ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

REPORT NO. 512017

LIMITED ENVIRONMENTAL SITE ASSESSMENT, LOT 491, DP729381 AND LOT 284, DP755684, TAMARIND DRIVE, BALLINA, NSW

ENVIRONMENTAL EARTH SCIENCES NNSW
REPORT TO GEOLINK
28 FEBRUARY 2013
VERSION 0


Glaeba (07) Pty Ltd trading as Environmental Earth Sciences NNSW
PO Box 1519, Ballina, NSW 2478
Phone / Fax: 61 2 6686 9744 Email: eesnnsw@environmentalearthsciences.com
www.environmentalearthsciences.com

EXECUTIVE SUMMARY

Environmental Earth Sciences was requested by Geolink, on behalf of Ballina Shire Council (Council) to undertake a limited environmental site assessment (ESA) of Lot 491 DP729381 and Lot 284 DP755684, Tamarind Drive, Ballina, NSW. We understand that Council wish to assess the suitability of the site for redevelopment as a sporting facility.

A limited desktop study and site intrusive investigation were undertaken as part of the assessment. The desktop study included review of available maps, aerial photographs and a previous environmental report and found that the site was formerly used as a landfill and council depot, and is currently being used as a council depot.

The field investigation consisted of 32 testpits and 8 surface samples, from which select samples were analysed by the laboratory for potential chemicals of concern.

Results of the field investigation, including field observations and laboratory analyses, showed that contamination on the eastern portion of the site is limited to the presence of waste material with no analytes detected exceeded guideline values. Petroleum hydrocarbons (C_{10}-C_{36}) were detected in the vicinity of the wash-down area on the depot. These exceeded sensitive landuse guidelines however are not considered to present a risk to site workers or the environment based on the current site zoning (rural) and landuse as a depot and storage space. If a more sensitive zoning is sought, this area would require further assessment.

This preliminary assessment did not detect gross contamination concentrations that would preclude consideration of the site for an indoor sporting facility. However, further assessment and consideration of matters not limited to, but including subsidence, landfill waste management (including cap integrity), groundwater quality, potential gas and leachate generation, infrastructure positioning and site access will be required to determine the suitability of the site for redevelopment as an indoor sporting facility.

Project Manager
Alice Plioplis
Senior Geologist

Project Director / Internal Reviewer
Christine Pitman
Principal Scientist
512017

TABLE OF CONTENTS

1 INTRODUCTION

Environmental Earth Sciences was requested by Geolink, on behalf of Ballina Shire Council (Council) to undertake a limited environmental site assessment (ESA) at the Ballina Council Depot (number 2), Tamarind Drive, Ballina, NSW. We understand that Council wish to assess the suitability of the site for redevelopment as an indoor sporting facility. Council selected a portion of land encompassing Lot 491 DP 729381 and Lot 284 DP 755684, Tamarind Drive, Ballina (the site), as a potential location for an indoor sports stadium. This limited ESA will assist Ballina Council to decide if this site should be considered further.

According to a preliminary historical review by Environmental Analysis Laboratory (EAL) Consulting, portions of this land had been used as:

- a landfill site for Ballina (Lot 284);
- a disposal area for night soil (Lot 284);
- a transfer station and animal pound (Lot 491); and
- a secondary works depot for Council (Lot 491).

In light of the former site uses and the unknown extent of potential contamination, Council required a staged contamination assessment to identify any significant contamination issues that would preclude consideration of this site for such a development.

2 OBJECTIVE AND SCOPE OF WORKS

The objective of the work is to determine if the site is suitable for potential redevelopment as an indoor sporting facility with associated carpark.

The scope of works to meet the objective included:

- a preliminary site inspection and discussion with Council staff , a desktop study of soil, geology, hydrogeology and topography;
- preparation of a Sampling and Analysis Plan for the proposed field work;
- field and laboratory program in accordance with the SAP;
- preparation of a report detailing the works undertaken and recommendations for further investigation, management or remediation works (if required).

3 DATA QUALITY OBJECTIVES

3.1 Data quality objectives

The Data Quality Objectives (DQOs) process is a systematic approach used to define the type, quantity and quality of data supporting decisions which relate to the environmental condition of a site. Undertaking DQOs for site assessment and remediation is a requirement of DEC (2006). The DQO process was formulated by the US EPA and provides sound guidance for a consistent approach to understanding site assessment and remediation.

The DQOs are defined in a series of seven steps as presented in Table 1.

TABLE 1 DATA QUALITY OBJECTIVES

Step	Description	Comment
1	State the problem	Ballina Shire Council is considering the suitability of the site for the development of an indoor sports stadium. A preliminary contamination investigation is required to evaluate the potential contamination associated with the reported former landfill, nightsoil disposal area and operation of the depot site. This preliminary assessment is intended to be a screening process and will assist in determining the need for any future investigation and/or remediation.
2	Identify the decision	Once the site has been investigated and site conditions characterised, decisions will be made as to whether potential contamination would prevent redevelopment at this site and whether the site is likely to pose an adverse risk to ecological and/or human health.
3	Identify the inputs for the decision	Inputs into the decision comprise a soil investigation. Laboratory results will then be compared to standard commercial/industrial soil guideline values.
4	Define the boundaries for the study	The site is described as Lot 491 DP 729381 and Lot 284 DP 755684, Tamarind Drive, Ballina. The temporal boundary of the project is restricted to the timing of the investigation.
5	Develop a decision rule	All analytical data for chemicals of concern in soil across the site will be compared and evaluated against appropriate published criteria. NEPC (1999) will be used as the primary guidance document in decision making on action levels. Dependent upon the sampling and analysis design, statistical parameters such as arithmetic mean, standard deviation and 95% upper confidence limits (95% UCLs) may be applied to designated soil populations for particular analytes. In the event that action levels are exceeded, a management plan, remedial action plan, and/or qualitative risk assessment may be required. These procedures constitute the alternative action plan.
6	Specify tolerable limits on decision error	Most of the procedures in the NSW EPA (1995), Standards Australia AS 4482.1 (2005) and NEPC (1999) have risk probabilities associated with allowable error margins incorporated into them. It is therefore proposed that no further "tolerable limits" be investigated at this stage of the project. Acceptable limits for field data analysis (relative percent differences for primary and duplicate results) are between 50 and 150 percent (depending on the origin of the sample and volatility of the chemicals present). Acceptable limits for laboratory duplicate analysis may be affected by the heterogeneity of soil and will be set based on site specific information such as background concentrations.

Step	Description	Comment
7	Optimise the design for obtaining data	The investigation will target areas of potential contamination to assess where possible the lateral and vertical extent of impact. The sample layout, density and testing regime proposed in the following sections is considered suitable for a preliminary assessment taking into account temporal limitations and access constraints.

3.2 Data quality indicators

Data quality is typically discussed in terms of precision, accuracy, representativeness, comparability and completeness. These are referred to as the PARCC parameters. The following PARCC (and additional QA) parameters will be discussed further in the QA/QC section of this report:

- repeatability;
- precision;
- accuracy;
- representativeness;
- completeness;
- comparability;
- sensitivity;
- holding times;
- blanks; and
- procedures for anomalous samples and confirmation checking.

The data quality indicators for this project are presented in Table 2.

TABLE 2 MEASUREMENT DATA QUALITY INDICATORS

Parameter	Procedure	Minimum Frequency	Criteria	
			(5 to 10x LOR[4])	>10x LOR
Precision	Field Duplicates	1 in 20 - metals	<80 RPD	<50 RPD
		1 in 20 - semi-volatiles	<100 RPD	<80 RPD
		1 in 20 - volatiles	<150 RPD	<130 RPD
	Lab Replicate*	1 in 20	<50 RPD	<30 RPD
Accuracy*	Reference Material	1 in 10	60% to 140%R	80% to 120%R
	Surrogate spikes			
Representativeness*	Reagent Blanks	1 per batch	No detection	
	Holding Times*	Every sample	-	
Blanks**	Rinsate Blanks	1 per batch	No detection	
Sensitivity	Limit of Reporting	Every sample	LOR < ½ site criteria	

Notes:

1. RPD – relative percentage difference;
2. %R – percent recovery;
3. LOR – limit of reporting;
4. 4 no limit at <5x LOR;
5. * the MDQI is usually specified in the standard method. If not, use the default values set out in this table; and
6. ** only necessary when measuring dissolved metals and volatile organic compounds in water samples.

Intra-laboratory duplicates (blind field duplicates) for soil should be collected and analysed at a rate of 5% of primary samples. Inter-laboratory (or split) duplicate should also be collected and analysed at 5%.

Soil trip spikes or trip blanks were not collected as the material on site is different to the well graded and washed sand used for spikes (and therefore not comparable).

It should be noted that Standards Australia (AS4482.1) specify that typical MDQIs for precision should be ≤50% RPD, however it is also acknowledged that low concentrations and organic compounds in particular can be acceptable outside this range. The standard suggests that ≤50% RPD be used as a 'trigger' and values above this level of repeatability need to be noted and explained.

Our adopted MDQI's for precision acknowledge the intrinsic heterogeneity of metal and semi-volatile chemical concentrations in disturbed soil that may potentially cause large variations in results between laboratory subsamples (although all efforts are made to homogenise non volatile duplicate samples). Similarly, large variations in volatile chemical concentrations between duplicates may be unavoidable even when using best practice sampling methodology, especially as we seek to minimise the disturbance to the sample while splitting it which means a high degree of inherent heterogeneity is expected.

As such, our adopted RPD criteria are considered to be a suitable measure for the reproducibility of results within a naturally heterogeneous media such as soil. A >50% RPD

trigger value will be used, with any exceedances being discussed and assessed for acceptability within the context of the proposed investigation.

4 SITE IDENTIFICATION AND HISTORY

4.1 Site identification

At the time of the onsite investigation (22 and 23 January 2013), the Depot portion of the site was operational with workers loading and unloading materials into trucks. Both the Depot and former landfill portions of the site were being used for the storage of plant, equipment and materials. Table 3 summarises the relevant site details.

TABLE 3 SITE IDENTIFICATION DETAILS

Item	Details
Address	Tamarind Drive, Ballina, NSW
Lot and DP Numbers and site owners	Lot 491 DP 729381 – Ballina Shire Council Lot 284 DP 755684 – Crown land
Site area	5.76 ha
Local Government Authority	Ballina Shire Council
Landuse zoning (LEP 1987)	1 (d) Rural (Secondary Agricultural Land)
Surrounding landuse	North – North Creek, commercial/industrial properties beyond this South – commercial properties East – wetlands West – residential properties and retail (Ballina Fair) beyond Tamarind Drive
Locality and site map	Figure 1 and Figure 2

4.2 Current and historical site use and potential for contamination

The site is currently used for the storage of mostly Council equipment, plant and materials. The western portion of the site, Lot 491 (~1.6 ha), has historically been used as the Council depot as well as a transfer station and animal pound (Figure 2).

The eastern portion of the site, Lot 284 (~4.16 ha) was historically used a landfill area and for disposal of night soil (Figure 2).

Potential for contamination associated with these landuses include fertilisers, fungicides, herbicides, pesticides, solvents, hazardous materials and hydrocarbons. Targeted chemicals of concern are discussed further in Section 8.1.

4.3 Site history

A brief site history was compiled from readily available information such as aerial photographs and discussions with site staff. Please note that no official records of landfilling are available at this time which is a limiting factor in the interpretation of the landfill area.

4.3.1 Previous work

A letter prepared by EAL Consulting Services (EAL) was provided for review as part of this assessment. The letter presented a brief desktop review of aerial photographs and online records regarding the site. It also proposed a sampling and analysis plan.

