatories

No. of samples received

Sampler Site Quote number

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 Newcastle - Asbestos, Mayfield West, NSW Christopher Owler Team Leader - Asbestos Sydney Inorganics, Smithfield, NSW Edwandy Fadjar Organic Coordinator Edwandy Fadjar Organic Coordinator Sydney Organics, Smithfield, NSW Ivan Taylor Analyst Sydney Inorganics, Smithfield, NSW Wisam Marassa Inorganics Coordinator Sydney Inorganics, Smithfield, NSW

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#### **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 l	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 (Soil	s) (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 Co	ontent (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: Exchangeal	e Cations (QC Lot: 19418	368)							
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 Meta	Is by ICP-AES (QC Lot: 19	<b>941966</b> )							
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

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Sub-Matrix: SOIL						Laboratory I	Duplicate (DUP) Report	:	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Met	als 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 Red	coverable Mercury by Fli	MS (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: Polychlorir	nated Biphenyls (PCB)(								
ES1827553-001	Anonymous	EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	<0.1	0.00	No Limit
	nlorine Pesticides (OC)				9/9		5.1	5.55	110 2
ES1827553-001	· · · ·		319-84-6	0.05	malka	<0.05	<0.05	0.00	No Limit
ES 102/333-001	Anonymous	EP068: alpha-BHC	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	58-89-9		mg/kg	<0.05	<0.05		1 1
		EP068: gamma-BHC	319-86-8	0.05	mg/kg			0.00	No Limit
		EP068: delta-BHC		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	<0.05	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		mg/kg	<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: Poly	nuclear Aromatic Hydro	ocarbons (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

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Sub-Matrix: SOIL						Laboratory L	Ouplicate (DUP) Report		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polyr	nuclear Aromatic Hydro	ocarbons (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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			205-82-3						
		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		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		hydrocarbons							
		EP075(SIM): Benzo(a)pyrene TEQ (zero)		0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Pe	etroleum Hydrocarbons	s (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 Pe	etroleum Hydrocarbons	s (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 Re	ecoverable Hydrocarbo	ons - 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 Re		ons - 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
E31020347-001	1F 101_0.0-0.2			100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction		50	mg/kg	<50	<50	0.00	No Limit
EDAGA DIEVAL (OG	1 4000404	EP071: >C10 - C16 Fraction		30	ilig/kg	<b>\</b> 30	<b>\</b> 30	0.00	NO LIIIII
EP080: BTEXN (QC							.0.5	0.00	N1 1 2 22
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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.5			N. 1
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

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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	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		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

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# 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)		Laboratory Control Spike (LC	S) Report	
				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: 19419	966)							
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 (C	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) (QCLo	t: 1937046)							
EP066: Total Polychlorinated biphenyls		0.1	mg/kg	<0.1	1 mg/kg	103	62	126
EP068A: Organochlorine Pesticides (OC) (QCLc	t: 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

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Sub-Matrix: SOIL		Method Blank (MB)	Laboratory Control Spike (LCS) Report					
				Report	Spike	Spike Recovery (%)	Recovery	Limits (%)
Method: Compound	CAS Number	LOR	Unit	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: 1	937041)							
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 Fra	ctions (QC	Lot: 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 Fra	ctions (QC	Lot: 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

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Sub-Matrix: SOIL				Method Blank (MB)	Laboratory Control Spike (LCS) Report					
				Report	Spike	Spike Recovery (%)	Recovery Limits (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	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	0.5	mg/kg	<0.5	2 mg/kg	91.5	66	118		
	106-42-3									
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.

ub-Matrix: SOIL		Matrix Spike (MS) Report					
				Spike	SpikeRecovery(%)	Recovery I	Limits (%)
aboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Me	tals 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 Re	coverable Mercury by FIMS (QCLot: 1	941965)					
ES1826547-001	TP101_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	75.7	70	130
EP066: Polychlori	nated Biphenyls (PCB) (QCLot: 19370	46)					
ES1827553-001	Anonymous	EP066: Total Polychlorinated biphenyls		1 mg/kg	100.0	70	130
EP068A: Organoc	hlorine Pesticides (OC) (QCLot: 19370	045)					
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: Poly	ynuclear Aromatic Hydrocarbons(QC	Lot: 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

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Sub-Matrix: SOIL			Matrix Spike (MS) Report					
				Spike	SpikeRecovery(%)	Recovery Li	mits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
EP080/071: Total P	etroleum Hydrocarbons (QCLot: 1936161) - continued							
ES1826044-001	Anonymous	EP080: C6 - C9 Fraction		32.5 mg/kg	75.4	70	130	
EP080/071: Total P	etroleum 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 F								
ES1826044-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	74.1	70	130	
EP080/071: Total F	ecoverable Hydrocarbons - NEPM 2013 Fractions (QCL	ot: 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 (Q	CLot: 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	2.5 mg/kg	79.9	70	130	
			106-42-3					
		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	



