Enirgi Power Storage Recycling Consolidation Project
Environmental Impact Statement
Appendix M - O

July 2018

Appendix M – Contaminated Site Assessment

Enirgi Power Storage Recycling

Enirgi Power Storage Recycling Consolidation Project EIS

Contaminated Site Assessment

July 2018

Table of contents

Table index

Appendices

1. Introduction

Enirgi Power Storage Recycling Pty Ltd (EPSR) is proposing to develop the Enirgi Power Storage Consolidation Project (the project). The project involves an expansion of the existing used lead acid battery (ULAB) recycling facility at 212 East Bomen Road, Bomen NSW. A site locality plan is shown as Figure 1, Appendix B.

The ULAB facility currently processes around 70,000 tonnes per annum (tpa) of ULABs to produce a range of products from soft lead and lead alloy products, in addition to other products such as sodium sulphate and polypropylene. The project involves expanding the existing operations to achieve a production capacity 120,000 tpa, within the site boundary of the existing facility.

An overview of the project includes the following major elements:

- Increasing production from 70,000 to 120,000 tpa
- A new building to the east of the current facility will contain a new salt storage, crystallisation area, purification and scrubber.
- A new warehouse to the north of the current facility will contain chemicals, raw materials and ULAB
- The existing facility will undergo some upgrades to include a new furnace to supplement the existing furnace, a new filter baghouse and exhaust stack, modified battery breaker to increase capacity, relocation of the slag bay, addition of on-site oxygen generation
- A small increase to capacity of existing car park
- The current office/change house building will be modified to house just a change house and the office employees will be moved to another nearby facility
- Changes to the existing water management system to increase processing ability and stormwater storage capacity
- Alterations to the existing internal roads to provide access to the new buildings and plastic resource recovery facility, and
- Inclusion of the activities of the adjoining plastics resource recovery facility (PRRF).

This contaminated site assessment (CSA) forms part of the environmental assessment requirements for the development approval and documents the site contamination status and potential contaminated land impacts associated with the proposed expansion. The report is based around the existing ULAB recycling operations at the site, which are the subject of development activities for the consolidation project.

1.1 Objectives

This report has been prepared to support the Environmental Impact Statement (EIS) for the proposed modification. The objectives of the CSA address the requirements outlined in the Secretary's Environmental Assessment Requirements (SEARs) for the project. The objectives are to:

- Consider whether the site is suitable for the proposed use in accordance with State Environmental Planning Policy No. 55 – Remediation of Land.
- Assess the potential for contamination associated with current and/ or historical use of the site, which may pose a risk to the proposed development.

- Assess whether contamination, if identified at the site, presents a potential risk to human health or the environment for an ongoing industrial/commercial land use scenario.
- Provide recommendations if soil contamination is encountered during the project.

1.2 Scope and limitations

The scope of work for the CSA initially included a desk based review of information pertaining to the site and a site inspection. In March 2018, an additional targeted soil investigation program was included in the scope following the desktop review. This CSA was updated accordingly to include the additional information obtained from the soil investigation program.

Generally, a one kilometre buffer surrounding the site was used for the purposes of the desktop assessment. The specific scope of work included:

Desktop review

- A review of available desktop information sources, including:
  - Council information, including the Local Environmental Plan (LEP) and land zoning maps.
  - Historical aerial photographs of the site, used to assist in establishing the physical patterns of development over time and previous land use.
  - NSW Environment Protection Authority (EPA) notices under the *Contaminated Land Management Act 1997* (CLM Act)
  - Licenses held under the provision of the *Protection of the Environment Operations Act 1997* (POEO Act).
  - Published geology, hydrogeology, hydrology, and topographical records.
  - Previous contamination assessment and monitoring reports made available to GHD
- Preparation of health and safety documentation prior to conducting the site inspection.
- A site inspection to identify areas of potential contamination based on observation of surface conditions and evidence of current or former potentially contaminating activities.

Targeted soil investigation

- Intrusive soil investigation targeting the vicinity of the eastern portion of the ring road surrounding the recycling facility, and the open air vacant land south of the recycling facility.
  - The investigation involved the drilling of total 12 boreholes using a hand auger, to a maximum depth of 0.5 metres below ground level (m BGL).
  - Subsurface profiles encountered during the drilling were logged and soil samples were collected from the encountered materials by a GHD environmental engineer.
- Soil samples were analysed in the laboratory for eight metals, which were identified to be the chemicals of concern for the site.
- Data interpretation and preparation of this report documenting the findings of the investigation.

The CSA did not include a hazardous buildings materials assessment, however, if any obvious indications of asbestos containing material (ACM) were observed during the site inspection, these were annotated as part of the CSA. No sampling and analysis was conducted for identified hazardous building materials (if any).

The CSA desktop review are limited to the information provided by the client and/or publically available regarding the site history and site contamination status. GHD has identified data gaps surrounding the current site contamination status from the information provided within this CSA.

The findings of this CSA report reflect the potential impacts of the proposed modification relative to the existing impacts (where known) associated with EPSR current operations, and are aligned to the objectives outlined in Section 1.1 of this CSA report.

Additional relevant limitations are outlined in Section 10 of this CSA report.

2. Site information

2.1 Site identification

A summary of the site identification details are provided in Table 2-1. Key site features shown in the site photograph log in Appendix A. The site location is shown in Figure 1 in Appendix B.

Table 2-1 Site identification

Information	Details
Street address	Part of 212 East Bomen Road, Bomen NSW 2650
Approximate total site area	98,000 m^2
Lot and Deposited Plan	Lot 21 of Deposited Plan 1128492
Local Government Area	City of Wagga Wagga
Local land use zoning	IN1 – General Industrial
Current land use	Commercial / Industrial
Proposed land use	Commercial / Industrial

2.2 Site inspection

A GHD environmental consultant completed a site inspection on 19 July 2017. The main site features observed during the walkover are summarised in Table 2-2. Selected relevant photographs are provided in a photographic log (Appendix A).

Table 2-2 Main site features

Information	Details
Site conditions	*Site use:* The site was operational at the time of the inspection, occupied by EPSR. The following general observations were made: • The industrial and processing areas were situated in the centre of the site and consisted of single storey warehouse sheds with annexure covered loading areas. • A stand alone office and administrative building was located to the west, with a sealed car park. • A central stormwater retention basin and two additional secondary basins are located to the middle of the site. All captured stormwater from hardstand areas within curbing is retained on site and flows to the retention basins. • A wash bay for vehicle exit is located at the northern extent of the ring road. The vehicle wash system runs off the stormwater capture system. It is effectively a closed system. • Some redundant EPSR machinery and small disused mobile plant were observed on unsealed hardstand and grassed areas of the site. • Liquid petroleum gas (LPG) and other chemical pressurised tank farms are noted within the processing areas and sheds.

Information	Details
	• An irrigation system for the grey and black water from the retention basins was observed along a grassed/cropping area to the western boundary of the site. • A water treatment plant was noted to exist on site. • Two operational transformers are noted to exist on the site. • Active above ground storage tanks (ASTs) containing diesel and LPG were observed in operation at the site.
Ground Surface and site drainage	*Ground cover*: The existing processing areas of the site were covered in concrete or bitumen hard stand. Surrounding the processing sheds, cleared open paddock and/or grassed land was observed. • The majority of the site was concrete hard stand. Minor staining from rust and oil was observed at certain locations. Minor cracking was noted throughout the hardstand on the site, though the hardstand was generally observed to be in good condition. • Site drainage controls (concrete spoon drains) were observed to be heavily damaged, with deep cracking, in some areas across the site. Specifically, on the sealed ring road. • A sealed concrete ring road surrounds the site for heavy vehicle movements. The ring road was observed to be in good condition. • The perimeter of the process area and infrastructure is generally unsealed, consisting of gravel hardstand and open grassed areas. • A large soil stockpile (topsoil) is noted on the open paddock immediately south of the processing shed and scrap metal storage area. • A large cleared paddock is located to the south of the process area and infrastructure. The paddock appears to have a cover crop. GHD understands that this open paddock is irrigated with treated water from the water treatment plant on site.
	Vegetation: The majority of the site is unsealed, with 80% grass cover. A tree screen of young tress and established shrubs is noted on the south, east and west boundaries. Established vegetation on site was observed to be in a healthy condition with no signs of stress evident.
	Site drainage: It is expected that surface water run off would flow to the west and north-west consistent with the site topography, toward Byrnes Road via the established drainage system on site. The stormwater drainage system was observed to drain initially to the north to the wheel wash, and west where it ultimately accumulated in the retention basins. The system was observed to be a closed system. Surface water on unsealed areas of the site is expected to generally infiltrate into surface soils and drain to the Kurrajong plains, consistent with site local topography and hydrogeology. The additional sheet water would be captured into the stormwater system and be retained on site.
Potentially contamination activities	*Refuse*: The open grassed surfaces of the site was generally observed to be free of litter and debris. Waste and recycling skip bins were noted across the hardstand areas of the site. General litter (plastics and paper waste) was noted

Information	Details
	in minor occurrences across the site on the unsealed areas within and directly adjacent to the processing sheds and infrastructure. A number of scrap storage areas were observed on the site, generally on sealed hardstand areas. These consisted of pallet storage, scrap metal, processing and industrial machinery parts (generators and engine parts), batteries, and general refuse. Waste oil and chemical Intermediate Bulk Containers (IBCs), drums and containers were stockpiled on the sealed hardstand generally within bunded areas. A number of IBCs, drums and containers were located within the scrap storage areas on unbunded, unsealed ground.
	Site structures and observations: • Vehicle wash bay – a vehicle wash was located to the north of the sealed ring road and consisted of an exit and entry point, rumble grid, water jet spray points, and wash basin. Water within the vehicle wash drained to the onsite retention basins. • An active diesel above ground storage tank and refuelling area was observed on the eastern flank of the sheds. The refuel area was observed to exist on concrete hardstand and the ring road, it was also observed the tank itself was of self bunded construction. • An active LPG above ground storage tank is located on site on concrete hardstand. • Two transformers are located on site to the east and south of the process infrastructure. The transformers were observed to be in operation, in good condition and sealed by concrete bunding and wire fencing. • Process by products, metals, and chemical use silos and subsequent load/unload areas are noted within hardstand areas of site infrastructure (for example, lead (Pb), Arsenic (As), (soda ash (Na2CO3), sodium hydroxide (NaOH), and sulphuric acid (H2SO4)). Concrete hardstand damage was observed within these areas. • The main retention basin was observed to be constructed from concrete and in good condition. The two secondary basins were in poor condition with cracks and tears observed in the flooring and wall HDPE layers.
	Potential Asbestos Containing Material (ACM): No potential ACM was observed in building infrastructure during the site inspection.
	Fill: Based on site observations, some cut to fill is likely to have taken place during site development for levelling purposes for site infrastructure. It is unknown if fill material was brought to site for the development. A large soil stockpile (potentially topsoil) is located to the south of the process infrastructure.

2.3 Existing site management measures

During GHD's site attendance on 1 March 2018 the following work health and safety management procedures were observed to be in place:

- A fence line is established along the site boundary. Persons entering the site are granted access either by presenting security passes or by obtaining approvals from site operators. As such the likelihood for unauthorised access and subsequent incidental exposure to site contamination is low.

- Prior to commencement of works, staff and contractors working on site are required to undergo site induction, which outlined the potential exposure risk associated with exposure to lead and the necessary work health and safety controls need to be implemented during their works.
- Staff and contractor entering the main operation area outside the administration building are required to wear personal protection equipment which comprised: boot cover, steel cap boots, hard hat, coverall and respiratory protection (may include mask, half face or full face respirator dependent on the level of protection required).
- Regular monitoring of blood lead level are being undertaken for staff working on site on a longer term basis.

2.4 Surrounding land uses

Land immediately adjacent to the site consists of the following:

- North – The former *Riverina Wool Combers* and associated grazing land.
- East – *Enirgi group* plastic recycling plant and associated cleared land.
- South – Vacant agricultural land used for stock grazing and cropping.
- West – Byrnes Road and a rail corridor.

3. Environmental setting

The following section provides an overview of the environmental setting of the site obtained from publically available information.

3.1 Topography

The general location of the site has a gently undulating and deeply weathered landscape, with high sloped ridges and flat, open flood plains.

The site is located at approximately 245 m Australia Height Datum (AHD) (Lotsearch report). Topographic data indicated the site has sloping grade to the west and north-west, towards Byrnes Road.

The majority of the site area was observed to be generally flat with a gentle sloping grade to the west, north-west. An approximate 1.5 to 2 m high embankment was observed to the east of the ring road.

3.2 Soils and geology

The 1:250,000 Wagga Wagga Geological Series Sheet (SI 55-15) indicates the site is underlain by Silurian aged Wantabadgery Granite units, comprising mafic, unfractionated and micaceous granites, overlain by Cainozoic Aeolian clay and silt deposits.

The 1:100,000 Soil Landscape Sheet for the Wagga Wagga area (Lotsearch report) indicates the site is comprised of the *East Bomen* (AEeb) soil landscape unit. This unit is characterised by Aeolian soils, and low hills of local relief on granite lithology. Soils can be mafic in composition, shallow to moderately deep and well-draining dermosols, red-brown non-calcic soils of varying depths, which are moderately permeable and moderately to well drained.

The site is not located within a known area classified as containing acid sulfate soils.

The local site geology observed during the site inspection may be described as reworked natural soil and fill layers overlaying residual dermosol soils and granite. Granite outcropping was observed in the surrounding lands.

3.3 Hydrology

The site is located at the top of a catchment, which drains into the Kurrajong floodplain system approximately two kilometres (km) downstream of the site. The closest receiving body of water is Duke's Creek, which eventually flows into the Murrumbidgee River approximately three km south of the Kurrajong floodplain.

On site is relatively flat, draining to the west towards the north-west corner and into the adjacent Byrnes Road Reserve, align to the surface topography.

It is understood stormwater and surface water run-off is generally captured on site with a closed system including a number of retention basins, and is processed by an onsite water treatment plant, and reused for site irrigation and operational processes.

3.4 Hydrogeology

A review of existing groundwater borehole records using the Department of Primary Industries Office of Water (DPI OoW) database was completed by Lotsearch on 28 June 2017. The search was conducted to identify registered groundwater boreholes in close proximity to the site and to record information such as groundwater use and standing water level. 11 registered boreholes were located within 500 m radius of the site, including five groundwater boreholes located onsite. According to the Hydrogeology Map of Australia (Lotsearch report), the bores were installed for groundwater monitoring purposes.

The five onsite groundwater boreholes all indicated similar sequences of sand and clayey sands overlaying several metres of sandy clays to clays and residual, highly weathered granites. The highly weathered granite is a potential water transmission zone.

It is considered likely the site is underlain by several metres of sandy clays underlain by a highly weathered residual granite which would act as a transmission zone for groundwater to a potential perched, unconsolidated aquifer.

Deeper boreholes identified in the DPI OoW database, greater than 500 m radius from the site, indicated a deeper aquifer exists in fresh granite bedrock where it likely moves through fracture zones.

Additionally, aquifers on site are described as fractured or fissured, extensive aquifers of low to moderate productivity (Lotsearch report).

4. Desktop assessment

4.1 Site history

4.1.1 Historical aerial photographs

A selection of historical aerial photographs was examined in order to assess past activities and land uses at the site. Photographs were examined from the years 1944, 1953, 1966, 1971, 1980, 1990, 1997, 2003, 2006, 2009, 2014. Copies of the photographs are provided in Appendix B.

A summary of the information gained from the review of historical aerial photographs for the site and its surrounds are provided in Table 4-1.

Table 4-1 Historical aerial photograph review

Aerial photograph	Site information	Surrounds information
1944 Black and white	The site appeared to be cleared, agricultural land covered by crops. No buildings or infrastructure were noted to be present on site.	Surrounding land appeared to be agricultural land. No buildings or infrastructure were noted to be present on site. Existing established trees formed a screen to the immediate southern and western boundaries of the site. A rail corridor was observed to the west of the site, running north-south. Two small dams were located to the south of the site on an adjoining property.
1953 Black and white	No significant observable changes had occurred since the 1944 aerial photograph.	Unsealed access roads appeared to be developed on the western and southern boundaries of the site.
1966 Black and white	No significant observable changes had occurred since the 1953 aerial photograph.	Surrounding land remained primarily unchanged since the 1953 aerial photograph.
1971 Black and white	No significant observable changes had occurred since the 1966 aerial photograph.	The smallest, closest dam to the site boundary appeared to be backfilled and disused. Some minor clearing of established trees and vegetation had occurred at the western boundary area adjoining the site.
1980 Black and white	No significant observable changes had occurred since the 1971 aerial photograph.	Additional clearing of the western adjoining boundary appeared to have occurred. A sealed main road (Byrnes Road) had been constructed running parallel to the rail corridor and the site (north to south). Agricultural / Industrial premises and associated infrastructure had been constructed on the northern adjoining property, consisting of a large shed and associated sealed access roads and sealed car park. A number of above ground tanks were also present to the south of the shed.

Aerial photograph	Site information	Surrounds information
1990 Colour	A stockpile of unknown material (possible building construction waste) was present in the south-east corner of the site. No other significant observable changes had occurred.	Additional infrastructure had been constructed to the north-east, including a second large shed, additional sealed roads, and garden beds and laid turf. Constructed buildings appeared to be of a commercial / industrial nature.
1997 Colour	No significant observable changes had occurred since the 1990 aerial photograph.	Additional infrastructure had been constructed on the property to the immediate east including a number of small rectangular water retaining basins, and a number of ASTs. Constructed buildings appear to be of a commercial / industrial nature. Sealed access roads had been constructed to the east and south-east to the new infrastructure. A triangular shaped dam appeared to have been constructed on the adjoining property to the south-east of the site.
2003 Colour	The stockpile of possible construction waste appears to have been removed from the site. No other significant observable changes had occurred since the 1997 aerial photograph.	Surrounding land remained primarily unchanged since the 1997 aerial photograph.
2006 Colour	No significant observable changes had occurred since the 2003 aerial photograph.	Surrounding land remained primarily unchanged since the 2003 aerial photograph.
2009 Colour	Major construction work appeared to be in progress. A large portion of the site had been cleared of vegetation, with a large commercial infrastructure building under construction in the middle of the site. Unsealed access roads into the site and across the site had been constructed, including a temporary hardstand/car park. Heavy mobile plant, commercial cars and construction vehicles were observed on the site. An additional large soil stockpile was located on site to the south of the construction work. A large sediment basin / dam structure appeared to have been constructed in the middle of the construction area (current location).	Surrounding land remained primarily unchanged since the 2006 aerial photograph.