The letter provided the following information:

- "*Historical aerial photography indicates that the surrounding land use has been predominantly agricultural or vacant land until recently where the lands to the south and east have become industrial and residential*". It is noted that photographs from the following years were reviewed – 1947, 1958, 1967, 1991, 2006 and 2009;
- No existing notices on the Contaminated Land Record register;
- No existing licences under the Protection Of Environment Operations Act 1997;
- from a dangerous goods register search "*two 70kg Chlorine gas cylinders are located in a shed approximately 110 m east of Tamarind Drive. The Site holds a Dangerous Goods Licence (Licence no. 35/031962) under Workcover NSW relating to the storage of dangerous goods at Tamirind* (sic) *Drive, Ballina and is listed on the Stored Chemical Information Database (SCID)*"; and
- the closest cattle tick dip site in Ballina was approximately 1 km north of the site and has been demolished.

In addition, the letter states that Lot 284 was used as a landfill site for Ballina, and night soil disposal, while Lot 491 (currently used as a depot) was used as a transfer station and an animal pound.

4.3.2 Aerial photograph review

Environmental Earth Sciences reviewed a series of aerial photographs taken by the NSW Department of Lands in an attempt to corroborate the historical assessment undertaken by EAL Consulting. Reference will be made to Lot 491 (currently housing the Council Depot) and Lot 284 (the former landfill site).

Table 4 outlines the photographs that were assessed. In addition, descriptions taken from EAL (2012) for photographs from 1947 and 1958 have been included for completion.

TABLE 4 AERIAL PHOTOGRAPHS

Date	Run	Map No	Series
21/5/1967	9	5132	Lismore-Ballina
9/8/1971	5	5004	Ballina
1/8/1987	6	257	Lismore
2001	15	4558	Ballina

Significant observations

1947 photograph (EAL, 2012)
"*The 1947 image indicates that all of the Lots are relatively undeveloped mostly cleared land with scatted trees. Also it appears that there was a small building located in the north eastern section of Lot 491.*"

1958 photograph (EAL, 2012)
"*The 1958 image shows that there has been some minor clearing of the all the Lots with an increase in size of the building noted in the previous image that was situated in the north eastern section of Lot 491 and now also the north western section of Lot 284.*"

1967 photograph
The 1967 aerial photograph shows that both Lots have been disturbed, being mostly cleared of vegetation with the exception of the trees along the creek bank (still present on site today). There appears to be many stockpiles on Lot 284, while there are several discernible buildings on Lot 491. Surrounding land both adjacent and across Tamarind Drive was undeveloped.

1971 photograph
A greater proportion of Lot 284 appears to be utilised as evidenced by a greater number of stockpiles and more cleared vegetation. Some new small sheds on Lot 491 are present in this photograph.

Development of the industrial subdivision to the east of the site has commenced with construction of the roads and several buildings.

1987 photograph
Infrastructure on Lot 491 in this photograph appears similar to the present day, while the majority of land across Lot 284 has been disturbed with stockpiles distributed throughout. The vegetation along the eastern boundary has been cleared, perhaps in association with the construction of a drainage channel at the rear of the adjacent industrial subdivision.

2001 photograph
Lot 491 appears in line with current site conditions, while operational land use within Lot 284 looks to be limited about the central access road as the remainder of the site looks to be well vegetated, mostly with grass.

4.3.3 Other site photographs

An aerial photograph provided for the area by Geolink, provided a view at a better resolution, although the exact date of the photograph is unknown, but estimated at approximately 2009. Details shown by this figure confirm that much of Lot 284 continues to be utilised for stockpiling excess material and equipment.

4.3.4 Interviews with former and current employees

Very little historical information was available for the site however a long time employee remembers that the night soil disposal pits were dug by hand. This could suggest that the pits were not as extensive in size or depth as initially thought.

4.3.5 Summary

In summary, the site has been in use since at least 1947. Stockpiling was evident in the 1967 photograph, so that landfilling would have occurred at the site prior to this and potentially continued through the site history.

The site has been used for more than 60 years, with historical uses including plant, machinery and equipment storage, materials stockpiling, animal pound, landfilling and night soil disposal.

5 SITE ENVIRONMENTAL SETTING

5.1 Regional geology and soils

The regional geology is described by Brown, *et al* (2007) as Quaternary aged (<1.8 million years) sediments. The site is located close to a geological boundary, between alluvial sediments and coastal and estuarine plain deposits. Typical sediments in these settings include sand, silt, clay, gravel and organic clays. The natural material encountered at the site included mostly sands, sandy clays and clays, consistent with the regional geology expected. Site stratigraphy is described further in Section 5.4.

Review of soil landscapes map for the area (Morand, 1994) indicated that the site is part of the disturbed terrain and has been greatly disturbed by human activity to a depth of at least 100 cm. The original soil has been removed, greatly disturbed or buried. Local relief <10 m, slopes <5%. Landfill includes soil, rock, building and waste material. The original vegetation has been completely cleared.

5.2 Regional and local hydrogeology and surface water

Information acquired from a NSW Water Information (2013) database search of registered groundwater bores revealed there were up to 35 licensed groundwater bores within a 1 km radius of the site. Registered purposes included domestic and monitoring. Domestic purposes were typically private owners, while the monitoring bores were registered under Ampol Pied Piper Service Station. This service station was redeveloped into fast food eateries.

Where driller's logs were completed in the groundwater works summaries, information was gleaned regarding subsurface geology. To the north-west of the site, coarse sand was present to at least 5 mbgl, and with groundwater observed from 3 mbgl. To the south of the site (former Ampol service station), groundwater was encountered at 1.8 mbgl in grey sand, which was overlain by gravelly clays.

Groundwater at the site was expected to be relatively shallow (i.e. <1.8 m) due to its close proximity to North Creek, towards which it likely flows. North Creek is a tidally influenced water body which flows south into the Richmond River (~2 km south), which in turn drains into the ocean, approximately 4 km south-east of the site. North Creek is considered to be the nearest sensitive environmental receptor to the site.

During the testpit program at the site, water was encountered within natural sands at the western portion of the site between 1.0 and 1.4 mbgl, while at the eastern portion at 1.3 (TP22 on the river bank, which included a hydrogen sulfide odour) and 2.1 mbgl (TP26,

through the landfill) in natural clay. It is noted that as the eastern portion is elevated relative to western, specifically TP26, the relative level of groundwater is similar at these locations. Water was also encountered within waste material at 2.5 mbgl, which had a distinct chemical odour.

5.3 Topography, drainage and vegetation

The site is located in a topographically low area relative to the surrounding land. It is generally flat, with a mound formed in eastern portion, in the area of the former landfill. Relative to the neighbouring properties, the former landfill appears to be raised by approximately 1.5 to 2 metres. This is also evident from a previous survey plan provided by Council, dated December 1993, where the eastern portion of the site was over 1 m higher than the western portion. It is expected that topography varies over time, since activities started prior to 1947 (Section 4.3.5).

The western portion of the site (the depot) is partly sealed by bitumen (~30 %), partly gravel (~50 %) and partly grassed (~20 %). Surface run off would infiltrate to the subsurface in the unsealed areas or flow into a small creek that intersects the site (flows south to north), as well as a small drainage line beyond the former animal pound, both of which drain to North Creek. A drainage line is also present along part of the southern boundary which would capture any runoff from the former landfill in that area (Figure 2).

Vegetated areas were present at the site, including trees and grass, with all areas that were not paved with bitumen or gravel, or covered by stockpiled material, being covered by grasses. The more heavily vegetated areas were along the creek bank, and along the small drainage creek that intersects the site. Figure 2 provides an indicative distribution of the vegetation encountered onsite.

5.4 Site stratigraphy

Site stratigraphy that was encountered during the field investigation generally included three types of material – fill, waste and natural. These are described in further detail in the following sub-sections, with testpit logs presented in Appendix A. Cross sections of the stratigraphy are shown on Figures 3 and 4.

5.4.1 Fill material

Fill material at the site was encountered in the western portion predominately, within the Council Depot. This varied in depth between 0.2 and 1.1 metres below ground level (mbgl) and consisted of a variety of types including the following:

- loose to firm, dark grey, silty clay with gravel (up to 20 %), dark yellow/brown sand with black clay,
- fragments of weathered grey rock (5 - 30 cm) with some dry orange/brown clay and gravels; and
- reworked natural clay – dark brown clay with red mottles, some rubbish (~20%: broken tiles, Perspex plastic, glass fragments)

A hydrocarbon odour was noted at locations TP10 (0.4-0.5 mbgl) in natural sands and TP12 (0.6-0.7 mbgl) in fill material. Green staining was also observed in the TP12 fill material at this depth, associated with the odour. These testpits are located in the vicinity of a wash-down area and the odours and staining may be associated with previous fuel spills.

A sweet chemical odour was noted at location TP6 within a rocky fill layer (0.2-0.3 mbgl) and the clayey fill material directly underlying this layer (0.4-0.5 mbgl). No volatile organic compounds (VOCs) were detected during the field screening with a photo ionisation detector (PID).

Fill at eastern portion of the site was typically encountered overlying the waste material from the ground surface to approximately 0.3 mbgl. This material could be considered a capping layer and generally consisted of black or dark grey silty clay, silt and fine gravels. It is likely that this surface fill material changes over time as several stockpiles are located in this are with heavy plant and machinery requiring access to these and the ground would need to be maintained for good access. Other fill material encountered included the reworked natural brown/red clays which appear to have been used to fill gaps and voids during landfilling or if a change in the levels at the site were required. This material was encountered typically on the northern edge of the landfill (e.g. TP17 and TP18) and within the waste material (e.g. TP19, TP21 and TP28).

5.4.2 Waste

Waste associated with former landfilling activities was encountered on the eastern portion of the site only (Lot 284, Figure 2) at locations TP16, TP19, TP20, TP21, TP26, TP27, TP28 and TP29, between 0.3 and to a depth greater than 3.2 mbgl (at location TP27). Typically the waste material included:

- dark brown silty clay and clay, black clays (50-70 %), mixed clays, roots;
- demolition rubble (up to 60 %) consisting of broken tiles, ceramic pipes, bricks, wood, barbed wire, metal pipes, star pickets;
- roots, gravels, fragmented cobble and bolder sized rocks (up to 60 %);
- general rubbish consisting of aluminium cans, plastic bottles, clothing, plastic bags (30 %);
- one tree trunk (1.3 m x0.4 m) at 1.3 mbgl at location TP26; and
- portion of a car body part at 0.8 mbgl at location TP27.

A sweet, chemical odour was noted within the waste water bearing zone at 2.5 mbgl at location TP27. VOCs were detected in waste material at location TP29 ranging between 2-25 parts per million (ppm) in the top 0.3 metres of the testpit to 144 ppm at 2.0 mbgl. No odours were associated with these VOC measurements. The pH of waste material was moderately acidic (6) to basic (8.5).

5.4.3 Natural

Natural soils at the site included sands and clays, typical of alluvial deposits. These are described as follows:

- loose yellow/brown/dark grey fine grained sands, moderately acidic to moderately basic (pH 5.0 to 8.0), with occasional gravels and roots; and
- dark grey/brown clay or sandy clay, with occasional dark orange/red mottles, slightly acidic to moderately basic (pH 6.5 to 8.0).

Hydrogen sulfide odour was noted within the natural sands at location TP3 (1.4-1.5 mbgl) and TP6 (1.1-1.2 mbgl), and in the natural clay at location TP22 (1.2-1.4 mbgl).

