EcOz Environmental Consultants

Dhupuma Plateau Bauxite Mine

Surface Water Baseline Monitoring

January 2017

Gulkula Mining Company Pty Ltd

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1 Introduction

Baseline surface water monitoring of watercourses draining the proposed Dhupuma Plateau Bauxite Mine was undertaken by EcOz Environmental Consultants (EcOz) on 23 and 24 January 2017. The Gulkula Mining Company Pty Ltd (GMC) commissioned EcOz to undertake this work, which is a component of the environment protection measures included in GMC's *Mining Management Plan* (MMP) and *Water Management Plan* (WMP). The preparation and approval of these plans is required under the Northern Territory (NT) *Mining Management Act* prior to the commencement of mining.

This report outlines the:

- Objectives of surface water monitoring,
- Justification for sample site locations, water quality parameters measured, and frequency of sampling,
- Site access information relevant to the on-going monitoring program,
- Water quality assessment guidelines to be used for on-going monitoring,
- Baseline surface water monitoring results for 23 and 24 January 2017, data interpretation, assessment, and implications for on-going monitoring, and
- Other relevant recommendations for surface water monitoring to be undertaken prior to, and during, mining operations.

This work builds on that undertaken and reported in *EL 30226 Hydrology and Hydrogeology Assessment*, prepared for GMC by EcOz, April 2016 (EcOz 2016).

1.1 Mining project summary

The proposed bauxite mine is located on the Dhupuma Plateau, approximately 30 km south of Nhulunbuy and 16 km south-west of Yirrkala (Figure 1-1). The plateau is encompassed by Exploration Licence EL30226. The area within EL30226 planned for mining and associated infrastructure is encompassed by Mineral Lease ML31025; granted 25 January 2017.

Mining operations are scheduled to start mid-2017 and will comprise surface strip mining of bauxite (maximum depth ~4.5 m), using front-end loaders (or similar), with a disturbance area of 35 ha planned in the first four years; including mining areas and associated infrastructure. The mine will have a life of up to 15 years, and involve a ramp-up from 100,000 to 500,000 tonnes per annum over the first four years. From project year five onwards, an estimated 15 ha per year are planned to be disturbed, predominantly from mining, with a total of less than 260 ha to be temporarily disturbed over the life of the mine.

Rehabilitation will be performed progressively, with pit voids mined and then back-filled and seeded within 12 months of initial clearing.

Acid mine drainage (AMD) potential is very low given the surface lateritic bauxite layer, mined to a maximum 4.5 m depth, is oxidised and contains negligible sulfide minerals (based on exploration drilling results).

There will be no ore processing activities on-site; the ore will be hauled to the Rio Tinto Alcan Gove hard stand ore stockpile, approximately 14 km from the Dhupuma plateau. The mining operation will not require any process / mine water dams and will also not generate waste rock, residues or tailings, and therefore no storage facility is required. Explosives will not be used; front end loaders, or other similar machinery will dig and load the ore, and haul it directly to Rio Tinto.

Infrastructure at the mine site includes an admin office, workshops, power supply, a water tank and worker accommodation facilities (Figure 1-1).

Water supply for the mine will be an existing groundwater bore; Production Bore 2 (Garma Bore). The majority of water use at the mine will be for dust suppression; estimated at 50 kL/day during the dry season and 25 kL/day during the wet season. Other minor water use includes for on-site office amenities (approx. 1.25 kL per day for the five employees working onsite at any one time), and for accommodation at the nearby college for 25 workers using approx. 6.25 kL per day.

Wastewater from the on-site office amenities and accommodation goes to a septic system and associated absorption trench.

1.2 Potential risks to surface water quality and mitigation measures

Mine surface water monitoring programs must be designed with regard to the potential risks to downstream surface water bodies. Based on the small-scale mining operations outlined above, potential risks to downstream surface water quality are considered low. Given that AMD risk is negligible, there will be no ore processing on site, and no requirement for tailings dams, process dams or waste stockpiles, potential risks are limited to:

- Erosion of exposed soil within mining and other operational areas leading to sedimentation and increased turbidity and other contaminants in run-off into surface water bodies.
- Pumping out of water that accumulates in mining pits after rainfall to allow mining to continue, and subsequent discharge of this potentially poorer quality water to the environment. Note that groundwater levels will remain well below the base of mining pits for the majority of time and pit dewatering will only be required during the wet season.
- Spills or leakage of fuels, oils, lubricants, or other hazardous materials used and stored on site into run-off leading to surface water bodies.

In regards to groundwater extraction for mine water requirements, groundwater aquifers and groundwater-dependant flows to surface water bodies will not be affected, based on the hydrogeological assessment by EcOz 2017a. The volume of groundwater used is extremely small in comparison to annual groundwater aquifer recharge during the wet season – i.e. annual wet season recharge across the plateau is estimated as 1645 ML, compared to annual groundwater extraction for mining of 16.5 ML (1%).

The following mitigation measures, included in the mine's MMP, aim to minimise the potential risks listed above:

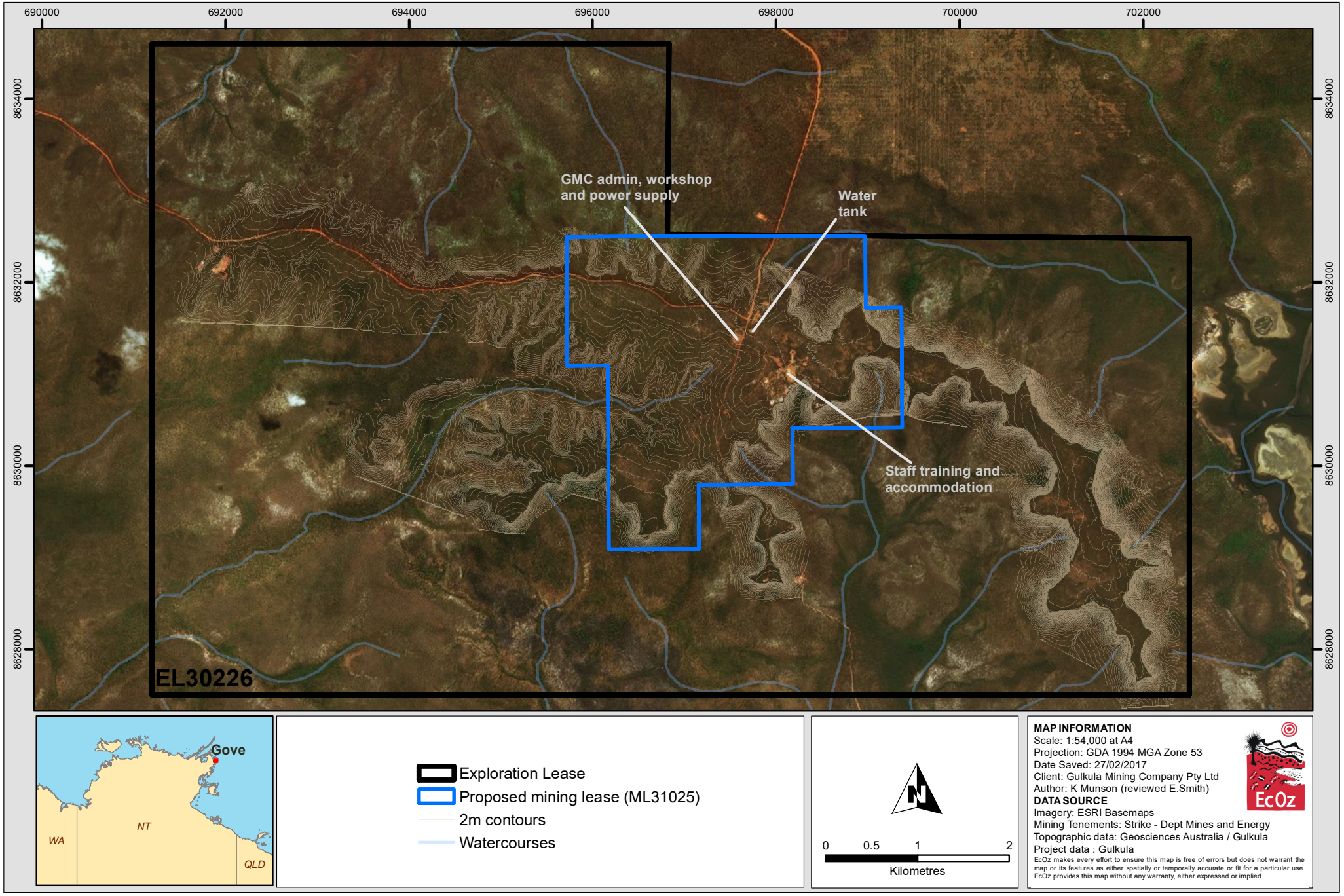
- Maintenance of a 20 m-wide buffer zone from the edge of the plateau, within which no mining will occur.
- Mining pits will be progressively rehabilitated to minimise the active area of mining at any one time.
- An Erosion and Sediment Control Plan will be developed, and all erosion and sediment control measures installed, prior to ground disturbance. Surface water flows will be mapped and down-slope erosion potential evaluated. Sediment basins and diversion banks will be established where high flows are expected. Clean run-off will be diverted around the site.
- The volume of water accumulating within pits will be minimised by diverting clean water around pits, and minimising pit area through progressive rehabilitation. All water must be tested and meet the assessment criteria prior to release.
- All fuels, oils, lubricants etc. will be managed in accordance with the mine's Hydrocarbon Management Plan. Hydrocarbon and chemical storage areas will be monitored daily and/or weekly to detect and respond to any leaks or spills. All hydrocarbons and chemicals will be stored in approved bunded enclosures in accordance with Australian Standards and Government Regulations.

- In the event of a spill, the area will be isolated, all contaminated soil removed and taken to a licensed waste facility. Spill response kits will be maintained on site and staff trained in their use.
- All hazardous wastes will be stored in dedicated storage areas on site for a limited period, before transport to the Nhulunbuy Corporation Waste Disposal Facility, in accordance with the Corporation's standards. All hazardous waste will be stored and transported in compliance with the NT *Dangerous Goods Act*.

1.3 Surface water monitoring objectives

Surface water monitoring aims to protect the environment downstream of the mine by providing early warning of impacts to surface water quality arising from bauxite mining operations including the potential risks identified in Section 1.2 above. The surface water monitoring program is outlined in Section 2 below and includes the:

- Establishment of routine surface water monitoring sites representative of all catchments receiving run-off from the mine.
- Selection of water quality parameters relevant to the detection of mining impacts and the identified potential risks.
- Collection of baseline (pre-mining) surface water quality data at the routine monitoring sites to enable differentiation of impacts caused by mining from pre-existing conditions and to determine appropriate assessment criteria (trigger values).
- Regular sampling of routine surface water quality monitoring sites during operations to assess the results against baseline conditions and detect any impacts.
- Maintenance of all surface water quality results in a central database.
- Analysis and interpretation of long-term surface water quality trends using the database in order to satisfy annual MMP reporting required by the regulator.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ16005 - Dhupuma Surface and Groundwater Studies\01 Project Files\Figure 1-1 Location of Dhupuma Plateau Bauxite Mine, associated infrastructure, and boundaries of EL30220 and proposed ML31025.mxd

Figure 1-1. Location of Dhupuma Plateau Bauxite Mine, associated infrastructure, and boundaries of EL30226 and proposed ML31025

2 Surface Water Monitoring Program

2.1 Climate and rainfall summary

Climate and rainfall is a major consideration in designing the surface water monitoring program. The Dhupuma Plateau has a tropical climate with a distinct dry season (approximately May to November) and wet season (December to April). Figure 2-1 depicts climate data from Gove Airport (station 14508) located approximately 30 km north-west of the site.