Aerial photograph	Site information	Surrounds information
2014 Colour	Construction work appeared to have been completed – the site comprised a number of developed commercial / industrial sheds and associated infrastructure including, a large main shed, a number of annexure buildings and sealed access roads ringing the infrastructure. The basin structure appeared to have been lined, and an additional two smaller basins were present to the north-west of the main basin. Heavy vehicles and commercial vehicles were observed on site. Two above ground tanks were present on the western boundary of the site (current location). The 2014 aerial image is representative of the current site layout at the time of these works.	Surrounding land remained primarily unchanged since the 2009 aerial photograph.

4.2 Regulatory information

4.2.1 Overview

As part of the desk based review, information was obtained from a number of sources to enable a greater understanding of the potential for contamination at the site. The desk based regulatory information review included a review of the following sources of information:

- Council information including land zoning and permissible use.
- NSW EPA contaminated Sites Register (notifications or incidents).
- NSW EPA Protection of the Environment Operations (POEO) licence register.

The findings of the information review are provided in Appendix B and are summarised below.

4.2.2 Wagga Wagga City Council information

Local environmental plan (LEP)

The site is located in the local government are of Wagga Wagga City Council. In accordance with the Wagga Wagga LEP (2010), the site is zoned as IN1 General Industrial.

The objectives of the IN1 General Industrial land zone are:

- To provide a wide range of industrial and warehouse land uses.
- To encourage employment opportunities.
- To minimise any adverse effect of industry on other land uses.
- To support and protect industrial land for industrial uses.

The project represents an expansion of the existing industrial land use and is considered consistent with the objectives of the land zone.

The site is not identified as ‘environmentally sensitive land’ under the LEP.

4.2.3 NSW EPA

A search of the datasets maintained by NSW EPA including notices under the CLM Act 1997 and POEO Environment Protection licence register was carried out. The search results are presented in Appendix B and summarised below.

Contaminated sites register

A site will be on the Contaminated Land: Record of Notices only if the NSW EPA was issued a regulatory notice in relation to the site under the CLM Act 1997.

No contaminated land records were listed for the site or for any sites immediately adjacent to the site, or within the dataset assessment buffer of 150 m.

List of NSW contaminated sites notified to EPA

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

The search did not identify any listings for the site or surrounding properties within the assessment buffer of 150 m.

POEO licence register

The POEO register identifies premises that are licenced for certain activities under the POEO Act 1997. Information of particular relevance to this assessment, which are listed on the Register includes, site location, activity type, relevant clean up notice and non-compliance information. Each licence provides information on potential point and on-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 current licenced activities under the POEO Act 1997 on site, and two within a 500 m radius.

The search also identified a single surrendered POEO licence for the site and four surrendered POEO licences within 500 m of the site.

No delicenced activities still regulated by the NSW EPA were identified within the dataset buffer.

These are summarised in Table 4-2 and Table 4-3.

Table 4-2 Licenced activities under the POEO Act 1997

EPL	Organisation	Location	Activity	Distance (m)	Direction
12878	Enirgi Power Storage Recycling Pty Ltd	212 East Bomen Road, Bomen NSW 2650	Metal Waste Generation	0	On site
	Enirgi Power Storage Recycling Pty Ltd	212 East Bomen Road, Bomen NSW 2650	Non-ferrous metal production (scrap metal)	0	On site
	Enirgi Power Storage Recycling Pty Ltd	212 East Bomen Road, Bomen NSW 2650	Recovery of hazardous waste and other waste	0	On site

EPL	Organisation	Location	Activity	Distance (m)	Direction
3142	Australian Rail Track Corporation Ltd	GPO Box 14, Sydney NSW 2001	Railway systems activities	40	North-west
13421	John Holland Rail Pty Ltd	PO box 215, Parramatta NSW 2124	Railway systems activities	40	North-west

Note: Enirgi Power Storage Recycling have recently changed name to Enirgi Power Storage Recycling Pty Ltd (EPRS) and are the applicant for the development application.

Table 4-3 Licenced activities under the POEO Act 1997 with surrendered licence

Licence No.	Organisation	Location	Status	Activity	Distance (m)	Direction
5686	Buckman Laboratories Pty Ltd	212 East Bomen Road, Wagga Wagga NSW 2650	Surrendered	Pesticides and related products production, Dangerous goods production	0	South-east
3914	Riverina Wool Combing Pty Ltd	Byrnes Road Wagga Wagga NSW 2650	Surrendered	Greasy wool or fleece processing	20	North-east
4653	Luhrmann Environment Management Pty Ltd	Waterways throughout NSW	Surrendered	Other activities / non-scheduled activity – application of herbicides	83	-
4838	Robert Orchard	Various waterways throughout NSW – Sydney NSW 2000	Surrendered	Other activities / non-scheduled activity – application of herbicides	83	-

4.3 Other information

The following is a summary of other information derived from the desktop search:

- The site or surrounding land are not classified as State Environmental Planning Policy Protected Areas.

- The site lies within an identified *sensitive zone* under the *Protection of the Environment (underground Petroleum Storage Systems) regulation 2014*. The zoning represents a conservative assessment of areas that are likely to be vulnerable to contamination from leaking UPSS, as a result of geology and groundwater properties, or proximity to vulnerable receptors such as rivers, lakes, groundwater extraction bores.
- There are no heritage items located within the site or in the vicinity of the site identified by the desktop assessment.
- The site lies within the Dryland Salinity National Assessment data. – Assessment 2050 *High Hazard or Risk* of occurrence.
- The site is not located on bushfire prone land.

4.4 Previous site assessments and reports

It was identified a number of previous assessments have been undertaken for the site, including a base line assessment of the contamination status of the site prior to the initial development (Aitken Rowe Testing Laboratories, 2009), an initial EIS (KBR, 2005), annual environmental management reports (AEMR), a section of ongoing monitoring of soil and groundwater, and two soil impact assessments conducted in 2017 (EMM).

GHD completed a review of the limited information provided by EPSR pertaining to the project site. Table 4-4 outlines the findings of the reports reviewed.

Table 4-4 Existing report review

Previous report	Relative information
Lead Battery Recycling Facility, Wagga Wagga – Environmental Impact Statement – KBR, May 2005	• The development is a lead battery recycling facility, including metal foundry and refinery, sodium sulphate crystallisation, and water treatment and processing facilities. • Potable mains water is the majority water supply for the processing, with rainwater and collected stormwater making up the additional supply. • Emissions from the operations of the plant were identified as: – Sulphur dioxide. – Lead. – Antimony. – Nitrogen dioxide. – Dust particulate. • The development was classed as a potentially hazardous development
Baseline Contamination Survey Enirgi Power Storage Recycling – ARTL, July 2009	• Identified a search of the NSW EPA register indicated "no statutory notices under the provisions of the *Contaminated Land Management Act 1997*" existed for the site. • Indicates potential historical sources of contaminants of concern as: – Pesticide residue from direct application or overspray from adjoining properties. – Migration of contaminants to the site from Riverina Wool Combing and Buckman Laboratories, the adjoining industrial premises. • Identifies the historical potential contaminants of concern as: – Organochlorine and organophosphate pesticides (OCP and OPPs) – Polychlorinated biphenyls (PCBs) – Polycyclic aromatic hydrocarbons (PAHs) – Total petroleum hydrocarbons (TPH) – Benzene, ethylbenzene, toluene and xylene (BTEX) – Metals – Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn). • Additional sample and analysis for the following was additionally undertaken to inform of soil baseline status (the analysis results were not compared against any relative guideline values): – Exchangeable calcium.

Previous report	Relative information
	– Electrical conductivity. – Nitrate. – Total nitrogen. – Extractable phosphorous. – Exchangeable potassium. – Exchangeable sodium. – Total organic carbon. • Construction had already began at the site prior to the baseline assessment being undertaken. Observations identified a significant level of cut and fill existed for the construction. • 12 composite soil samples consisting of 56 subsamples were taken during the assessment. A number of areas were unable to be sampled due to concrete already being placed. • No obvious signs of contamination were observed during the investigation. • Soil analytical results were compared against the HILs for Standard Residential development in accordance with the Environment Protection Heritage Council (EPHC) (1999). All soils sampled were below the selected guidelines for the identified potential contaminants of concern. • Sampling was limited to the open spaces along the perimeter of the site. • The report concludes the site is clean with respect to TPH, BTEX, OCPs, OPPs, PCBs, PAH and Metals.
Surface Soil Sampling and Analysis, Renewed Metal Technologies, Bomen, Wagga Wagga – ARTL, October 2012	• Six surface soil samples were collected between 0-0.15 mbgl from the site in the open paddock south of the main operation area. • The samples were tested for arsenic and lead. • The arsenic concentrations were reported to be ≤4 mg/kg in all samples and the lead concentrations were reported to be ≤11 mg/kg in all samples.
Stage 2 Soil Survey, 509 Byrnes Road, Bomen, Wagga Wagga – ARTL, October 2012	• 10 composite soil samples (consisted of 4 x sub samples per composite) were taken from across the open grassed areas of the site, at depths between 0 m and 1 m bgl. Samples were analysed for: – Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), – TPH, – PAH,

Previous report	Relative information
	– BTEX, – OCP, – OPP – PCBs – Exchangeable calcium. – Electrical conductivity. – Nitrate. – Total nitrogen. – Total phosphorous. – Exchangeable potassium. – Exchangeable sodium. – Total organic carbon. • The analytical suites were consistent with the analytical suites adopted in the baseline contamination survey (ARTL, 2009) • No obvious signs of contamination were observed during the investigation. • Soil analytical results were compared against the HILs for Standard Residential development in accordance with the Environment Protection Heritage Council (EPHC) (1999) and Contaminated Sites – Guidelines for Assessing Service Station Sites (NSW EPA 1994). All soils sampled were below the selected guidelines for the identified potential contaminants of concern. • ARTL concluded that the site was considered clean with respect TPH, BTEX, OCP's, OPP's, PCB's, PAH and metals. It appears that the operation of the lead recycling facility had no adverse impact on the soil materials at the site.
Groundwater Monitoring Renewed Metals Technologies – ARTL, March 2013	• Five groundwater wells are identified existing on the site. • Four groundwater wells were identified as dry during the groundwater assessment. The fifth monitoring well was observed to hold water but it was identified the well monument and casing was compromised, therefore the water was not considered representative of groundwater conditions.
Biennial Soil Monitoring Renewed Metals Technologies – ARTL, March 2014	• 10 composite soil samples (4 x sub samples per composite) were taken from across the open grassed areas of the site, at depths between 0 m and 1 m bgl. Samples were analysed for: • As, Cd, Cr, Cu, Pb, Hg, Ni, Zn.

Previous report	Relative information
	• The assessment reported on findings of the above for years 2009, 2012 and 2014. • The report concluded that EPSR operations have had no adverse effects on the soil materials at the site.
Process area decommissioning. Site inspection and sampling, GHD, May 2014	• The study was initiated by the former owner of the site prior to EPSR's acquisition and operation of the property. • The report is a facility inspection with limited sampling for the purposes of equipment dismantling and demobilisation from site. • The investigation included a limited desktop assessment, site inspection (visual), and limited grid based sampling of site surface soils and fill material, and process equipment. • Soil samples of open areas across the site did not identify the presence of soil contamination exceeding the chosen criteria considered to be protective of all potential land uses. • A single sample recovered from *first flush sediment* exceeded the HIL and EIL criteria for lead and zinc. • A groundwater investigation was not conducted as part of the scope of this investigation. • The report concluded the contamination risk to ecological and human health overall was low, and therefore, demobilisation of site and equipment can be dismantled and relocated at low risk.
Biennial Soil Monitoring Renewed Metals Technologies – ARTL, November 2014	• 10 composite soil samples (4 x sub samples per composite) were taken from across the open grassed areas of the site, at depths between 0 m and 1 m bgl. Samples were analysed for: • As, Cd, Cr, Cu, Pb, Hg, Ni, Zn. • The assessment reported on findings of the above for years 2009, 2012 and 2014. • The report concluded that EPSR operations have had no adverse effects on the soil materials at the site.
AEMR – enirgi group, May 2014 – April 2015	• A nano filtration plant was installed, resulting in zero water discharge from site. • All emissions (metals and particulates) were identified as below the NSW EPA operating licence limits. • All solid waste removed from the facility achieved *General Solid Waste* classification. • Soil testing showed no change in lead content since pre-commissioning. • A new heat exchanger was installed in the Crystalliser which resulted in improved energy efficiency and reduction in natural gas usage.

Previous report	Relative information
AEMR – enirgi group, May 2015 – April 2016	• Zero water discharged from site • 100% compliance with NSW EPA operating licence limits • All solid waste removed from the facility achieved *General Solid Waste* classification. • Five groundwater wells are identified existing on the site. • Four groundwater wells were identified as dry during the groundwater assessment. The fifth monitoring well was observed to hold water but it was identified the well monument and casing was compromised, therefore the water was not considered representative of groundwater conditions. • All metals and particulate emissions were below the guidance and allowable licence limits. • The soil monitoring concluded EPSR operations had *no adverse effects on the soil material at the site*.
Biennial Soil Monitoring Renewed Metals Technologies – ARTL, November 2016	• 10 composite soil samples (4 x sub samples per composite) were taken from across the open grassed areas of the site, at depths between 0 m and 1 m bgl. Samples were analysed for: • As, Cd, Cr, Cu, Pb, Hg, Ni, Zn. • The assessment reported on findings of the above for years 2009, 2012, 2014 and 2016. • The report concluded that EPSR operations have had no adverse effects on the soil materials at the site.
J17100 - Soil impact assessment and verification of the RMT facility, Wagga Wagga, EMM Consulting Pty Limited, memorandum dated 21 December 2017	• Two soil sampling events were undertaken in May 2017 and December 2017. • In the May 2017 event, soils to a maximum depth of 1 m bgl were assessed at four locations (site 1 to site 4), for pH, sulfate and metals (As, Ba, Be, B, Cd, Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, V, Zn). One location was further assessed for EC, exchangeable cations and CEC, exchangeable sodium percentage, phosphorus, nitrogen, NO_2, NO_3 and chloride. • In the December 2017 event, soils to a maximum depth of 0.6 m bgl were assessed at site 1 to site 4 and two additional locations (site 5 and site 6). Soils were assessed for pH, sulfate and metals (As, Ba, Be, B, Cd, Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, V, Zn). Three locations (site 4 to 6) were further assessed for EC, exchangeable cations and CEC, exchangeable sodium percentage, phosphorus, nitrogen, NO_2, NO_3 and chloride. • In both sampling rounds, lead concentrations in surficial soils (≤0.2 m bgl) at site 3 east of the existing warehouse exceeded the NEPC (2013) NEPM 2013 HIL – D criterion (1,500 mg/kg). The concentrations ranged between 25,700 mg/kg and 84,300 mg/kg. Concentrations in underlying samples were reported below the nominated HIL(D) • Concentrations of other analytes were below the NEPM HIL-D criteria in both sampling rounds.

Previous report	Relative information
	• Sulfate levels at site 3 east of the existing warehouse were high, with concentrations up to 28,800 mg/kg. • EMM reported the lead contamination was likely attributable to lead sulfate, deposited by contaminated surface runoff from hardstand areas. • The EMM report recommended the top 0.2 m of soil in the impacted area to be removed and disposed to a licensed facility. It was also recommended additional delineation sampling to be conducted to provide a better understanding of the extent of the contamination.

5. Impact assessment

The following section outlines potential for contamination to occur at the site, as identified from the desktop review and site inspection. This information is based on the findings of the desktop review completed by GHD as part of these works, including consideration of the previous sampling undertaken by others. This information forms the basis of a preliminary conceptual site model (CSM) for EPSR for ongoing management of their site.

5.1 Sources

5.1.1 Sources relative to the site

The overarching potential sources of contamination identified during this site assessment include:

- Vehicle wash bay and stormwater retention basins.
- Above ground storage tanks containing diesel and liquid petroleum gas.
- Chemical storage and use onsite for processing and maintenance, including coolant products, degreasers, hydraulic oils, and acids and bases.
- Silos containing process by-product and chemicals, including lead (Pb), Arsenic (As), (soda ash (Na_2CO_3), sodium hydroxide (NaOH), and sulphuric acid (H_2SO_4).
- Fill material (imported or cut-to-fill) used in site levelling of building structures and development.
- Waste water treatment plant and the use of treated water for irrigation purposes in the open paddock.
- Metals and chemical particulates from site treatment works.
- Location of two transformers on site.
- Stockpiled soil on the site.
- Contaminants migrating from adjacent sites.

5.1.2 Sources relative to the project

The project potential sources of contamination identified during this site assessment include:

- Potential unknown sources of soil contamination in areas which will be disturbed where intrusive site investigations have not previously been completed
- Contaminants migrating from adjacent sites
- Spills (hydrocarbon and/or chemical) related to construction activities of the project
- Fill material (imported or cut-to-fill) and road construction materials used in construction activities of the project.

5.2 Pathways

The primary pathways by which current and future receptors could be exposed to the potential sources of contamination are considered to be:

- Direct contact (including ingestion and inhalation) with potentially contaminated soil

- Vertical and horizontal migration of any potential contaminants within the soil and/or groundwater, and via surface run-off.
- On site reuse of potentially contaminated run-off water, collected in the retention basins, in uncontaminated areas.
- Leaching of reclaimed metals and chemicals, as a result of site processing works, to soil and/or groundwater.
- Leachate of potential contaminants of concern to soil and/or groundwater from infiltration from the retention basins.

5.3 Receptors

When evaluating potential adverse health and/or environmental effects from exposure to a contaminated site, all potentially exposed populations (current and future) should be considered. For the site, the key populations of interest are considered to include:

- Onsite industrial/commercial users of the site.
- Intrusive maintenance or construction workers.
- Off-site occupants of nearby properties.
- Onsite and off-site ecological receptors (soil, surface water, groundwater, and flora and fauna).