6 FIELD PROGRAM

6.1 Borehole locations

The sampling and analysis plan (Environmental Earth Sciences NNSW, 2013) presents a detailed rationale for investigation locations. This is summarised in Table 5.

TABLE 5 SAMPLING LOCATION RATIONALE

Sampling point	Rationale
TP1-7	Site coverage around the council depot to determine the vertical and lateral extent of contamination
TP8-10	Targeted the former animal pound and asphalt storage
TP11-14	Targeted the remainder of the depot, targeting various drums and above ground storage tank
TP15-19	Site coverage about the transition area between council depot and former landfill
TP22-25	Targeted the potential night soil disposal area
TP20, 21 26-32	Targeted potential former landfill area to delineate the extent of filled area
SS1-8	Surface samples collected within or immediately outside of sheds, buildings, storage areas

6.2 Methodology

An experienced environmental scientist undertook all fieldworks including logging and sample collection. Soil samples were collected on a discrete basis at changes in the lithology and/or at regular intervals. Detailed logs of the testpits describing the soil profile, noting any odours or visible signs of contamination are presented in Appendix A.

Samples were placed into laboratory prepared jars (organic analysis) and plastic bags (inorganic analysis) by the scientist wearing disposable nitrile gloves and placed into chilled Eskies.

All soil samples were screened using a photo ionisation detector (PID) to determine the presence of volatile organic compounds as well as assist the sample selection process for laboratory analysis.

Sample containers were labelled with a waterproof marker with the following information: project number, location, sample depth and date of sample collection. All soil samples were transported to the laboratory on ice within 24-48 hours of sampling.

6.3 Site observations

A site walkover was undertaken during the fieldworks. The following information was observed:

- the western portion of the site (the depot) was occupied by one large warehouse style building at the centre of the lot, a smaller derelict building in the north-west corner

(former animal pound) and several smaller demountable buildings and shipping containers. The ground surface was either sealed by bitumen or hardstand (~80 %) with the remainder consisting of grass cover, trees or bare ground;

- a wash-down area was present to the immediate north-east of the former animal pound building, which appeared to be used on a regular basis;
- an old, very corroded above ground storage tank was present at the north-east corner of the depot. The previous contents of this tank are unknown, but based on the dark black staining, it was likely to have contained bitumen emulsion used in two coat seals. From the previous dangerous goods site search in EAL (2012) the only licensed dangerous goods for the site are two chlorine gas cylinders;
- various areas of the depot were used for storage of materials including metal poles, fencings, wood, safety barricades (plastic, concrete), signage;
- the eastern portion of the site (former landfill) was used for stockpile material storage and was accessed on a daily basis. Materials included gravels, mulch, soil, broken concrete slabs and other concrete structures (for the repair of the Ballina bar seawall). Note that the stockpiles were not assessed during this investigation;
- measurements for the presence of gas were taken in select testpits and ambient air using a landfill gas analyser (GEM2000). No landfill gases typical of putrescible wastes were detected (methane, carbon dioxide, carbon monoxide and hydrogen sulfide). This is in line with the type of waste observed in testpits (Section 5.4.2); and
- a drainage line was present along the southern boundary which intersected the site between the depot and former landfill and drained north eventually into North Creek. There was water present in the drain where it intersected the site, which appeared stagnant at the time of the investigation.

7 ASSESSMENT CRITERIA

The NSW DEC (2006) cites investigation levels for soil in the assessment of site contamination. The soil investigation levels presented are based on the National Environmental Health Forum (1996) *Health based soil investigation levels* which has been updated and nationally endorsed through the National Environment Protection Council (1999) *National Environment Protection (Assessment of Site Contamination) Measure*.

These investigation levels are derived from toxicity of substances and estimated exposure of humans to the soil. If the site redevelopment is undertaken, the site is expected to be rezoned as commercial/industrial landuse. Accordingly the commercial/industrial investigation levels in the NSW DEC (2006) will be considered as a screening guide in this investigation.

For substances where the NEHF (1996) and NEPC (1999) have not provided heath based soil investigation levels (i.e. benzene, toluene, ethyl-benzene, xylene, petroleum hydrocarbons C_6-C_9 and C_{10}- C_{40}) the sensitive landuse guidelines in the NSW EPA (1994) can be used as a screening guide.

TABLE 6 HEALTH BASED SOIL INVESTIGATION LEVELS

Substance	Health-based Soil Investigation Levels (mg/kg)				Phytotoxicity Levels (mg/kg)
	Standard Residential	High Density Residential	Parks & Open Spaces	Commercial & Industrial	
Metals and Metalloids					
Arsenic (total)	100	400	200	500	20
Cadmium	20	80	40	100	3
Chromium (III)	12%	48%	24%	60%	400
Chromium (VI)	100	400	200	500	1
Copper	1,000	4,000	2 000	5,000	100
Lead	300	1,200	600	1,500	600
Mercury (inorganic)	15	60	30	75	1
Nickel	600	2,400	600	3,000	60
Zinc	7,000	28,000	14 000	35,000	200
Organics					
Polyaromatic hydrocarbons (total)	20	80	40	100	-
Benzo(a)pyrene	1	4	2	5	-

Note: Table derived from DEC NSW (2006) *Contaminated Sites: Guidelines for the NSW Site Auditors Scheme (2nd edition)*

TABLE 7 NSW EPA (1994) THRESHOLD - SOILS

Analytes	Threshold Concentrations (mg/kg dry wt)	Sources
TPH: C_6-C_9	65	-
TPH: C_{10}-C_{40}	1,000	-
Benzene	1	ANZECC/NHMRC 1992
Toluene	130	Netherlands 1994
Ethyl benzene	50	Netherlands 1994
Total Xylene	25	Netherlands 1994
Total Lead	300	ANZECC/NHMRC 1992
Benzo(a)pyrene	1	ANZECC/NHMRC 1992
Total PAHs	20	ANZECC/NHMRC 1992

Note: Threshold concentrations have been derived from the NSW EPA (1994) *Guidelines for assessing service station sites*.

8 LABORATORY ANALYSIS

8.1 Analytical schedule

Table 8 identifies the laboratory analysis schedule for soil samples collected during this investigation. Not all samples were submitted for analysis of all chemicals of potential concern (CoPCs). Samples were selected on the basis of field observations and coverage.

The analytes selected are based on determination of the CoPC for the site. The analytical methods selected are based on those recommended by the laboratories and publications such as Standard methods for the examination of water and waste-water (APHA 2005, 21st edition).

TABLE 8 ANALYTICAL SCHEDULE

Analyte	No. primary samples	No. of field blind duplicates	Duplicate rate achieved
Heavy metals	31	4	13%
TPH	15	3	20%
PAH	6	2	33%
BTEX	9	1	11%
8260	8	1	13%
8270	3	0	0%

Note: methods used are reported in the laboratory transcripts appended and are detailed in the Standard methods for the examination of water and waste-water (APHA 2005 and/or Soil Chemical Methods (Rayment & Lyons 2010).

8.2 Quality assurance and control

Quality assurance and quality control (QA/QC) procedures were undertaken throughout the sampling program with disposable gloves changed between locations and sample collection as required. Furthermore, quality control is achieved by utilising NATA accredited laboratories, using standard methods supported by internal duplicates, the checking of high, abnormal or otherwise anomalous results against background and other chemical results for the sample concerned.

During the investigation, a calibrated landfill gas analyser was used to screen for landfill gases. A calibration certificate for this instrument is presented in Appendix D.

A total of four (4) field duplicates were submitted for various analyses as presented in Appendix B. In brief, the relative percent differences (RPD) of duplicate results were generally within the acceptable range of reproducibility as were internal laboratory duplicate and standards.

In accordance with our QA/QC procedure, those samples with a RPD of >50% have been presented in Table 9 for discussion. Both inter laboratory duplicates (between the primary and secondary laboratories) and intra laboratory (within the primary laboratory) have been included.

Results from some analyses were below the level of reporting and thus could not be calculated.

TABLE 9 SUMMARY OF RPD EXCEEDANCES

Sample	Analyte	Duplicate RPD (type)	Applicable RPD limit	Type of material
TP7 (0.5-0.7) + FD1	Cu	75.86 % (inter)	80	Natural
TP7 (0.5-0.7) + FD1	Zn	59.74 % (inter)	50	Natural
TP7 (0.5-0.7) + FD1	Cr	98.51 % (inter)	50	Natural
TP7 (0.5-0.7) + FD1	Ni	81.48 % (inter)	50	Natural
TP15 (0.2-0.3) + FD3	Cu	127.71 % (intra)	50	Fill
TP15 (0.2-0.3) + FD3	Zn	54.78 % (inter)	50	Fill
TP15 (0.2-0.3) + FD3	Cr	53.33 % (inter)	50	Fill
TP15 (0.2-0.3) + FD3	Ni	61.22 % (inter)	50	Fill
TP15 (0.2-0.3) + FD3	As	52.63 % (inter)	80	Fill
SS5 (0.0-0.1) + FD4	Cu	56.25 % (inter)	50	Fill
SS5 (0.0-0.1) + FD4	Pb	50.19 % (inter)	50	Fill
SS5 (0.0-0.1) + FD4	Cr	79.07 % (inter)	50	Fill
SS5 (0.0-0.1) + FD4	As	66.67 % (inter)	80	Fill
SS5 (0.0-0.1) + FD4	C_{29} - C_{36}	104.52 % (inter)*	130	Fill
SS5 (0.0-0.1) + FD4	C_{10} – C_{36}	126.53 % (inter)*	130	Fill
SS5 (0.0-0.1) + FD4	C_{15}-C_{28}	141.90 % (inter)	130	Fill

Note: * exceed trigger value of 50% however are within acceptable limits.

Fourteen RPD values for the intra and inter laboratory duplicate samples exceeded 50% RPD. In accordance with Standards Australia these exceedances have been noted and the variations are thought to be associated with limitations with the field splitting method and low concentration levels (close to the method detection limit).

Most exceedances were calculated for heavy metals inter-laboratory duplicates from fill material. Fill material can be heterogeneous, with heavy metals typically forming in clusters, thus it is expected that some variety will be encountered within samples. In addition, different laboratories place samples within extraction liquids for a varying amount of time, which may produce slightly different results. This may be the case for heavy metals in the natural material of sample and duplicate TP7 (0.5-0.7) and FD1, where exceedances were noted for heavy metals in the inter-laboratory duplicate.

The only organic exceedances was for petroleum hydrocarbons C_{15}-C_{28} in the inter-laboratory duplicate of SS5 (0.0-0.1), a surface fill sample. This sample was collected from an area where a thin layer of pitch (~3 cm) overlies the fill material and it is possible that some fill material was collected for the inter-laboratory duplicate that was in contact with this. The intra-laboratory duplicate did not display the same difference.

The RPD exceedances do not represent significant concern to the integrity of the data set as the source of the exceedances can be interpreted through sound field observations.

Extraction and analysis of samples were all within the relevant prescribed holding times. The internal laboratory control results (blanks, duplicates and spikes) are considered to be acceptable.

In summary, the quality assurance and control program has demonstrated that the laboratory data is reliable. A quality assurance and control report for this project is present in Appendix B.

8.3 Summary of results

Most results of organic analyses were below the limit of detection or reporting for the laboratory and thus only those detected are presented in the report (Table 10 and Table 11). Analytical results of the heavy metals are presented in Table 12.

Complete laboratory transcripts and associated chain of custody forms are provided in Appendix C.

Laboratory analysis showed low concentrations of heavy metals in fill and natural material below the health investigation criteria for commercial/industrial landuse criteria (DEC, 2006).