# 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.

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#### Outliers: Analysis Holding Time Compliance

Matrix: SOIL

Matrix. Goil							
Method		Extraction / Preparation		Analysis			
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days	Date analysed	Due for analysis	Days	
				overdue			overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
TP101_0.0-0.2,	TP101_0.5-0.6,	19-Sep-2018	13-Sep-2018	6			
TP105_0.0-0.2,	TP105_0.6-0.7						

## **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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

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

Matrix: SOIL					Evaluation	: 🔻 = Holding time	breach, V - Villi	in noluling time
Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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,	06-Sep-2018	19-Sep-2018	13-Sep-2018	3¢	19-Sep-2018	19-Sep-2018	✓
TP105_0.0-0.2,	TP105_0.6-0.7							
EA055: Moisture Content (Dried @ 105-110°C								
Soil Glass Jar - Unpreserved (EA055)								
TP101_0.0-0.2,	TP102_0.0-0.2,	06-Sep-2018				18-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 (EA055)								
COMP 4,	COMP 5	18-Sep-2018				18-Sep-2018	02-Oct-2018	✓
EA200: AS 4964 - 2004 Identification of Asbes	stos in Soils							
Snap Lock Bag - ACM/Asbestos Grab Bag (EA	A200)							
TP106_0.0-0.2		06-Sep-2018				19-Sep-2018	05 <b>-M</b> ar-2019	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
TP101_0.0-0.2,	TP101_0.5-0.6,	06-Sep-2018	20-Sep-2018	04-Oct-2018	✓	20-Sep-2018	04-Oct-2018	✓
TP105_0.0-0.2,	TP105_0.6-0.7							

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Matrix: **SOIL**Evaluation: ★ = Holding time breach; ✓ = Within holding time.

Method		Sample Date	Ex	xtraction / Preparation			Analysis	
Container / Client Sample ID(s)			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	1	20-Sep-2018	05-Mar-2019	<b>✓</b>
TP103_0.0-0.2,	TP104_0.0-0.2,	00 000 2010	20 000 2010	00 Mai 2010	•	20 000 2010	00 Mai 2010	<b>V</b>
TP105_0.0-0.2,	TP106_0.0-0.2,							
FD20	11 100_0.0-0.2,							
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)							00.0.4.0040	
COMP 4,	COMP 5	18-Sep-2018	18-Sep-2018	02-Oct-2018	✓	19-Sep-2018	28-Oct-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbo	ns							
Soil Glass Jar - Unpreserved (EP075(SIM))				00.0			00.0.1.0010	
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)		00.0211.0040	18-Sep-2018	20 0 2010		40.0 0040	20 0 2010	
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)		00.0	40.0 0040	20 0 2042		00.0 00.10	20 0-4 2042	
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								

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Matrix: **SOIL** Evaluation: ★ = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Recoverable Hydrocarbon	s - NEPM 2013 Fractions								
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									
EP080: BTEXN									
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									

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# **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	not within specification; ✓ = Quality Control frequency within specification.						
Quality Control Sample Type		Co	ount		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Reaular	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(S <b>I</b> M)	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(S <b>I</b> M)	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(S <b>I</b> M)	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(S <b>I</b> M)	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

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# **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/Phenois (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.

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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.

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#### **CHAIN OF** CUSTODY

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0390 E: adelaide@plsglobal.com DBRISBANE 32 Shand Street Stafford QLD 4053
Ph 07 3243 7222 E: samples brisbane@alsglobal.c DMACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

DMELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph 03 8549 9800 E samples melbourne@alsglobal.com

INCEWCASTLE 5:585 Mailland Rd Mayfield West NSW 2304 Phr 02 4014 2500 E. samples newcastle@aisglobal.com UNOWRA 4/13 Geary Place North Novra INSW 2541 Ph; 024423 2063 E: novra@elsglobel.com

USYDNEY 277 289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples sydney@alsglobal.com UTOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Phr 07 4796 0600 E. townsville, environmental@afsetebal.com