Annual average rainfall is 1450 mm, the bulk of which occurs during the wet season, with negligible rain between June and October. The wettest months are January, February and March with averages of 274 mm, 281 mm and 280 mm, respectively.

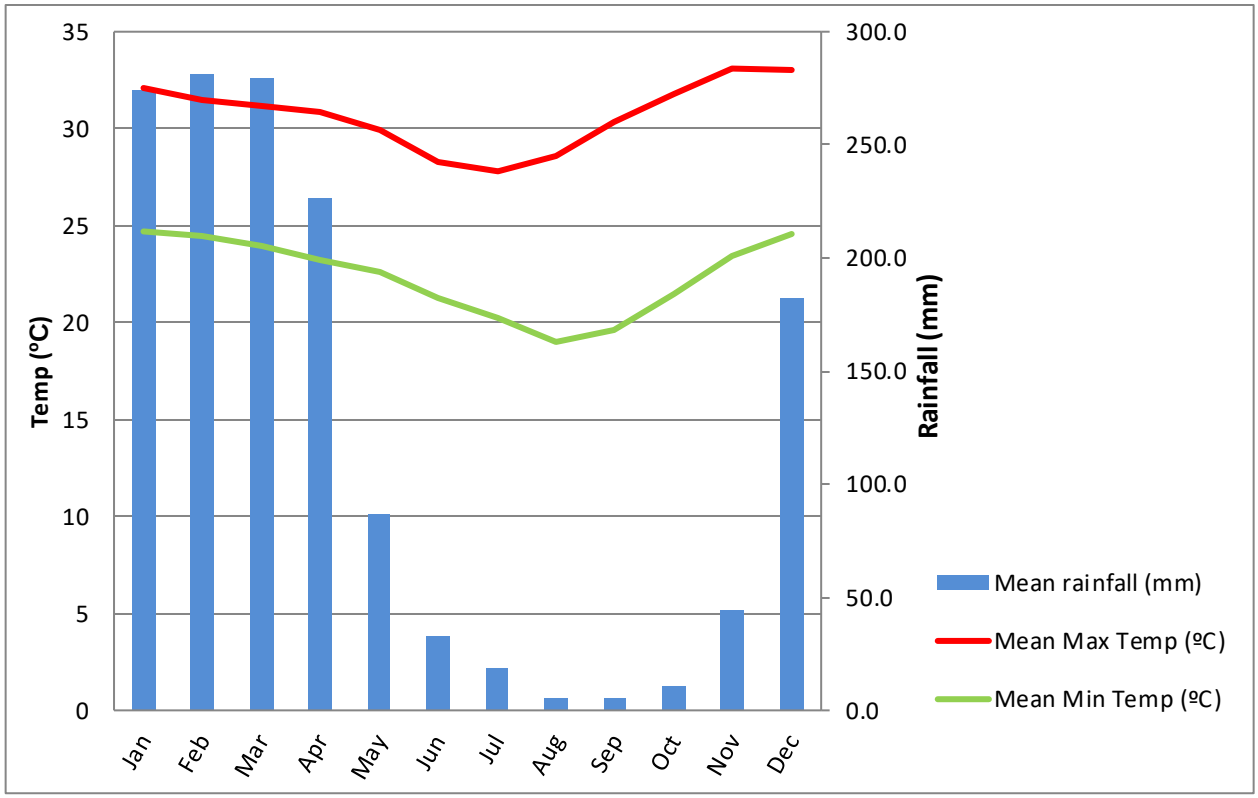


Figure 2-1. Climate data – Gove Airport (Station 14508)

2.2 Surface water monitoring sites

Figure 2-2 shows the location of surface water monitoring sites and catchment boundaries in relation to the proposed mining area. The catchments north and west of the proposed mining area drain into the Latram and Giddy Rivers respectively, which flow into Melville Bay. The two un-named catchments to the south and east (labelled A and B respectively) drain into the Gulf of Carpentaria. The proposed mining area lies almost entirely within the un-named catchment A, with a very small proportion in the Latram River catchment.

Two surface water monitoring sites were established and sampled in April 2016 during a previous field survey; DPSW1 and DPSW2 (see EcOz 2016). Both these sites are located within un-named catchment A. DPSW1 lies on a watercourse that drains the eastern side of the proposed mine site and includes the staff training and accommodation facilities and associated amenities and septic absorption trench. DPSW2 lies on a watercourse that drains the majority of the proposed mining pit area, associated roads, office and workshops.

The watercourse of DPSW1 is considered perennial, and maintains waterholes and some flow even at the end of the dry season (see Prowse et al 1999). The watercourse of DPSW2 may dry up by the end of the dry season depending on total rainfall during the previous wet season and consequent groundwater aquifer recharge and maintenance of flows from groundwater seepage. Similarly, the extent of flow remaining in the perennial watercourse of DPSW1 at the end of the dry season would depend on the amount of groundwater aquifer recharge during the previous wet season.

Surface water monitoring sites DPSW4 and DPSW5 were established and sampled for the first time during the recent monitoring round on 23 and 24 January 2017. These are both within the Latram River catchment located on tributaries north and northeast of the mine respectively. The watercourse of DPSW4 drains a small proportion of the proposed mining area, and DPSW5 does not receive any run-off from the mining area and will hence be used as a background reference site.

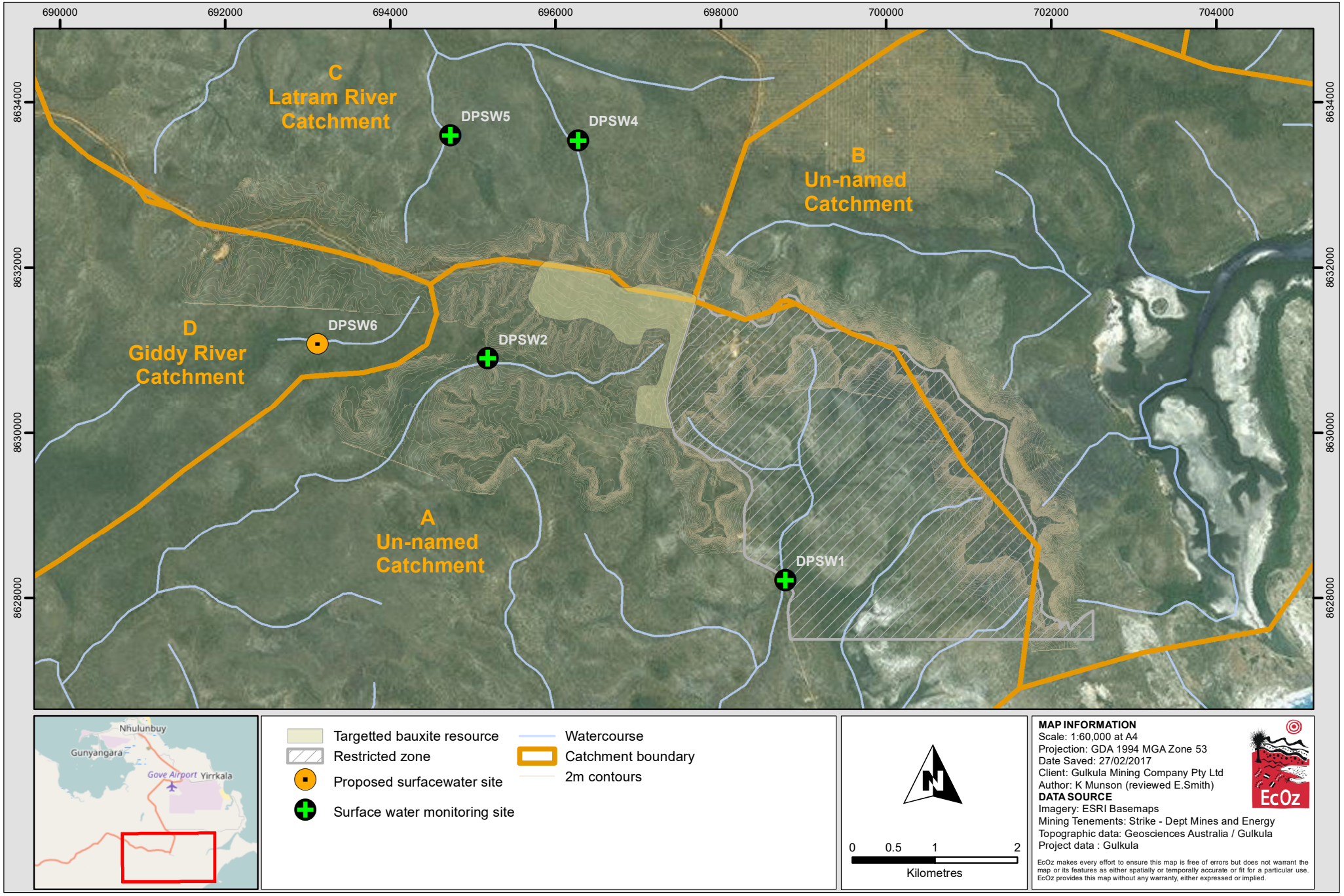
Proposed surface water monitoring site DPSW6 has not yet been visited or sampled. This site will be included in future monitoring rounds. It is located west of the mine site on an upper tributary of the Giddy River. The watercourse of DPSW6 does not receive any run-off from the mine and will represent an additional background reference site.

The watercourses of DPSW4, DPSW5 and DPSW6 would likely dry up during most dry seasons depending on total rainfall for the previous wet season.

Table 2-1 summarises the details of the five routine surface water monitoring sites.

Two sites have been visited and sampled but deemed unsuitable for the ongoing monitoring program. DPS1 was sampled during the April 2016 field survey and is located south of the mine in a small drainage line, or soak (referred to as the 'west soak'), fed by a spring (Figure 2-2). The soak supports an area of rainforest at the base of the plateau and has been the subject of habitat surveys for the endangered Gove Crow Butterfly, *Euploea alcathoe enastri* (see EcOz 2017b). The soak is not considered suitable as a surface water monitoring site because it has poor surface water flow, and is not representative of surface water run-off from the mining area. It is more representative of groundwater, which will be covered in the mine's groundwater monitoring program. The final design of this monitoring program will be developed following the drilling of groundwater monitoring bores in April / May 2017 and may include this soak as a groundwater monitoring site.

A site identified as DPSW3 was sampled during the January 2017 monitoring round but due to difficult access was later deemed as unsuitable as an ongoing monitoring site and was replaced by DPSW5. Original site names are retained to be consistent with laboratory documentation (Appendix A) and field data documentation.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ16005 - Dhupuma Surface and Groundwater Studies\01 Project Files\Figure 2-2. Location of surface water monitoring sites and catchment boundaries.mxd

Figure 2-2. Location of surface water monitoring sites and catchment boundaries.