5.4 Site characterisation

While site-wide contamination was not identified during previous investigations (visual or desktop analysis) the presence of lead in an area east of the existing industrial processing warehouse was reported in a recent soil impact assessment (EMM, 2017). Through review of existing reporting of the contamination status of the site, data gaps were identified. The gaps identified consisted of the following:

- No groundwater information was available from the reviewed existing groundwater assessment. The groundwater report identified four out of five monitoring wells to be dry, with the fifth monitoring well to hold water but had a compromised casing. Anecdotal evidence indicates the wells have always been dry.
- There is limited understanding of the lateral extent of the identified lead contamination located east of the warehouse. The EMM (2017) report associated the lead contamination with a white crust noted at the ground surface likely being lead sulfate. The impact appeared to be limited to surficial soils, however, further sampling and analysis around the inferred contaminated area would be required to confirm its extent.
- The existing soil monitoring reports reviewed assessed for heavy metals, nutrients and selected physiochemical properties only. Other contaminants of potential concern were not assessed during these works.
- There is some inconsistency around sample design and reasoning behind sample density, as well as analytical suites chosen with past reports. Non-conformances with the NEPC (2013) guidelines in the quality control and quality assurance of past investigations are also identified (i.e. absence of quality control samples), posing uncertainties in the existing soil dataset.

6. Targeted soil investigation

In March 2018, GHD undertook a program of intrusive soil investigation targeting an area located east of the warehouse where lead impact was previously identified by EMM (2017), and the open paddock located south of the main factory facility that is irrigated with treated water from the sites water treatment plant. This section documents the investigation rationale, methodology and findings of this program.

6.1 Rationale for investigation and investigation extent

During two previous soil sampling activities conducted by EMM, lead impact was identified in soils at the sampling location Site 3 located east of main warehouse building and the ring road (Figure 2). The reported lead concentrations in surficial soils (≤0.2 m bgl) at this location ranged between 25,700 mg/kg and 84,300 mg/kg, above the adopted human health assessment criterion for the site (HIL D from NEPM 2013, 1,500 mg/kg). Existing data provided limited understanding on the lateral extent of this lead impact, and the potential human and environmental risk as posed by this impact.

The following aspects have been considered during the design of intrusive investigation program, based on findings from the desktop review and anecdotal information provided by the client:

- The existing sampling data in May and December 2017 from EMM suggested the lead impact at Site 3 was limited to relatively shallow depth (≤0.2 mbgl);
- The identified lead impact was likely associated with transportation activities on site, originating from possible spillage from vehicles exiting the main warehouse and entering the ring road, as suggested by anecdotal information from the client;
- The need to further understand the lateral extent of the identified impact, to inform risk assessment and evaluate the need for remediation and management actions; and
- The need to obtain additional data on the likely background soil conditions on site, away from the active operation area.

On the basis of the above, the investigation program was designed to target shallow soils (≤0.5 mbgl) in the following three areas of potential concern:

1. Area 1: in the vicinity of the location Site 3,
2. Area 2: accessible soils located on the eastern side of the ring road immediately adjacent to the sealed driveway; and
3. Area 3: the open paddock located south of the main operation area of the ULAB facility used for irrigation of treated water from the on-site water treatment plant.

6.2 Sampling methodology

A Sampling, Analytical and Quality Plan (SAQP) was developed based on the data quality objectives (DQOs) set out in Appendix F. The SAQP comprised the components summarised in Table 6-1. The sampling locations referred to in Table 6-1 are presented in Figure 2, Appendix B.

Table 6-1 SAQP for targeted soil investigation program

Aspects	Descriptions
Sampling locations	A total of 12 locations (BH101 to BH112) were drilled and sampled in the following areas: • five locations targeting both Area 1 and Area 2 of potential concern (BH102 to BH106) • five locations targeting Area 2 (BH101, and BH107 to BH110) • two locations targeting Area 3 (BH111 and BH112)
Investigation depths	To a maximum of 0.5 m bgl
Sampling method	All locations were drilled using a hand auger. Soil samples were collected from cuttings brought up to the surface by the hand auger, using the grab method with gloved hands. Samples were placed directly into laboratory supplied containers.
Field vapour screening	A small portion of soil was separated from each primary samples and screened on site using a photo-ionisation detector (PID) for potential vapour presence. The PID used in this program has a 10.6 eV lamp and was calibrated prior in accordance with manufacturer's specification. The calibration certificate is attached in Appendix E.
Decontamination procedure	The hand auger was brushed and washed down with tap water between each boreholes. Disposable gloves were used during sampling. Gloves were replaced between each sampling locations.
Sampling storage and preservations	Collected soil samples were placed in laboratory supplied glass jars and sealed with Teflon lined plastic lids. Samples were stored in ice-chilled cool boxes whilst on site and during transit to the laboratory.
Laboratory analysis	Soil samples were assigned for laboratory analysis for eight heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc). All analytical laboratories engaged in this investigation are NATA accredited. Primary soil samples were analysed in Charles Sturt University Environmental Analytical Laboratories in Wagga Wagga. The analysis was repeated in Envirolab in Sydney. An inter-laboratory quality control sample was analysed by Eurofins MGT in Sydney.
Quality assurance and quality control (QA/QC)	The QA/QC program of this investigation included: • Collection of a pair of intra-laboratory and inter-laboratory duplicates, and assessment of the relative percentage differences (RPD) between the analytical results. • Implementation and adherence to GHD's standard operation procedures for soil investigation and sampling.

6.3 Assessment criteria

The soil criteria adopted in this assessment are discussed below:

- NEPM (2013) Health Investigation Levels (HILs) HIL D – commercial / industrial land use

  HIL D was adopted as tier one screening criteria for the protection of identified human receptors on site (Section 5.3).

- NEPM (2013) Ecological Investigation Levels (HILs) EIL D – commercial / industrial land use

  EIL D was adopted as tier one screening criteria for the protection of ecological receptors on site (e.g. vegetation).

The commercial / industrial scenario (HIL-D) described in NEPM (2013) was considered applicable to this assessment based on current site use.

6.4 Quality assurance and quality control assessment

The data produced from these QA/QC processes is assessed in Appendix F.

Variability in laboratory analytical results, including the concentrations of lead, was identified between the two primary laboratories (Charles Sturt University and Envirolab Sydney). Further discussion regarding the difference in lead concentrations reported between the two laboratories is provided in Appendix F. Whilst the difference concentrations reported by the laboratories raises questions about the precision of the data set, the results reported by both laboratories indicate that the concentrations of lead in soils are above the nominated health based investigation levels, and additional works are required to further understand the extent of the lead impact.

Overall, the analytical data set is considered of sufficient reliability for interpretation, and for establishing the contamination status in the investigation area.

6.5 Investigation findings

6.5.1 Soil profile

The subsurface strata encountered during this investigation were logged and presented as borehole logs in Appendix D. The subsurface layers encountered typically comprised:

- Fill near the eastern side of the ring road, generally extending beyond 0.5 mbgl.
  - Gravel was commonly present in the fill encountered in this area, suggesting the fill may be road base materials placed in the area for construction of the ring road.
- Red-brown natural soils encountered from the surface, in the open paddock south of the main operation area and on top of the embankment east of the internal ring road.

6.5.2 Field observations

The following observations were made on the targeted investigation area on 1 March 2018:

- Most of the investigation locations near the ring road (BH101, BH102, BH104, BH106 to BH110) were located in an approximately 5 to 6 m-wide strip of soils, located at the foot of the ~2m high embankment to the east, between the ring road and the embankment. Based on previous EMM's findings at Site 3 (located in this strip), the facility layout and the topographical setting, soils in this strip would be considered more likely to be susceptible to contamination from the factory operations and contaminated surface water run-off.
- Consistent with EMM's observations in 2017 (EMM, 2017), white crust was observed at surface at some locations within this strip of soils. EMM considered this white crust was lead sulfate which was related to the production activities of the facility.
- Presence of spherical metal objects (up to approximately 20 mm in diameter) was observed at the ground surface in the area. It remains unknown if such spherical objects are related to the production activities of the facility. A photo of such object is included in Plate 16, Appendix A.

- The ground surface of this strip of soils was noted to be largely bare, with minimal vegetation. The side slope and top of the embankment (BH103) was vegetated by grass which appeared to be in good condition.
- At BH105, which was located immediately east of the main warehouse building, the ground surface comprised a layer of ballast. The ballast was underlain by fill materials of similar appearance to other investigation locations near the ring road.
- In the open paddock irrigation area (BH111 and BH112), the ground surface was vegetated. No obvious sign of vegetation distress was observed.

6.5.3 Analytical results

The analytical results are tabulated Appendix C. The analytical results provided by Charles Sturt University (CSU) are presented in Table 1 and the analytical results provided by Envirolab Sydney are presented in Table 2. The variations in the two sets of results are discussed further in Appendix F. For the purpose of data interpretation, GHD has considered both data sets as part of the evaluation process.

In summary the following observations on the analytical results were made:

Assessment against HILs

- With the exception of lead, analytical results for analysed metals (arsenic, cadmium, chromium, copper, mercury, nickel and zinc) were below the adopted HILs.
- Lead exceedances of the HIL (1,500 mg/kg) were noted at a number of locations near the ring road, being BH101, BH102, BH104 (CSU result only), BH105, BH107, BH108, BH109 (Envirolab result only) and BH110. The lead concentrations in the investigated soil profiles at these boreholes are summarised in Table 6-2.

Table 6-2 Lead exceedances of HIL-D and concentration ranges in soil profile

BH ID	Sampling depth (mbgl)	Exceeding HIL-D	Lead concentration (CSU) (mg/kg)	Lead concentration (Envirolab) (mg/kg)
BH101	0.1-0.2	Yes	72,200	37,000
	0.3–0.4	Yes	3,860	2,400
BH102	0.0-0.1	Yes	75,100	33,000
	0.2-0.3	Yes	12,800	3,500
BH104	0.0-0.1	Yes [(a)]	2,700	1,100
	0.25-0.35	No	267	230
	0.4-0.5	No	144	85
BH105	0.1-0.2	Yes	9,350	3700
	0.4-0.5	No	844	640
BH107	0.0-0.1	Yes	24,400	7,700
	0.3-0.4	Yes	73,300	4,800

BH ID	Sampling depth (mbgl)	Exceeding HIL-D	Lead concentration (CSU) (mg/kg)	Lead concentration (Envirolab) (mg/kg)
BH108	0.0-0.1	Yes	66,100	31,000
	0.4-0.5	No	733	810
BH109	0.0-0.1	Yes	25,400	9,100
	0.3-0.4	No	543	200
BH110	0.0-0.1	Yes [(a)]	970	2,800
	0.4-0.5	No	167	110

(a) Variability noted between results reported by CSU Laboratory and Envirolab. Concentration reported above HIL(D) by one laboratory only

- In general, the lead concentrations at deeper depths were noted to be lower compared to the surficial sample at the same location, consistent with the proposition that surficial soils are more likely subjected to impact from the operations at the site.
- The lead levels at investigation locations on top of the embankment (BH103) and in the open paddock (BH111 and BH112) were all below the adopted HIL. In particular, the lowest lead concentrations among all locations were observed at BH111 and BH112, away from the main operation area.

Assessment against EILs

- Analytical results for arsenic, cadmium, chromium and mercury were below the adopted EILs.
- At BH101, BH102, BH104 (CSU result only), BH105, BH107, BH108, BH109 and BH110 (Envirolab result only), where the lead concentrations exceeded the adopted HIL, the lead concentration also exceeded the adopted EIL (1,800 mg/kg).
- At BH101, BH102, BH105, BH108 and BH109, copper, nickel and zinc exceedances of EILs were also observed. These EIL-exceeding sampling locations coincided with the locations where lead exceedances were reported. The exceeding concentration ranges were:
  - Copper: 90 mg/kg to 360 mg/kg. The corresponding EIL is 85 mg/kg
  - Nickel: 73 mg/kg to 150 mg/kg. The corresponding EIL is 55 mg/kg
  - Zinc: 130 mg/kg to 320 mg/kg. The corresponding EIL is 110 mg/kg
- At BH111 and BH112 (within the open paddock irrigation area), the concentrations of the eight metal analytes (arsenic, cadmium, chromium, copper, mercury, lead, nickel and zinc) in soils were below the adopted EILs.

7. Discussion

This section provides discussions on the implication of investigation findings from two aspects:

- The implications on ongoing use of the site under the current configuration (Section 7.1)
- The implications on the application and approval process for the proposed expansion activities (Section 7.2)

7.1 Human health and ecological risks under current uses

Elevated concentrations of lead were identified in the vicinity of the eastern portion of the ring road by the intrusive soil investigation undertaken by GHD in March 2018. The identified lead concentrations exceeded relevant human health and ecological investigation levels at a number of locations, and in some samples, reported to be over an order of magnitude above the relevant HIL and EIL. The lead impact appeared to be related to the industrial operation on site, as suggested by the following lines of evidence:

- The highest lead concentrations were identified in the vicinity of the main warehouse building and the ring road, where most material handling and transportation activities are understood to take place.
- Lead concentrations were generally lower in areas less likely affected by the site operation. For instance, lead concentrations at the two investigation locations in the open paddock (BH111 and BH112) away from the main factory facilities were reported to be the lowest among the investigated locations. The lead concentrations reported at BH103, which was topographically elevated and thus less likely affected by site operations, were also lower comparing to the remaining locations near the ring road.
- The reported metal concentrations in soils at BH111 and BH112 were below the adopted HILs and EILs, indicating the use of treated water has not adversely impacted soils in the irrigation area.
- The lead concentrations present at deeper depths were generally lower than surficial samples, suggesting a “top-down” scenario where contamination was introduced by above-ground activities and migrating downwards through the soil profile.

A number of copper, nickel and zinc exceedances of EILs were also identified by the soil investigation. These exceedances likely coexist with the elevated lead concentrations at the same locations, and as such they are assessed along with the lead impact hereafter.

Based on the findings of these results, and the potential source-pathway-receptors linkages identified by the CSM, the presence of lead in shallow soils represents a potential human health and environmental risk under a commercial / industrial land use as defined in NEPM 2013. The potential risk to on site users is considered lower as a number of work health and safety control measures are currently implemented at the site (Section 2.3). Further investigation however is considered warranted to assess the risk to other potential receptors (i.e. occupants on nearby properties, ecological receptors, and workers for the proposed project if not subjected to same level of work health and safety controls).

Based on the above consideration, further investigation and management of the identified lead impact is therefore required to understand the extent of the impact both laterally and vertically. It should be noted that, the existing lead impact near the ring road has not been fully delineated by the targeted investigation to the north, west and south (as presented in Figure 3, Appendix B). Further investigation will be required to establish the full extent of the lead impact, in order to inform subsequent management and remediation activities.

7.2 Consideration of SEPP 55 with respect to the DA

SEPP 55 provides for a statewide planning approach to the remediation of contaminated land and aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment by:

a. specifying when consent is required, and when it is not required, for a remediation work,

b. by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular,

c. by requiring that a remediation work meet certain standards and notification requirements.

In determining a development application, a consent authority is required to consider if the land is contaminated and if contamination is identified is the land suitable in its contaminated state for the purpose for which the development is proposed to be carried out and if any remediation is required to make the land suitable for that purpose.

Currently available soil data of the site suggested presence of lead contamination in an area east of the existing processing warehouse. The contamination was considered to be associated with activities at the site. The reported lead levels were above the NEPM (2013) criterion for the existing site use (commercial/industrial) by over an order of magnitude at some locations. Lead impact was reported in accessible surficial soils prone to atmospheric dispersion and surface run-off. As such, GHD considers a complete source-pathway-receptor linkage likely exists for the identified lead contamination, which may represent a potential human health risk for existing and future on-site occupants.

Based on review of the proposed project description, the proposed expansion activities are expected to involve works in the lead impacted area and its vicinity, including construction of new internal road, plants and buildings. Given the shallow depth of the identified contamination, disturbance of the impacted soils is likely, leading to potential migration and exposure during the proposed expansion works.

In view of the above considerations, and further to the discussions provided in Section 7.1, contamination has been identified adjacent to the ring road which will be required to be fully delineated and managed as a condition of the DA. Based on GHD's understanding of the extent of the lead contamination, and proposed development of the site, it is considered that the site can be made suitable for ongoing industrial use as part of the redevelopment process. This would include further assessment and delineation of the extent of lead impact and management of these soils as part of the redevelopment process.

Due to the nature of the industrial processes there is potential that yet unidentified contamination may be encountered during construction and operation activities. Potential risks can be managed through implementation of an *unexpected finds* protocol.

8. Conclusion and recommendations

8.1 Conclusions

GHD completed a desktop study and site walkover inspection to evaluate the potential for contamination to be present onsite as a result of past activities and current operations onsite, and to assess the potential risks for future users of the site posed by any identified contaminants as a result of the project. Subsequent to the desktop study, in March 2018 GHD further undertook a programme of targeted intrusive soil investigation, to enable further characterisation of the site.

In accordance with the objectives outlined in Section 1.1 of this report, and based on the information contained within this report, the following conclusions are made:

- The site has been used for industrial recycling and processing of lead acid batteries since development in 2009
- The site is currently operational, comprising a number of process and storage warehouses, processing infrastructure, above ground storage of chemicals and fuels, and a number of retention basins. The site also includes a water treatment plant, and a large open grassed agricultural paddock used for irrigation of the treated water
- Based on the findings of the desktop review, potential sources of contamination were identified at the site (outlined in Section 5.1.1). Potential sources which relate to the footprint of the proposed development include
  - Potential unknown sources of soil contamination where intrusive site investigations have not previously been completed
  - Spills (hydrocarbon and/or chemical) related to construction activities of the project
  - Fill material (imported or cut-to-fill) and road construction materials used in construction activities of the project.
- Two limited soil sampling events in 2017 identified lead-impacted soils in an area located to the east of the existing industrial warehouse (EMM, 2017).
- GHD's limited soil investigation programme targeted the shallow soils (≤0.5 mbgl) in the vicinity of the lead-impacted area identified previously by EMM (2017) and the open paddock to the south of the operation area. The investigation found:
  - Lead contamination extended further north, south and west of the lead-impacted area previously identified by EMM. The lateral and vertical extent of this impact was not fully delineated in this investigation.
  - Concentrations of lead were reported above the NEPM 2013 human health and ecological investigation levels under a commercial and industrial land use scenario.
  - Some exceedances of copper, nickel and zinc over the NEPM 2013 ecological investigation levels were also identified in locations that contained elevated lead concentrations in soils.
  - Areas less likely impacted by the operations at the site (e.g. area topographically elevated from the main warehouse and the open paddock south of the main operation area) generally reported lower lead concentrations in soils.
  - Concentrations of lead in underlying soils were generally lower than those reported for near-surface soils at the same location.
  - The lead impact was considered related to the industrial operations at the site.