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CLIENT:	GHD				OUND REQUIREMENTS :	Standard TAT (Lis	t due date):			FORLAGORATOR	CUSEONLX (Greis) 1000 (COSCIO)
OFFICE:	Newcastle			(Standard T Ultra Trace	AT may be longer for some tests e.g Organics)	☐ Non Standard or u	gent TAT (List du	e date):		Carrie Challetort's	
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				51500 T T T T T T T T T T T T T T T T T T							
LAB ID	SAMPLE ID	<sub>נ</sub> ם	ATE / TIME	MATRIX	TYPE & PRESERVATIV. (refer to codes below)	TOTAL		LAS	B OF ORI	GIN:	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
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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 Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; VS = VOA Vial Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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# **CHAIN OF**

□ADELAIDE 21 Burma Road Pooraka SA 5095 Ph; 08 8359 0890 E; adelaide@alsglobal.com

CNPWCASTLE 5/585 Mailland Rd Mayfield West NSW 2304 Ph; 02 4014 2500 F; samples.newcastle@aleglobal.com

DSYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph 02 8784 8555 E: samples.sydney@alsglobal.com

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DMACKAY 78 Harbour Road Mackay OLO 4740 Ph; 07 4944 0177 E mackay@alsglobal.com

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**CHAIN OF CUSTODY** 

LIADELAIDE 21 Surma Road Pooraka SA 5095 ⊔BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples brisbane@alsglobal.com DMACKAY 78 Harbour Road Mackey QLD 4740 Ph. 07 4944 0177 E: mackay@alsglobal.com

☐MELBOURNE 2.4 Westall Road Springvale VIC 3171 Phr 03 8549 9500 E, samples melhoume@alsglobal.com #NEWCASTLE 5/585 Maitland Rd Mayteld 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: novra@alsglobal.com

□SYDNEY 277-289 Wondpark Road Smithfield NSW 2164 Ph. 02 8784 8555 E. samples sydney@alsglobel.com DTOWNSVILLE 14-15 Desma Court Boble QLD 4818 Pb: 07 4796 0000 E: townsville.environmental@alsglobal.com

Erick	ronheeta	ALS Laboratory: please tick →			ndah Drive Clinton CI,D 4680 ne@alsglobal.com	Ph: 02,8372,6735 E: mi	road Muogee NSW 2850 rigee mai@alsglobal.com	DPERT Ph: 08 :	FH 10 Hod Way f 9209 7655 E: sai	Malaga WA 609 mples.perth@al	90 sglobal com		ONG 99 Kenny Street Wollongong NSW 2500 1125 E. portkembia@alsglobal.com
CLIENT:	GHD			TURNAR	OUND REQUIREMENTS :	Standard TAT	List due date):			-	FOR LABORE	ON Y USE OF	
OFFICE:	Newcastle			(Standard T Ultra Trace	AT may be longer for some tests e.g Organics)	☐ Non Standard	r urgent TAT (List du	e date);			Company (Fee Inte		
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SAMPLER:	Julian Fowler		SAMPLER M	OBILE: 04	66049181	RELINQUISHED B		RECEIVED BY:		>	RELINQUISHED BY:		RECEIVED BY:
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Email Repo	orts to (will default to PM if no	other addresses a	re listed): Alison, ghdlab	reports, ntl	l.car	DATE/TIME:	1/20	DATE/TIME	المل ا	4.1.1	DATE/TIME:		DATE/TIME: 7/41/07 7:50/0
Email Invo	ice to (will default to PM if no	other addresses ar	re listed): ap-fss@ghd.co	m		7/9/18	1620	ラバ	118				719108 11500
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				THE THE SAME OF THE									
1				_		TOTAL					1		
LAB ID	SAMPLE ID		DATE / TIME	MATRIX	TYPE & PRESERVATIV (refer to codes below)	Æ TE		1.0	BOF	ORI	GIN: LE		Comments on likely contaminant levels, dilutions, or samples requiring specific QC
				Ĕ	(10101 10 00000 00101)	غ ا غ		LF		ACT			analysis etc.
			, ,						NEW	$\uparrow$ A $\supset$ $\iota$			
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2	TP 101 0	1-0.3		ĵ		2					TO ES		

TPIDI -0.5-0.6 2 P102 - 0.0.0. 2 + P102 0.2-0 Jar 2 **Environmental Division** Sydney Work Order Reference 2 Jum. ES1826547 Jm 2 )w 2 12 1 14 Jar 2 Telephone: +61-2-8784 9555 2 2 Jar Jar, B

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 Giass Unpreserved; AP - Airfreight Unpreserved Plastic V= VoA Vial HCI Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sodium Bisulphate Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Storile Bottle; ASS = Plastic Bottle; ASS = Pl





# CHAIN OF CUSTODY

19 19 19

□ADELAIDE 21 Burma Road Pooraka SA 5095
Ph. 08 8359 0390 E. adelaide@alsglobal.com
□BRISBANE 32 Shand Street Stafford OLD 4053
Ph. 07 3243 7222 E. samples brisbane@alsglobal.com
□GLADSTOKE 46 Cellemondah Drive Chilon QLD 4680