Table 2-1. Routine surface water monitoring site details

Site ID	Coordinates MGA Zone 53		Catchment	Monitoring Purpose	Flows
	Easting	Northing			
DPSW1	136.8285	-12.4028	Un-named catchment A – site receives run-off from eastern side of mine, staff training and accommodation facilities and associated amenities and septic absorption trench.	Early detection of surface water impacts from mining, in particular eastern side of mining area, staff training and accommodation facilities.	Likely to flow throughout the year.
DPSW2	136.7952	-12.3788	Un-named catchment A – site receives run-off from majority of mine pit area, associated roads, office and workshops.	Early detection of surface water impacts from mining, in particular mine pit area, office and workshop.	May dry up towards end of dry season.
DPSW4	136.8051	-12.3549	Latram River catchment – site receives run-off from small proportion of mine pit area.	Early detection of surface water impacts from mining, in particular northern edge of mine.	Likely to dry up in dry season.
DPSW5	136.7909	-12.3544	Latram River catchment – site does not receive any run-off from mine.	Background reference site	Likely to dry up in dry season.
DPSW6	136.7762	-12.3774	Giddy River catchment – site does not receive any run-off from mine.	Background reference site	Likely to dry up in dry season.

2.2.1 Surface water monitoring site access information

The following site access information is provided to assist those undertaking future surface water sampling.

DPSW1

Surface water monitoring site DPSW1 is located approximately 3.6 km south-east of the old Dhupuma College (Garma) site (Figure 2-3). DPSW1 can be accessed using a vehicle via the Port Bradshaw Road and sampled from the boxed culvert bridge on the median strip.

DPSW2

DPSW2 is located approximately 1.2 km south of the Central Arnhem Highway or 2.5 km west-south-west of the Dhupuma College site (Figure 2-3). DPSW2 can be accessed using a vehicle via the existing drill lines (tracks); followed by a short hike of approximately 1 km through the bush. Vehicle access using the existing drill lines during the wet season is limited and often not possible. At these times, the site can be accessed via a short 1.2 km hike through the bush from the Central Arnhem Highway; as was done during the January 2017 monitoring round (Figure 2-3).

DPSW4

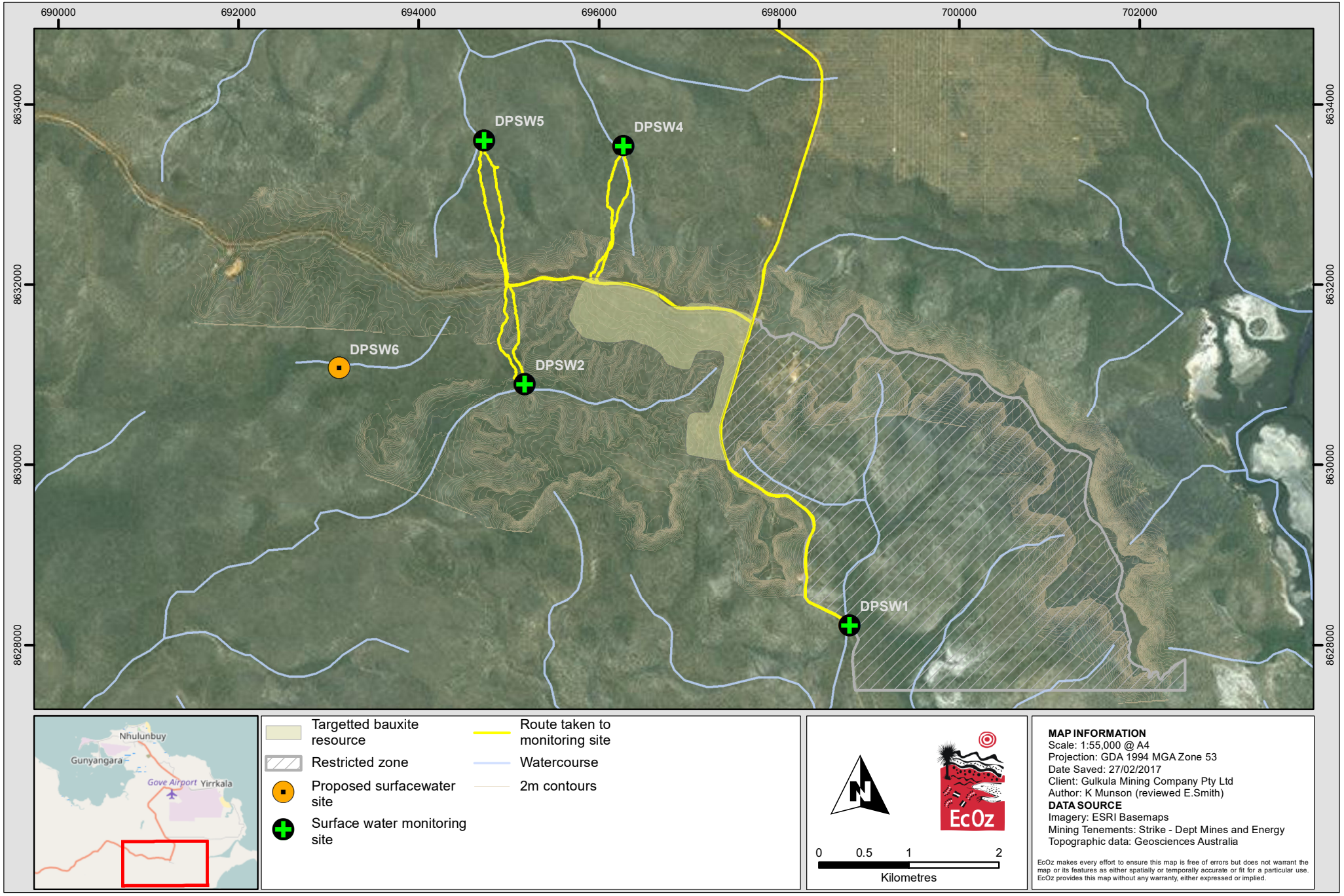
DPSW4 is located approximately 1.5 km north of the Central Arnhem Highway (Figure 2-3). This site can only be accessed on foot through the bush; there are no existing tracks or drill lines.

DPSW5

DPSW5 is located approximately 1.6 km north of the Central Arnhem Highway (Figure 2-3). This site can only be accessed on foot through the bush; there are no existing tracks or drill lines.

DPSW6

DPSW6 has not yet been visited, but an approximate location has been chosen for future sampling (Figure 2-3, coordinates in Table 2-1). Access to this site will require a short hike of approximately 1 km through the bush from the Central Arnhem Highway; there are no existing tracks or drill lines.



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Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ16005 - Dhupuma Surface and Groundwater Studies\01 Project Files\Figure 2-3. Routes taken to surface water monitoring sites during January 2017 monitoring.mxd

Figure 2-3. Routes taken to surface water monitoring sites during January 2017 monitoring.

2.3 Water quality parameters

Water quality parameters selected for monitoring are based on the risks identified in Section 1.2, and listed in Table 2-2.

Physical parameters are measured in-situ using hand-held field meters and provide basic information on current water quality condition. Parameters such as temperature, pH and oxidation reduction potential (ORP) can influence the form of other parameters, such as the solubility of metals and amount of ammonia versus ammonium. Dissolved oxygen (DO) levels can indicate the water source and/or presence of algal blooms, or excessive organic loads. Turbidity indicates possible erosion and sedimentation issues; as does electrical conductivity (EC), total dissolved solids (TDS) and salinity. EC, pH and ORP can also indicate the water source (surface or groundwater) or AMD issues.

Samples for laboratory analysis are collected into laboratory-supplied bottles for required sample preservation, and delivered to the laboratories for analysis. Cations, anions and alkalinity reflect the water source and can indicate major changes in water chemistry due to catchment impacts. Dissolved metals may increase due to the discharge of mine pit water. Nutrients may increase due to erosion and sedimentation, or seepage from septic systems. Hydrocarbons can indicate pollution from vehicles, machinery, workshops or fuel storages.

Table 2-2. Water quality parameters to be monitored

Physical Parameters
Temperature, pH, Dissolved Oxygen (DO), Electrical Conductivity (EC), Total Dissolved Solids (TDS), Salinity, Turbidity, Oxidation Reduction Potential (ORP). Also record flow conditions, L/s if possible, or fast/medium/slow and any other relevant site observations such as algae, pollutants, odour, water colour etc.
Laboratory Parameters
Major Anions: Hydroxide Alkalinity as $CaCO_3$, Carbonate Alkalinity as $CaCO_3$, Bicarbonate Alkalinity as $CaCO_3$, Total Alkalinity as $CaCO_3$, Sulfate as SO_4, Chloride
Major Cations: Calcium, Magnesium, Sodium, Potassium
Nutrients: Ammonia (NH_3) as N, Nitrite (NO_2) as N, Nitrate (NO_3) as N, Nitrite + Nitrate (NO_x) as N, Total Kjeldahl Nitrogen (TKN) as N, Total Nitrogen (TN) as N, Total Phosphorus (TP) as P, Reactive Phosphorus as P
Dissolved Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Zinc, Mercury
Hydrocarbons: *Total Petroleum Hydrocarbons (TPH) NEPM 1999 Fractions:* C_6 - C_9 Fraction, C_{10} - C_{14} Fraction, C_{15} - C_{28} Fraction, C_{29} - C_{36} Fraction, C_{10} - C_{36} Fraction (sum) *Total Recoverable Hydrocarbons NEPM 2013 Fractions:* C_6 - C_{10} Fraction, C_6 - C_{10} Fraction minus BTEX (F1), $>C_{10}$ - C_{16} Fraction, $>C_{16}$ - C_{34} Fraction, $>C_{34}$ - C_{40} Fraction, $>C_{10}$ - C_{40} Fraction (sum), $>C_{10}$ - C_{16} Fraction - Naphthalene (F2) *BTEXN:* Benzene, Toluene, Ethylbenzene, meta- & para-Xylene, ortho-Xylene, Total Xylenes, Sum of BTEX, Naphthalene

2.4 Monitoring frequency

Surface water monitoring will be undertaken at least three times during the wet season and once during the dry season at sites where flow is maintained. Sampling frequency and timing will be reviewed after a year of data collection.

Suggested timing of monitoring rounds in 2017 / 2018:

2017 mid-late wet season: January (already completed), March, May – all five monitoring sites.

2017 dry season: August – only sites with flow, probably only DPSW1, possibly DPSW2.

2017/2018 wet season: November/December (depending on rainfall and flows), January/February, March/April – all five monitoring sites.

2.5 Water quality assessment criteria

Until adequate baseline reference data is collected, the ANZECC 2000 *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000 guidelines) will be used for comparison purposes. This includes Tables 3.3.4-3.3.5 *Tropical Australia: default trigger values for physical and chemical stressors for tropical Australia for slightly disturbed ecosystems*, in particular those for "Upland river" systems, and Table 3.4.1 *Trigger values for toxicants*, in particular those for "freshwater, 95% species protection". The specific trigger values are listed in Tables 3-1 and 3-2 below.

Baseline reference data will be important for defining site-specific trigger values for the monitoring program. This reference data will include the pre-mining monitoring data collected from all five routine monitoring sites, and on-going data collected from the two reference sites (DPSW5 and DPSW6) which are located outside any influences from mining operations but subject to similar catchment conditions as the sites downstream of mining operations (DPSW1, DPSW2, DPSW4).

It is important to note that the limited baseline data collected so far (April 2016 and January 2017) indicate that some parameters are already outside the ANZECC 2000 trigger values (see Section 3 below). As such, a breach in these trigger values during mining operations would not necessarily indicate impacts from mining.