- GHD reviewed the existing site characterisation data and considered the identified lead contamination represented a potential risk to human health and ecological receptors, as the impact:
  - exceeded the NEPM 2013 criterion for commercial and industrial land uses
  - was located in shallow, accessible soils prone to atmospheric dispersion and surface run-off
  - was located in areas expected to be part of the proposed expansion, and
  - complete or potentially complete source-pathway-receptors linkage likely exist for the identified contamination.
- No groundwater data was available for interpretation as part of these works. However, it is understood the project involves shallow excavations less than 5 metres deep. Groundwater wells currently installed onsite had an indicated depth range between eight and 12 metres, with available data indicating the wells have historically been dry. Therefore, groundwater is not expected to be encountered or interacted with as a result of the project.
- A potential risk to human health and the environment associated with the presence of lead impacted soils was identified during this stage of works. The potential risk to on site users is considered lower as a number of work health and safety control measures are currently implemented at the site (Section 2.3). However, further investigation and management is considered warranted to assess the risk to other potential receptors (i.e. occupants on nearby properties, ecological receptors, and construction workers for the project).
- Based on currently available information on site status and the proposed redevelopment, it is considered that the identified lead contamination can be managed and the site can be made suitable for the proposed project, provided appropriate assessment works followed by remediation, validation and management activities are undertaken prior to and during the development process.

8.2 SEARs

As outlined in Section 1.1, this report has been prepared to support the EIS for the proposed consolidation. The objectives of the CSA address the requirements outlined in the Secretary's Environmental Assessment Requirements (SEARs) for the project. Table 8-1 presents a summary of the outcomes of this report with respect to the SEARs.

Table 8-1 Secretary's Environmental Assessment Requirements

SEARs	Summary outcomes of CSA
Assessment of any potential site contamination and details of all potential contamination sources	The CSA has identified potential sources of contamination which relate to the footprint of the proposed development including: – Potential unknown sources of soil contamination where intrusive site investigations have not previously been completed – Spills (hydrocarbon and/or chemical) related to construction activities of the project – Fill material (imported or cut-to-fill) and road construction materials used in construction activities of the project.

SEARs	Summary outcomes of CSA
Identification of any contaminated soil likely to be impacted by the development	Lead impacted soils have been identified within the project footprint which may be encountered during the course of the proposed development. Further characterisation of the identified lead impact near the internal ring road should be completed prior to development works as a condition of consent for the DA. Such works should aim to delineate the lateral and vertical extent of the impact and identify potential contamination source(s), in order to inform subsequent management and remediation activities, as well as to improve future site practices.
Proposed measured to be implemented if soil contamination is encountered	Unexpected finds procedures to be incorporated into both the construction environmental management plan (CEMP) and Operational Environmental Management Plan (OEMP) outlining the process for the management of potential unexpected encounters with contaminated soil and/or groundwater during site development activities, maintenance works and/ or site operation
How site contamination will be remediated and managed for the proposed development	Mitigation measures to manage contamination during construction would be outlined in the CEMP. These measures would be informed by the outcomes of additional characterisation works and the subsequent remedial action plan (RAP)

8.3 Recommendations

GHD provides the following recommendations for the project, based on currently available information and findings from this contaminated site assessment:

- Further characterisation of the identified lead impact near the internal ring road prior to development works as a condition of consent for the DA. Such works should aim to delineate the lateral and vertical extent of the impact and identify potential contamination source(s), in order to inform subsequent management and remediation activities, as well as to improve future site practices. The characterisation works should address other data gaps in the existing CSM, including potential contaminants of concern that have not been assessed to date.
- Preparation of a remediation action plan outlining the strategies to remove / mitigate the human health and environmental risks arising from the identified lead impact and other potential unidentified contamination at the site.
- Update to the existing site management and work health and safety plans as an interim management measure to:
  - limit the potential risk of exposure to contamination during the current operation of the facility by maintaining appropriate design and continuation of existing site management practices
  - provide an indication of any emerging contamination issues by maintaining biennial soil monitoring as required in the development consent (DA05/0517, issued by City of Wagga Wagga) for the existing facility.
  - Unexpected finds procedures to be incorporated into both the CEMP and OEMP outlining the process for the management of potential unexpected encounters with contaminated soil and/or groundwater during site development activities, maintenance works and/ or site operation.

9. References

- Aitken Rowe Testing Laboratories (2009) *Baseline Contamination – Survey Enirgi Power Storage Recycling.*
- Aitken Rowe Testing Laboratories (2012) *Surface Soil Sampling and Analysis, Renewed Metal Technologies, Bomen, Wagga Wagga*
- Aitken Rowe Testing Laboratories (2012) *Stage 2 Soil Survey, 509 Byrnes Road, Bomen, Wagga Wagga*
- Aitken Rowe Testing Laboratories (2013) *Groundwater Monitoring – Renewed Metals Technologies.*
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- Department of Mineral Resources (1983) Geological Series Sheet 9130, 1:100,000 Sydney. Geological Survey of NSW, Department of Mineral Resources, NSW.
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- enirgi group (2015) *EPSR Annual Environmental Management Report – May 2014 to April 2015*
- enirgi group (2016) *EPSR Annual Environmental Management Report – May 2015 to April 2016.*
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- KBR (May 2005) *Lead Battery Recycling Facility, Wagga Wagga – Environmental Impact Statement*.
- NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPM) (as amended May 2013).
- NSW EPA (1995), *Contaminated Sites: Sampling Design Guidelines*.
- NSW Office of Environment & Heritage (OEH) (2011), *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.*

10. Limitations

This report: has been prepared by GHD for Enirgi Power Storage Recycling and may only be used and relied on by Enirgi Power Storage Recycling for the purpose agreed between GHD and the Enirgi Power Storage Recycling as set out in section 8 of this report.

GHD otherwise disclaims responsibility to any person other than Enirgi Power Storage Recycling 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 Enirgi Power Storage Recycling 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.

Appendices

Appendix A – Photographic log

Photographic log

Plate 1 – Processing sheds and stacks. Photograph taken facing south-east. (19 July 2017)

Plate 2 – processing infrastructure and heavy vehicle hardstand observed to be in good condition. Photograph taken facing east. (19 July 2017)

Plate 3 – Existing operational transformer on site. Photograph taken facing south-east. (19 July 2017)

Plate 4 – Operational vehicle wash bay, located at the northern corner of the site. Photograph taken facing west. (19 July 2017)

Plate 5 – Operational LPG AST on concrete hardstand. Photograph taken facing east. (19 July 2017)

Plate 6 – Damaged concrete stormwater drainage line observed running adjacent to the heavy vehicle ring road. (19 July 2017)

Plate 7 – Stormwater drain adjacent to the heavy vehicle ring road. Photo taken facing north-east. (19 July 2017)

Plate 8 – Operational diesel AST adjacent to the heavy vehicle ring road. Photo taken facing north-west. (19 July 2017)

Plate 9 – Operational processes storage silo. (19 July 2017)

Plate 10 – Example of general plastic refuse. Photo taken within process infrastructure hardstand area at centre of the site. (19 July 2017)

Plate 11 – Main stormwater retention basin in foreground. Site administrative building and carpark observed in the distance. Photo taken facing south-west. (19 July 2017)

Plate 12 – Secondary retention basins observed to be in poor condition. Photograph taken facing north-west. (19 July 2017)

Plate 13 – The internal ring road. Embankment to the east is shown on the right hand side and the main warehouse is shown on the left hand side. (1 March 2018).

Plate 14 – Bare strip of soils between the ring road and the embankment. (1 March 2018)

Plate 15 – White crust observed at surface next to the ring road. (1 March 2018)

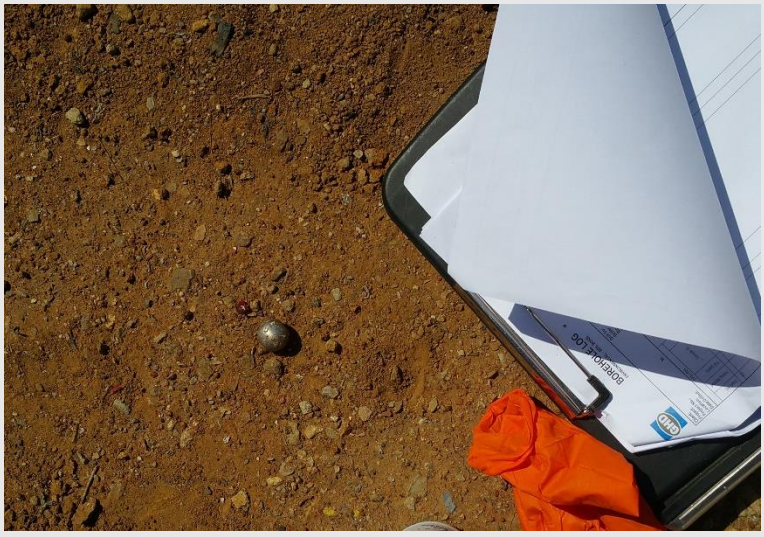
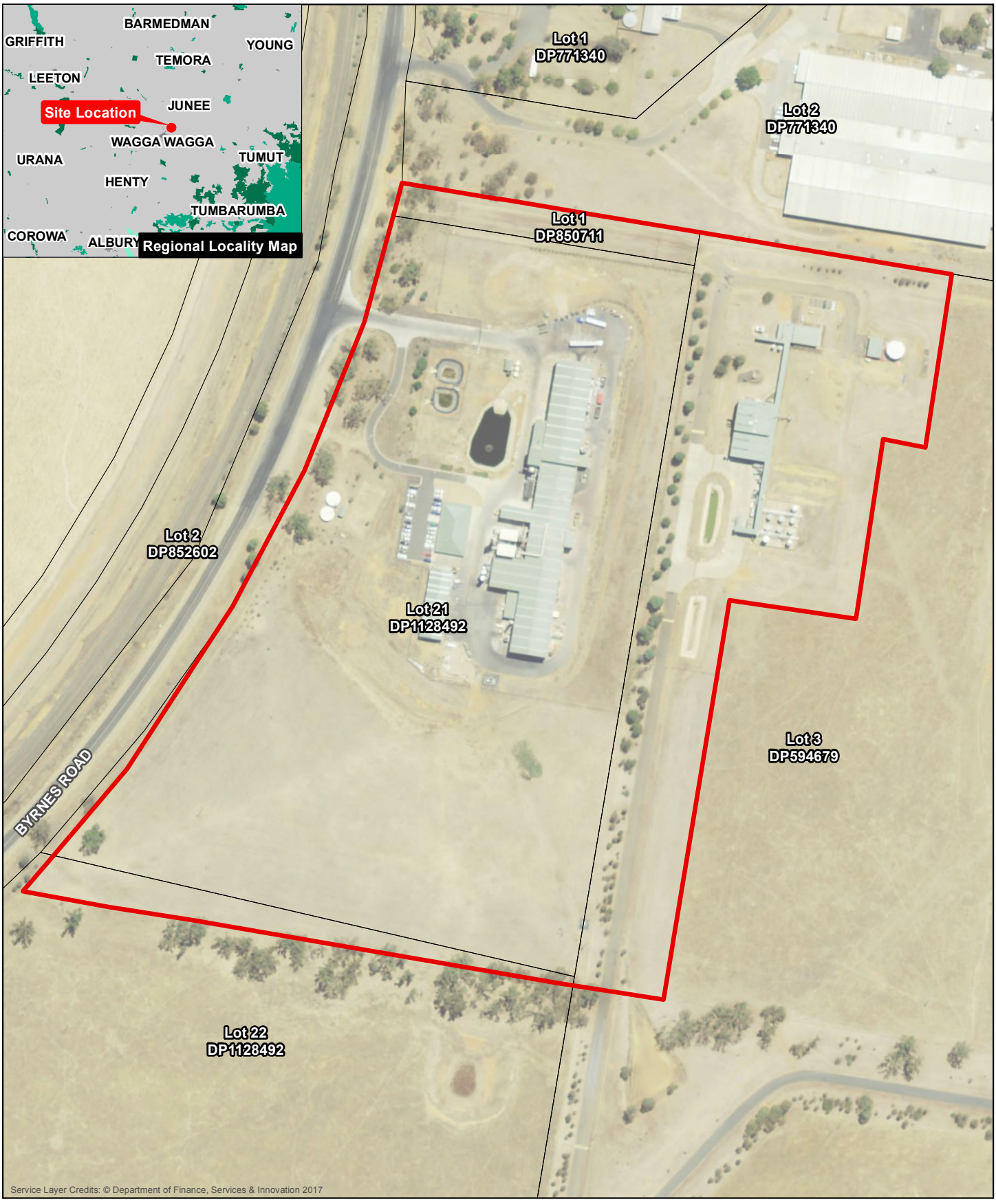


Plate 16 – Spherical metal object observed at surface next to the ring road. (1 March 2018)

Appendix B – Figures



LEGEND

Project Application Area

Lot Boundaries

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Enirgi Power Storage Recycling
Contaminated Site Assessment with Targeted Soil Sampling
212 East Bomen Road, Bomen NSW

Job Number 23-15946-21
Revision A
Date 18 Jun 2018

Site Locality

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

N:\AU\Wagga Wagga\Projects\23\15946\GIS\Maps\Deliverables\23_15946_Z007_BOMEN_SiteLocality.mxd

Data source: Aerial Imagery: Sixmaps (2017 - NSW LPI); Inset map - Geoscience Australia; General topo - NSW LPI DTDB 2015 & 2012. Created by:mking3

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Enirgi Power Storage Recycling
Contaminated Site Assessment with Targeted Soil Sampling
212 East Bomen Road, Bomen NSW

Job Number 23-15946-21
Revision A
Date 18 Jun 2018

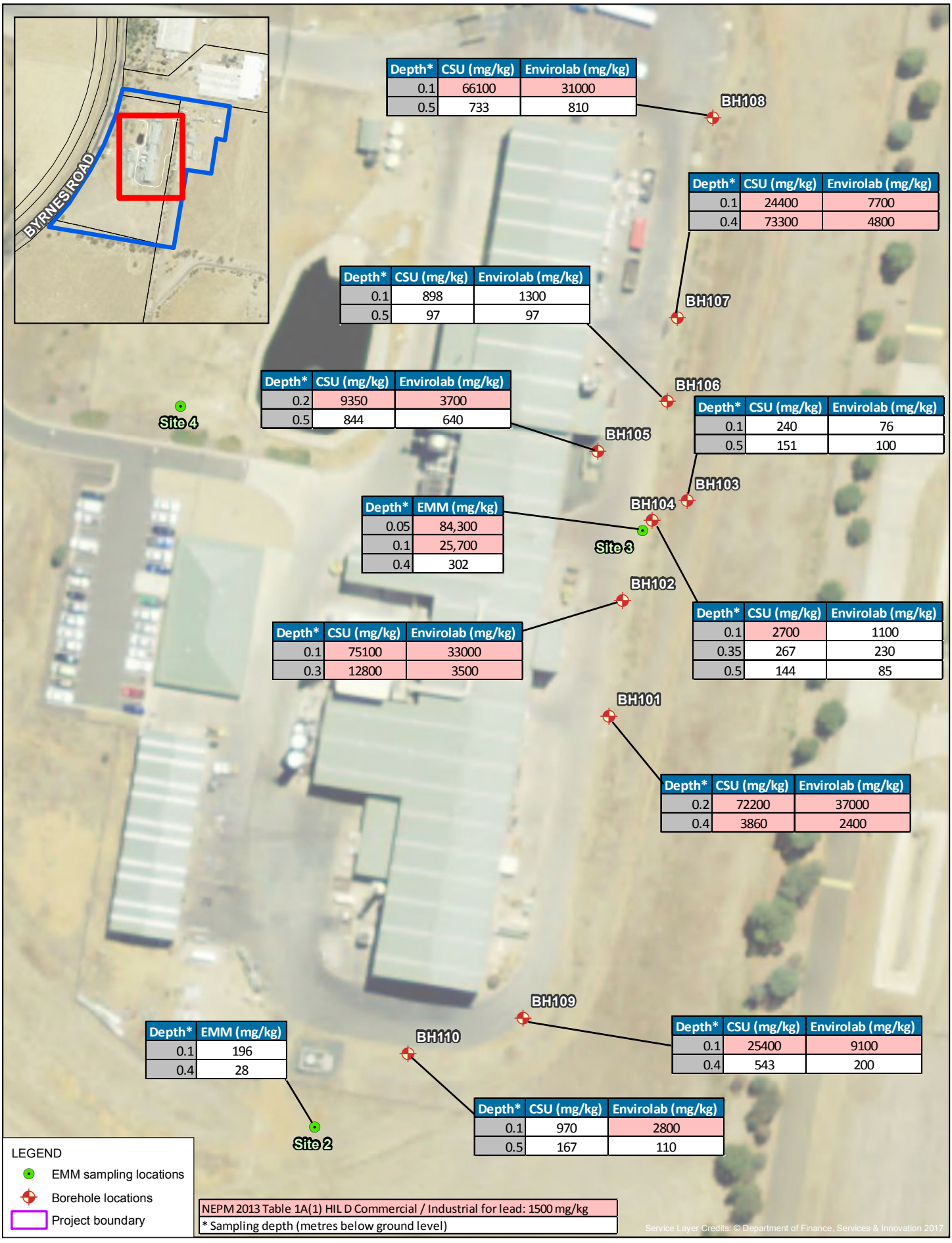
Sampling Location Plan

Figure 2

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

N:\AU\Wagga Wagga\Projects\23\15946\GIS\Maps\Deliverables\23_15946_Z008_BOMEN_SamplingLocationPlanAndExceedances.mxd