☐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 2650 Ph 02 6372 6735 E: mudgee mail@alsglobal.com ONE WCASTLE 5/585 Mailand Rd Mayfield West NSW 2304 PR: 02 4014 2500 E: samples.newcastle@alsglobal.com

□NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@a/sglobal corn □PERTH 19 Hod Way Malaga WA 6090 □SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Phr '02 8784 8555 E: samples sydney@aleglobal com □JTOWNSVIELF 14-15 Desma Court Bohle QLD 4818 Phr 07 4795 05000 E: twwnswite environmental@alsglobalcom □LWOLLONGONG 99 Kenny Street Wolongong NSW 2500

	ALS Laboratory: please tick >	LIGLADSTI Ph: 07-747	ONE 46 Callemo 5600 E: gladsto	ndah Drive Ckriton QLD 4680 pne@alsglobal.com	DMUDGEE 27 Sydney Ros Ph: 02 6372 6735 E, mudge	ad Mudgee NSW 2850 ee.mail@alsglobal.com		DPERTH 10 Hod Wa Ph: 08 9209 7655 E: :	y Malaga WA 606 samoles perth@als	90 sglobal.com	□WOLLONGONG 99 Kenny Street Wollong Ph. 02 4225 3125 E⊤portkembla@alsglobal.	ong NSW 2500 com
CLIENT:	GHD			ROUND REQUIREMENTS:	Standard TAT (Lis	st due date):				06.00 (19	ORY USE ONLY (Circle)	(August
OFFICE:	Vewcastle		(Standard Ultra Trace	TAT may be longer for some tests e.g e Organics)	Non Standard or urgent TAT (List due date):							- NA
PROJECT:	2219573	•	ALS QU	OTE NO.:				SEQUENCE NUM	BER (Circle)	leceptor. The pro-	e bricks plekels upon	
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	MANAGER: Alison Monkley	CONTACT			<u> </u>		OF: 1 RECEIVED	(2) 3 4	5 6	7 Other comment	<b>6</b>	
	Julian Fowler	SAMPLER			RELINQUISHED BY:	<u>-</u> 1	RECEIVED	BY:		RELINQUISHED BY:	RECEIVED BY	
	rts to (will default to PM if no other addresses	EDD FORM			DATE/TIME:	Fal	DATE/TIME	:-		DATE/TIME:		
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COMMENT	S/SPECIAL HANDLING/STORAGE OR DISPO	DSAL:			1-1/1110					<u></u>		
ALS	SAMPLE DET	all S		- Water		ANALYSIS	REQUIRED in	cluding SUITES ()	JR Suite Codes	must suited to attract suit	ite price)	
- FUSE	MATRIX: SOLID (S) W	VATER (W)		CONTAINER/INFOR	RMATION :	Where Metals are	required, speci	fy Total (unfiltered	pottle required	prospected to attract suit or Dissolved (field filtered t	oottle required). Additional li	nformation
		200	100000000000000000000000000000000000000	The second secon	60				تعطنطيا			
	·		×	TYPE & PRESERVATIV	. J. NER.		]		<b></b>		Comments on likely conta	aminant Jevels.
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CLIENT: GHD TURNAROUND REQUIREMENTS: Standard TAT (List due date): FORLABORATORY(USE OF	
OFFICE: Newcastle ((Standard TAT may be longer for some tests e.g., Ultra Trace Organics)  Non Standard or urgent TAT (List due date):	y: nd (TA)
PROJECT: 2219573 ALS QUOTE NO.: COC SEQUENCE NUMBER (Circle)	official tension of the tension of t
ORDER NUMBER:	T 3:00 T
PROJECT MANAGER: Allson Monkley CONTACT.PH: 49799999 OF: 1 2 3 4 5 6 7 Office commercial	
SAMPLER: Julian Fowler  SAMPLER MOBILE: 0466049181  RELINQUISHED BY:  RECEIVED BY:  RECEIVED BY:  RECEIVED BY:	RECEIVED BY:
Email Reports to (will default to PM if no other addresses are listed): Alson, ghdiab reports, nil.car DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed): ap-fsx@ghd.com	DATE TIME.
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:	
ALS CONTAINER INFORMATION.  ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price)  USES (MATRIX-SOLID (8)-WATER (W))  Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LABID SAMPLE ID DATE ALMON TYPE & PRESERVATIVE (refer to codes below)  TYPE & PRESERVATIVE (refer to codes below)	Comments on likely contaminant levels, disclose, or samples requiring specific QC analysis etc.
1 TP 01 - 00-0. Son 18 or Lab Split 80 2	Please hold
2 TP 101 0 2-0.3 138 Aprelys 5:1 2	
4 TP10/ 0.5-0.6 Organi od 37 Date: 2	
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
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C TV 107 05 v. h   h chiernal Shark )	
Environm	ental Division
0)4110)	der Reference
	826547
9 TP103 0. 5-0.6 Jur. 1	020077
10 TP 103 _ 10-1.	P RILLS BUT - 201 (1)
1 TP 104 0.0-0.2 ) W B 2	
12 TO 104 0-2 -0.3 Jur. B 2	
14 thios 0.0-0.7 Jar, B 2 Telephone: +1	31-2-8784 8555
(5 TP/05 0.2-0.3) 2	
$ \langle\langle                                    $	
(5 17103 0.6-0.7) (7 17105 1.0-1.1)	