3 Baseline Surface Water Monitoring Results

3.1 Rainfall and site conditions

The latest January 2017 monitoring round coincided with typically the wettest period of the wet season (see Figure 2-1), whereas the previous April 2016 monitoring round coincided with the late wet season when rainfalls are reducing.

At the time of sampling on 23 and 24 January 2017, the site was experiencing heavy monsoon rainfall conditions. Based on rainfall records from the nearest BoM Station at Gove Airport (14508), around 185 mm had fallen between 1 January 2017 and the start of sampling on 23 January. Another 71 mm fell during the two days of sampling. All sites were flowing rapidly at the time of sampling.

In contrast, prior to sampling on 7 April 2016 there had been a period of 20 days with little rainfall. The 2015/2016 wet season had also been very unusual, with no rain until mid-December when 360 mm fell, then almost no rain in January, and below average rainfall in March and February. The three sites sampled had slow to moderate water flow.

3.2 Baseline physical parameters

Table 3-1 provides physical parameter results for the April 2016 and January 2017 baseline monitoring rounds compared against the ANZECC 2000 guidelines.

The discontinued monitoring site DPS1 stands out as having a high proportion of groundwater inflow with much higher EC, TDS, salinity, and lower DO than the other sites. The higher turbidity may be caused by the shallowness of this watercourse.

For DPSW1 and DPSW2, the concentration of most parameters is similar during both the April 2016 and January 2017 monitoring rounds. The only change is a more acidic pH and slightly lower DO during January 2017. The more acidic pH is likely due to the greater input of fresh rainwater, which is naturally acidic in tropical regions (see Ayers et al. 1993, Galloway et al. 1982, Gillet et al. 1990, Noller et al. 1990), and the lower DO may be from a higher organic / nutrient load in runoff into the waterways increasing oxygen demand (see Section 3.3 below).

Notable baseline results for site DPSW4, located on the northern side of the proposed mine, are a lower EC and ORP compared to the other sites, and a higher turbidity.

Table 3-1. Physical parameter results for April 2016 and January 2017 monitoring rounds
Highlighted concentrations are outside ANZECC 2000 (Tables 3.3.4-3.3.5) *Tropical Australia default trigger values for physical and chemical stressors for tropical Australia for slightly disturbed ecosystems* "Upland river".

Site		ANZECC 2000 Trigger Values	DPSW1	DPSW2	DPS1	DPSW1	DPSW2	DPSW4	DPSW5
Date Sampled			7/04/2016	7/04/2016	8/04/2016	23/01/2017	24/01/2017	24/01/2017	23/01/2017
Time	24 hrs		1300	1700	1000	1030	1040	1215	1615
Flow	L/s or fast/med/slow		58.5	2.0-5.0	<1	fast	fast	fast	fast
pH	pH unit	6.0-7.5	6.72	6.24	6.58	5.34	5.25	6.14	5.60
Temp	°C		30.8	31.5	28.0	26.8	27.4	27.0	27.4
ORP	mV		161.0	169.0	184.0	139.9	130.2	11.1	134.7
EC	µS/cm	250	92.1	65.1	473	89.7	53.3	33.3	71.4
TDS	g/L		0.06	0.04	0.30	0.06	0.03	0.02	0.05
Salinity	ppt		0.00	0.00	0.20	0.04	0.02	0.01	0.03
DO	%sat	90-120	104	94	67	88	76	100	91
Turbidity	NTU	15	7.5	2.9	21.0	9.4	2.8	30.3	12.7

3.3 Baseline laboratory parameters

Table 3-2 provides laboratory parameter results for the April 2016 and January 2017 baseline monitoring rounds compared against the ANZECC 2000 guidelines.

Similarly to the physical parameter results, the discontinued monitoring site DPS1 stands out as having a high proportion of groundwater inflow with much higher alkalinity, chloride, sodium, and potassium concentrations; whereas all anion and cation concentrations were low at all other sites in both April 2016 and January 2017.

All hydrocarbon and dissolved metal concentrations were below detection limits at all sites in both April 2016 and January 2017, except for a low zinc concentration at DPS1.

Nutrient concentrations were commonly above the ANZECC 2000 guidelines; in particular nitrogen species. Ammonia was above the trigger value at all sites in both April 2016 and January 2017, except DPSW1 in April 2016. DPSW4 had a much higher ammonia concentration than the other sites. Ammonia was also higher in January 2017 than in April 2016 at sites DPSW1 and DPSW2.

Due to the laboratory limits of reporting for NOx, it is not possible to determine if the April 2016 results were above the ANZECC 2000 trigger value. The January 2017 results, however, were above the trigger value at DPSW2 and DPSW4.

The TKN concentration and TN concentration is measured as the same at all sites in both April 2016 and January 2017. Therefore, the nitrogen present is predominantly in two forms – either ammonia or organic N – since TKN is the sum of ammonia and organic N. Subtracting the ammonia concentration from the TKN concentration shows that the majority of nitrogen in surface water is organic in for example, organic tannins and fine organic debris. Notably, site DPS1, which is predominantly groundwater, not surface water, has low TKN and slightly higher TP compared to the other sites.

Table 3-2. Laboratory parameter results for April 2016 and January 2017 monitoring rounds

Highlighted concentrations are outside ANZECC 2000 (Table 3.4.1) *Trigger values for toxicants* "freshwater, 95% species protection" for metals and hydrocarbons, and ANZECC 2000 (Tables 3.3.4-3.3.5) *Tropical Australia default trigger values for physical and chemical stressors for tropical Australia for slightly disturbed ecosystems* "Upland river" for nutrients.

Site		ANZECC 2000 Trigger Values	DPSW1	DPSW2	DPS1	DPSW1	DPSW2	DPSW4	DPSW5
Date Sampled			7/04/2016	7/04/2016	8/04/2016	23/01/2017	24/01/2017	24/01/2017	23/01/2017
Time	24 hrs		1300	1700	1000	1030	1040	1215	1615
Major Anions									
Hydroxide Alkalinity as CaCO3	mg/L		<10	<10	<10	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L		<10	<10	<10	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L		<20	<20	23	3	5	2	<1
Total Alkalinity as CaCO3	mg/L		<20	<20	23	3	5	2	<1
Sulfate as SO4	mg/L		<1	<1	<1	1	<1	<10	7
Chloride	mg/L		24	14	130	20	10	5	16
Major Cations									
Calcium	mg/L		1	<0.5	5.7	<1	<1	<1	<1
Magnesium	mg/L		1.4	0.9	6.3	1	<1	<1	1
Sodium	mg/L		13	8.5	61	12	8	5	13
Potassium	mg/L		<0.5	<0.5	2.8	<1	<1	<1	<1
Dissolved Metals									
Arsenic	mg/L	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.0014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.001	<0.001	0.002	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nutrients									
Ammonia as N	mg/L	0.0060	0.02	<0.01	0.02	0.06	0.08	0.11	0.04
Nitrite as N	mg/L		<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L		<0.02	<0.02	<0.02	<0.01	0.05	0.04	0.01
Nitrite + Nitrate as N	mg/L	0.03	<0.05	<0.05	<0.05	<0.01	0.05	0.04	0.01
TKN as N	mg/L		0.14	0.13	<0.1	0.2	0.2	0.3	0.1
Total Nitrogen as N	mg/L	0.15	0.14	0.13	<0.1	0.2	0.2	0.3	0.1
Total Phosphorus as P	mg/L	0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01
Reactive Phosphorus as P	mg/L	0.005	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01
Total Petroleum Hydrocarbons NEPM 1999 Fractions									
C6 - C9 Fraction	µg/L		-	-	-	<20	<20	<20	<20
C10 - C14 Fraction	µg/L		<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L		<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	µg/L		<100	<100	<100	<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L		<100	<100	<100	<50	<50	<50	<50
Total Recoverable Hydrocarbons NEPM 2013 Fractions									
C6 - C10 Fraction	µg/L		-	-	-	<20	<20	<20	<20
C6 - C10 Fraction minus BTEX (F1)	µg/L		-	-	-	<20	<20	<20	<20
>C10 - C16 Fraction	µg/L		<50	<50	<50	<100	<100	<100	<100
>C16 - C34 Fraction	µg/L		<100	<100	<100	<100	<100	<100	<100
>C34 - C40 Fraction	µg/L		<100	<100	<100	<100	<100	<100	<100
>C10 - C40 Fraction (sum)	µg/L		-	-	-	<100	<100	<100	<100
>C10 - C16 Fraction - Naphthalene (F2)	µg/L		-	-	-	<100	<100	<100	<100
BTEXN									
Benzene	µg/L	950	-	-	-	<1	<1	<1	<1
Toluene	µg/L		-	-	-	<2	<2	<2	<2
Ethylbenzene	µg/L		-	-	-	<2	<2	<2	<2
meta- & para-Xylene	µg/L		-	-	-	<2	<2	<2	<2
ortho-Xylene	µg/L	350	-	-	-	<2	<2	<2	<2
Total Xylenes	µg/L		-	-	-	<2	<2	<2	<2
Sum of BTEX	µg/L		-	-	-	<1	<1	<1	<1
Naphthalene	µg/L		-	-	-	<5	<5	<5	<5

3.4 Summary of baseline surface water quality

The following points are highlighted in regards to baseline surface water quality:

- pH can be slightly acidic (between 4 and 6) due to the input of rainfall, which is naturally acidic in tropical regions.
- DO levels may be lower during wet season rains due to the input of nutrients and organic matter increasing oxygen demand.
- Turbidity can, at times, be moderately above the ANZECC 2000 trigger value due to wet season rainfall and runoff, such as at DPSW4 in January 2017.
- The water quality at discontinued monitoring site DPS1 indicates a high groundwater input with much higher EC, lower DO and higher alkalinity, chloride, sodium and potassium concentrations than the other sites.
- Nitrogen species concentrations (ammonia, NO_x and TN) are already above the ANZECC 2000 guidelines at all sites (except the discontinued DPS1). Most nitrogen in surface water exists as organic nitrogen, from sources such as natural plant tannins and fine organic debris.
- Dissolved metal and hydrocarbon concentrations were all below detection limits at all sites in both April 2016 and January 2017 (except a low zinc concentration at discontinued DPS1).

4 Conclusions and Recommendations

This report outlines the surface water monitoring program to be undertaken before and during mining operations, and the results of two pre-mining baseline monitoring rounds. It is recommended the monitoring program be implemented as specified in this plan in order to detect any mining impacts on downstream environments at an early stage, and to allow time for early corrective action. Undertaking this monitoring program will also allow GMC to demonstrate the mine is not impacting downstream environments; assuming the mitigation measures outlines in Section 1.2 are effective.

The baseline surface water quality results indicate that some parameters are already outside the default ANZECC 2000 guidelines despite the absence of mining activity. This highlights the importance of collecting adequate baseline water quality data for calculating site-specific trigger values that would represent a better measure for detecting mining impacts than the ANZECC 2000 guidelines. It is recommended that at least two more pre-mining monitoring rounds are undertaken in order to obtain this data. These monitoring rounds would need to occur before the end of the 2016/2017 wet season to ensure good flows at all five monitoring sites.