Organic analytes were also generally non-detectable or below guideline values. Notable detections include:

- TP10 (0.4-0.5) – C10-C36 was 930 mg/kg (below sensitive landuse guideline value);
- TP12 (0.6-0.7) – C10-C36 was 2,570 mg/kg (above sensitive landuse guideline value);
- SS5 (0.0-0.1) – C10-C36 was 630 mg/kg (below sensitive landuse guideline value); and
- SS6 (0.0-0.1) – C10-C36 was 510 mg/kg (below sensitive landuse guideline value).

The result for TP 12 is not considered to be of concern based on the following reasons:

- the exceedance is at a depth of 0.6-0.7 mbgl and dermal exposure is unlikely; and
- any leachable petroleum hydrocarbons would attenuate naturally prior to reaching North Creek which is located approximately 75 m north of testpit TP12. Natural attenuation would include microbial breakdown and/or sorption of BaP in organic rich alluvial clays, dispersion and dilution.

9 DISCUSSION

9.1 Council Depot

Contamination at the depot portion of the site (west) is limited to petroleum hydrocarbon impact at location TP10 (0.4-0.5) and TP12 (0.6-0.7), based on field and laboratory data. The only exceedance of guidelines was for TP12 (0.6-0.7) C_{10}-C_{40} however these guidelines are for sensitive use and do not represent a risk to sensitive environmental receptors or site

workers, as the site is currently zoned rural. If the land zoning was to change to a more sensitive use then further assessment may be needed.

From review of testpit logs and cross sections, the depot was in-filled over time with various types of fill, derived from on site (dark brown clays) and offsite (inclusion of gravels, broken bottles and the like) to level the site to its current elevation. The depth to natural soil becomes greater towards North Creek which is expected as water bodies are typically topographically low.

9.2 Landfill area

When assessing landfill it is prudent to determine the risks presented by potential physical exposure, leachate migration and seepage, subsidence and landfill gas.

From the data collected in this assessment the following conclusions can be made:

- physical exposure: the fill material placed on top of the waste can be considered a landfill cap and varies in thickness from 0.2 to 0.3 m and consists of silt and silty clay. This cap would not comply with guideline requirements (NSW EPA, 1996) for design of landfill caps for current landfills. Further assessment of the landfill cap integrity (thickness, permeability and quality) would be required to determine potential surface water infiltration, as well as release of landfill gas (final landfills caps are typically at least 2 m thick consisting of layers for sealing, gas drainage, infiltration drainage and revegetation). This assessment may allow for a site specific cap design and provide justification for non conformance with the requirements of the NSW EPA (1996) guidelines;
- leachate: groundwater was encountered at one location within the waste material and had a sweet, chemical odour. This demonstrates that groundwater is flowing through the waste and leaching chemicals. As groundwater has not been assessed or characterised, the extent of potential impact is unknown. A leachate plume could potentially exist and would likely flow north towards North Creek and eventually drain into the creek. No seepage from the former landfill was observed during the field works. Seepage is likely to occur after heavy rain events, and would likely pool in low lying areas (e.g. the drainage line to the south of the site or along the creek bank to the north;
- landfill gas: gas is generated from decomposition of organic waste (including putrescible and green waste). The waste encountered at the site was predominately inert demolition rubble mixed with other wastes (car parts, glass bottles etc) with minimal organic waste. It is noted however that typically in old landfills, organic waste is present within ‘pockets’, and would not have been placed in the same location. It may be possible that more organic waste is present in parts of the landfill that were not accessed during the field investigation, which may potentially create landfill gas. No landfill gases were detected at concentrations that pose a risk during the fieldworks; and
- subsidence: it is expected that some subsidence would have occurred to date. A survey from 1993 was provided for this assessment however the current levels are unknown. An assessment of previous or potential future subsidence cannot be made at this time without further assessment.

9.3 Landuse limitations

The following limitations are typically associated with former landfill sites. A detailed landfill assessment (including waste and gas) would be required to demonstrate if the landfill poses a risk to human health or the environment.

The following limitations would require consideration when planning the redevelopment:

- if structures (including buildings or a carpark) were to be constructed on the landfill, ground subsidence may occur (over time and in the short term);
- corrosion of buildings and materials due to landfill gases may occur;
- if gas is present, this may accumulate below or within buildings and therefore a gas mitigation or management plan would be required;
- a site management plan would be required to document the presence of the landfill that outlines current site conditions and management practices for any future site works. This is typically noted on Council planning certificates;
- a site management plan should be developed to ensure that any site works including movement of machinery or plant must not damage the integrity of the current landfill cap. Improvements to the cap design in accordance with NSW EPA (1996) are recommended; and,
- site access and reshaping the landform should also be considered. At the time of this investigation, the access to site is from Tamarind Drive. An increase in thoroughfare at the site entry would impact local traffic conditions so an alternative should be considered. Any other access point may require reshaping the land to create a roadway. This may require relocating waste. Considerations would include the onsite containment of waste or offsite disposal, potential exposure to waste and environmental impacts to flora, fauna, water bodies, site users and neighbouring properties.

10 CONCLUSION AND RECOMMENDATIONS

A limited desktop study and site intrusive investigation were undertaken at the Ballina Depot at the request of Geolink (on behalf of Ballina Shire Council). The desktop study included review of available maps, aerial photographs and a previous environmental report and found that the site was formerly used as a landfill and council depot, and is currently being used as a council depot. This information was used to develop a sampling and analysis plan for a field investigation.

The field investigation consisted of 32 testpits and 8 surface samples, from which select samples were analysed by the laboratory for potential chemicals of concern.

Results of the field investigation, including field observations and laboratory analyses, showed that contamination is limited to the presence of waste material within the eastern portion of the site with no analytes detected exceeding guideline values. In addition, petroleum hydrocarbons (C_{10}-C_{36}) were detected in the vicinity of the wash-down area on the depot. These exceeded sensitive landuse guidelines however are not considered to present a risk to site workers or the environment based on the current site zoning (rural) and landuse as a depot and storage space. If a more sensitive zoning is sought, this area would require further assessment.

This preliminary assessment did not detect gross contamination concentrations that would preclude consideration of the site for an indoor sporting facility. However, further assessment and consideration of matters not limited to, but including subsidence, landfill waste management (including cap integrity), groundwater quality, potential gas and leachate generation, infrastructure positioning and site access will be required to determine the suitability of the site for redevelopment as an indoor sporting facility.

If Council decides that they would like to continue exploring the possibility of redeveloping this land then the following recommendations should be considered once the location of the building/ infrastructure footprint has been determined:

- detailed characterisation of waste and potential for gas generation (including landfill cap and leachate);
- testing of stockpiles on site to determine suitable options for their disposal or relocation;
- assessment of potential subsidence (including a survey of the site);
- geotechnical assessment for stability of proposed building structures; and
- studies on the impact to local and regional traffic conditions.

11 LIMITATIONS

This report has been prepared by Environmental Earth Sciences NNSW ABN 109 442 284 in response to and subject to the following limitations:

1. The specific instructions received from Geolink;
2. The specific scope of works set out in PO512021 issued by Environmental Earth Sciences for and on behalf of Geolink, is included in Section 2 (Objective and scope of work) of this report;
3. May not be relied upon by any third party not named in this report (with the exception of Ballina Shire Council) for any purpose except with the prior written consent of Environmental Earth Sciences NNSW (which consent may or may not be given at the discretion of Environmental Earth Sciences NNSW);
4. This report comprises the formal report, documentation sections, tables, figures and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason;
5. The report only relates to the site referred to in the scope of works being located at Tamarind Drive, Ballina, NSW (“the site”);
6. The report relates to the site as at the date of the report as conditions may change thereafter due to natural processes and/or site activities;
7. No warranty or guarantee is made in regard to any other use than as specified in the scope of works and only applies to the depth tested and reported in this report;
8. Fill, soil, groundwater and rock to the depth tested on the site may be fit for the use specified in this report. Unless it is expressly stated in this report, the fill, soil and/or rock may not be suitable for classification as clean fill if deposited off site; and
9. Our General Limitations set out at the back of the body of this report.

12 REFERENCES

American Public Health Association (APHA) 2005, *Standard methods for the examination of water and waste-water*, 21st edition, APHA, Washington DC.

Brown, R.E, Cranfield, L.C., Denaro, T.J., Burrows, P.E., Henley, H.F., Stroud, W.J., Brownlow, J.W. (2007) *Warwick-Tweed Heads 1:250,000 Metallogenic map SH/56 2-3*, geological Survey of NSW, Maitland and Geological Survey of QLD, Brisbane

Environmental Earth Sciences NNSW (2013) *Sampling and analysis plan for a preliminary contamination assessment, Ballina Council, Depot, Tamarind Drive, Ballina, NSW*; report number 512017_SAP

Morand, D. T. (1994) *Soil landscapes of the Lismore-Ballina 1:100 000 Sheet Map*, Soil Conservation Service of NSW, Sydney

National Environment Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*

NSW Department of Environment and Conservation (2006) *Contaminated sites: guidelines for the NSW site auditor scheme*

NSW Department of Environment and Conservation (2007) *Contaminated sites: guidelines for the assessment and management of groundwater contamination*;

NSW Environment Protection Authority (1994) *Contaminated sites: guidelines for assessing service station sites*

NSW EPA (1996) *Environmental guidelines: Solid Waste Landfills*

NSW Environment Protection Authority (1995) *Contaminated sites: sampling design guidelines*

NSW Environment Protection Authority (2011) *Guidelines for consultants reporting on contaminated sites*

Rayment, GE & Higginson, FR 1992, *Australian laboratory handbook of soil and water chemical methods*, Inkarta Press, Melbourne.

Standards Australia AS 4482.1 (1997) *Guide to the sampling and investigation of potentially contaminated soil*

Standards Australia, 2005, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds*, (AS 4482.1)

Standards Australia, 1999, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 2: Volatile substances*, (AS4482.2)

13 GLOSSARY OF TERMS

The following descriptions are of terms used in the text of this report.

Alluvial describes material deposited by, or in transit in, flowing water.

Background natural level of a property.

Borehole an uncased well drill hole.

Clay Soil material composed of particles finer than 0.002 mm. When used as a soil texture group such soils contain at least 35% clay.

Cobble rock fragment, rounded or abraded between 64 and 256 mm in diameter. Cobbles are larger than gravel and smaller than boulders.

Contaminant generally, any chemical species introduced into the soil or water. More particularly relates to those species that render soil or water unfit for beneficial use.

Contamination is considered to have occurred when the concentration of a specific element or compound is established as being greater than the normally expected (or actually quantified) background concentration.

Discrete sample samples collected from different locations and depths that will not be composited but analysed individually.

Fluvial material deposited by, or in transit, in streams or watercourses.

Gradient rate of inclination of a slope. The degree of deviation from the horizontal; also refers to pressure.

Groundwater water held in the pores of an aquifer.

Heavy Metals all metallic elements whose atomic mass exceeds that of calcium (20) and includes lead (Pb), copper (Cu), Zinc (Zn), cadmium (Cd), and tin (Sn).

Hydrocarbon molecule consisting of carbon and hydrogen atoms only, such as found in petroleum.

Leachate water that flows through waste material (or other material) will liberate soluble molecules to form leachate.

Mottled masses, blobs or blotches of sub-dominant, varying colours in the soil matrix.

Organics chemical compounds comprising atoms of carbon, hydrogen and others (commonly oxygen, nitrogen, phosphorous, sulfur). Opposite is inorganic, referring to chemical species not containing carbon.