TOTAL Water Confainer Codes: P = Unovestieved Plastic, N = Mittle Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved Plastic, AG = Amber Glass Unpreserved; AP - Arifre git Unpreserved Plastic
V = VOA Vial HCI Preserved VB = VOA Vial Sudium Blubbate Preserved VS = VOA Vial Sudium Preserved VB = VOA Vial HCI Preserved Plastic; HS = HCI preserved Plastic; HS = HCI preserved Speciation bottle; SP = Sulfunic Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zing Acctate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle: ASS = Plastic Bag for Acid Sulphate Soils, B = Unpreserved Bag.

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CLIENT: OFFICE:	GHD Newcastle			(Standard	ROUND REQUIREMENTS: TAT may be longer for some tests e.g., Organics)	•	ard TAT (Lis	du <b>e date):</b> gent TAT (List due	a date);				TORY/USE[QNLY/(Circle)) as 4
PROJECT ORDER N	: 2219573 !UMBER:				OTE NO.:				-1	EQUENCE NUM	BER (Circle)	receipt?	to brick Pracquison I (2) (2) (6)
<u> </u>	MANAGER: Alison M R: Julian Fowler	onkley	CONTACT P			RELINQUI	SHED BY:		OF: 1	2) 3 4 Y:	5 6	7 Other commence RELINQUISHED BY:	: RECEIVED BY:
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XUSE		MATRIX: SOLID (S) W	ATER (W) XIP		CONTAINER INFOR	MATION	39/00**			Total (unfiltered		or Dissolved (field filtered	
LAB ID	SAMPI	LE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIV (reier to codes below)	E	TOTAL	TLU, SIP.	Presente	فية	2 (ma) "	-l. \ \	Continents on likely contaminant levels, distributions, or samples recuiring specific Quantity is cited.
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Water Confainer Codes: P = Uppreserved Plastic, N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide/Cd Preserved Plastic; AG = Amber Glass Uppreserved; AP - Artiferght Uppreserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved Plastic; AG = Amber Glass Uppreserved; AP - Artiferght Uppreserved Plastic; AF = With Confainer Codes: H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acadiste Preserved Bottle; E = EDTA Preserved Bottles, ST = Steffe Boolle, ASS = Plastic Bag for Acid Sulphale Solis; B = Uppreserved Bag.