5 Acronyms

AMD	Acid Mine Drainage
ANZECC	Australian New Zealand Environment and Conservation Council
BoM	Bureau of Meteorology
BTEXN	Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene
DO	Dissolved Oxygen
EC	Electrical Conductivity
EL	Exploration Licence
EPBC	Environment Protection and Biodiversity Conservation Act
GMC	Gulkula Mining Company Pty Ltd
ML	Mineral Lease
MMP	Mining Management Plan
NH_3	Ammonia
NO_2	Nitrite
NO_3	Nitrate
NO_x	Nitrite + Nitrate
ORP	Oxidation Reduction Potential
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
WMP	Water Management Plan

6 References

ANZECC 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Paper No. 4, Volume 1, The Guidelines, Chapters 1-7, National Water Quality Management Strategy, October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC), Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra, ACT.

Ayers, G.P., Gillett, R.W., Selleck, P., Warne, J.O., Huysing, P. & Forgan, B.W. 1993, *A pilot study on rain-water composition at Darwin Airport*. Australian Meteorological Magazine 42 (1993), 143-150.

EcOz 2016, *EL 30226 Hydrology and Hydrogeology Assessment*, report prepared for Gulkula Mining Company Pty Ltd by EcOz Environmental Consultants Pty Ltd, April 2016, Darwin, NT.

EcOz 2017a, *Response to EPBC Act Referral Request for Additional Groundwater Information, Dhupuma Plateau Bauxite Mine Project, Gove NT*, report prepared for Gulkula Mining Company Pty Ltd by Simon Fulton, consultant to EcOz Environmental Consultants Pty Ltd, February 2017, Darwin, NT.

EcOz 2017b, *Gove Crow Butterfly – habitat assessment*, report prepared for Gulkula Mining Company Pty Ltd by EcOz Environmental Consultants Pty Ltd, February 2017, Darwin, NT.

Galloway, J.N., Linkens, G.E., Keene, W.C. and Miller, J.M. 1982, The composition of precipitation in remote areas of the world. *Journal of Geophysical Research* 87, 8771-86.

Gillett R.W., Ayers G.P. & Noller B.N. 1990, Rainwater acidity at Jabiru, in the wet season of 1983/84. *The Science of the Total Environment* 92, 129-144.

Noller B.N., Currey N.A., Ayers G.P. & Gillett R.W. 1990, Chemical composition and acidity of rainfall in the Alligator Rivers region, Northern Territory, Australia. *The Science of the Total Environment* 91, 23-48.

Prowse, G, Zaar, U, Tickell, S and Matthews, I, 1999, *Water resources of East Arnhem Land 1:250,000 map*, Department of Lands, Planning and Environment, Palmerston, NT.

Appendix A Laboratory Documentation for 7 April 2016 and 23 and 24 January 2017 Sampling

Includes for each monitoring round:

Chain of Custody (COC)

Sample Receipt Notification (SRN)

Certificate of Analysis (COA)

QA/QC Documentation

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0680 E: adelaide@alsglobal.com

☐ BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐ GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

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

☐ MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐ MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐ NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐ NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

☐ PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

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

☐ TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☒ WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: EcOz Environmental	**TURNAROUND REQUIREMENTS :** ☑ Standard TAT (List due date):		
OFFICE: Darwin	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):		
PROJECT: EZ16121 Dhupuma Surface Water - Jan 2017	**ALS QUOTE NO.:** SYBQ/284/16	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7	
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	
PROJECT MANAGER: Emma Smith	**CONTACT PH:** 08 8981 1100		
SAMPLER: Simon Ruckenstuhl, Harriet Allen	**SAMPLER MOBILE:** 0430835540	**RELINQUISHED BY:**	**RECEIVED BY:** Lana ALS
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**	DATE/TIME: 30/1/17	DATE/TIME: 30-01-17 1200
Email Reports to: emma.smith@ecoz.com.au,		**RELINQUISHED BY:**	**RECEIVED BY:**
Email Invoice to: lyndall.ryan@ecoz.com.au, emma.smith@ecoz.com.au		DATE/TIME:	DATE/TIME: 31/1/17 1500

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price)
Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	NT-1:Cations (Ca, Mg, Na,K)	NT-2:Anions major (Cl, SO4, Alkalinity)	W-5: 8 Metals Dissolved/TPH/BTEXN	NT-4A:Total Nitrogen, TKN, Nox, NO2, NO3,NH3, Total Phosphorus, Reactive P										Additional Information
1	DPWS2	24/01/2017 10:40		P,SP,VS,AP,AG	6	x	x	x	x										
2	DPSW4	24/01/2017 12:15		P,SP,VS,AP,AG	6	x	x	x	x										
				TOTAL															

Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

ES1701995

LAB OF ORIGIN: DARWIN

Environmental Division
Sydney
Work Order Reference
ES1701995

Telephone : +61-2-8784 8555

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

HT

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

BRISBANE 32 Shand Street, Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

CAIRNS 21/42 Mc Gregor Road Smithfield QLD 4878 Ph: 07 4796 0300 E: cairns@alsglobal.com

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

MELBOURNE 4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: melbourne@alsglobal.com

NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

ORANGE 10 Warne Street Orange NSW 2800 Ph: 02 6372 6735 E: orange.mail@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

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

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0300 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: EcOz Environmental	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☑ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)** Custody Seal Intact? Yes / No / N/A
OFFICE: Darwin		☐ Non Standard or urgent TAT (List due date):	Cooling Method: Ice / Ice Bricks / Frozen / Ice Bricks present upon arrival? Yes / No / N/A
PROJECT: EZ16121 Dhupuma Surface Water - Jan 2017	**ALS QUOTE NO.:** SYBQ/284/16	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	Other comments:
PROJECT MANAGER: Emma Smith	**CONTACT PH:** 08 8981 1100		
SAMPLER: Simon Ruckenstuhl, Harriet Allen	**SAMPLER MOBILE:** 0430835540		
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to: emma.smith@ecoz.com.au			
Email Invoice to: lyndall.ryan@ecoz.com.au, emma.smith@ecoz.com.au			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
H Allen	SOYS		
DATE/TIME: 24/1/17	DATE/TIME: 25/1/17 1430	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).													Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS		NT-1: Cations (Ca, Mg, Na, K)	NT-2: Anions major (Cl, SO4, Alkalinity)	W-5: 6 Metals Dissolved / TPH/ BTEXN	NT-8A: Total Nitrogen, TKN, NOx, NO2, NO3, NH3, Total Phosphorus, Reactive P									
1	DUP	23/1/17 10:30	W	P, SP, VS, AP, AG	6		✓	✓	✓	✓									
2	DPSW1	23/1/17 10:30	"	" "	6		✓	✓	✓	✓									
3	DPSW5	23/1/17 16:15	"	" "	6		✓	✓	✓	✓									
					TOTAL														

Environmental Division Sydney
Work Order Reference
ES1701848

Telephone : + 61-2-8784 8555

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1701995**

Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: emma.smith@ecoz.com.au	E-mail	: ALSEnviro.Sydney@alsglobal.com
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Facsimile	: +61 08 89811102	Facsimile	: +61-2-8784 8500
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Page	: 1 of 2
Order number	: ----	Quote number	: ES2016ECOZENV0008 (SYBQ-284-16)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Harriet Allen, Simon Ruckenstuhl		

Dates

Date Samples Received	: 31-Jan-2017 15:00	Issue Date	: 31-Jan-2017
Client Requested Due Date	: 06-Feb-2017	Scheduled Reporting Date	: **06-Feb-2017**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 12.6'c - Ice present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P +	WATER - W-05 TRH/BTEXN/8 Metals
ES1701995-001	24-Jan-2017 10:40	DPWS2	✓	✓	✓
ES1701995-002	24-Jan-2017 12:15	DPSW4	✓	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

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

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
DPSW4	Clear Plastic Bottle - Natural	----	26-Jan-2017	31-Jan-2017	×	----	----
DPWS2	Clear Plastic Bottle - Natural	----	26-Jan-2017	31-Jan-2017	×	----	----
EK071G: Reactive Phosphorus as P-By Discrete Analyser							
DPSW4	Clear Plastic Bottle - Natural	----	26-Jan-2017	31-Jan-2017	×	----	----
DPWS2	Clear Plastic Bottle - Natural	----	26-Jan-2017	31-Jan-2017	×	----	----

Requested Deliverables

EMMA SMITH

- *AU Certificate of Analysis - NATA (COA)	Email	emma.smith@ecoz.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	emma.smith@ecoz.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	emma.smith@ecoz.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	emma.smith@ecoz.com.au
- A4 - AU Tax Invoice (INV)	Email	emma.smith@ecoz.com.au
- Chain of Custody (CoC) (COC)	Email	emma.smith@ecoz.com.au
- EDI Format - ENMRG (ENMRG)	Email	emma.smith@ecoz.com.au
- EDI Format - ESDAT (ESDAT)	Email	emma.smith@ecoz.com.au

LYNDALL RYAN

- A4 - AU Tax Invoice (INV)	Email	Lyndall.ryan@ecoz.com.au

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1701848**

Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: emma.smith@ecoz.com.au	E-mail	: ALSEnviro.Sydney@alsglobal.com
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Facsimile	: +61 08 89811102	Facsimile	: +61-2-8784 8500
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Page	: 1 of 2
Order number	: ----	Quote number	: ES2016ECOZENV0008 (SYBQ-284-16)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: HARRIET ALLEN, SIMON RUCKENSTUHL		

Dates

Date Samples Received	: 25-Jan-2017 14:30	Issue Date	: 25-Jan-2017
Client Requested Due Date	: 01-Feb-2017	Scheduled Reporting Date	: **01-Feb-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 22.2 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P +	WATER - W-05 TRH/BTEXN/8 Metals
ES1701848-001	23-Jan-2017 10:30	DUP	✓	✓	✓
ES1701848-002	23-Jan-2017 10:30	DPSW1	✓	✓	✓
ES1701848-003	23-Jan-2017 16:15	DPSW5	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

EMMA SMITH

- *AU Certificate of Analysis - NATA (COA)	Email	emma.smith@ecoz.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	emma.smith@ecoz.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	emma.smith@ecoz.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	emma.smith@ecoz.com.au
- A4 - AU Tax Invoice (INV)	Email	emma.smith@ecoz.com.au
- Chain of Custody (CoC) (COC)	Email	emma.smith@ecoz.com.au
- EDI Format - ENMRG (ENMRG)	Email	emma.smith@ecoz.com.au
- EDI Format - ESDAT (ESDAT)	Email	emma.smith@ecoz.com.au