Permeability property of porous medium relating to its ability to transmit or conduct liquid (usually water) under the influence of a driving force. Also referred to as hydraulic conductivity.

pH logarithmic index for the concentration of hydrogen ions in an aqueous solution, which is used as a measure of acidity.

Phytotoxicity toxic concentration of a substance that is associated with symptoms of toxicity or reduced vigour, growth, and production of a plant.

Plume spreading of a contaminant from a point source, under the influence of dispersion, diffusion and the like.

Polycyclic aromatic Hydrocarbons (PAH's) complex organic molecules which originate typically in the combustion of organic compounds.

Profile the solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

Putrescible waste food waste, waste consisting of animal matter (including dead animals or animal parts) or biosolids categorised as Stabilisation Grade C in accordance with the criteria set out in the Biosolids Guidelines.

QA/QC Quality Assurance / Quality Control.

Remediation restoration of land or groundwater contaminated by pollutants, to a state suitable for other, beneficial uses.

Representative Sample assumed not to be significantly different than the population of samples available. In many investigations samples are often collected to represent the worst case situation.

Saturated Zone zone in which the rock or soil pores are filled (saturated) with water.

Stratigraphy vertical sequence of geological units.

Subsidence the downward settling of material with little horizontal movement.

Subsoil subsurface material comprising the B and C horizons of soils with distinct profiles. They often have brighter colours and higher clay content than topsoils.

Texture is the size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

Topsoil part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.

Toxicity the inherent potential or capacity of a material to cause adverse effects in a living organism.

Unsaturated zone vadose zone. The zone between the land surface and the water table, in which the rock or soil pores contain both air and water.

Volatile having a low boiling or subliming pressure (a high vapour pressure).

ENVIRONMENTAL EARTH SCIENCES GENERAL LIMITATIONS

Scope of services

The work presented in this report is Environmental Earth Sciences response to the specific scope of works requested by, planned with and approved by the client. It cannot be relied on by any other third party for any purpose except with our prior written consent. Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.

Data should not be separated from the report

A report is provided inclusive of all documentation sections, limitations, tables, figures and appendices and should not be provided or copied in part without all supporting documentation for any reason, because misinterpretation may occur.

Subsurface conditions change

Understanding an environmental study will reduce exposure to the risk of the presence of contaminated soil and or groundwater. However, contaminants may be present in areas that were not investigated, or may migrate to other areas. Analysis cannot cover every type of contaminant that could possibly be present. When combined with field observations, field measurements and professional judgement, this approach increases the probability of identifying contaminated soil and or groundwater. Under no circumstances can it be considered that these findings represent the actual condition of the site at all points.

Environmental studies identify actual sub-surface conditions only at those points where samples are taken, when they are taken. Actual conditions between sampling locations differ from those inferred because no professional, no matter how qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden below the ground surface. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated. However, steps can be taken to help minimize the impact. For this reason, site owners should retain our services.

Problems with interpretation by others

Advice and interpretation is provided on the basis that subsequent work will be undertaken by Environmental Earth Sciences NNSW. This will identify variances, maintain consistency in how data is interpreted, conduct additional tests that may be necessary and recommend solutions to problems encountered on site. Other parties may misinterpret our work and we cannot be responsible for how the information in this report is used. If further data is collected or comes to light we reserve the right to alter their conclusions.

Obtain regulatory approval

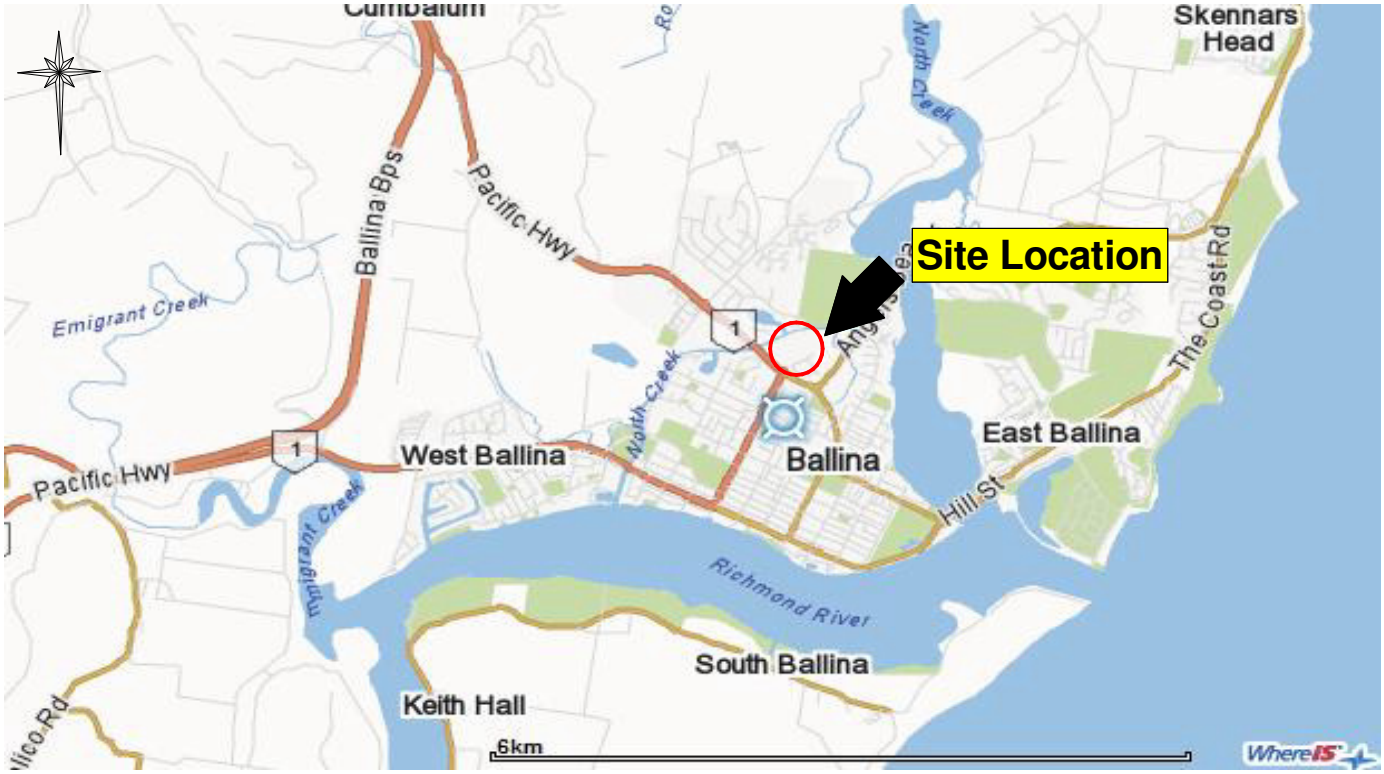
The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.

Limit of liability

This study has been carried out to a particular scope of works at a specified site and should not be used for any other purpose. This report is provided on the condition that Environmental Earth Sciences NNSW disclaims all liability to any person or entity other than the client in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Environmental Earth Sciences NNSW disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in Environmental Earth Sciences NNSW's proposal number and according to Environmental Earth Sciences general terms and conditions and special terms and conditions for contaminated sites.

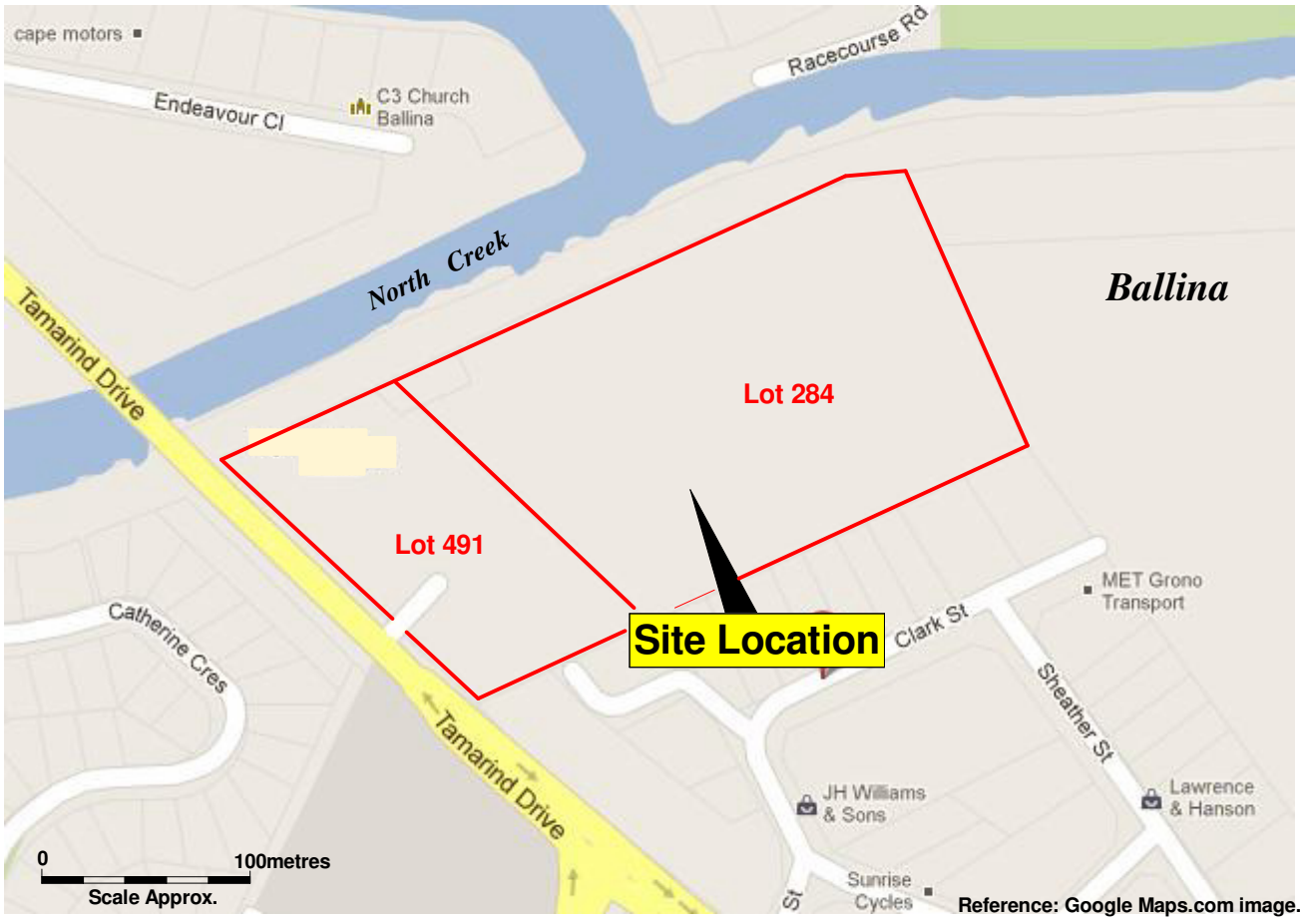
To the maximum extent permitted by law, we exclude all liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise for any loss or damage whatsoever that may arise in any way in connection with the supply of services. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased service.

FIGURES



Reference: WhereIs.com image.