Data source: Aerial Imagery: Sixmaps (2017 - NSW LPI). Created by:mking3



Paper Size A4

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Enirgi Power Storage Recycling
Contaminated Site Assessment with Targeted Soil Sampling
212 East Bomen Road, Bomen NSW

Job Number 23-15946-21
Revision A
Date 18 Jun 2018

Lead Exceedances of Human Health Criteria

Figure 3

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

N:\AU\Wagga Wagga\Projects\23\15946\GIS\Maps\Deliverables\23_15946_Z009_BOMEN_LeadExceedances.mxd

Data source: Aerial Imagery: Sixmaps (2017 - NSW LPI). Created by:mking3

Appendix C – Results table

Appendix C
Table 1
Summary of soil analytical results - metals (by CSU)

			Metals							
			Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2	0.4	5	5	5	0.1	5	5
NEPM 2013 EIL-Commercial/Industrial			160			85	1800		55	110
NEPM 2013 Table 1A(1) HIL D Comm/Ind			3000	900	3600	240000	1500	730	6000	400000
Field_ID	**Sample_Depth_Range**	**Sampled_Date_Time**								
BH101 0.1-0.2	0.1-0.2	1/03/2018	50	87.2	481	167	72200	6	125	161
BH101 0.3-0.4	0.3-0.4	1/03/2018	7	4.3	79.9	30.6	3860	5	30	50.2
BH102 0.0-0.1	0.0-0.1	1/03/2018	35	71.3	180	206	75100	4	140	137
BH102 0.2-0.3	0.2-0.3	1/03/2018	15	11.8	308	46.2	12800	12	46	58.8
BH103 0.0-0.1	0.0-0.1	1/03/2018	<2	<0.2	42.1	13.0	240	9	17	26.3
BH103 0.4-0.5	0.4-0.5	1/03/2018	8	<0.2	77.7	16.7	151	8	21	34.7
BH104 0.0-0.1	0.0-0.1	1/03/2018	22	2.4	52.5	38.6	2700	6	54	93.6
BH104 0.25-0.35	0.25-0.35	1/03/2018	3	<0.2	34.3	15.4	267	6	22	32.6
BH104 0.4-0.5	0.4-0.5	1/03/2018	<2	<0.2	46.5	21.9	144	6	31	44.6
BH105 0.1-0.2	0.1-0.2	1/03/2018	6	7.7	60.5	60.0	9350	6	37	91.7
BH105 0.4-0.5	0.4-0.5	1/03/2018	5	<0.2	50.9	30.3	844	6	33	47.5
BH106 0.0-0.1	0.0-0.1	1/03/2018	21	0.5	35.3	31.4	898	6	39	66.9
BH106 0.4-0.5	0.4-0.5	1/03/2018	6	<0.2	47.9	24.4	97	16	30	42.1
BH107 0.0-0.1	0.0-0.1	1/03/2018	16	5.3	48.5	43.7	24400	10	43	106
BH107 0.3-0.4	0.3-0.4	1/03/2018	9	2.2	59.9	34.3	73300	8	38	71.7
BH108 0.0-0.1	0.0-0.1	1/03/2018	36	13.5	93.5	231	66100	9	74	318
BH108 0.4-0.5	0.4-0.5	1/03/2018	5	<0.2	41.9	23.9	733	7	26	47.7
BH109 0.0-0.1	0.0-0.1	1/03/2018	22	21.1	44.3	90.0	25400	7	77	130
BH109 0.3-0.4	0.3-0.4	1/03/2018	<2	<0.2	47.4	19.6	543	7	17	26.6
BH110 0.0-0.1	0.0-0.1	1/03/2018	13	0.3	41.2	25.3	970	7	29	59.6
BH110 0.4-0.5	0.4-0.5	1/03/2018	3	<0.2	36.6	12.1	167	6	11	18.4
BH111 0.0-0.1	0.0-0.1	1/03/2018	<2	<0.2	32.8	11.9	27	13	12	17.6
BH111 0.4-0.5	0.4-0.5	1/03/2018	2	<0.2	45.5	17.7	13	10	16	26.0
BH112 0.0-0.1	0.0-0.1	1/03/2018	<2	<0.2	34.1	11.4	58	9	11	18.2
BH112 0.4-0.5	0.4-0.5	1/03/2018	2	<0.2	46.5	19.0	13	7	21	32.2
QD1 (BH104_0.0-0.1)	0.0-0.1	1/03/2018	17	2.9	43.0	34.3	3100	7	45	76.9

Appendix C
Table 2
Summary of soil analytical results - metals (by Envirolab)

			Metals							
			Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2	0.4	5	5	5	0.1	5	5
NEPM 2013 EIL-Commercial/Industrial			160			85	1800		55	110
NEPM 2013 Table 1A(1) HIL D Comm/Ind			3000	900	3600	240000	1500	730	6000	400000
Field_ID	**Sample_Depth_Range**	**Sampled_Date_Time**								
BH101 0.1-0.2	0.1-0.2	1/03/2018	64	82	210	200	37000	<0.1	150	150
BH101 0.3-0.4	0.3-0.4	1/03/2018	6	3	41	32	2400	<0.1	22	27
BH102 0.0-0.1	0.0-0.1	1/03/2018	34	48	86	160	33000	<0.1	73	110
BH102 0.2-0.3	0.2-0.3	1/03/2018	9	4.4	110	43	3500	<0.1	27	31
BH103 0.0-0.1	0.0-0.1	1/03/2018	<4	<0.4	33	10	76	<0.1	8	12
BH103 0.4-0.5	0.4-0.5	1/03/2018	<4	<0.4	36	13	100	<0.1	10	14
BH104 0.0-0.1	0.0-0.1	1/03/2018	13	1	24	31	1100	<0.1	31	46
BH104 0.25-0.35	0.25-0.35	1/03/2018	5	<0.4	32	18	230	<0.1	17	19
BH104 0.4-0.5	0.4-0.5	1/03/2018	<4	<0.4	29	17	85	<0.1	17	19
BH105 0.1-0.2	0.1-0.2	1/03/2018	10	4.6	37	92	3700	<0.1	21	57
BH105 0.4-0.5	0.4-0.5	1/03/2018	6	<0.4	25	19	640	<0.1	16	23
BH106 0.0-0.1	0.0-0.1	1/03/2018	13	0.9	26	30	1300	<0.1	35	49
BH106 0.4-0.5	0.4-0.5	1/03/2018	5	<0.4	32	21	97	<0.1	18	22
BH107 0.0-0.1	0.0-0.1	1/03/2018	12	3	42	37	7700	<0.1	31	52
BH107 0.3-0.4	0.3-0.4	1/03/2018	9	2	41	31	4800	<0.1	25	42
BH108 0.0-0.1	0.0-0.1	1/03/2018	45	13	110	360	31000	0.2	100	320
BH108 0.4-0.5	0.4-0.5	1/03/2018	7	<0.4	34	25	810	<0.1	18	30
BH109 0.0-0.1	0.0-0.1	1/03/2018	17	13	46	79	9100	<0.1	50	76
BH109 0.3-0.4	0.3-0.4	1/03/2018	<4	<0.4	29	17	200	<0.1	12	16
BH110 0.0-0.1	0.0-0.1	1/03/2018	17	2	35	38	2800	<0.1	24	47
BH110 0.4-0.5	0.4-0.5	1/03/2018	<4	<0.4	29	12	110	<0.1	7	13
BH111 0.0-0.1	0.0-0.1	1/03/2018	<4	<0.4	25	11	24	<0.1	8	13
BH111 0.4-0.5	0.4-0.5	1/03/2018	<4	<0.4	39	16	11	<0.1	10	14
BH112 0.0-0.1	0.0-0.1	1/03/2018	<4	<0.4	45	10	23	<0.1	8	12
BH112 0.4-0.5	0.4-0.5	1/03/2018	<4	<0.4	40	16	11	<0.1	11	14
QD1 (BH104_0.0-0.1)	0.0-0.1	1/03/2018	12	2	27	30	2300	<0.1	31	45

Appendix C
Table 3
Summary of soil duplicate RPD results

				Metals							
				Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				2	0.4	1	1	1	0.1	1	1
Location Code	**Date**	**Field ID**	**Matrix Type**								
BH104	1/03/2018	BH104 (CSU)	soil	22	2.4	52.5	38.6	2700	6	54	93.6
	1/03/2018	QD1 (CSU)	soil	17	2.9	43.0	34.3	3100	7	45	76.9
RPD (%)				26	19	20	12	14	15	18	20
BH104	1/03/2018	BH104 (CSU)	soil	22	2.4	52.5	38.6	2700	6	54	93.6
	1/03/2018	QT1 (Eurofin)	soil	20	3.4	41	36	3,800	<0.1	47	74
RPD (%)				10	**34**	25	7	**34**	0	14	23
BH104	1/03/2018	BH104 (Envirolab)	soil	13	1	24	31	1,100	<0.1	31	46
	1/03/2018	QD1 (Envirolab)	soil	12	2	27	30	2,300	<0.1	31	45
RPD (%)				8	**67**	12	3	**71**	0	0	2
BH104	1/03/2018	BH104 (Envirolab)	soil	13	1	24	31	1,100	<0.1	31	46
	1/03/2018	QT1 (Eurofin)	soil	20	3.4	41	36	3,800	<0.1	47	74
RPD (%)				**42**	**109**	**52**	15	**110**	0	**41**	**47**

Appendix C
Table 4
RPDs between CSU and Envirolab Lead Analyses

Lead Field_ID	CSU Results (mg/kg)	Envirolab Results (mg/kg)	RPD
BH101 0.1-0.2	72200	37000	64.47%
BH101 0.3-0.4	3860	2400	46.65%
BH102 0.0-0.1	75100	33000	77.89%
BH102 0.2-0.3	12800	3500	114.11%
BH103 0.0-0.1	240	76	103.80%
BH103 0.4-0.5	151	100	40.64%
BH104 0.0-0.1	2700	1100	84.21%
BH104 0.25-0.35	267	230	14.89%
BH104 0.4-0.5	144	85	51.53%
BH105 0.1-0.2	9350	3700	86.59%
BH105 0.4-0.5	844	640	27.49%
BH106 0.0-0.1	898	1300	36.58%
BH106 0.4-0.5	97	97	0.00%
BH107 0.0-0.1	24400	7700	104.05%
BH107 0.3-0.4	73300	4800	175.42%
BH108 0.0-0.1	66100	31000	72.30%
BH108 0.4-0.5	733	810	9.98%
BH109 0.0-0.1	25400	9100	94.49%
BH109 0.3-0.4	543	200	92.33%
BH110 0.0-0.1	970	2800	97.08%
BH110 0.4-0.5	167	110	41.16%
BH111 0.0-0.1	27	24	11.76%
BH111 0.4-0.5	13	11	16.67%
BH112 0.0-0.1	58	23	86.42%
BH112 0.4-0.5	13	11	16.67%
QD1 (BH104_0.0-0.1)	3100	2300	29.63%

Appendix D – Borehole logs

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539146
Northing 6120276
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					Gravelly SILT, pale brown- yellow, fine to medium gravel (FILL)	D	-	no odour, no staining	0
0.1		0.4	BH101_0.1-0.2							-0.1
0.2						Clayey SILT, pale yellow (possible NATURAL - SOIL)	D	-	no odour, no staining	-0.2
0.3		0.3	BH101_0.3-0.4							-0.3
0.5						Termination Depth at: 0.50 m. Target depth achieved.				-0.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH102

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.4
Diameter (mm) 75

Easting 539154
Northing 6120299
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	0.3	BH102_0.0-0.1			Gravelly SILT, pale brown- yellow, some: fine to medium gravel (FILL)	D	-	no odour, white straining at surface	0
0.1						Silty GRAVEL, fine to coarse, yellow to pale brown (FILL)	D	-	no odour, no staining	-0.1
0.2		0.8	BH102_0.2-0.3							-0.2
0.4						Termination Depth at: 0.40 m. Refusal on gravelly fill.				-0.4

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539167
Northing 6120319
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	0.9	BH103_0.0-0.1			ML - Clayey SILT, brown, trace rootlets (NATURAL - SOIL)	M	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		1.1	BH103_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH104

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539160
Northing 6120315
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	0.4	BH104_0.0-0.1 (QD1/QT1)			Clayey SILT, brown, with medium to coarse gravel (FILL)	D	-	no odour, white staining at surface	0
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26		0.7	BH104_0.25-0.35			Clayey SILT, pale brown- yellow, some fine gravel (FILL)	D	-	no odour, no staining	-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		0.5	BH104_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH105

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539149
Northing 6120329
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					BALLAST		-	Road base	0
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1		0.9	BH105_0.1-0.2			Clayey SILT, pale brown to pale yellow, with fine to medium gravel (FILL)	D	-	no odour, no staining	-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		0.8	BH105_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539160
Northing 6120339
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	0.9	BH106_0.0-0.1			Clayey SILT, pale brown to pale yellow, with fine to medium gravel (FILL)	D	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		0.5	BH106_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH107

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.4
Diameter (mm) 75

Easting 539160
Northing 6120356
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	1.2	BH107_0.0-0.1			Clayey SILT, pale brown to pale yellow, with fine to medium gravel (FILL)	D	-	no odour, no staining	0
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3		1.1	BH107_0.3-0.4							-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4						Termination Depth at: 0.40 m. Refusal on gravelly fill.				-0.4

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539169
Northing 6120396
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	0.9	BH108_0.0-0.1			Clayey SILT, brown, with fine to medium gravel (FILL)	D	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		1.2	BH108_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539134
Northing 6120215
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	0.5	BH109_0.0-0.1			Clayey SILT, yellow pale brown, with fine to medium gravel (FILL)	D	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3		0.8	BH109_0.3-0.4							-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4										-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Refusal on possible gravelly fill.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH110

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 539108
Northing 6120208
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	0.7	BH110_0.0-0.1			Clayey SILT, yellow, with fine to medium gravel (FILL)	D	-	no odour, no staining, Possible reworked natural	0
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		0.6	BH110_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 538963
Northing 6120221
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	1.1	BH111_0.0-0.1			ML - Clayey SILT, brown, trace rootlets (NATURAL - SOIL)	M	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		1.2	BH111_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

Client Enirgi Power Storage Recycling
Project Enirgi Power Storage Recycling, Contamination Site Assessr
Project No. 231594621
Site Renewed Metal Technologies
Location 509 Byrnes Road, Bomen NSW 2650
Date Drilled 01/03/2018 - 01/03/2018

Drill Co. GHD
Driller CY
Rig Type -
Drill Method Hand auger
Total Depth (m) 0.5
Diameter (mm) 75

Easting 538965
Northing 6120172
Grid Ref GDA94_MGA_zone_55
Elevation
Logged By C. Yi
Checked By J. Hallchurch

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA	1.2	BH112_0.0-0.1			ML - Clayey SILT, brown to dark brown, with silty clay, trace rootlets (NATURAL - SOIL)	M	-	no odour, no staining	
0.02										-0.02
0.04										-0.04
0.06										-0.06
0.08										-0.08
0.1										-0.1
0.12										-0.12
0.14										-0.14
0.16										-0.16
0.18										-0.18
0.2										-0.2
0.22										-0.22
0.24										-0.24
0.26										-0.26
0.28										-0.28
0.3										-0.3
0.32										-0.32
0.34										-0.34
0.36										-0.36
0.38										-0.38
0.4		0.9	BH112_0.4-0.5							-0.4
0.42										-0.42
0.44										-0.44
0.46										-0.46
0.48										-0.48
0.5										-0.5
0.52						Termination Depth at: 0.50 m. Target depth achieved.				-0.52

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix E – Calibration records

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105859

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6eV Lamp			
Alarms	Beeper	✓	**Low**	**High**	**TWA**	**STEL**
	Settings	✓	50ppm	100ppm	N/A	N/A
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		98ppm Isobutylene	NATA	SY137		97.9ppm

Calibrated by: Michelle C Wagner **Michelle Wagner**

Calibration date: **27/02/2018**

Next calibration due: **29/03/2018**

BUNNINGS warehouse

ARTARMON
BUNNINGS GROUP LIMITED
ABN 26 008 672 179
Ph: (02) 9462 0300

28/02/2018 07:39:05 AM
FRONT END REGISTERS R07

Sale
** TAX INVOICE **

4713169002124 SPRAYER GARDEN 500ML TRIGGER HW405356^	$1.50
9341136016604 BLANKET MOVING WRAP&MOVE 1.8X2.0M 01660	$11.49
9310357270140 CLOTH TAPE BEAR 50MMX15M BLACK 6603	$5.54
9317807142255 CORD STARTER GRUNT 3.5MMX5M WHITE GRROPE0095	$4.90
3165140902519 MEASURER LASER DISTANCE BOSCH ZOOM ZAMO II 0.603.672.650	$59.00
5 @ SubTotal:	$82.43

Total **$82.43**
GST INCLUDED IN THE TOTAL $7.49
EFT $82.43
CARD NO: 516361-722
CREDIT

Rounding $0.00
Change **$0.00**

"*" Indicates non taxable item(s)

S7174 R07 P61 C353891 N007-49762-7174-2018-02-28

Thank you for shopping with Bunnings
Please retain receipt for proof of purchase

COMMONWEALTH BANK EFTPOS
BUNNINGS ARTARMON
7174 REG 07
TERMINAL 12644707
REFERENCE 476633

CUSTOMER COPY
CARD NO: 3722(c)
EXPIRY DATE:
AID: A0000000041010
ATC:701 TVR:0000008000
CSN:01 16FC6910BCF13FDC
28 FEB 2018 07:38

Debit MasterCard
CREDIT
PURCHASE $82.43
TOTAL AUD $82.43

APPROVED 00
AUTH NO: R21334
POS REF NO: 00749762

Appendix F – DQOs, DQIs and QA/QC Assessment

Data Quality Objectives

Data Quality Objects (DQOs) have been established for this assessment to assist the design and implementation of data collection activities. The DQO process involves seven steps which are describe in the table below.