TOTAL

cots 7/9/18 17:00 Fi



# **CERTIFICATE OF ANALYSIS**

Issue Date

**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 Address

NEWCASTLE WEST NSW, AUSTRALIA 2302

 Telephone
 : -- Telephone
 : (02) 8784 8504

 Project
 : 2219573
 Date Samples Received
 : 11-Sep-2018 08:37

 Order number
 : 2219573
 Date Analysis Commenced
 : 12-Sep-2018

Sampler : D.COOPER

Site

C-O-C number

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

277-289 Woodpark Road Smithfield NSW Australia 2164

: 26-Sep-2018 18:38

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

Page : 2 of 4

Work Order : ES1826738 Amendment 1

Client : GHD PTY LTD

Project : 2219573

# ALS

#### **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.

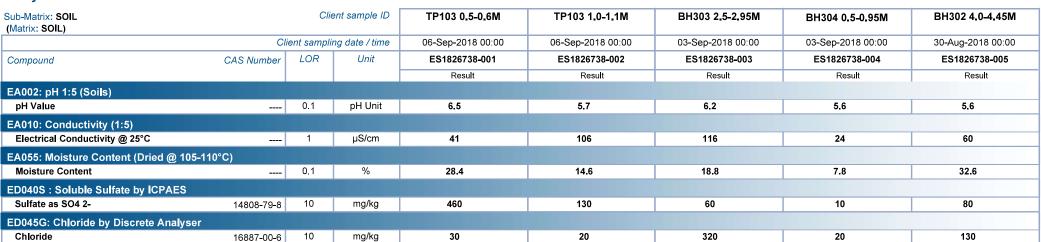
Page : 3 of 4

Work Order : ES1826738 Amendment 1

Client : GHD PTY LTD

Project : 2219573

#### Analytical Results





Page : 4 of 4

Work Order ES1826738 Amendment 1

Client : GHD PTY LTD

Project : 2219573

# Analytical Results



Sub-Matrix: SOIL		Clie	ent sample ID	BHA302 1.0-1.45M	BH201 4.0-4.45M	 	
(Matrix: SOIL)							
	Cli	ent samplii	ng 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 (Soi <b>l</b> s)							
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 @ 105-11	0°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	 	



#### **QUALITY CONTROL REPORT**

: (02) 8784 8504

Accreditation No. 825

Accredited for compliance with ISO/IEC 17025 - Testing

**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 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NEWCASTLE WEST NSW, AUSTRALIA 2302

Telephone : ---- Telephone
Project : 2219573 Date Samples Received

 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

No. of samples received

Quote number : EN/005/18

No. of samples analysed : 7

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.



Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits

Matrix Spike (MS) Report; Recovery and Acceptance Limits

: 7

This Quality Control Report contains the following information:

#### 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

Page : 2 of 3

Work Order : ES1826738 Amendment 1

Client : GHD PTY LTD
Project : 2219573



#### **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 I	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	s) (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 Co	ntent (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 Ma	ajor Anions (QC Lot: 192656	9)							
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 b	y Discrete Analyser (QC Lo	t: 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

Page : 3 of 3

Work Order : ES1826738 Amendment 1

Client : GHD PTY LTD
Project : 2219573



# 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)	Laboratory Control Spike (LCS) Report				
				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: 19	26571)								
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.

Matrix Spike (MS) Report Sub-Matrix: SOIL Spike SpikeRecovery(%) Recovery Limits (%) Laboratory sample ID Client sample ID CAS Number Concentration MS Low High Method: Compound ED045G: Chloride by Discrete Analyser (QCLot: 1926571) ES1826738-001 TP103 0.5-0.6M 16887-00-6 130 ED045G: Chloride 1250 mg/kg 118 70



# QA/QC Compliance Assessment to assist with Quality Review

**Issue Date** 

: ES1826738 **Work Order** Page : 1 of 5

: 1 Amendment

Client Laboratory Environmental Division Sydney GHD PTY LTD

Contact : MR BRIAN OBERDORF Telephone : (02) 8784 8504 **Project** 2219573 **Date Samples Received** : 11-Sep-2018

Site

: 26-Sep-2018 No. of samples received Sampler D.COOPER

: 7 No. of samples analysed . 7 Order number 2219573

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.

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Project : 2219573



#### Outliers: Analysis Holding Time Compliance

Matrix: SOIL

Method		Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days	Date analysed	Due for analysis	Days
				overdue			overdue
EA002: pH 1:5 (Soils)							
Snap Lock Bag							
BH303 2.5-2.95M,	BH304 0.5-0.95M,	12-Sep-2018	10-Sep-2018	2			
BH201 4.0-4.45M							
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,	BH304 0.5-0.95M,	12-Sep-2018	10-Sep-2018	2			
BH201 4.0-4.45M							
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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

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

Matrix: SOIL					Evaluation	ı: 🔻 = Holding time	breach; ✓ = vvitni	n nolding time
Method		Sample Date	Ex	traction / Preparation			Analysis	
Container / Client Sample ID(s)			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	<b>√</b>
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	<b>√</b>
<b>Snap Lock Bag (EA002)</b> 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	✓

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BH302 4.0-4.45M.