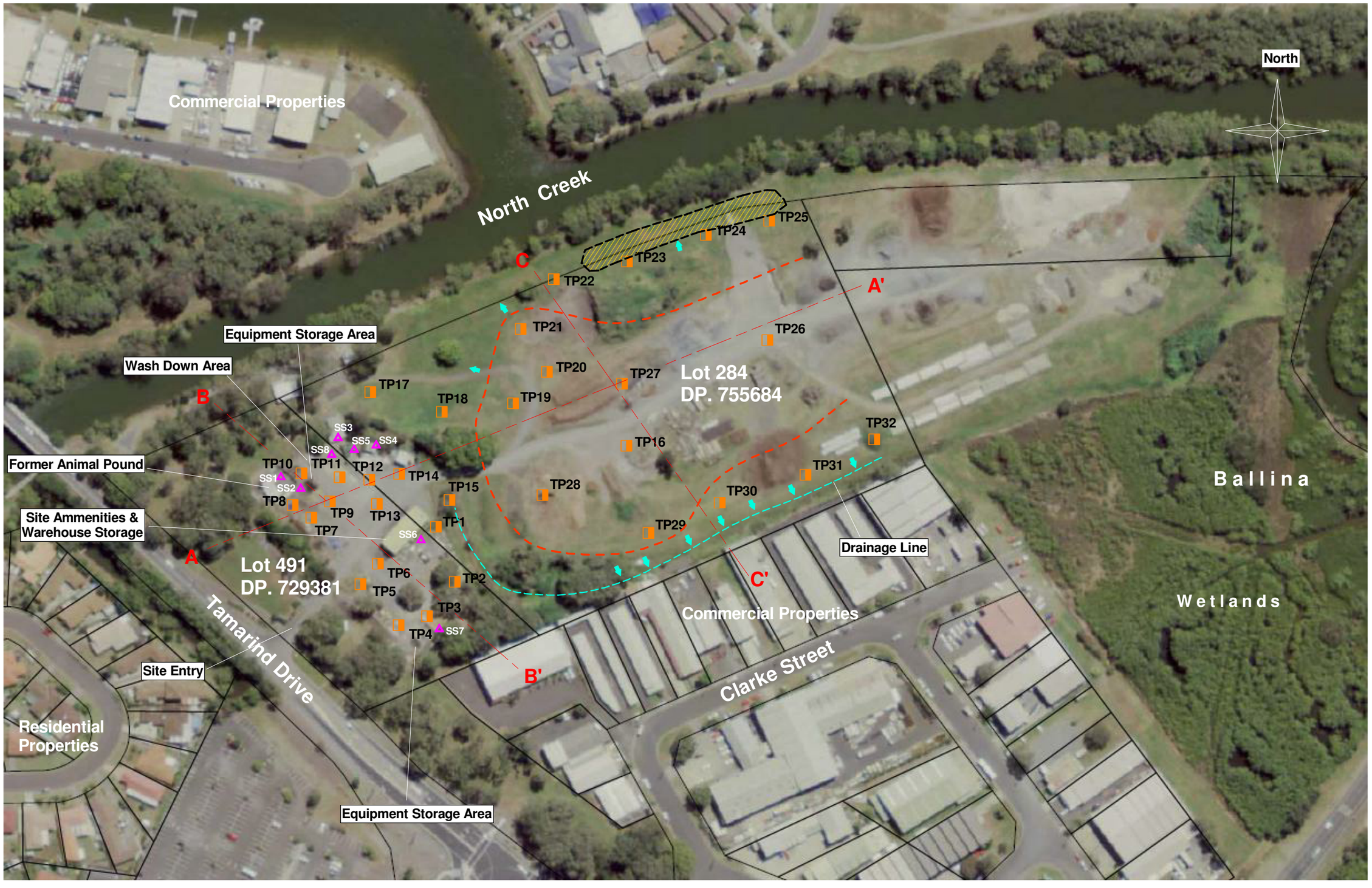
Regional Locality Map - Ballina, NSW



Reference: Google Maps.com image.

Site Locality Map

ENVIRONMENTAL EARTH SCIENCES THE KNOW AND THE HOW	Title: Site Location	
	Location: Tamarind Drive, Ballina, NSW	
Client: Geolink		Job number: 512017
Drawn by: TRJ	Scale: As shown	Source: See Ref.
Proj Man: CP	Date: Jan. 2013	Figure 1



0 50 100 150metres

Scale Approx.

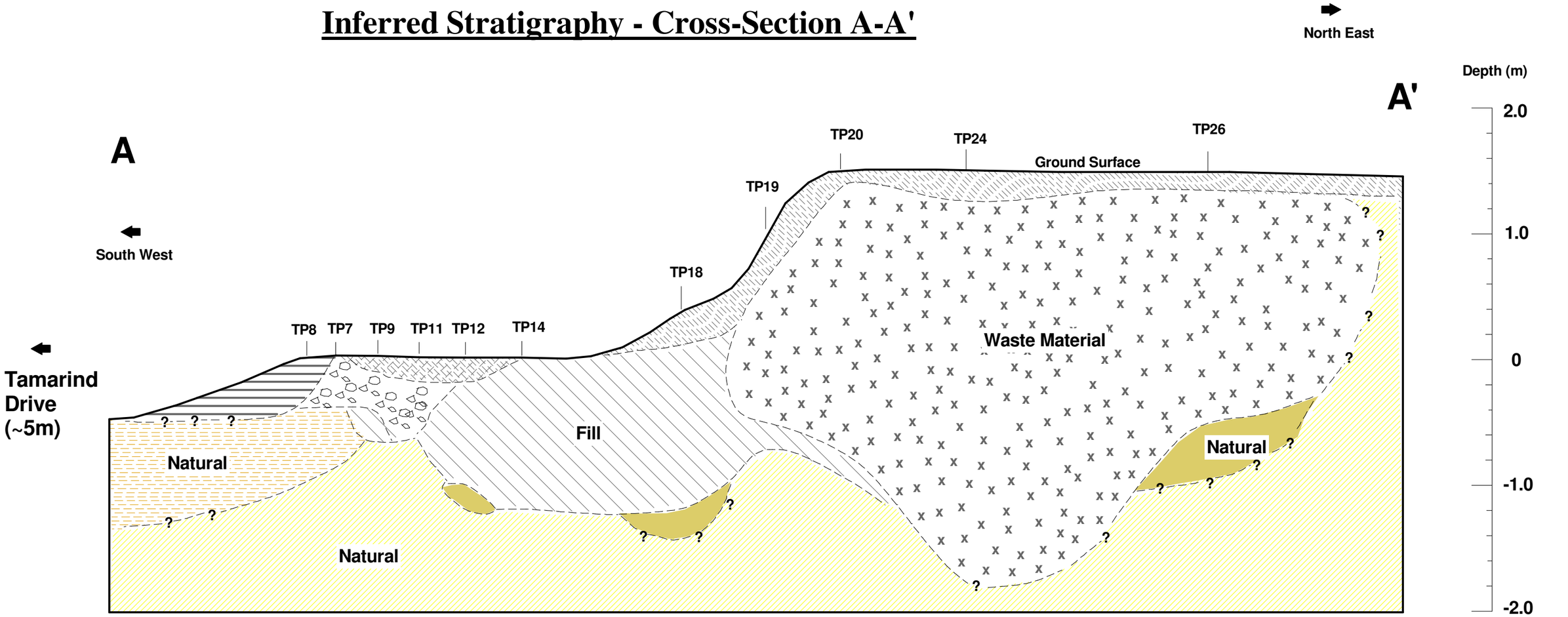
Legend:

- Cross Section locations (see Figs 3 & 4)
- Surface slope/runoff direction
- TP4 – Test Pit locations by EES (Jan 2013)
- SS1 – Surface sample locations
- Possible extent of waste (based on test pit logs)
- Possible location of night soil trenches (not encountered)

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

Title:	Sampling Locations Council Depot Landfill Site
Location:	Tamarind Drive, Ballina, NSW
Client: Geolink	Job number: 512017
Drawn by: TRJ	Scale: As shown
Proj Man: CP	Date: Feb. 2013
	Figure 2

Inferred Stratigraphy - Cross-Section A-A'



Note: Vertically exaggerated

340m

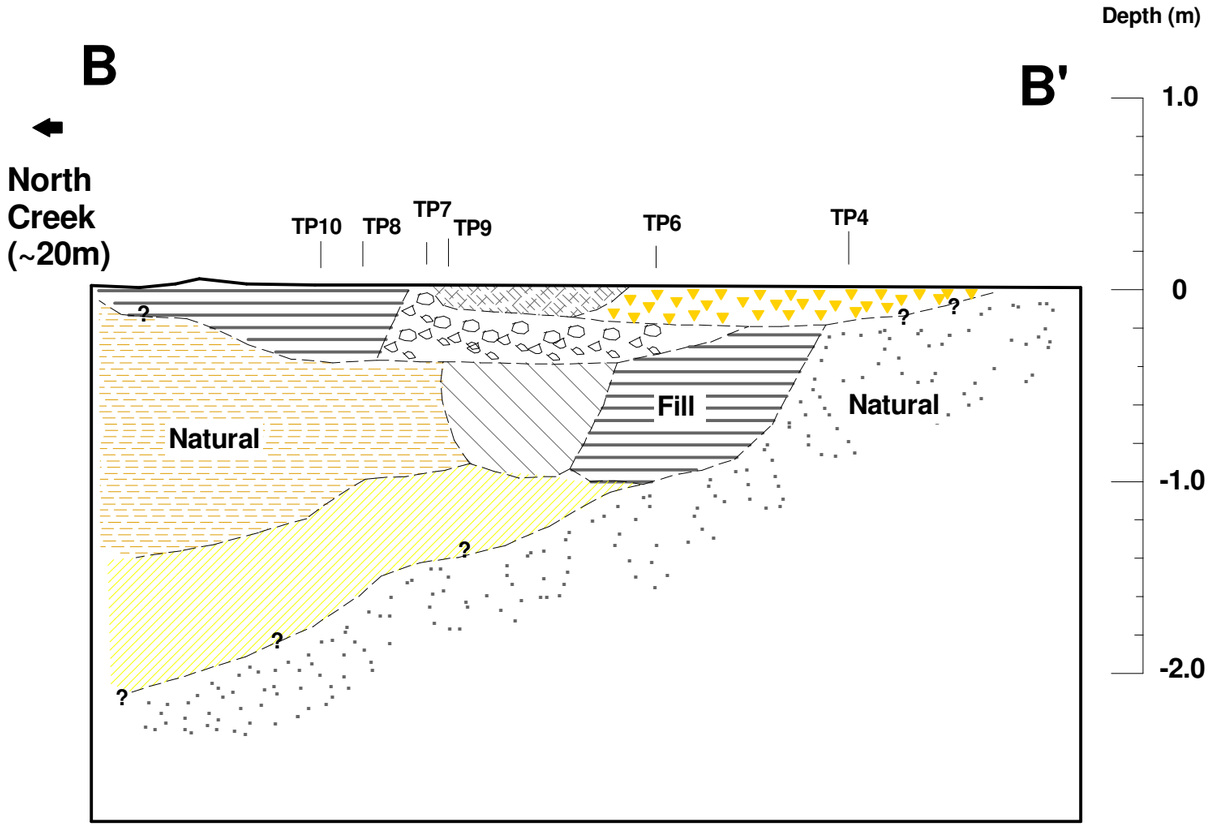
Legend:

- Waste (mixed clays with rubbish-broken glass bottles, tiles,bricks,wood,plastic,metal,wire,minor putrescibles)
- Fill (firm or loose,dark grey/brown,silt or silty clay or sand)
- Fill (Dark brown silty clay,black clay with yellow sand,gravel or bitumen)
- Fill (Mixed clays with minor gravels)
- Fill (Broken rock fragments with some clay)
- Fill (Dark brown silty clay or clay with minor rubbish - broken glass bottles,tiles and wood chips)
- FILL (Yellow sand and clay)
- NATURAL (Dark brown silty clay and clay with dark red and orange mottles)
- NATURAL (Dark grey/brown clay or sandy clay)
- NATURAL (Dark grey/brown sand and sandy clay)
- NATURAL (Yellow/grey sand)