Table F-1 Data Quality Objectives

DQO Steps	Descriptions
Step 1: State the problem	Previous investigation (EMM, 2017) identified a lead-impacted area east of the main warehouse. Delineation of the impacted area had not been achieved. Further soil investigation was required to assess the extent of the lead impact as well as to verify the likely background soil conditions in an area away from the main operation facility.
Step 2: Identify the decision	The decisions to be made at the end of this assessment are: • Does site soil represent a potential risk to current and future land occupants, construction/maintenance workers and ecological receptors, under the current site configuration as well as the proposed layout post expansions? • Are further assessment, remediation and / or management necessary, to protect the identified receptors, as well as to satisfy the requirements under SEPP 55 to facilitate the EIS approval?
Step 3: Identify inputs to the decision	Information being considered comprised: • findings from the desktop study and previous investigation reports • the CSM developed for the investigation area • soil data from the intrusive investigations • applicable regulatory tools, including but not limited to: – NEPC (2013) – Contaminated Land Management Act 1997 – Protection of the Environment Operations Act 1997 – Work Health and Safety Act 2011 – Work Health and Safety Regulation 2017 – *Sampling Design Guidelines* (NSW EPA, 1995)
Step 4: Define the study boundaries	The lateral investigation extent was limited to the three areas of potential concern identified in Section 6 of this report. The maximum vertical extent was limited to 0.5 m bgl.
Step 5: Develop a decision rule	The decision rules adopted in this contamination assessment were: • the concentrations of contaminant would be assessed against site investigation levels, sourced from NSW EPA endorsed guidelines with reference to site-specific exposure scenarios

DQO Steps	Descriptions
	• when all reported chemical concentrations are below the adopted investigation levels, assessed soil are considered unlikely constituting an unacceptable risk to potential receptors. In such case, no further investigation, remediation or management is required • conversely, when concentration(s) of contaminant of exceed the adopted site investigation levels, further assessment would be required to evaluate the need for additional investigation and / or remediation / management activities.
Step 6: Specify limits on decision errors	Two primary decision error-types may occur due to uncertainties or limitations in the project data set: • a sample/area may be deemed to pass the nominated criteria, when in fact it does not. This may occur if contamination is 'missed' due to limitations in the sampling plan, or if the project analytical data set is unreliable • a sample/area may be deemed to fail the nominated criteria, when in fact it does not. This may occur if the project analytical data set is unreliable, due to inappropriate sampling, sample handling, or analytical procedures. The following aspects were considered when establishing the acceptable limits on decision errors: • the null hypothesis for the project is: the sample / investigation area is deemed to be contaminated. Sufficient weight of evidence, via gathering of multiple lines of evidence, would be required to reject / disapprove the null hypothesis. • a quality assurance / quality control (QA/QC) assessment evaluating the reliability and useability of data, which are expressed as five data quality indicators (DQI) discussed in Table F-2 below.
Step 7: Optimise the design for obtaining data	A SAQP was developed for the targeted investigation programme based on the DQO steps described above and is presented in Section 6 of this report.

The DQIs for sampling techniques and laboratory analysis of collected samples identifies the acceptable level of error for this investigation. The DQIs adopted in this investigation comprise five components discussed in Table F-2.

Table F-2 Data Quality Indicators

DQIs	Descriptions
Precision	The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs $$RPD(\%) = \frac{\lvert C_o - C_d \rvert}{C_o + C_d} \times 200$$ Where C_O= Analyte concentration of the primary sample

DQIs	Descriptions
	C_d= Analyte concentration of the duplicate sample A nominal acceptance criterion of ± 30% RPD for inorganics in accordance with NEPM requirements (NEPC, 2013). However, it is noted that this will not always be achieved, particularly at low analyte concentrations and in heterogeneous media.
Accuracy	Measures the bias in a measurement system. Accuracy can be undermined by such factors as field contamination of samples, poor preservation of samples, poor sample preparation techniques and poor selection of analytical techniques by the analysing laboratory. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes, laboratory blanks and analyses against reference standards. The nominal "acceptance limits" on laboratory control samples are defined as follows: • laboratory spikes – 60-130% recovery for metals / inorganics and 60-140% for organics • laboratory duplicates – Nominal RPD values of 30% or lower. Higher RPD values are generally considered acceptable when the result is close to the PQL • laboratory surrogates (Organics only) – 60% - 130% recovery • laboratory blanks - <PQL.
Representativeness	Expresses the degree which sample data accurately and precisely represents a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples in appropriate locations across the investigation area, and by using an adequate number of sample locations to characterise soil at the investigation area. Consistent and repeatable sampling techniques and methods are utilised throughout the sampling
Comparability	A qualitative parameter expressing the confidence whether one data set can be compared with others. This is achieved through maintaining a level of consistency in techniques used to collect samples and requiring analysing laboratories to use consistent analysis techniques and reporting methods.
Completeness	Defined as the percentage of measurements made which are judged valid measurements. The completeness goal is set at there being sufficient valid data generated during the study. If there is insufficient valid data, then additional data are required to be collected.

QA/QC Assessment

Field duplicates

A pair of intra-laboratory and inter-laboratory field duplicates were collected from the primary sample BH104_0.0-0.1. The duplicates were analysed for eight heavy metals. The intra-laboratory duplicate and the primary sample were analysed in CSU, and separately a second analysis in Envirolab Sydney. The inter-laboratory duplicate was analysed in Eurofin MGT.

The RPDs calculated between the primary and the duplicate samples are tabulated in Table 3, Appendix C. With reference to Table 3, Appendix C:

- The RPDs between the intra-laboratory duplicate and the primary sample as analysed in CSU were all within the RPD acceptance criterion.
- The RPDs between the primary sample (analysed by CSU) and the inter-laboratory duplicate (analysed by Eurofins MGT) were mostly within the RPD acceptance criterion, except cadmium (34%) and lead (34%). It is noted that the cadmium concentrations were relatively low (less than 10 times of laboratory limits of reporting, LOR) in both the duplicate and the primary sample and as such the cadmium RPD was considered acceptable.
- The RPDs between the primary sample and the inter-laboratory duplicate as analysed in Envirolab Sydney were mostly within the RPD acceptance criterion, except cadmium (67%) and lead (71%). It is noted that the cadmium concentrations were relatively low (less than 10 times of laboratory LOR) in both the duplicate and the primary sample and as such the cadmium RPD was considered acceptable.
- Between the primary sample (analysed by Envirolab) and the inter-laboratory duplicate (analysed by Eurofins MGT), the copper and mercury RPDs were within the RPD acceptance criterion. The following RPD exceedances of the nominal criteria (30%) were noted:
  - Arsenic (42%). The concentrations were relatively low (less than 10 times of laboratory LOR) in both the duplicate and the primary sample and as such the RPD was considered acceptable.
  - Cadmium (109%). The concentrations were relatively low (less than 10 times of laboratory LOR) in both the duplicate and the primary sample and as such the RPD was considered acceptable.
  - Chromium (52%).
  - Lead (110%).
  - Nickel (41%)
  - Zinc (47%)

The elevated RPDs were considered attributable to the inherent heterogeneity of fill materials. The granulated nature of the fill materials, reflected by the common presence of gravel in fill, also increased the analytical uncertainties introduced by the sub-sampling and sample preparation processes conducted in each laboratories. GHD however considers that, on review of the entire assessment dataset, and based on the analytical results provided by CSU and Envirolab separately (discussed below), the overall conclusion drawn in regards to the contamination status at the site is not affected by observed RPD elevation. The analytical data set is considered of sufficient reliability for interpretation and assessment purpose.

Laboratory quality control

All analytical laboratories (CSU, Envirolab Sydney and Eurofins MGT Sydney) engaged in this assessment are NATA accredited. Envirolab Sydney and Eurofins MGT Sydney also undertook internal quality assurance and quality control testing. These internal testing data are provided within the laboratory reports (Appendix G). A summary of the laboratory quality control data is provided in Table F-3.

Table F-3 Summary of laboratory quality control data

Items	Descriptions
Technical holding times	All contaminant analysis were conducted within the technical holding time requirements.
Laboratory Limits of Reporting (LOR)	All laboratory LORs are within the adopted investigation levels and are considered acceptable.
Laboratory duplicates	High RPDs were reported in two analyses in the Envirolab report referenced 187724, concerning zinc in the sample BH105_0.4-0.5 and lead in the sample BH110_0.4-0.5. A triplicate was analysed in both cases. GHD reviewed the laboratory duplicate results and considered the variations in data did not affect the overall assessment outcome.
Laboratory spikes	All spike results were within the laboratory acceptance criteria.
Laboratory blanks	All blank results were within the laboratory acceptance criteria.

Variations in analytical results between CSU and Envirolab Sydney

The primary samples collected from the targeted soil investigation were analysed in CSU and Envirolab Sydney. Each of the laboratories conducted sub-sampling, sample preparation and analysis activities independently. Both sets of data are presented in Table 1 and Table 2 in Appendix C. For the key contaminant of concern lead, GHD compared the two sets of results and the RPD differences between the two datasets are calculated and presented in Table 4, Appendix C. The following observations were made:

- RPD values for 18 of the 25 primary samples (72% of the dataset) were above the nominal acceptance criterion (RPD > 30%).
- Among the 12 samples which lead exceedance of the adopted HIL and EIL were reported, concentrations in ten of these samples were reported above the HIL and EIL consistently by both laboratories.
- The lead exceedances found in two samples (BH104_0.0-0.1 and BH110_0.0-0.1) were inconclusive. For BH104_0.0-0.1, CSU reported the sample contained a lead level above the HIL and EIL while the lead level reported by Envirolab was below the HIL and EIL. Similarly for BH110_0.0-0.1, the result by Envirolab suggested a lead exceedance of HIL and EIL where the CSU result suggested the lead level was below the HIL and EIL.
- GHD considers as the majority of the observed lead exceedances were reported in both datasets consistently, based on weight of evidence, the conclusion drawn in regards to the overall contamination status of the site (i.e. further investigation, management and/or remediation are required) is considered reasonable. The variations between the two data sets, however, affects the conclusion on the extent of the lead impact. Therefore further site characterisation is considered necessary to inform delineation of the impact.

For other analysed metals (arsenic, cadmium chromium, copper, mercury, nickel and zinc), the following observations were made:

- The datasets provided by both laboratories consistently showed the concentrations of these metal analytes were below the relevant HILs.
- The two datasets also consistently showed concentrations of most of the metal analytes were below the relevant EILs, except for copper in BH105_0.1-0.2 and copper, nickel and zinc in BH109_0.0-0.1. As the EIL exceedances were considered likely coexisting with the lead impact, they can be managed along with the lead impact. Therefore the EIL exceedances are not considered a main driver for future investigation and management, and as such the variations do not affect the overall conclusion drawn in regards to the site.
- The mercury results reported by CSU were generally above the laboratory LOR, ranging between 4 to 16 mg/kg. The mercury results reported by Envirolab Sydney were below, or close to the laboratory LOR, ranging between <0.1 mg/kg and 0.2 mg/kg.
  - GHD understood that different sample digestion and analytical methods were adopted by the two laboratories. CSU adopted acid digestion as the preparation method (APHA 3030E/3120B) while Envirolab Sydney adopted cold vapour atomic absorption spectrometry as the preparation / analytical method. The different methodology used was considered the likely cause of the difference in results.
  - GHD notes that the method adopted by Envirolab Sydney is endorsed in Schedule B3, NEPC(2013).
  - Furthermore, the mercury concentrations reported by Envirolab Sydney were consistent with previous investigation findings.
  - It is noted that, however, the variations in the two sets of mercury results do not affect the overall conclusions drawn in regards to the contamination status of the site.

Appendix G – Laboratory analytical reports

Include this number as the project reference number

1803-0012

Charles Sturt University

						ANALYTES REQUIRED *Complete & tick as required*															
CLIENT:	GHD Pty Ltd (23159460?)					8 metals (As, Cd, Cu, Cr, Pb, Ni, Hg, Zn)															
CONTACT:	Carmen Yi																				
ADDRESS:	Level 15, 133 Castlereagh Street, Sydney NSW 2000 Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650 ABN: 39008488373																				
TELEPHONE:	0292397630		**E-mail**	carmen.yi@ghd.com Dylan.Galt@ghd.com																	
SAMPLE IDENTIFICATION	**NATURE OF SAMPLE**	**DATE SAMPLED**	**TIME SAMPLED**	**CONTAINER TYPE**	**NUMBER OF CONTAINERS**																
BH101_0.1-0.2	Soil	1/3/18		Jar	1	X															
" _0.3-0.4	↓	↓		↓	↓	↓															
BH102_0.0-0.1																					
" _0.2-0.3																					
BH103_0.0-0.1																					
" _0.4-0.5																					
BH104_0.0-0.1	↓	↓		↓	↓	↓															

	NAME	SIGNATURE	ORGANISATION	DATE	TIME
RELINQUISHED BY:	Carmen Yi		GHD	1/3/18	4:25
Mode of Transport Include Consignment Note # if applicable	Please make lab report available in both PDF and ESDat format				
RECEIVED BY:	Chhavi Arora			1/3/18	4:25

Charles Sturt University

CLIENT:	GHD Pty Ltd				
CONTACT:	Carmen Yi				
ADDRESS:	Level 15, 133 Castlereagh Street, Sydney NSW 2000 Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650 ABN: 39008488373				
TELEPHONE:	0292397630		E-mail	carmen.yi@ghd.com Dylan.Galt@ghd.com	

SAMPLE IDENTIFICATION	NATURE OF SAMPLE	DATE SAMPLED	TIME SAMPLED	CONTAINER TYPE	NUMBER OF CONTAINERS	ANALYTES REQUIRED *Complete & tick as required* 8 metals (As, Cd, Cu, Cr, Pb, Ni, Hg, Zn)
BH104_0.25-0.35	Soil	1/3/18		Jar	1	X
BH104_0.4-0.5	↓	↓		↓	↓	↓
BH105_0.1-0.2						
BH105_0.4-0.5						
BH106_0.0-0.1						
BH106_0.4-0.5						
BH107_0.0-0.1	↓	↓		↓	↓	↓

	NAME	SIGNATURE	ORGANISATION	DATE	TIME
RELINQUISHED BY:	As per sheet 1		GHD		
Mode of Transport Include Consignment Note # if applicable	Please make lab report available in both PDF and ESDat format				
RECEIVED BY:	Chronis Protistakis			4/8	4:25

1/8/18

Charles Sturt University

CLIENT:	GHD Pty Ltd				
CONTACT:	Carmen Yi				
ADDRESS:	Level 15, 133 Castlereagh Street, Sydney NSW 2000 Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650 ABN: 39008488373				
TELEPHONE:	0292397630		E-mail	carmen.yi@ghd.com Dylan.Galt@ghd.com	

SAMPLE IDENTIFICATION	NATURE OF SAMPLE	DATE SAMPLED	TIME SAMPLED	CONTAINER TYPE	NUMBER OF CONTAINERS	ANALYTES REQUIRED *Complete & tick as required* 8 metals (As, Cd, Cu, Cr, Pb, Ni, Hg, Zn)
BH107-0.0-0.1	Soil	1/3/18		Jar	1	X
BH107-0.3-0.4	↓	↓		↓	↓	↓
BH108-0.0-0.1						
BH108-0.0-0.5						
BH109-0.0-0.1						
BH109-0.3-0.4						
BH110-0.0-0.1	↓	↓		↓	↓	↓

	NAME	SIGNATURE	ORGANISATION	DATE	TIME
RELINQUISHED BY:	As per sheet		GHD		
Mode of Transport Include Consignment Note # if applicable	Please make lab report available in both PDF and ESDat format				
RECEIVED BY:	Chromis Pro. Sydney			01/3/18	4:25

Charles Sturt University

CLIENT:	GHD Pty Ltd				
CONTACT:	Carmen Yi				
ADDRESS:	Level 15, 133 Castlereagh Street, Sydney NSW 2000 Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650 ABN: 39008488373				
TELEPHONE:	0292397630		E-mail	carmen.yi@ghd.com Dylan.Galt@ghd.com	

SAMPLE IDENTIFICATION	NATURE OF SAMPLE	DATE SAMPLED	TIME SAMPLED	CONTAINER TYPE	NUMBER OF CONTAINERS	8 metals (As, Cd, Cu, Cr, Pb, Ni, Hg, Zn)	ANALYTES REQUIRED *Complete & tick as required*
BH10_0.0-0.1	Soil	1/3/18		Jar		X	
BH10_0.4-0.5	↓	↓		↓		↓	
BH11_0.0-0.1							
BH11_0.4-0.5							
BH12_0.0-0.1							
BH12_0.4-0.5				↓			
QD1							

	NAME	SIGNATURE	ORGANISATION	DATE	TIME
RELINQUISHED BY:	Carmen Yi		GHD		
Mode of Transport Include Consignment Note # if applicable	Please make lab report available in both PDF and ESDat format				
RECEIVED BY:	Chronis Kraisiakis	CK		1/3/18	4:25

Charles Sturt University

CLIENT:	GHD Pty Ltd				
CONTACT:	Carmen Yi				
ADDRESS:	Level 15, 133 Castlereagh Street, Sydney NSW 2000 Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650 ABN: 39008488373				
TELEPHONE:	0292397630		E-mail	carmen.yi@ghd.com Dylan.Galt@ghd.com	
SAMPLE IDENTIFICATION	NATURE OF SAMPLE	DATE SAMPLED	TIME SAMPLED	CONTAINER TYPE	NUMBER OF CONTAINERS
	Soil			Jar	

ANALYTES REQUIRED *Complete & tick as required*															
8 metals (As, Cd, Cu, Cr, Pb, Ni, Hg, Zn)															

	NAME	SIGNATURE	ORGANISATION	DATE	TIME
RELINQUISHED BY:			GHD		
Mode of Transport Include Consignment Note # if applicable	Please make lab report available in both PDF and ESDat format				
RECEIVED BY:					

Charles Sturt University

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

Locked Bag 588
Wagga Wagga NSW 2678

Tel: +61 2 6933 2849
Fax: +61 2 6933 2477
Email: eal@csu.edu.au
www.csu.edu.au/faculty/science/eal