BHA302 1.0-1.45M

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Project : 2219573



Matrix: SOIL Evaluation: × = Holding time breach; ✓ = Within holding time. Method Sample Date Extraction / Preparation Analysis Container / Client Sample ID(s) Date extracted Due for extraction Evaluation Date analysed Due for analysis Evaluation EA010: Conductivity (1:5) Snap Lock Bag (EA010) 03-Sep-2018 10-Sep-2018 10-Oct-2018 BH303 2.5-2.95M, 12-Sep-2018 12-Sep-2018 BH304 0.5-0.95M, × BH201 4.0-4.45M Snap Lock Bag (EA010) 10-Oct-2018 TP103 0.5-0.6M, 06-Sep-2018 12-Sep-2018 13-Sep-2018 12-Sep-2018 TP103 1.0-1.1M 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) 17-Sep-2018 03-Sep-2018 12-Sep-2018 BH303 2.5-2.95M. BH304 0.5-0.95M. BH201 4.0-4.45M Snap Lock Bag (EA055) 20-Sep-2018 TP103 0.5-0.6M, TP103 1.0-1.1M 06-Sep-2018 12-Sep-2018 Snap Lock Bag (EA055) 30-Aug-2018 12-Sep-2018 13-Sep-2018 BH302 4.0-4.45M. BHA302 1.0-1.45M ED040S: Soluble Sulfate by ICPAES Snap Lock Bag (ED040S) 10-Oct-2018 BH303 2.5-2.95M, 03-Sep-2018 12-Sep-2018 01-Oct-2018 12-Sep-2018 BH304 0.5-0.95M, BH201 4.0-4.45M 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) 30-Aug-2018 BH302 4.0-4.45M. BHA302 1.0-1.45M 12-Sep-2018 27-Sep-2018 12-Sep-2018 10-Oct-2018 ED045G: Chloride by Discrete Analyser Snap Lock Bag (ED045G) 03-Sep-2018 12-Sep-2018 01-Oct-2018 12-Sep-2018 10-Oct-2018 BH303 2.5-2.95M, BH304 0.5-0.95M, BH201 4.0-4.45M Snap Lock Bag (ED045G) 12-Sep-2018 04-Oct-2018 10-Oct-2018 06-Sep-2018 12-Sep-2018 TP103 0.5-0.6M, 1 TP103 1.0-1.1M Snap Lock Bag (ED045G)

30-Aug-2018

12-Sep-2018

27-Sep-2018

1

12-Sep-2018

10-Oct-2018

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GHD PTY LTD Client 2219573 Project



# **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: SOII

Matrix: SOIL				Evaluatio	n: * = Quality Co	ontrol frequency	not within specification; $\checkmark$ = Quality Control frequency within specificati
Quality Control Sample Type		C	ount		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Reaular	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

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 Client
 : GHD PTY LTD

 Project
 : 2219573



# **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-CI- 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	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
analytes			are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for
			analysis.



# CHAIN OF CUSTODY

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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		TURN	AROUND REQUIREMENTS :	⊠ Stand	lard TAT (Lis	st due date):			FOR LABORATORYUS	E(O)(Y)(Circle)
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	TP103, 0.5 - 0.6m,	6/09/2018	s	В		1	x				
	TP103, 1.0 - 1.1 m	6/09/2018	s	В		1	x				
	внзоз, 2.5-2.75	3/09/2018	s	В		. 1	x				
	BH304, 0.5 - 0.95m	3/09/2018	s	В		1	×				
	BH302, 4.0 - 4.45 m,	30/08/2018	s	В		1	x			Environmental !	Division
	BHA302, 1.0-1.45 m	30/08/2018	S	В		1	x			Sydney Work Order Ref ES1820	erence 3738
	BH202, 2.5 - 2.95 m	3/09/2018	s	В		1 .	×			E0102	3700
	BH201, 4.0 - 4.45 m	3/09/2018	s	В		1	x				
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V = VOA V	tainer Codes: P = Unipreserved Plastic; N = Nitric al HC: Preserved; VB = VOA Vial Sodium Bisulphate etate Preserved Bottle; E = EDTA Preserved Bottle	Preserved: VS = VOA Vial	Sulfurio Pr	reserved: AV = Airfreight Unpreserved '	Vial SG = Sulf	S = Sodium I furic Preserve	Hydroxide Preser d Amber Glass;	ved Plastic; AG = Amber H = HCl preserved Plas	Glass Unpreserved; AP tic; HS = HCI preserved	- Airfreight Unpreserved Plastic   Speciation bottle; SP = Sulfuric Pres	erved Plastic; F = Formaldehyde Preserved Glass



### CHAIN OF CUSTODY

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LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE to codes below)	(refer	TOTAL	Aggressivity Suite (EC, PH, Sulphur, CI		MA				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
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3	внзоз, —— 2.5-2.75	3/09/2018	s	В		1	x						
Ý	BH304, 0.5 - 0.95m	3/09/2018	S	В		1	x			}			Ulaion
5	BH302, 4.0 - 4.45 m,	30/08/2018	s	В	· · · · · · · · · · · · · · · · · · ·	1	x				Environm	nentai Di	Algori :
Ь	BHA302, 1.0-1.45 m	30/08/2018	S	В		1	x				Sydney Work C <b>ES</b>	order Refer	<sup>ence</sup> 738
	BH202, 2.5 - 2.95 m - GNR P.	1 13/09/2018	-s	В		1	x				EO	1020	
8	BH201, 4.0 - 4.45 m	3/09/2018	s	В		1	x						
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					TOTAL	8	8						