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

Title: Inferred Stratigraphy Cross-Sections A-A'		
Location: Tamarind Drive, Ballina, NSW		
Client: Geolink		Job number: 512017
Drawn by: TRJ	Scale: As shown	Figure 3
Proj Man: CP	Date: Feb. 2013	

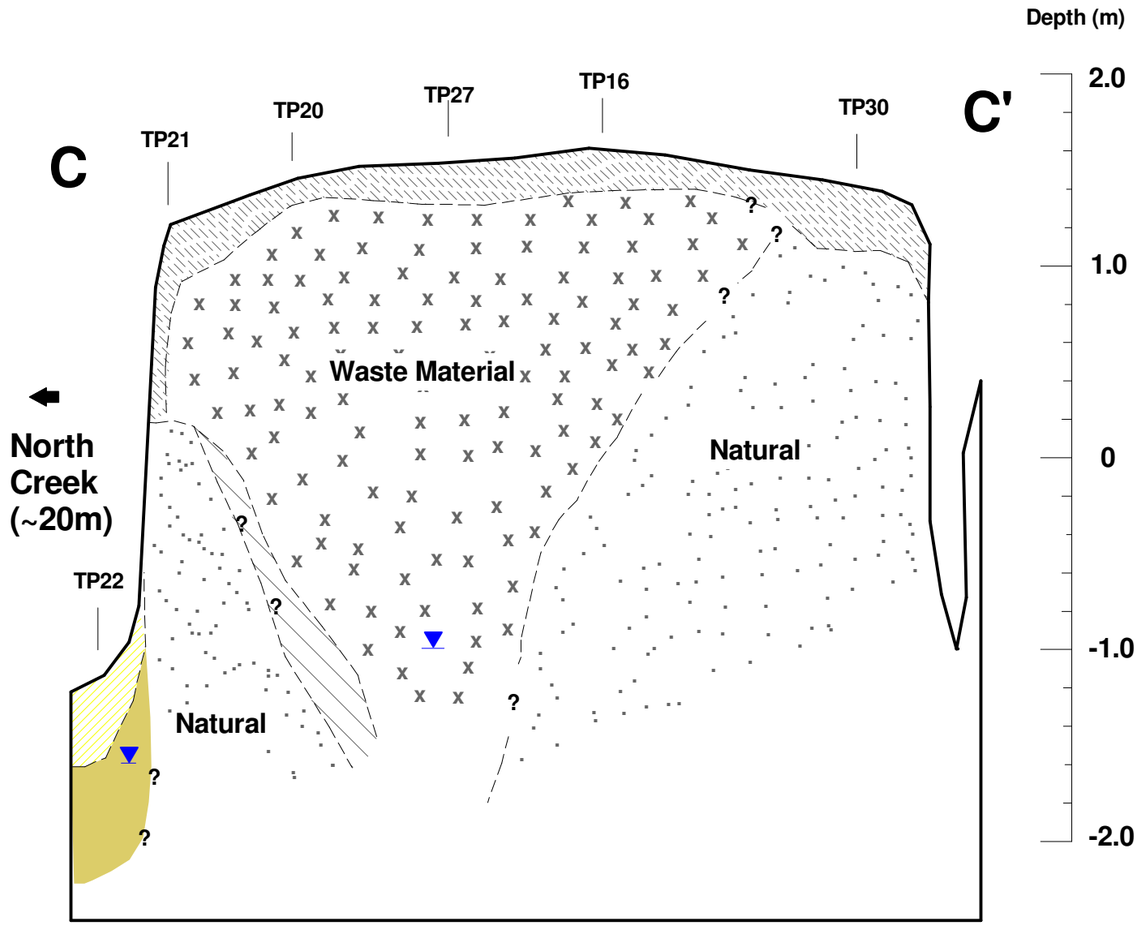
Inferred Stratigraphy - Cross-Section B-B'



Note: Vertically exaggerated

~175m

Inferred Stratigraphy - Cross-Section C-C'



Note: Vertically exaggerated

~160m

Legend:

- Waste (mixed clays with rubbish-broken glass bottles, tiles,bricks,wood,plastic,metal,wire,minor putrescibles)
- Fill (firm or loose,dark grey/brown,silt or silty clay or sand)
- Fill (Dark brown silty clay,black clay with yellow sand,gravel or bitumen)
- Fill (Mixed clays with minor gravels)
- Standing water level
- Fill (Broken rock fragments with some clay)
- Fill (Dark brown silty clay or clay with minor rubbish - broken glass bottles,tiles and wood chips)
- FILL (Yellow sand and clay)
- NATURAL (Dark brown silty clay and clay with dark red and orange mottles)
- NATURAL (Dark grey/brown clay or sandy clay)
- NATURAL (Dark grey/brown sand and sandy clay)
- NATURAL (Yellow/grey sand)

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

Title: Inferred Stratigraphy Cross-Sections BB' & CC'		
Location: Tamarind Drive, Ballina, NSW		
Client: Geolink		Job number: 512017
Drawn by: TRJ	Scale: As shown	Figure 4
Proj Man: CP	Date: Feb. 2013	

TABLES

TABLE 10 SUMMARY OF DETECTABLE ORGANIC RESULTS

Sample	TP1 (0.0-0.1)	TP4 (0.1-0.2)	TP5 (0.1-0.2)	TP6 (0.4-0-5)	TP6 (1.1-1-2)	TP7 (0.5-0.7)	TP8 (0.2-0.3)	TP9 (0.1-0.2)	TP10 (0.4-0.5)	TP11 (0.7-0.8)	TP12 (0.2-0.3)	TP12 (0.6-0.7)	SS1 (0.0-0.1)	SS5 (0.0-0.1)	SS6 (0.0-0.1)	DEC (2006)	NSW EPA 1994 (sensitive landuse)
Type	Natural	Fill	Fill	Fill	Natural	Natural	Fill	Fill	Natural	Fill	Fill	Fill	Fill	Fill	Fill	-	-
Polycyclic Aromatic Hydrocarbons																	
Naphthalene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Acenaphthylene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Acenaphthene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Fluorene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Phenanthrene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Anthracene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Fluoranthene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Pyrene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Benz(a)anthracene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Chrysene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Benzo(b)&(k)fluoranthene	-	<1	<1	-	-	-	<1	<1	-	-	<1	-	-	<1	-	-	-
Benzo(a)pyrene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	**5**	**1**
Indeno(1,2,3-cd)pyrene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Dibenzo(a,h)anthracene	-	<0.5	<0.5	-	-	-	<0.5	<0.5	-	-	<0.5	-	-	<0.5	-	-	-
Benzo(g,h,i)perylene	-	<0.5	<0.5	-	-	-	<0.5	0.63	-	-	<0.5	-	-	<0.5	-	-	-
Total PAH	-	ND	ND	-	-	-	ND	0.63	-	-	ND	-	-	ND	-	**100**	**20**
BTEX																	
Benzene	<0.5	-	-	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	-	**1**
Toluene	<0.5	-	-	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	-	**1.4**
Ethyl Benzene	<0.5	-	-	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	-	**3.1**
m, p - Xylene	<1	-	-	<1	<1	<1	-	-	<1	<1	-	<1	<1	-	<1	-	-
o - Xylene	<0.5	-	-	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	-	**14**
Total Petroleum Hydrocarbons																	
C_6 - C_9	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	25	<25	<25	<25	-	**65**
C_{10} - C_{14}	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	520	<50	<50	<50	-	-
C_{15} - C_{28}	<100	<100	<100	<100	<100	<100	<100	<100	660	<100	<100	1,600	<100	260	110	-	-
C_{29} - C_{36}	<100	<100	<100	<100	<100	<100	<100	120	270	<100	<100	450	<100	370	400	-	-
Total C_{10}-C_{36}	ND	ND	ND	ND	ND	ND	ND	120	930	ND	ND	**2,570**	ND	630	510	-	**1,000**

Notes:

1. results and guidelines are in mg/kg;
2. **bold** value indicates exceedance of guideline;
3. – not tested or no guideline; and
4. ND – not detected.

TABLE 11 SUMMARY OF DETECTED PAH RESULTS

Sample	TP9 (0.5-0.6)	TP13 (0.5-0.6)	TP18 (0.6-0.7)	DEC (2006)	NSW EPA 1994 (sensitive landuse)
Type	Fill	Fill	Fill	-	-
Polycyclic Aromatic Hydrocarbons (USEPA 8270 semi-volatile screen)-					
Acenaphthylene	<1	<1	<1	-	-
Naphthalene	<1	<1	<1	-	-
Acenaphthene	<1	<1	<1	-	-
Fluorene	<1	<1	<1	-	-
Phenanthrene	<1	<1	2.4	-	-
Anthracene	<1	<1	<1	-	-
Fluoranthene	<1	<1	2.9	-	-
Pyrene	<1	<1	3.5	-	-
Benz(a)anthracene	<1	<1	1.9	-	-
Chrysene	<1	<1	2	-	-
Benzo(b,k)fluoranthene	<2	<2	2.7	-	-
Benzo(a)pyrene	<1	<1	**2.2**	**5**	**1**
Indeno(1,2,3-cd)pyrene	<1	<1	1.2	-	-
Dibenz(a,h)anthracene	<1	<1	<1	-	-
Benzo(g,h,i)perylene	<1	<1	1.2	-	-
Total PAH	ND	ND	20	**100**	**20**

Notes:

1. results and guidelines are in mg/kg;
2. **bold** value indicates exceedance of guideline;
3. - not tested or no guideline; and
4. ND – not detected.

TABLE 12 HEAVY METAL RESULTS (mg/kg)

Sample (m)	Type	Cu	Pb	Zn	Cd	Cr	Ni	As	Hg
TP1 (0.5-0.6)	N	12	80	47	<0.5	8	4.5	3.5	0.08
TP3 (0.1-0.3)	F	20	19	60	<0.5	3.5	8	4.5	0.045
TP4 (0.4-0.5)	N	1.5	3	4.5	<0.5	2	1	1.5	0.005
TP6 (0.4-0.5)	F	7	18	48	<0.5	18	15	3.5	0.05
TP7 (0.5-0.7)	N	4.5	9	27	<0.5	17	8	3	0.035
TP8 (0.2-0.3)	F	15	24	37	<0.5	4	4.5	3	0.045
TP9 (0.1-0.2)	F	13	28	84	<0.5	5	10	4	0.035
TP10 (0.4-0.5)	N	23	24	68	<0.5	4.5	12	4.5	0.055
TP11 (0.7-0.8)	F	19	15	56	<0.5	3	9.5	4	0.08
TP12 (1.1-1.2)	N	4	7	47	<0.5	12	6	3	0.04
TP13 (0.5-0.6)	F	22	92	280	<0.5	15	13	5	0.13
TP14 (0.5-0.6)	F	9	12	35	<0.5	8.5	10	3	0.015
TP15 (0.2-0.3)	F	34	47	57	<0.5	11	8.5	3.5	0.06
TP17 0.3-0.4)	F	21	47	240	<0.5	14	15	5.5	0.085
TP19 (0.2-0.3)	F	10	24	92	<0.5	17	14	4.5	0.03
TP19 (0.6-0.7)	W	19	90	190	<0.5	14	14	6.5	0.085
TP19 (2.0-2.1)	N	7	35	34	<0.5	10	6.5	3	0.03
TP21 (0.5-0.6)	W	68	260	620	1.5	18	2	6	0.14
TP22 (0.4-0.5)	N	4	12	19	<0.5	10	7	3	0.04
TP26 (1.1-1.2)	W	80	350	910	2.5	13	14	7	0.12
TP27 (1.5-1.6)	W	60	220	1,760	2.5	17	23	8	0.22
TP28 (0.9-1.0)	W	4	14	28	<0.5	10	7.5	6	0.35
TP28 (1.1-1.2)	N	1	1.5	3	<0.5	1	2	0.5	0.005
TP29 (2.0-2.1)	F	90	460	880	3.5	28	3	6.5	0.12
TP30 (0.4-0.5)	N	12	52	92	0.5	7	7.5	5	0.05
TP31 (0.4-0.5)	N	2.5	11	23	<0.5	7	6.5	3	0.01
TP32 (0.6-0.7)	N	2	6	16	<0.5	5.5	4.5	2.5	0.01
SS2 (0.0.-0.1)	F	32	17	110	<0.5	6.5	5.5	4	0.045
SS4 (0.0-0.1)	F	30	30	390	0.5	12	11	6.5	0.04
SS5 (0.0.-0.1)	F	23	100	250	0.5	13	11	4.5	0.03
SS6 (0.0-0.1)	F	100	270	1960	2.5	26	17	7.5	0.24
DEC (2006)	**-**	**5,000**	**1,500**	**35,000**	**100**	**500**	**3,000**	**500**	**75**

Note: N = Natural, F= Fill, W= Waste.