LYNDALL RYAN

- A4 - AU Tax Invoice (INV)	Email	Lyndall.ryan@ecoz.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1701995**	Page	: 1 of 6
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 31-Jan-2017 15:00
Order number	: ----	Date Analysis Commenced	: 31-Jan-2017
C-O-C number	: ----	Issue Date	: 03-Feb-2017 12:42
Sampler	: Harriet Allen, Simon Ruckenstuhl		
Site	: ----		
Quote number	: SYBQ-284-16		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	DPWS2	DPSW4	----	----	----
			Client sampling date / time	24-Jan-2017 10:40	24-Jan-2017 12:15	----	----	----
Compound	CAS Number	LOR	Unit	ES1701995-001	ES1701995-002	--------	--------	--------
				Result	Result	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**5**	**2**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**5**	**2**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<10	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**10**	**5**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	----	----	----
Magnesium	7439-95-4	1	mg/L	<1	<1	----	----	----
Sodium	7440-23-5	1	mg/L	**8**	**5**	----	----	----
Potassium	7440-09-7	1	mg/L	<1	<1	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.08**	**0.11**	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.05**	**0.04**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.05**	**0.04**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**0.3**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	DPWS2	DPSW4	----	----	----
			Client sampling date / time	24-Jan-2017 10:40	24-Jan-2017 12:15	----	----	----
Compound	CAS Number	LOR	Unit	ES1701995-001	ES1701995-002	--------	--------	--------
				Result	Result	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.2**	**0.3**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.01**	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**0.38**	**0.18**	----	----	----
Total Cations	----	0.01	meq/L	**0.35**	**0.22**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	DPWS2	DPSW4	----	----	----
				Client sampling date / time	24-Jan-2017 10:40	24-Jan-2017 12:15	----	----	----
Compound	CAS Number	LOR	Unit		ES1701995-001	ES1701995-002	--------	--------	--------
					Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	2	%		**95.8**	**94.1**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%		**101**	**98.0**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**99.8**	**94.9**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1701848**	Page	: 1 of 6
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 25-Jan-2017 14:30
Order number	: ----	Date Analysis Commenced	: 25-Jan-2017
C-O-C number	: ----	Issue Date	: 02-Feb-2017 09:12
Sampler	: HARRIET ALLEN, SIMON RUCKENSTUHL		
Site	: ----		
Quote number	: SYBQ-284-16		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	DUP	DPSW1	DPSW5	----	----
			Client sampling date / time	23-Jan-2017 10:30	23-Jan-2017 10:30	23-Jan-2017 16:15	----	----
Compound	CAS Number	LOR	Unit	ES1701848-001	ES1701848-002	ES1701848-003	--------	--------
				Result	Result	Result	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**3**	**3**	<1	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**3**	**3**	<1	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**1**	**1**	**7**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**20**	**20**	**16**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	<1	----	----
Magnesium	7439-95-4	1	mg/L	**1**	**1**	**1**	----	----
Sodium	7440-23-5	1	mg/L	**13**	**12**	**13**	----	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.07**	**0.06**	**0.04**	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	**0.01**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	**0.01**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**0.2**	**0.1**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	DUP	DPSW1	DPSW5	----	----
			Client sampling date / time	23-Jan-2017 10:30	23-Jan-2017 10:30	23-Jan-2017 16:15	----	----
Compound	CAS Number	LOR	Unit	ES1701848-001	ES1701848-002	ES1701848-003	--------	--------
				Result	Result	Result	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.2**	**0.2**	**0.1**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.20**	<0.01	<0.01	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.02**	<0.01	<0.01	**----**	**----**
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**0.64**	**0.64**	**0.60**	**----**	**----**
Total Cations	----	0.01	meq/L	**0.65**	**0.60**	**0.65**	**----**	**----**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	**----**	**----**
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	**----**	**----**
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	**----**	**----**
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	**----**	**----**
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	**----**	**----**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	**----**	**----**
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	**----**	**----**
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	**----**	**----**
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	**----**	**----**
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	**----**	**----**
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	**----**	**----**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	**----**	**----**
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	**----**	**----**
Toluene	108-88-3	2	µg/L	<2	<2	<2	**----**	**----**
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	**----**	**----**
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	**----**	**----**
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	**----**	**----**
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	**----**	**----**
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	**----**	**----**
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	DUP	DPSW1	DPSW5	----	----
				Client sampling date / time	23-Jan-2017 10:30	23-Jan-2017 10:30	23-Jan-2017 16:15	----	----
Compound	CAS Number	LOR	Unit		ES1701848-001	ES1701848-002	ES1701848-003	--------	--------
					Result	Result	Result	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	2	%		**129**	**122**	**127**	**----**	**----**
Toluene-D8	2037-26-5	2	%		**111**	**98.3**	**102**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**98.5**	**90.6**	**89.3**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1701995**	Page	: 1 of 7
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 31-Jan-2017
Order number	: ----	Date Analysis Commenced	: 31-Jan-2017
C-O-C number	: ----	Issue Date	: 03-Feb-2017
Sampler	: Harriet Allen, Simon Ruckenstuhl		
Site	: ----		
Quote number	: SYBQ-284-16		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 739512)									
ES1701915-009	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	4	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	4	4	0.00	No Limit
ES1701300-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	442	458	3.44	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	442	458	3.44	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 738223)									
ES1702141-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	180	182	1.17	0% - 20%
ES1701995-001	DPWS2	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 738224)									
ES1702141-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	44	44	0.00	0% - 20%
ES1701995-001	DPWS2	ED045G: Chloride	16887-00-6	1	mg/L	10	11	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 738577)									
ES1701940-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	240	238	1.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	35	32	7.05	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	77	73	5.76	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	16	16	0.00	0% - 50%
ES1702042-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	10	10	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	16	17	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 738576)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 738576) - continued									
ES1701940-011	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.017	0.017	0.00	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.031	0.032	4.94	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
ES1701940-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0003	<0.0001	89.2	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.006	0.005	21.2	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.003	43.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.008	0.008	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.037	0.038	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 738578)									
ES1701995-001	DPWS2	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 738532)									
ES1701995-001	DPWS2	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.08	0.00	No Limit
ES1702004-007	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.07	0.07	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 738221)									
ES1702004-007	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1701995-001	DPWS2	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 738533)									
ES1701995-001	DPWS2	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.05	0.04	0.00	No Limit
ES1702004-007	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 738514)									
ES1701995-001	DPWS2	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.1	0.00	No Limit
ES1702007-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.4	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 738513)									
ES1701995-001	DPWS2	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1702007-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.01	0.00	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 738222)									
ES1702004-007	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	<0.01	0.00	No Limit
ES1701995-001	DPWS2	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 738602)									
EB1701699-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1702126-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 738602)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 738602) - continued									
EB1701699-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1702126-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 738602)									
EB1701699-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1702126-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 739512)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	104	81	111
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 738223)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	82	122
ED045G: Chloride by Discrete Analyser (QCLot: 738224)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	88.9	81	127
				<1	1000 mg/L	97.4	81	127
ED093F: Dissolved Major Cations (QCLot: 738577)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.3	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.4	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.9	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.5	85	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 738576)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.0	85	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.8	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	85	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.7	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.0	83	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.3	82	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.9	81	117
EG035F: Dissolved Mercury by FIMS (QCLot: 738578)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	104	83	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 738532)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	99.1	90	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 738221)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	107	82	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 738533)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	95.6	91	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 738514)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	97.4	69	101
				<0.1	1 mg/L	101	70	118
				<0.1	5 mg/L	104	74	118
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 738513)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 738513) - continued								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	85.8	71	101
				<0.01	0.442 mg/L	92.6	72	108
				<0.01	1 mg/L	99.1	78	118
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 738222)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	107	85	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 738485)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	99.7	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	95.6	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	93.8	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 738602)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	92.1	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 738485)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	94.5	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	94.5	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	98.3	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 738602)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	94.6	75	127
EP080: BTEXN (QCLot: 738602)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	91.7	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	93.6	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	101	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	99.0	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	102	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	92.6	70	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 738223)							
ES1701995-001	DPWS2	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	103	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 738224)							
ES1701995-001	DPWS2	ED045G: Chloride	16887-00-6	250 mg/L	105	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 738576)							
ES1701940-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	100	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	98.4	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	99.9	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	103	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	99.5	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	100	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	102	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 738578)							
ES1701969-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	72.2	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 738532)							
ES1701995-001	DPWS2	EK055G: Ammonia as N	7664-41-7	1 mg/L	93.9	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 738221)							
ES1701995-001	DPWS2	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	99.2	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 738533)							
ES1701995-001	DPWS2	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	96.6	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 738514)							
ES1701995-002	DPSW4	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	104	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 738513)							
ES1701995-002	DPSW4	EK067G: Total Phosphorus as P	----	1 mg/L	104	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 738222)							
ES1701995-001	DPWS2	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	98.6	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 738602)							
EB1701699-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	111	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 738602)							
EB1701699-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	110	70	130
EP080: BTEXN (QCLot: 738602)							
EB1701699-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	95.6	70	130
		EP080: Toluene	108-88-3	25 µg/L	97.2	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	108	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	106	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	106	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	93.1	70	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1701848**	Page	: 1 of 7
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Contact	: Customer Services ES
Address	: PO BOX 381 DARWIN NT, AUSTRALIA 0801	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 89811100	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 25-Jan-2017
Order number	: ----	Date Analysis Commenced	: 25-Jan-2017
C-O-C number	: ----	Issue Date	: 02-Feb-2017
Sampler	: HARRIET ALLEN, SIMON RUCKENSTUHL		
Site	: ----		
Quote number	: SYBQ-284-16		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Accreditation No. 825
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ISO/IEC 17025 - Testing