Water Container Codes: P = Unipreserved 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; VS = VOA Vial Sulfuric Preserved; VS = VOA Vial Sulfuric Preserved Plastic; F = Emaile Preserved Plas



# **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 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NEWCASTLE WEST NSW, AUSTRALIA 2302

 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

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

: 26-Sep-2018 18:36

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

Page : 2 of 2

Work Order : ES1827112 Amendment 1

Client : GHD PTY LTD

Project : 2219573



#### **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)		Clie	ent sample ID	BH202 2.5-2.95M	 	 
	Cl	ient sampli	ng 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 @ 105-11	0°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	 	 



### **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 Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

NEWCASTLE WEST NSW, AUSTRALIA 2302

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 : (02) 8784 8504

 Project
 : 2219573
 Date Samples Received
 : 13-Sep-2018

 Order number
 : 2219573
 Date Analysis Commenced
 : 14-Sep-2018

C-O-C number | Ssue Date | 26-Sep-2018

Sampler : DEMETRIUS COOPER

: 1

This Quality Control Report contains the following information:

Site :

No. of samples received

Quote number : EN/005/18

No. of samples analysed : 1

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.

• 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

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Client : GHD PTY LTD
Project : 2219573



#### **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	s) (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 Co	ntent (Dried @ 105-110°C)(0	QC Lot: 1931161)								
ES1827143-001	Anonymous	EA055: Moisture Content		0.1	%	26.8	26.7	0.394	0% - 20%	
ED040S: Soluble Ma	jor 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 b	y 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	

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Project : 2219573



### 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	p-Matrix: <b>SOIL</b>					Laboratory Control Spike (LCS) Report				
				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.

Matrix Spike (MS) Report Sub-Matrix: SOIL Spike SpikeRecovery(%) Recovery Limits (%) Laboratory sample ID Client sample ID CAS Number Concentration MS Low High Method: Compound ED045G: Chloride by Discrete Analyser (QCLot: 1938772) ES1827105-001 Anonymous 16887-00-6 130 ED045G: Chloride 1250 mg/kg 117 70



# QA/QC Compliance Assessment to assist with Quality Review

**Issue Date** 

: 26-Sep-2018

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

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.

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Project : 2219573



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

17-Oct-2018

19-Sep-2018

### **Outliers : Analysis Holding Time Compliance**

Matrix: SOIL

Matrix: SOIL

Snap Lock Bag (ED045G)

BH202 2.5-2.95M

Matrix. Soil						
Method Method	Ex		Analysis			
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days	Date analysed	Due for analysis	Days
			overdue			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 <u>VOC in soils</u> 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 <u>or</u> Vinyl Chloride and Styrene are not key analytes of interest/concern.

Method Sample Date Extraction / Preparation Analysis Container / Client Sample ID(s) 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) 03-Sep-2018 19-Sep-2018 10-Sep-2018 19-Sep-2018 17-Oct-2018 BH202 2.5-2.95M EA055: Moisture Content (Dried @ 105-110°C) Snap Lock Bag (EA055) 03-Sep-2018 17-Sep-2018 BH202 2.5-2.95M 14-Sep-2018 ED040S: Soluble Sulfate by ICPAES Snap Lock Bag (ED040S) 01-Oct-2018 17-Oct-2018 03-Sep-2018 19-Sep-2018 19-Sep-2018 BH202 2.5-2.95M ED045G: Chloride by Discrete Analyser

03-Sep-2018

01-Oct-2018

19-Sep-2018

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Work Order ES1827112 Amendment 1

Client GHD PTY LTD 2219573 Project



# **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				Evaluatio	n: × = Quality Co	ontrol frequency	not within specification ; ✓ = Quality Control frequency within specifica
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

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 Client
 : GHD PTY LTD

 Project
 : 2219573



# **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-CI- 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

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DGLADSTONE 46 Callemondah Drive Clinton QLD 4580
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Ph: 02 4225 3125 E: portkembla@alsglobal.com

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z = Zinc Ac	etate Preserved Bottle; E = EDTA Preserved Bottle	es; ST = Sterile Bottle: ASS	= Plastic B	lag for Acid Sulphate Soils; B = Unpres	erved Bag.					

### GHD

Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300 PO Box 5403 Hunter Region Mail Centre NSW 2310 T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com

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Rev	<del>rent Status</del> Author	Reviewer		Approved for Issue			
No.		Name	Signature	Name	Signature	Date	
0	E Griffin	A Monkley		N Malcolm		11/10/2019	
1	E Griffin	A Monkley	L	N Malcolm	1. hleh	05/11/2019	
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