GHD

Suite 3, Level 1 161-169 Baylis Street

Wagga Wagga NSW 2650

Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 1 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0053	**BH101 0.1-0.2** 01.03.18					
		Arsenic	**50**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**87.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**481**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**167**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**72200**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**125**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**161**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0054	**BH101 0.3-0.4** 01.03.18					
		Arsenic	**7**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**4.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**79.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**30.6**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**3860**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**5**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**30**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**50.2**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0055	**BH102 0.0-0.1** 01.03.18					

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Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 2 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0055	**BH102 0.0-0.1** 01.03.18					
		Arsenic	**35**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**71.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**180**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**206**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**75100**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**4**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**140**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**137**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0056	**BH102 0.2-0.3** 01.03.18					
		Arsenic	**15**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**11.8**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**308**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**46.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**12800**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**12**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**46**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**58.8**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0057	**BH103 0.0-0.1** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 3 of 14
For all enquiries related to this report please quote document number: 1803-0012

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Order # 231594607

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EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0057	**BH103 0.0-0.1** 01.03.18					
		Arsenic	**<2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**42.1**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**13.0**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**240**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**9**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**17**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**26.3**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0058	**BH103 0.4-0.5** 01.03.18					
		Arsenic	**8**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**77.7**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**16.7**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**151**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**8**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**21**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**34.7**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0059	**BH104 0.0-0.1** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 4 of 14
For all enquiries related to this report please quote document number: 1803-0012

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18Mar-0059	**BH104 0.0-0.1** 01.03.18					
		Arsenic	**22**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**2.4**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**52.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**38.6**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**2700**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**54**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**93.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0060	**BH104 0.25-0.35** 01.03.18					
		Arsenic	**3**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**34.3**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**15.4**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**267**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**22**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**32.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0061	**BH104 0.4-0.5** 01.03.18					

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Report Number:1803-0012
Page 5 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

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18Mar-0061	**BH104 0.4-0.5** 01.03.18					
		Arsenic	**<2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**46.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**21.9**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**144**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**31**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**44.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0062	**BH105 0.1-0.2** 01.03.18					
		Arsenic	**6**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**7.7**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**60.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**60.0**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**9350**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**37**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**91.7**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0063	**BH105 0.4-0.5** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 6 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

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18Mar-0063	**BH105 0.4-0.5** 01.03.18					
		Arsenic	**5**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**50.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**30.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**844**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**33**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**47.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0064	**BH106 0.0-0.1** 01.03.18					
		Arsenic	**21**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**0.5**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**35.3**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**31.4**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**898**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**39**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**66.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0065	**BH106 0.4-0.5** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 7 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

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Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0065	**BH106 0.4-0.5** 01.03.18					
		Arsenic	**6**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**47.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**24.4**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**97**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**16**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**30**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**42.1**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0066	**BH107 0.0-0.1** 01.03.18					
		Arsenic	**16**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**5.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**48.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**43.7**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**24400**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**10**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**43**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**106**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0067	**BH107 0.3-0.4** 01.03.18					

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Page 8 of 14
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18Mar-0067	**BH107 0.3-0.4** 01.03.18					
		Arsenic	**9**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**2.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**59.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**34.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**73300**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**8**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**38**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**71.7**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0068	**BH108 0.0-0.1** 01.03.18					
		Arsenic	**36**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**13.5**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**93.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**231**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**66100**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**9**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**74**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**318**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0069	**BH108 0.0-0.5** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 9 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

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18Mar-0069	**BH108 0.0-0.5** 01.03.18					
		Arsenic	**5**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**41.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**23.9**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**733**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**26**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**47.7**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0070	**BH109 0.0-0.1** 01.03.18					
		Arsenic	**22**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**21.1**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**44.3**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**90.0**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**25400**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**77**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**130**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0071	**BH109 0.3-0.4** 01.03.18					

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LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 10 of 14
For all enquiries related to this report please quote document number: 1803-0012

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18Mar-0071	**BH109 0.3-0.4** 01.03.18					
		Arsenic	**<2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**47.4**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**19.6**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**543**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**17**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**26.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0072	**BH110 0.0-0.1** 01.03.18					
		Arsenic	**13**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**0.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**41.2**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**25.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**970**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**29**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**59.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0073	**BH110 0.4-0.5** 01.03.18					

Charles Sturt University

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

Locked Bag 588
Wagga Wagga NSW 2678

Tel: +61 2 6933 2849
Fax: +61 2 6933 2477
Email: eal@csu.edu.au
www.csu.edu.au/faculty/science/eal

GHD

Suite 3, Level 1 161-169 Baylis Street

Wagga Wagga NSW 2650

Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 11 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0073	**BH110 0.4-0.5** 01.03.18					
		Arsenic	**3**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**36.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**12.1**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**167**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**6**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**11**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**18.4**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0074	**BH111 0.0-0.1** 01.03.18					
		Arsenic	**<2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**32.8**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**11.9**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**27**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**13**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**12**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**17.6**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0075	**BH111 0.4-0.5** 01.03.18					

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Wagga Wagga NSW 2650

Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 12 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0075	**BH111 0.4-0.5** 01.03.18					
		Arsenic	**2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**45.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**17.7**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**13**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**10**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**16**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**26.0**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0076	**BH112 0.0-0.1** 01.03.18					
		Arsenic	**<2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**34.1**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**11.4**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**58**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**9**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**11**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**18.2**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0077	**BH112 0.4-0.5** 01.03.18					

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Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 13 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
18Mar-0077	**BH112 0.4-0.5** 01.03.18					
		Arsenic	**2**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**<0.2**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**46.5**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**19.0**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**13**	mg/kg	APHA 3030 E/3120 B	1
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**21**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**32.2**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
18Mar-0078	**QD1** 01.03.18					
		Arsenic	**17**	mg/kg	APHA 3030 E/3120 B	2
		Cadmium	**2.9**	mg/kg	APHA 3030 E/3120 B	0.2
		Chromium	**43.0**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2
		Copper	**34.3**	mg/kg	APHA 3030 E/3120 B	0.2
		Lead	**3100**	mg/kg	APHA 3030 E/3120 B	20
		Mercury	**7**	mg/kg	* APHA 3030 E/3120 B	3
		Nickel	**45**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	1
		Zinc	**76.9**	mg/kg	LTM-S-019 (APHA 3030E/3120B)	0.2

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Attention: Nathan Szymanski

Thursday, March 8, 2018

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:1803-0012
Page 14 of 14
For all enquiries related to this report please quote document number: 1803-0012

Facility:

Order # 231594607

Sample Type
Soil

Collected By
C. Yi

Date Received
01-March-2018

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting

Note:

**** NATA Accreditation does not cover the performance of this service.***

Signed ..... David Wade, Laboratory Manager.

All samples analysed as received.
All soil results are reported on a dry basis.
The EAL takes no responsibility for the end use of results within this report.
This report shall not be reproduced except in full.
This report replaces any previously issued report

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Sydney ☑
Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
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Brisbane ☐
Unit 1-21 Smallwood Place, Murarie
Phone: +617 3902 4600
Email: enviro.bris@mgtlabmark.com.au

Melbourne ☐
2 Kingston Town Close, Oakleigh, VIC 3166
Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD Pty Ltd	**Contact Name : Carmen Yi**	**Purchase Order :**	**COC Number :**
Office Address :	**Project Manager : Brooke Neville**	**PROJECT Number : 231594621**	**Eurofins | mgt quote ID :**
Level 15, 133 Castlereagh Street, Sydney NSW 2000	**Email for results : carmen.yi@ghd.com**	**PROJECT Name : Enirgi Power Storage Recycling**	**Data output format:** Esdat, PDF

Special Directions & Comments :

Samples delivered from Charles Sturt University in Wagga

Wagga on behalf of GHD

Please forward to Envirolab (Chatswood)

Eurofins | mgt DI water batch number:

Analytes

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 187724
Date Received: 21/3/18
Time Received: 11:30
Received by: MT
Temp: Cool/Ambient 21.1
Cooling: Ice/Icepack
Security: Intact/Broken/None

Some common holding times (with correct preservation).
For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

	Sample ID	Date	Matrix	8 Metals	Containers: 1LP	250P	125P	1LA	40mL vial	125mL A	Jar	zl bag	Sample comments:
1	BH101 0.1-0.2	1/03/2018	Soil	X							X		Please forward to Envirolab (Chatswood)
2	BH101 0.3-0.4	1/03/2018	Soil	X							X		
3	BH102 0.0-0.1	1/03/2018	Soil	X							X		
4	BH102 0.2-0.3	1/03/2018	Soil	X							X		
5	BH103 0.0-0.1	1/03/2018	Soil	X							X		
6	BH103 0.4-0.5	1/03/2018	Soil	X							X		
7	BH104 0.0-0.1	1/03/2018	Soil	X							X		
8	BH104 0.25-0.35	1/03/2018	Soil	X							X		
9	BH104 0.4-0.5	1/03/2018	Soil	X							X		
10	BH105 0.1-0.2	1/03/2018	Soil	X							X		
11	BH105 0.4-0.5	1/03/2018	Soil	X							X		
12	BH106 0.0-0.1	1/03/2018	Soil	X							X		
13	BH106 0.4-0.5	1/03/2018	Soil	X							X		
14	BH107 0.0-0.1	1/03/2018	Soil	X							X		
15	BH107 0.3-0.4	1/03/2018	Soil	X							X		
16	BH108 0.0-0.1	1/03/2018	Soil	X							X		

Laboratory Staff

Relinquished By: Carmen Yi
Date & Time : 14/3/2018
Signature:

Received By: MT EA
Date & Time : 21/3/18 11:30
Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ , 10 DAY ☐ Other:

Method Of Shipment

☑ Courier
☐ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 21.1

Report number: 187724

eurofins | mgt

☑ **Sydney**
Unit F3 - 6 Building F, 16 Mars Road, Lane Cove
Phone: +612 9900 8400
Email: enviro.syd@mgtlabmark.com.au

☐ **Brisbane**
Unit 1-21 Smallwood Place, Murrarie
Phone: +617 3902 4600
Email: enviro.bris@mgtlabmark.com.au

☐ **Melbourne**
2 Kingston Town Close, Oakleigh, VIC 3166
Phone: +613 8564 5000 Fax: +613 8564 5090
Email: enquiries.melb@mgtlabmark.com.au

CHAIN OF CUSTODY RECORD

CLIENT DETAILS

Company Name : GHD Pty Ltd	**Contact Name : Carmen Yi**	**Purchase Order :**	**COC Number :**
Office Address :	**Project Manager : Brooke Neville**	**PROJECT Number : 231594621**	**Eurofins | mgt quote ID :**
Level 15, 133 Castlereagh Street, Sydney NSW 2000	**Email for results : carmen.yi@ghd.com**	**PROJECT Name : Enirgi Power Storage Recycling**	**Data output format:**

Special Directions & Comments :

Samples delivered from Charles Sturt University in Wagga Wagga on behalf of GHD

Eurofins | mgt DI water batch number:

Some common holding times (with correct preservation). For further information contact the lab

Waters		Soils	
BTEX, MAH, VOC	14 days	BTEX, MAH, VOC	14 days
TRH, PAH, Phenols, Pesticides	7 days	TRH, PAH, Phenols, Pesticides	14 days
Heavy Metals	6 months	Heavy Metals	6 months
Mercury, CrVI	28 days	Mercury, CrVI	28 days
Microbiological testing	24 hours	Microbiological testing	72 hours
BOD, Nitrate, Nitrite, Total N	2 days	Anions	28 days
Solids - TSS, TDS etc	7 days	SPOCAS, pH Field and FOX, CrS	24 hours
Ferrous iron	7 days	ASLP, TCLP	7 days

	Sample ID	Date	Matrix	Analytes: 8 Metals	Containers: 1LP	250P	125P	1LA	40mL vial	125mL A	Jar	zl bag	Sample comments:
1	BH108 0.4-0.5		Soil	X							X		Please forward to Envirolab (Chatswood)
2	BH109 0.0-0.1		Soil	X							X		
3	BH109 0.3-0.4		Soil	X							X		
4	BH110 0.0-0.1		Soil	X							X		
5	BH110 0.4-0.5		Soil	X							X		
6	BH111 0.0-0.1		Soil	X							X		
7	BH111 0.4-0.5		Soil	X							X		
~~8~~	~~BH112 0.0-0.1~~		~~Soil~~	~~X~~							X		
9	BH112 0.4-0.5		Soil	X							X		
10	QD1		Soil										
11													
12													
13													
14													
15													
16													

Laboratory Staff

Relinquished By: Carmen Yi
Date & Time : 14/3/2018
Signature:

Received By: MT ECL
Date & Time : 21/3/18 11:30
Signature:

Turn around time

1 DAY ☐ 2 DAY ☐ 3 DAY ☐
5 DAY ☑ 10 DAY ☐ Other:

Method Of Shipment

☑ Courier
☐ Hand Delivered
☐ Postal
Courier Consignment # :

Temperature on arrival: 21.1

Report number: 187724

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD Pty Ltd (Sydney)
Attention	Carmen Yi

Sample Login Details

Your reference	231594621
Envirolab Reference	187724
Date Sample Received	21/03/2018
Date Instructions Received	21/03/2018
Date Results Expected to be Reported	28/03/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	26 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	21.1
Cooling Method	Ice
Sampling Date Provided	YES

Comments

QD1 will be tested

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Acid Extractable metalsin soil
BH101-0.1-0.2	✓
BH101-0.3-0.4	✓
BH102-0.0-0.1	✓
BH102-0.2-0.3	✓
BH103-0.0-0.1	✓
BH103-0.4-0.5	✓
BH104-0.0-0.1	✓
BH104-0.25-0.35	✓
BH104-0.4-0.5	✓
BH105-0.1-0.2	✓
BH105-0.4-0.5	✓
BH106-0.0-0.1	✓
BH106-0.4-0.5	✓
BH107-0.0-0.1	✓
BH107-0.3-0.4	✓
BH108-0.0-0.1	✓
BH108-0.4-0.5	✓
BH109-0.0-0.1	✓
BH109-0.3-0.4	✓
BH110-0.0-0.1	✓
BH110-0.4-0.5	✓
BH111-0.0-0.1	✓
BH111-0.4-0.5	✓
BH112-0.0-0.1	✓
BH112-0.4-0.5	✓
QD1	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 187724

Client Details

Client	GHD Pty Ltd (Sydney)
Attention	Carmen Yi
Address	Level 15, 133 Castlereagh St, Sydney, NSW, 2000

Sample Details

Your Reference	**231594621**
Number of Samples	26 soil
Date samples received	21/03/2018
Date completed instructions received	21/03/2018

Analysis Details

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

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

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

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

Report Details

Date results requested by	28/03/2018
Date of Issue	28/03/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Leon Ow, Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

Acid Extractable metals in soil						
Our Reference		187724-1	187724-2	187724-3	187724-4	187724-5
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.1-0.2	0.3-0.4	0.0-0.1	0.2-0.3	0.0-0.1
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	64	6	34	9	<4
Cadmium	mg/kg	82	3	48	4.4	<0.4
Chromium	mg/kg	210	41	86	110	33
Copper	mg/kg	200	32	160	43	10
Lead	mg/kg	37,000	2,400	33,000	3,500	76
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	150	22	73	27	8
Zinc	mg/kg	150	27	110	31	12

Acid Extractable metals in soil						
Our Reference		187724-6	187724-7	187724-8	187724-9	187724-10
Your Reference	UNITS	BH103	BH104	BH104	BH104	BH105
Depth		0.4-0.5	0.0-0.1	0.25-0.35	0.4-0.5	0.1-0.2
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	<4	13	5	<4	10
Cadmium	mg/kg	<0.4	1	<0.4	<0.4	4.6
Chromium	mg/kg	36	24	32	29	37
Copper	mg/kg	13	31	18	17	92
Lead	mg/kg	100	1,100	230	85	3,700
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	31	17	17	21
Zinc	mg/kg	14	46	19	19	57

Acid Extractable metals in soil						
Our Reference		187724-11	187724-12	187724-13	187724-14	187724-15
Your Reference	UNITS	BH105	BH106	BH106	BH107	BH107
Depth		0.4-0.5	0.0-0.1	0.4-0.5	0.0-0.1	0.3-0.4
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	6	13	5	12	9
Cadmium	mg/kg	<0.4	0.9	<0.4	3	2
Chromium	mg/kg	25	26	32	42	41
Copper	mg/kg	19	30	21	37	31
Lead	mg/kg	640	1,300	97	7,700	4,800
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	16	35	18	31	25
Zinc	mg/kg	23	49	22	52	42

Acid Extractable metals in soil						
Our Reference		187724-16	187724-17	187724-18	187724-19	187724-20
Your Reference	UNITS	BH108	BH108	BH109	BH109	BH110
Depth		0.0-0.1	0.4-0.5	0.0-0.1	0.3-0.4	0.0-0.1
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	45	7	17	<4	17
Cadmium	mg/kg	13	<0.4	13	<0.4	2
Chromium	mg/kg	110	34	46	29	35
Copper	mg/kg	360	25	79	17	38
Lead	mg/kg	31,000	810	9,100	200	2,800
Mercury	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	100	18	50	12	24
Zinc	mg/kg	320	30	76	16	47

Acid Extractable metals in soil						
Our Reference		187724-21	187724-22	187724-23	187724-24	187724-25
Your Reference	UNITS	BH110	BH111	BH111	BH112	BH112
Depth		0.4-0.5	0.0-0.1	0.4-0.5	0.0-0.1	0.4-0.5
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	29	25	39	45	40
Copper	mg/kg	12	11	16	10	16
Lead	mg/kg	110	24	11	23	11
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	8	10	8	11
Zinc	mg/kg	13	13	14	12	14

Acid Extractable metals in soil				
Our Reference		187724-26	187724-27	187724-28
Your Reference	UNITS	QD1	BH105 - [TRIPLICATE]	BH110 - [TRIPLICATE]
Depth		-	0.4-0.5	0.4-0.5
Date Sampled		01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	12	7	<4
Cadmium	mg/kg	2	0.5	<0.4
Chromium	mg/kg	27	32	32
Copper	mg/kg	30	26	13
Lead	mg/kg	2,300	1,300	270
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	31	19	8
Zinc	mg/kg	45	24	16

Moisture						
Our Reference		187724-1	187724-2	187724-3	187724-4	187724-5
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.1-0.2	0.3-0.4	0.0-0.1	0.2-0.3	0.0-0.1
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	0.5	0.7	0.5	0.4	0.6