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 733174)									
ES1701840-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	4	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	4	4	0.00	No Limit
ES1701795-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	132	148	11.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	132	148	11.4	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 733203)									
EW1604894-009	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ES1701619-021	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 733202)									
EW1604894-009	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	<1	<1	0.00	No Limit
ES1701619-021	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	10	10	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 734944)									
ES1701699-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	71	70	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	103	103	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	231	229	0.571	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	477	478	0.287	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 734943)									
ES1701657-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0010	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.010	<0.010	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.010	<0.010	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.010	<0.010	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 734943) - continued									
ES1701657-002	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.010	<0.010	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.069	0.066	3.51	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 734945)									
ES1701718-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 734919)									
ES1701669-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.03	98.5	No Limit
ES1701669-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 733204)									
EW1604894-003	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1701619-021	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 734918)									
ES1701669-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1701669-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 734906)									
ES1701628-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	19.6	16.7	15.8	0% - 20%
ES1701671-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	126	121	4.38	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 734907)									
ES1701628-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	36.0	37.2	3.28	0% - 20%
ES1701671-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	52.0	50.0	3.82	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 733206)									
ES1701848-001	DUP	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	<0.01	78.1	No Limit
EW1604894-012	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 734359)									
ES1701705-028	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1701746-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 734359)									
ES1701705-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1701746-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 734359)									
ES1701705-028	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1701746-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 734359) - continued									
ES1701746-002	Anonymous	EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 733174)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	104	81	111
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 733203)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.1	82	122
ED045G: Chloride by Discrete Analyser (QCLot: 733202)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	109	81	127
				<1	1000 mg/L	97.4	81	127
ED093F: Dissolved Major Cations (QCLot: 734944)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100	85	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 734943)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	102	85	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.8	85	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.9	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.2	83	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.6	82	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.0	81	117
EG035F: Dissolved Mercury by FIMS (QCLot: 734945)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	105	83	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 734919)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	103	90	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 733204)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	94.8	82	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 734918)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.2	91	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 734906)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	101	69	101
				<0.1	1 mg/L	108	70	118
				<0.1	5 mg/L	118	74	118
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 734907)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 734907) - continued								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	86.0	71	101
				<0.01	0.442 mg/L	93.4	72	108
				<0.01	1 mg/L	113	78	118
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 733206)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	98.5	85	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 733969)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	87.4	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	90.7	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	85.0	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 734359)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	102	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 733969)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	87.0	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	91.9	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	90.0	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 734359)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	103	75	127
EP080: BTEXN (QCLot: 734359)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	105	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	96.8	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	87.5	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	85.7	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	87.2	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	89.8	70	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 733203)							
ES1701619-021	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	101	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 733202)							
ES1701619-021	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	96.4	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 734943)							
ES1701657-003	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	96.0	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	98.5	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	98.9	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	95.2	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	99.0	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	99.5	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	97.9	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 734945)							
ES1701707-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	81.3	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 734919)							
ES1701669-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	80.4	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 733204)							
ES1701619-021	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	# 39.5	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 734918)							
ES1701669-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	102	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 734906)							
ES1701629-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	# Not Determined	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 734907)							
ES1701629-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	115	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 733206)							
ES1701848-001	DUP	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	88.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 734359)							
ES1701705-028	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	112	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 734359)							
ES1701705-028	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	112	70	130
EP080: BTEXN (QCLot: 734359)							
ES1701705-028	Anonymous	EP080: Benzene	71-43-2	25 µg/L	108	70	130
		EP080: Toluene	108-88-3	25 µg/L	101	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	92.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	88.3	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	88.4	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	88.0	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1701995**	Page	: 1 of 8
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 31-Jan-2017
Site	: ----	Issue Date	: 03-Feb-2017
Sampler	: Harriet Allen, Simon Ruckenstuhl	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
DPWS2,	DPSW4	----	----	----	31-Jan-2017	26-Jan-2017	**5**
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural							
DPWS2,	DPSW4	----	----	----	31-Jan-2017	26-Jan-2017	**5**
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved							
DPWS2,	DPSW4	01-Feb-2017	31-Jan-2017	**1**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved							
DPWS2,	DPSW4	01-Feb-2017	31-Jan-2017	**1**	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**01-Feb-2017**	07-Feb-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**31-Jan-2017**	21-Feb-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**31-Jan-2017**	21-Feb-2017	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**01-Feb-2017**	21-Feb-2017	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**01-Feb-2017**	23-Jul-2017	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**02-Feb-2017**	21-Feb-2017	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**01-Feb-2017**	21-Feb-2017	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**31-Jan-2017**	26-Jan-2017	×
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**01-Feb-2017**	21-Feb-2017	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	21-Feb-2017	✓	**01-Feb-2017**	21-Feb-2017	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	21-Feb-2017	✓	**01-Feb-2017**	21-Feb-2017	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G)								
DPWS2,	DPSW4	**24-Jan-2017**	**----**	----	----	**31-Jan-2017**	26-Jan-2017	×
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	31-Jan-2017	×	**02-Feb-2017**	13-Mar-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	07-Feb-2017	✓	**01-Feb-2017**	07-Feb-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	31-Jan-2017	×	**02-Feb-2017**	13-Mar-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
DPWS2,	DPSW4	**24-Jan-2017**	**01-Feb-2017**	07-Feb-2017	✓	**01-Feb-2017**	07-Feb-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
DPWS2, DPSW4	**24-Jan-2017**	**01-Feb-2017**	07-Feb-2017	✓	**01-Feb-2017**	07-Feb-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1701848**	Page	: 1 of 8
Client	: **ECOZ ENVIRONMENTAL SERVICES**	Laboratory	: Environmental Division Sydney
Contact	: MS EMMA SMITH	Telephone	: +61-2-8784 8555
Project	: EZ16121 Dhupuma Surface Water - Jan 2017	Date Samples Received	: 25-Jan-2017
Site	: ----	Issue Date	: 02-Feb-2017
Sampler	: HARRIET ALLEN, SIMON RUCKENSTUHL	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK057G: Nitrite as N by Discrete Analyser	ES1701619--021	Anonymous	**Nitrite as N**	14797-65-0	39.5 %	70-130%	**Recovery less than lower data quality objective**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser	ES1701629--001	Anonymous	**Total Kjeldahl Nitrogen as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / *Container* / Client Sample ID(s)		*Sample Date*	*Extraction / Preparation* Date extracted	Due for extraction	Evaluation	*Analysis* Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
DUP, DPSW5	DPSW1,	**23-Jan-2017**	**----**	----	----	**25-Jan-2017**	06-Feb-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
DUP, DPSW5	DPSW1,	**23-Jan-2017**	**----**	----	----	**25-Jan-2017**	20-Feb-2017	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
DUP, DPSW5	DPSW1,	**23-Jan-2017**	**----**	----	----	**25-Jan-2017**	20-Feb-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**27-Jan-2017**	20-Feb-2017	✓
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**27-Jan-2017**	22-Jul-2017	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**30-Jan-2017**	20-Feb-2017	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**27-Jan-2017**	20-Feb-2017	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**25-Jan-2017**	25-Jan-2017	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**27-Jan-2017**	20-Feb-2017	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**27-Jan-2017**	20-Feb-2017	✓	**27-Jan-2017**	20-Feb-2017	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**27-Jan-2017**	20-Feb-2017	✓	**27-Jan-2017**	20-Feb-2017	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**----**	----	----	**25-Jan-2017**	25-Jan-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**30-Jan-2017**	30-Jan-2017	✓	**31-Jan-2017**	11-Mar-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**27-Jan-2017**	06-Feb-2017	✓	**27-Jan-2017**	06-Feb-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**30-Jan-2017**	30-Jan-2017	✓	**31-Jan-2017**	11-Mar-2017	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**27-Jan-2017**	06-Feb-2017	✓	**27-Jan-2017**	06-Feb-2017	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
DUP, DPSW1, DPSW5	**23-Jan-2017**	**27-Jan-2017**	06-Feb-2017	✓	**27-Jan-2017**	06-Feb-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

eurofins | mgt

Certificate of Analysis

Ecoz P/L
Level 3 , Winlow House, 75 Woods St
Darwin
NT 0800

NATA Accredited
Accreditation Number 1261
Site Number 1254

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

Attention: **Emma Smith**

Report **496356-W**
Project name DHUPUMA
Project ID EZ16005
Received Date Apr 12, 2016

Client Sample ID			**DPSW1**	**DPSW2**	**DPS1**	**GARMA BORE**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M16-Ap09880**	**M16-Ap09881**	**M16-Ap09882**	**M16-Ap09883**
Date Sampled			**Apr 07, 2016**	**Apr 07, 2016**	**Apr 08, 2016**	**Apr 07, 2016**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Ammonia (as N)	0.01	mg/L	0.02	< 0.01	0.02	0.12
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite (as N)	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
Phosphate total (as P)	0.01	mg/L	< 0.01	< 0.01	0.02	< 0.01
Phosphorus reactive (as P)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Total Kjeldahl Nitrogen (as N)	0.1	mg/L	0.14	0.13	< 0.1	< 0.1
Total Nitrogen (as N)	0.1	mg/L	0.14	0.13	< 0.1	< 0.1
Alkalinity (speciated)						
Hydroxide Alkalinity (as CaCO3)	10	mg/L	< 10	< 10	< 10	< 10
Total Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	23	< 20
Major Anions						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	23	< 20
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10	< 10	< 10
Chloride	1	mg/L	24	14	130	13
Nitrate (as N)	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
Sulphate (as S)	1	mg/L	< 1	< 1	< 1	< 1
Heavy Metals						
Aluminium	0.05	mg/L	< 0.05	0.15	0.05	< 0.05
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Barium	0.02	mg/L	< 0.02	< 0.02	0.12	< 0.02
Barium (filtered)	0.02	mg/L	< 0.02	< 0.02	0.12	< 0.02
Beryllium	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Boron	0.05	mg/L	0.09	< 0.05	0.16	< 0.05

Client Sample ID			DPSW1	DPSW2	DPS1	GARMA BORE
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M16-Ap09880**	**M16-Ap09881**	**M16-Ap09882**	**M16-Ap09883**
Date Sampled			**Apr 07, 2016**	**Apr 07, 2016**	**Apr 08, 2016**	**Apr 07, 2016**
Test/Reference	LOR	Unit				
Heavy Metals						
Boron (filtered)	0.05	mg/L	< 0.05	< 0.05	0.08	< 0.05
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium	0.001	mg/L	< 0.001	< 0.001	0.001	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.006
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.006
Iron	0.05	mg/L	0.46	4.2	1.1	1.9
Iron (filtered)	0.05	mg/L	0.16	0.38	0.64	0.31
Lead	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.006
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.002
Manganese	0.005	mg/L	< 0.005	< 0.005	0.036	0.011
Manganese (filtered)	0.005	mg/L	< 0.005	< 0.005	0.036	0.011
Mercury	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Selenium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Uranium	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Uranium (filtered)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium (filtered)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	0.001	mg/L	< 0.001	< 0.001	0.002	0.006
Zinc (filtered)	0.001	mg/L	< 0.001	< 0.001	0.002	0.005
Alkali Metals						
Calcium	0.5	mg/L	1.0	< 0.5	5.7	1.6
Magnesium	0.5	mg/L	1.4	0.9	6.3	0.7
Potassium	0.5	mg/L	< 0.5	< 0.5	2.8	< 0.5
Sodium	0.5	mg/L	13	8.5	61	7.0

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
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Apr 15, 2016	7 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 15, 2016	7 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Major Cations			
Ammonia (as N)	Melbourne	Apr 12, 2016	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Alkali Metals	Melbourne	Apr 12, 2016	180 Day
- Method: USEPA 6010 Alkali Metals			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Apr 12, 2016	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Apr 12, 2016	7 Day
- Method: APHA 4500 TKN			
Nitrite (as N)	Melbourne	Apr 12, 2016	2 Day
- Method: APHA 4500-NO2 Nitrite Nitrogen by FIA			
Phosphate total (as P)	Melbourne	Apr 12, 2016	28 Day
- Method: APHA 4500-P E. Phosphorous			
Phosphorus reactive (as P)	Melbourne	Apr 13, 2016	2 Day
- Method: APHA4500-PO4			
Alkalinity (speciated)	Melbourne	Apr 13, 2016	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Major Anions			
Bicarbonate Alkalinity (as CaCO3)	Melbourne	Apr 13, 2016	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Carbonate Alkalinity (as CaCO3)	Melbourne	Apr 13, 2016	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Chloride	Melbourne	Apr 13, 2016	28 Day
- Method: MGT 1100A			
Nitrate (as N)	Melbourne	Apr 13, 2016	7 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Sulphate (as S)	Melbourne	Apr 13, 2016	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
Heavy Metals	Melbourne	Apr 15, 2016	180 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			
Heavy Metals (filtered)	Melbourne	Apr 15, 2016	180 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			
Mobil Metals : Metals M15	Melbourne	Apr 15, 2016	28 Day
- Method: LTM-MET-3040 Metals in Waters by ICP-MS			

Company Name: Ecoz P/L
Address: Level 3 , Winlow House, 75 Woods St
Darwin
NT 0800

Project Name: DHUPUMA
Project ID: EZ16005

Order No.:
Report #: 496356
Phone: 08 8981 1100
Fax:

Received: Apr 12, 2016 8:15 AM
Due: Apr 19, 2016
Priority: 5 Day
Contact Name: Emma Smith

Eurofins | mgt Client Manager: Ryan Gilbert

Sample Detail					Aluminium	Aluminium (filtered)	Arsenic	Arsenic (filtered)	Barium	Barium (filtered)	Beryllium	Beryllium (filtered)	Boron	Boron (filtered)	Cadmium	Cadmium (filtered)	Chromium	Chromium (filtered)	Cobalt	Cobalt (filtered)	Copper	Copper (filtered)	Hydroxide Alkalinity (as CaCO3)	Iron	Iron (filtered)	Lead	Lead (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Nickel	Nickel (filtered)	Nitrite (as N)	Phosphate total (as P)	Phosphorus reactive (as P)	Selenium	Selenium (filtered)	Total Alkalinity (as CaCO3)	Uranium	Uranium (filtered)	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Total Nitrogen Set (as N)	Major Anions	Major Cations	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted																																																	
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																																	
Brisbane Laboratory - NATA Site # 20794																																																	
External Laboratory																																																	
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																																													
DPSW1	Apr 07, 2016		Water	M16-Ap09880	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DPSW2	Apr 07, 2016		Water	M16-Ap09881	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
DPS1	Apr 08, 2016		Water	M16-Ap09882	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
GARMA BORE	Apr 07, 2016		Water	M16-Ap09883	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. 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 Sample Receipt Advice.

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.

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

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. 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.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (Eurofins | mgt uses NATA accredited in-house method LTM-GEN-7010)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
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 20-130%.

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Phosphorus reactive (as P)	mg/L	< 0.05			0.05	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.1			0.1	Pass	
Method Blank							
Alkalinity (speciated)							
Hydroxide Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Major Anions							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as S)	mg/L	< 1			1	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Aluminium (filtered)	mg/L	< 0.05			0.05	Pass	
Arsenic	mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Barium	mg/L	< 0.02			0.02	Pass	
Barium (filtered)	mg/L	< 0.02			0.02	Pass	
Beryllium	mg/L	< 0.001			0.001	Pass	
Beryllium (filtered)	mg/L	< 0.001			0.001	Pass	
Boron	mg/L	< 0.05			0.05	Pass	
Boron (filtered)	mg/L	< 0.05			0.05	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Cobalt	mg/L	< 0.001			0.001	Pass	
Cobalt (filtered)	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Iron	mg/L	< 0.05			0.05	Pass	
Iron (filtered)	mg/L	< 0.05			0.05	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Manganese	mg/L	< 0.005			0.005	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Selenium	mg/L	< 0.001			0.001	Pass	
Selenium (filtered)	mg/L	< 0.001			0.001	Pass	
Uranium	mg/L	< 0.005			0.005	Pass	
Uranium (filtered)	mg/L	< 0.005			0.005	Pass	
Vanadium	mg/L	< 0.005			0.005	Pass	
Vanadium (filtered)	mg/L	< 0.005			0.005	Pass	
Zinc	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.001			0.001	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C10-C14	%	119			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	119			70-130	Pass	
LCS - % Recovery							
Ammonia (as N)	%	94			70-130	Pass	
Nitrate & Nitrite (as N)	%	93			70-130	Pass	
Nitrite (as N)	%	100			70-130	Pass	
Phosphate total (as P)	%	88			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Total Alkalinity (as CaCO3)	%	115			70-130	Pass	
LCS - % Recovery							
Major Anions							
Chloride	%	101			70-130	Pass	
Nitrate (as N)	%	93			70-130	Pass	
Sulphate (as S)	%	109			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	84			80-120	Pass	
Aluminium (filtered)	%	84			80-120	Pass	
Arsenic	%	93			80-120	Pass	
Arsenic (filtered)	%	93			80-120	Pass	
Barium	%	96			80-120	Pass	
Beryllium	%	96			80-120	Pass	
Boron	%	89			80-120	Pass	
Boron (filtered)	%	89			80-120	Pass	
Cadmium	%	96			80-120	Pass	
Cadmium (filtered)	%	96			80-120	Pass	
Chromium	%	100			80-120	Pass	
Chromium (filtered)	%	100			80-120	Pass	
Cobalt	%	89			80-120	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Cobalt (filtered)	%	89			80-120	Pass	
Copper	%	93			80-120	Pass	
Copper (filtered)	%	93			80-120	Pass	
Iron	%	96			80-120	Pass	
Iron (filtered)	%	96			80-120	Pass	
Lead	%	99			80-120	Pass	
Lead (filtered)	%	99			80-120	Pass	
Manganese	%	99			80-120	Pass	
Manganese (filtered)	%	99			80-120	Pass	
Mercury	%	81			75-125	Pass	
Mercury (filtered)	%	81			70-130	Pass	
Nickel	%	90			80-120	Pass	
Nickel (filtered)	%	90			80-120	Pass	
Selenium	%	97			80-120	Pass	
Selenium (filtered)	%	97			80-120	Pass	
Uranium	%	89			80-120	Pass	
Uranium (filtered)	%	89			70-130	Pass	
Vanadium	%	98			80-120	Pass	
Zinc	%	91			80-120	Pass	
Zinc (filtered)	%	91			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	118			70-130	Pass	
Magnesium	%	115			70-130	Pass	
Potassium	%	105			70-130	Pass	
Sodium	%	111			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M16-Ap09789	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M16-Ap09789	NCP	%	103			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia (as N)	M16-Ap09880	CP	%	97			70-130	Pass	
Nitrate & Nitrite (as N)	M16-Ap09880	CP	%	93			70-130	Pass	
Nitrite (as N)	M16-Ap09880	CP	%	100			70-130	Pass	
Phosphate total (as P)	M16-Ap09800	NCP	%	90			70-130	Pass	
Phosphorus reactive (as P)	B16-Ap09652	NCP	%	107			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	S16-Ap10336	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Total Alkalinity (as CaCO3)	M16-Ap09805	NCP	%	124			70-130	Pass	
Spike - % Recovery									
Major Anions				Result 1					
Bicarbonate Alkalinity (as CaCO3)	M16-Ap10859	NCP	%	111			70-130	Pass	
Chloride	M16-Ap14838	NCP	%	85			70-130	Pass	
Nitrate (as N)	M16-Ap09880	CP	%	93			70-130	Pass	
Sulphate (as S)	M16-Ap14838	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M16-Ap09880	CP	%	88			75-125	Pass	
Arsenic (filtered)	M16-Ap12006	NCP	%	89			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Barium	M16-Ap09880	CP	%	83			75-125	Pass	
Barium (filtered)	M16-Ap12006	NCP	%	86			75-125	Pass	
Beryllium	M16-Ap09880	CP	%	89			75-125	Pass	
Beryllium (filtered)	M16-Ap12006	NCP	%	90			75-125	Pass	
Boron	M16-Ap11098	NCP	%	79			75-125	Pass	
Cadmium	M16-Ap09880	CP	%	94			75-125	Pass	
Cadmium (filtered)	M16-Ap12006	NCP	%	92			70-130	Pass	
Chromium	M16-Ap09880	CP	%	91			75-125	Pass	
Chromium (filtered)	M16-Ap12006	NCP	%	90			70-130	Pass	
Cobalt	M16-Ap09880	CP	%	90			75-125	Pass	
Cobalt (filtered)	M16-Ap12006	NCP	%	89			75-125	Pass	
Copper	M16-Ap09880	CP	%	92			75-125	Pass	
Copper (filtered)	M16-Ap12006	NCP	%	89			70-130	Pass	
Iron	M16-Ap10099	NCP	%	95			75-125	Pass	
Iron (filtered)	M16-Ap12006	NCP	%	164			70-130	Fail	Q08
Lead	M16-Ap09880	CP	%	93			75-125	Pass	
Lead (filtered)	M16-Ap12006	NCP	%	90			70-130	Pass	
Manganese	M16-Ap09880	CP	%	88			75-125	Pass	
Manganese (filtered)	M16-Ap12006	NCP	%	89			70-130	Pass	
Mercury	M16-Ap09880	CP	%	184			70-130	Fail	Q08
Mercury (filtered)	M16-Ap12006	NCP	%	102			70-130	Pass	
Nickel	M16-Ap09880	CP	%	90			75-125	Pass	
Nickel (filtered)	M16-Ap12006	NCP	%	87			70-130	Pass	
Selenium	M16-Ap09880	CP	%	88			75-125	Pass	
Selenium (filtered)	M16-Ap12006	NCP	%	93			70-130	Pass	
Uranium	M16-Ap09880	CP	%	95			75-125	Pass	
Uranium (filtered)	M16-Ap12006	NCP	%	93			70-130	Pass	
Vanadium	M16-Ap09880	CP	%	91			75-125	Pass	
Vanadium (filtered)	M16-Ap12006	NCP	%	93			75-125	Pass	
Zinc	M16-Ap10099	NCP	%	97			75-125	Pass	
Zinc (filtered)	M16-Ap12006	NCP	%	181			70-130	Fail	Q08
Spike - % Recovery									
Alkali Metals				Result 1					
Potassium	M16-Ap10130	NCP	%	92			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M16-Ap09882	CP	%	99			70-130	Pass	
Magnesium	M16-Ap09882	CP	%	97			70-130	Pass	
Sodium	M16-Ap09882	CP	%	100			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	M16-Ap09788	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	M16-Ap09788	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M16-Ap09788	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	M16-Ap09788	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	M16-Ap09788	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	M16-Ap09788	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M16-Ap09880	CP	mg/L	0.02	0.02	11	30%	Pass	
Nitrate & Nitrite (as N)	M16-Ap09880	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Nitrite (as N)	M16-Ap09880	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Phosphate total (as P)	M16-Ap09800	NCP	mg/L	0.06	0.08	22	30%	Pass	
Phosphorus reactive (as P)	B16-Ap09652	NCP	mg/L	< 0.05	0.06	24	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Hydroxide Alkalinity (as CaCO3)	M16-Ap10858	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M16-Ap10858	NCP	mg/L	160	160	<1	30%	Pass	
Duplicate									
Major Anions				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M16-Ap10858	NCP	mg/L	160	160	<1	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M16-Ap10858	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Chloride	M16-Ap14838	NCP	mg/L	190	190	<1	30%	Pass	
Nitrate (as N)	M16-Ap09880	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Sulphate (as S)	M16-Ap14838	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	M16-Ap09880	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Barium	M16-Ap09880	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Beryllium	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Boron	M16-Ap09880	CP	mg/L	0.09	0.08	9.0	30%	Pass	
Cadmium	M16-Ap09880	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iron	M16-Ap09880	CP	mg/L	0.46	0.49	6.0	30%	Pass	
Lead	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese	M16-Ap09880	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Mercury	M16-Ap09880	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Selenium	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Uranium	M16-Ap09880	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Vanadium	M16-Ap09880	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Zinc	M16-Ap09880	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium (filtered)	M16-Ap09881	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Barium (filtered)	M16-Ap09881	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Beryllium (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Boron (filtered)	M16-Ap09881	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Cadmium (filtered)	M16-Ap09881	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iron (filtered)	M16-Ap09881	CP	mg/L	0.38	0.38	1.0	30%	Pass	
Lead (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	M16-Ap09881	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Mercury (filtered)	M16-Ap09881	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Selenium (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Uranium (filtered)	M16-Ap09881	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Vanadium (filtered)	M16-Ap09881	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Zinc (filtered)	M16-Ap09881	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M16-Ap09882	CP	mg/L	5.7	5.7	<1	30%	Pass	
Magnesium	M16-Ap09882	CP	mg/L	6.3	6.4	1.0	30%	Pass	
Potassium	M16-Ap09882	CP	mg/L	2.8	2.8	1.0	30%	Pass	
Sodium	M16-Ap09882	CP	mg/L	61	61	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M16-Ap09883	CP	mg/L	< 0.1	< 0.1	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
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

Ryan Gilbert	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)
Mele Singh	Senior Analyst-Organic (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

Uncertainty data is available on request

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