Moisture						
Our Reference		187724-6	187724-7	187724-8	187724-9	187724-10
Your Reference	UNITS	BH103	BH104	BH104	BH104	BH105
Depth		0.4-0.5	0.0-0.1	0.25-0.35	0.4-0.5	0.1-0.2
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	0.5	0.5	0.6	0.6	0.5

Moisture						
Our Reference		187724-11	187724-12	187724-13	187724-14	187724-15
Your Reference	UNITS	BH105	BH106	BH106	BH107	BH107
Depth		0.4-0.5	0.0-0.1	0.4-0.5	0.0-0.1	0.3-0.4
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	0.5	0.5	0.5	0.5	0.7

Moisture						
Our Reference		187724-16	187724-17	187724-18	187724-19	187724-20
Your Reference	UNITS	BH108	BH108	BH109	BH109	BH110
Depth		0.0-0.1	0.4-0.5	0.0-0.1	0.3-0.4	0.0-0.1
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	0.6	0.6	0.5	0.5	0.6

Moisture						
Our Reference		187724-21	187724-22	187724-23	187724-24	187724-25
Your Reference	UNITS	BH110	BH111	BH111	BH112	BH112
Depth		0.4-0.5	0.0-0.1	0.4-0.5	0.0-0.1	0.4-0.5
Date Sampled		01/03/2018	01/03/2018	01/03/2018	01/03/2018	01/03/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	0.6	0.6	0.7	1.0	0.6

Moisture		
Our Reference		187724-26
Your Reference	UNITS	QD1
Depth		-
Date Sampled		01/03/2018
Type of sample		soil
Date prepared	-	22/03/2018
Date analysed	-	23/03/2018
Moisture	%	0.7

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	187724-2
Date prepared	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	23/03/2018	23/03/2018		23/03/2018	23/03/2018
Arsenic	mg/kg	4	Metals-020	<4	1	64	64	0	102	71
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	82	88	7	93	76
Chromium	mg/kg	1	Metals-020	<1	1	210	220	5	101	82
Copper	mg/kg	1	Metals-020	<1	1	200	240	18	108	100
Lead	mg/kg	1	Metals-020	<1	1	37000	41000	10	97	#
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	107	109
Nickel	mg/kg	1	Metals-020	<1	1	150	160	6	102	75
Zinc	mg/kg	1	Metals-020	<1	1	150	170	12	93	73

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	187724-22
Date prepared	-			[NT]	11	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			[NT]	11	23/03/2018	23/03/2018		23/03/2018	23/03/2018
Arsenic	mg/kg	4	Metals-020	[NT]	11	6	6	0	111	88
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	106	91
Chromium	mg/kg	1	Metals-020	[NT]	11	25	28	11	110	107
Copper	mg/kg	1	Metals-020	[NT]	11	19	22	15	113	116
Lead	mg/kg	1	Metals-020	[NT]	11	640	900	34	110	90
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	119	105
Nickel	mg/kg	1	Metals-020	[NT]	11	16	17	6	111	99
Zinc	mg/kg	1	Metals-020	[NT]	11	23	41	56	107	87

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	21	23/03/2018	23/03/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	21	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	21	29	32	10	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	21	12	13	8	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	21	110	190	53	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	21	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	21	7	8	13	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	21	13	15	14	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 187724-11 for Zn. Therefore a triplicate result has been issued as laboratory sample number 187724-27.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 187724-21 for Pb. Therefore a triplicate result has been issued as laboratory sample number 187724-28.

Acid Extractable metals in soil - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

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

☐ Brisbane Laboratory
Unit 1, 21 Smallwood Pl, Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

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

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	GHD Pty Ltd.
Address	Level 15, 133 Castlereagh Street, Sydney
Contact Name	Carmen Yi
Phone №	92397630
Special Directions	
Purchase Order	
Quote ID №	
Project №	231594621
Project Name	RMT FACILITY (ENERGI)
Project Manager	BROOKE NEVILLE
EDD Format (ESdat, EQuIS, Custom)	ESDAT, PDF
Sampler(s)	Carmen Yi
Handed over by	Carmen Yi
Email for Invoice	BROOKE.NEVILLE@ghd.com
Email for Results	CARMEN.YI@GHD.com

Analyses: 8 metals (As, Cd, Cr, Cu, Hg, Ni, Zn, Pb)

Turnaround Time (TAT) Requirements: ☐ Overnight (9am)* ☐ 1 Day* ☐ 2 Day* ☐ 3 Day* ☑ 5 Day ☐ Other ( ) * Surcharges apply

Containers: 1L Plastic | 250mL Plastic | 125mL Plastic | 200mL Amber Glass | 40mL VOA vial | 500mL PFAS Bottle | Jar (Glass or HDPE) | Other (Asbestos WA Guidelines)

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	8 metals	Containers	Sample Comments / Dangerous Goods Hazard Warning
1	QT1	1/3/18	S		Jar (Glass or HDPE): X	
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total Counts						

Method of Shipment: ☑ Courier (# Picked by lab) ☐ Hand Delivered ☐ Postal — Name: Carmen Yi — Signature: [signature] — Date: 2/3/18 — Time: 10:00

Eurofins | mgt Laboratory Use Only

Received By	R Phillips	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature	[signature]	Date	2/3/18	Time	16:56	Temperature 12.3°C
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	/ /	Time	:	Report № 587501

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

eurofins | mgt

Melbourne
3-5 Kingston Town Close
Oakleigh Vic 3166
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NATA # 1261
Site # 1254 & 14271

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

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

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd NSW**
Contact name:	Carmen Yi
Project name:	RMT FACILITY (ENIRGI)
Project ID:	231594621
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Mar 2, 2018 4:56 PM
Eurofins | mgt reference:	**587501**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 22.3 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

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

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Carmen Yi - carmen.yi@ghd.com.

eurofins | mgt

ABN– 50 005 085 521
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web : www.eurofins.com.au

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NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name:	GHD Pty Ltd NSW	**Order No.:**		**Received:**	Mar 2, 2018 4:56 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	**Report #:**	587501	**Due:**	Mar 9, 2018
		Phone:	02 9239 7100	**Priority:**	5 Day
		Fax:	02 9239 7199	**Contact Name:**	Carmen Yi
Project Name:	RMT FACILITY (ENIRGI)				
Project ID:	231594621				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QT1	Mar 01, 2018		Soil	S18-Ma02616	X	X
Test Counts						1	1

eurofins | mgt

30 years Testing For Life 1987–2017
Celebrating 30 years Testing and Protecting Human Health

Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Carmen Yi**

Report **587501-S**
Project name RMT FACILITY (ENIRGI)
Project ID 231594621
Received Date Mar 02, 2018

Client Sample ID			**QT1**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**S18-Ma02616**
Date Sampled			**Mar 01, 2018**
Test/Reference	LOR	Unit	
Heavy Metals			
Arsenic	2	mg/kg	20
Cadmium	0.4	mg/kg	3.4
Chromium	5	mg/kg	41
Copper	5	mg/kg	36
Lead	5	mg/kg	3800
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	47
Zinc	5	mg/kg	74
% Moisture	1	%	3.6

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Metals M8	Melbourne	Mar 06, 2018	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Mar 02, 2018	14 Day
- Method: LTM-GEN-7080 Moisture			

ABN– 50 005 085 521
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Site # 23736

Company Name:	GHD Pty Ltd NSW	**Order No.:**		**Received:**	Mar 2, 2018 4:56 PM
Address:	Level 15, 133 Castlereagh Street Sydney NSW 2000	**Report #:**	587501	**Due:**	Mar 9, 2018
		Phone:	02 9239 7100	**Priority:**	5 Day
		Fax:	02 9239 7199	**Contact Name:**	Carmen Yi
Project Name:	RMT FACILITY (ENIRGI)				
Project ID:	231594621				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QT1	Mar 01, 2018		Soil	S18-Ma02616	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

ug/L: micrograms per litre

ppb: Parts per billion

org/100mL: Organisms per 100 millilitres

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

mg/L: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	104			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	114			80-120	Pass	
Copper	%	109			80-120	Pass	
Lead	%	115			80-120	Pass	
Mercury	%	83			75-125	Pass	
Nickel	%	107			80-120	Pass	
Zinc	%	105			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M18-Ma04852	NCP	%	90			75-125	Pass	
Cadmium	M18-Ma04852	NCP	%	102			75-125	Pass	
Chromium	M18-Ma04852	NCP	%	85			75-125	Pass	
Copper	M18-Ma04852	NCP	%	91			75-125	Pass	
Lead	M17-Oc11668	NCP	%	128			75-125	Fail	Q08
Mercury	M18-Ma04852	NCP	%	104			70-130	Pass	
Nickel	M18-Ma04518	NCP	%	109			75-125	Pass	
Zinc	M18-Ma04852	NCP	%	89			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M18-Ma04852	NCP	mg/kg	16	16	<1	30%	Pass	
Cadmium	M18-Ma04852	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M18-Ma04852	NCP	mg/kg	120	120	1.0	30%	Pass	
Copper	M18-Ma04852	NCP	mg/kg	32	33	2.0	30%	Pass	
Lead	M17-Oc11668	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Mercury	M18-Ma04852	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M18-Ma04852	NCP	mg/kg	61	62	2.0	30%	Pass	
Zinc	M18-Ma04852	NCP	mg/kg	60	61	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S18-Ma02630	NCP	%	9.0	9.3	3.0	30%	Pass	

Comments

Sample Integrity

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

Comments

Qualifier Codes/Comments

Code	Description
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference

Authorised By

Nibha Vaidya	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

GHD

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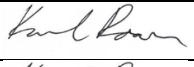
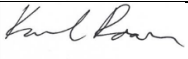
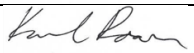
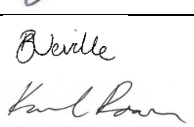
2315946-75201/https://projects.ghd.com/oc/Canberra/rmtpreliminaryapprov/Delivery/Documents/EIS Specialist Studies/Contamination assessment/2315946-REP-Rev 5_Renewed Metal Technologies-Contaminated Site Assessment_Final.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
2	D. Galt	J. Hallchurch		K. Rosen		23/10/2017
3	C. Yi / D. Galt	J. Hallchurch		K. Rosen		19/02/2018
4	C. Yi	J. Hallchurch		K. Rosen		13/06/2018
5	C. YI	J. Hallchurch		K. Rosen		20/06/2018
6_Final	J. Hallchurch	B. Neville K. Rosen		K. Rosen		09/07/2018

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Appendix N – Biodiversity Assessment Field Results

Biodiversity Assessment Field Results

Biodiversity field survey results

Listed species, populations and ecological communities that may occur in the study area

Species / community	Status*	Act
Ecological communities		
Grey Box grassy woodlands and derived native grasslands of south-eastern Australia	E	EPBC TSC
Weeping Myall Woodland	E E	EPBC TSC
White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grassland	CE E	EPBC TSC
Flora		
A Speargrass *Austrostipa wakoolica*	E	EPBC TSC
Mueller Daisy *Brachyscome muelleroides*	V	EPBC TSC
Slender Darling-pea *Swainsona murrayana*	V	EPBC TSC
Birds		
Barking Owl *Ninox connivens*	V	TSC
Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis*	V	TSC
Black Falcon *Monarcha melanopsis*	V	TSC
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	V	TSC
Diamond Firetail *Stagonopleura guttata*	V	TSC
Dusky Woodswallow *Artamus cyanopterus*	V	TSC
Flame Robin *Petroica phoenicea*	V	TSC
Fork-tailed Swift *Apus pacificus*	Mi	EPBC
Hooded Robin (south-eastern form) *Melanodryas cucullata*	V	TSC
Latham's Snipe *Gallinago hardwickii*	Mi	EPBC
Little Eagle *Hieraaetus morphnoides*	V	TSC
Little Lorikeet *Glossopsitta pusilla*	V	TSC

Species / community	Status*	Act
Painted Honeyeater *Grantiella picta*	V	EPBC TSC
Scarlet Robin Petroica boodang	V	TSC
Speckled Warbler *Pyrrholaemus saggitatus*	V	TSC
Spotted Harrier *Circus assimilis*	V	TSC
Superb Parrot Polytelis swainsonii	V	EPBC TSC
Swift Parrot *Lathamus discolor*	E	EPBC TSC
Varied Sittella *Daphoenositta chrysoptera*	V	TSC
White-throated Needletail *Hirundapus caudacutus*	Mi	EPBC
Mammals		
Grey-headed Flying-fox *Pteropus poliocephalus*	V	EPBC TSC
South-eastern Long-eared Bat *Nyctophilus corbeni*	V	EPBC TSC
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	V	TSC

Species recorded during field surveys

FLORA LIST

P1 & P2 – 2017 survey

P3 & P4 – 2018 survey

* Introduced species

✓ Species present

Numbers are per cent cover

Scientific Name	Common Name	P1	P2	P3	P4
Acaena sp.		1			
Aristida sp.				<1	
Austrostipa scabra	Speargrass			<1	
*Avena fatua**	Wild Oats				<1
*Bidens pilosa**	Pitch-forks		✓		
Boerhavia dominii	Tarvine				<1
Bothriochloa macra	Red-leg Grass	✓	2	2	<1
*Cenchrus clandestinus**	Kikuyu Grass	2		<1	
Chloris truncata	Windmill Grass	2	20	5	10
*Cichorium intybus**	Chicory		1	<1	
*Citrullus lanatus**	Camel Melon			<1	
Cynodon dactylon	Couch Grass	1	20	5	
*Cyperus eragrostis**	Umbrella Sedge		✓		
Digitaria divaricatissima	Umbrella Grass			1	<1
*Dittrichia graveolens**	Stinkwort	1			
*Echium plantagineum**	Paterson's Curse	1			<1
*Eragrostis cilianensis**	Stinkgrass			<1	
*Erodium botrys**	Long Storksbill	1	1		
Eucalyptus camaldulensis	River Red Gum	✓			
Eucalyptus melliodora	Yellow Box				5
Euphorbia drummondii	Caustic Weed			<1	<1
*Heliotropium europaeum**	Common Heliotrope				<1
*Hypericum perforatum**	St John's Wort	1			
*Hypochaeris radicata**	Catsear	5	5	1	<1
Juncus sp.			✓		
*Lactuca serriola**	Prickly Lettuce	1		<1	
Microlaena stipoides	Weeping Grass		1		
*Oenothera stricta**		1			
Oxalis sp.*			✓		
Panicum effusum	Hairy Panic	1	10	10	10
*Paspalum dilatatum**	Paspalum	10		<1	5
*Plantago lanceolata**	Lamb's Tongues	20			
Poa sp.		1			

Scientific Name	Common Name	P1	P2	P3	P4
*Polygonum aviculare**	Wireweed			10	
*Romulea rosea**	Onion Grass	1	1		
Rumex brownii	Swamp Dock				<1
Rytidosperma caespitosum	Ringed Wallaby Grass			<1	
Rytidosperma erianthum	A Wallaby Grass		5		
Rytidosperma sp.		1			<1
*Salvia verbenaca**	Vervain		1	<1	
*Setaria parviflora**		1			
Setaria sp.*				<1	
Sida corrugata	Corrugated Sida				<1
*Solanum elaeagnifolium**	Silver-leaved Nightshade				<1
*Solanum nigrum**	Blackberry Nightshade		✓		
*Sonchus oleraceus**	Common Sowthistle		✓	<1	
*Taraxacum officinale**	Dandelion	1	1		
*Trifolium subterraneum**	Subterranean Clover	1	10		
Trifolium sp.*	A Clover		1		
Typha domingensis	Narrow-leaved Cumbungi		✓		
Vittadinia cuneata	Fuzzweed	1	1		

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Species	Common Name	Observation type
Birds		
Gymnorhina tibicen	Australian Magpie	W
Corvus coronoides	Australian Raven	O, W
Coracina novaehollandiae	Black-faced Cuckoo-shrike	O
Eolophus roseicapillus	Galah	O, W
Corvus mellori	Little Raven	O. W
Grallina cyanoleuca	Magpie Lark	O, W
Vanellus miles	Masked Lapwing	W
Falco cenchroides	Nankeen Kestrel	O
Malurus cyaneus	Superb Fairy-wren	W
Rhipidura leucophrys	Willie Wagtail	O, W
Mammals		
*Oryctolagus cuniculus**	European Rabbit	P

O – observed, W – heard call, P – scat. * - introduced

Appendix O – EPBC Protected Matters Report

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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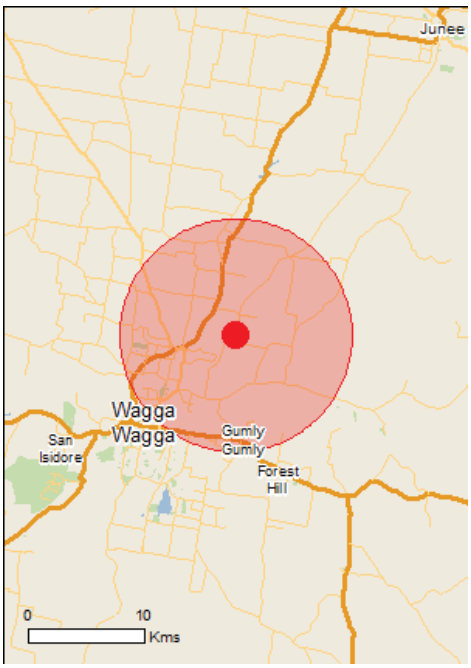

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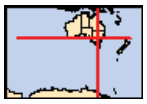

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	19
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	7
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	600 - 700km upstream
Hattah-kulkyne lakes	400 - 500km upstream
Riverland	500 - 600km upstream
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Galaxias rostratus		
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Caladenia tensa		
Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar		
Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Broadcasting Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Defence - WAGGA ARES DEPOT ; BLAMEY BKS -WAGGA WAGGA TRG DEP
Defence - WAGGA - WATER BORE SITE AP1
Defence - WAGGA - WATER BORE SITE AP2
Defence - WAGGA - WATER BORE SITE AP3

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.06003 147.42708

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
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-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
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-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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Please feel free to provide feedback via the Contact Us page.

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