APPENDIX A TESTPIT LOGS

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP1	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Natural: Topsoil - dark brown gravelly, SILTY CLAY.			M	7	0.2		No odour throughout Septic tank nearby
.2	Natural: Loose, yellow SAND with some dark grey clay.							
.4				M	5	0.1		
.6	Natural: Loose, dark brown SAND.							
.8								
1				M	5			
1.2	End of hole: Target depth @ 1.2 metres.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP2	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1 / 1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Gravel at surface; brown CLAY and dark grey, gravelly silty clay (70%, <5cm); metal pipe and roots present.			M	7	0		No odour throughout
.4	Natural: Loose, white SAND with fine red gravel and some roots.			M	6.5	0.1		
1.2	End of hole: Target depth @ 1.2 metres.							

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP3	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark grey, sandy, silty GRAVEL (shale, 70%, <5 cm) with minor clay			M	7	0		No odour
.2								
.4	Natural: Loose, yellow coarse SAND with occasional gravel.							
.6				M	6.5	0.3		No odour
.8								
1								
1.2	Natural: Dark brown/orange CLAY.							
1.4				m	5	0.1		Minor H2S odour
1.6	End of hole: Target depth @ 1.5 metres.							
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP4	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 24/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 24/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	HARDSTAND (~5 cm) Fill: Hard, dark yellow CLAY with some black clay.			D	7	0		No odour throughout.
.2	Natural: Yellow/orange SAND with minor rounded gravel (10%, <2 cm).							
.4				M	6.5	0		
.6								
.8								
1								
1.2				M/W	5.5	0		
	End of hole: 1.2 metres in natural material							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP5	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 24/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 24/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, dark brown, slity CLAY with angular to sub-rounded fine gravels (20%, <3 cm); some rootlets.			M	4.5	0		No odour throughout.
.2								
.4	Natural: Loose, yellow/orange/white SAND with minor rounded gravel (5%, <3 cm).							
.6								
.8								
1				M	6.5	0		
1.2	End of hole: 1.0 metre in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP6	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	HARDSTAND (~5 cm) Fill: Firm, yellow/orange SAND and CLAY.			D				No odour.
.2	Fill: Grey, weathered, hard rock with some black and blue staining.							
	Fill: Stiff, dark brown/black sticky CLAY with some mixed orange/brown/yellow clay.			D	6.5	0		Slight sweet chemical odour.
.4				M	5	0.5		Slight sweet manure odour.
.6								
.8								
1	Natural: Loose, grey/black SAND.							
				M	7	0		Slight H2S odour.
1.2	End of hole: 1.2 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP7	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Gravel.							
.2	Fill: Grey, weathered rock and hard, dry orange/brown CLAY with gravel.			D	6.5	0		No odour.
.4	Natural: Stiff, brown CLAY with dark orange mottles (20%).			M	7	0		No odour Field blind duplicate FD1 collected here
.6								
.8								
1								
1.2								
1.4	End of hole: 1.4 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP8	LOGGED BY:
EASTING: -	DRILL TYPE: Backhoe		A.Plioplis
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED:
ELEVATION: -	DATE FINISHED: 22/1/2013		C. Pitman

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Stiff and/or firm, orange/grey/red SILTY CLAY with weathered angular gravel (ironstone, shale; 20%).			M	5	0		No odour throughout.
.4	Natural: Stiff, sticky, dark brown SILTY CLAY with red mottles.			M	5	0		
1	Natural: Loose, grey/brown/orange, fine grained SAND.			W	6.5	0		
1.4	End of hole: 1.5 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP9	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark brown SILTY CLAY with bitumen.							
.2	Fill: Grey weathered rock with minor silt and silty clay.			D	8	0		No odour Field blind duplicate FD2 collected here
.4	Fill: Dark brown CLAY with orange mottles and some rubbish (broken glass, roots, minor gravels [<1%, <1 cm] fragments of tiles, perspex plastic, fake teeth).			M	5	0.3		No odour.
.6								
.8								
1	Natural: Loose to firm, dark grey/brown SAND with minor clay.							
1.2				M/W	6.5	0		No odour.
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP10	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Black/dark brown/dark grey CLAY.							
.2				D	6	0		No odour.
	Natural: Dark grey CLAY with gravel and minor mixed brown clay.							
.4								
	Natural: Dark grey CLAY with minor grey sand.			M/W	7	0.2		Strong hydrocarbon odour.
.6								
.8			—	MW	5	0.2		No odour.
1								
1.2	Natural: Dark grey SAND.							
1.4				W	6.5	0		No odour.
	End of hole: 1.5 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP11	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark brown SILTY CLAY with gravel.			D				No odour.
.2	Fill: Rock fragments, angular (70%, 1-10 cm; shale) with grey clay.							
.4								
.6								
.8	Natural: Soft, dark grey SAND.			M/D	7	0		No odour.
1								
1.2				W	7.5	0		No odour.
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP12	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark brown, black CLAY.							
	FILL: Loose, yellow SAND.							
.2	Fill: MIxed black/red/brown/orange clay with angular gravels of black rock, tiles, glass bottles			M	5	0.1		No odour.
.4								
.6				M	6	1.1		Stong hydrocarbon odour associated with staining
	Green staining							
.8								
1	Natural: Dark grey/brown CLAY with some sand.							
1.2				M	6.5	0		No odour.
	End of hole: 1.2 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP13	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Hard, mixed yellow/orange CLAY with gravel (shale/ white rock).		—	D				No odour.
.2	Fill: Dark brown/orange CLAY with broken and intact glass bottles.							
.4								
.6			■	M	5	6		No odour.
.8								
1	Natural: Dark brown/red CLAY.							
1.2			■	M	5.5	0		No odour.
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP14	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: "Metal dust" (fine black gravels) followed by Mixed yellow sand with black gravel (basalt, <0.5 cm, 50%) and minor organics (wood chips).							
.2								
.4								
.6				M	6.5	0		No odour.
.8								
1								
1.2	Natural: Dark grey SAND.			W	6.5	0		No odour.
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP15	LOGGED BY:
EASTING: -	DRILL TYPE: Backhoe		A.Plioplis
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED:
ELEVATION: -	DATE FINISHED: 22/1/2013		C. Pitman

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, dark brown, SILTY CLAY (topsoil).			M				Grassed ground surface
.2	Fill: Stiff, mixed dark grey/black/dark brown CLAY.			M	7	0		No odour. Field blind duplicate FD3 collected here.
1	Natural: Loose, yellow/dark grey SAND.			m	5.5	0		No odour.
1.2	End of hole: 1.3 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP16	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Hard/loose, light brown SILT with rootlets and some weathered shale.			D	6.5	0		No odour throughout
.2	Fill: WASTE: Loose, mixed grey/brown silt, clay and sand with broken glass bottles and rock fragments, minor copper sulfate, plastics							
.4								
.6								
.8								
1	Natural: Loose, yellow/light brown SAND.			M	8	0		
1.2								
1.4								
1.6								
1.8				m	8	0		
2	End of hole: 2 metres in natural material.							

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP17	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark brown SILTY CLAY with glass shards, tiles and glass bottles.							Grassed surface
.2								
.4			■	D/M	6.5	0.1		No odour.
.6								
.8								
1								
1.2	Natural: Firm, yellow/brown SAND.		■	M	7	0.1		No odour.
1.4	End of hole: 1.4 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP18	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Firm, mixed dark brown/orange/grey SILTY CLAY with roots, gravels, cobbles, tiles and glass bottles.			D/M	5	0.1		No odour throughout.
.2	Fill: Firm, dark brown SILTY CLAY with occasional fragments of glass bottles and tiles.							
.4								
.6				M	5.5	0		
.8								
1								
1.2								
1.4								
1.6	Natural: Dark grey mottled brown SANDY CLAY.			M	7.5	0		
	End of hole: 1.4 metres in natural material.							
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP19	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Grey gravelly SILT (roadbase)			D				
	Fill: Dark brown/grey SILTY CLAY.							No odour throughout.
.2				D	7	0		
	Fill: WASTE - Mixed grey/orange/brown silty clay with broken bricks, glass, wood and tiles.							
.4								
.6				M	7	0.1		
.8								
1								
1.2								
1.4								
	Fill: Dark brown SILTY CLAY with minor sand, broken glass, wood and tiles and some black clay.							
1.6								
1.8	Natural: Dark grey SANDY CLAY							
2								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP19	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
2				M	7.5	0		
2.2	End of hole: 2.2 metres in natural material.							
2.4								
2.6								
2.8								
3								
3.2								
3.4								
3.6								
3.8								
4								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP20	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Grey silty gravel (roadbase).			D				No odour.
.2	Fill: WASTE - Mixed brown/dark grey silty clay with rubbish consisting of broken bottles, tiles, rock (<20 cm, gravel to cobble sized), bricks and barbed wire (40%).							
.4								
.6								
.8				D/M				No odour.
1								
1.2								
1.4								
1.6								
1.8								
2								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP20	LOGGED BY:
EASTING: -	DRILL TYPE: Backhoe		A.Plioplis
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED:
ELEVATION: -	DATE FINISHED: 23/1/2013		C. Pitman

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
2								
2.2	Fill: Dark brown clayey SAND with some rubbish.			M	7	0		No odour.
	End of hole: 2.3 metres in fill/waste (target depth).							
2.4								
2.6								
2.8								
3								
3.2								
3.4								
3.6								
3.8								
4								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP21	LOGGED BY:
EASTING: -	DRILL TYPE: Backhoe		A.Plioplis
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED:
ELEVATION: -	DATE FINISHED: 23/1/2013		C. Pitman

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Firm, black SILT.							
.2				D				No odour.
	Root zone							
	Fill: WASTE - Firm to stiff SILTY CLAY with minor rubbish (plastic and glass).							
.4								
.6				D/M	7.5	0.2		No odour.
.8								
1	Natural: Loose, yellow/brown SAND.							
1.2								
1.4	Saturated zone (1.4-1.5 m)			W	7.5	0.2		Chemical odour.
	Natural: Stiff, sticky, dark grey/black CLAY.			M	8	0.3		No odour.
1.6	End of hole: 1.6 metres in natural material.							
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP22	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose/firm, brown, fine grained SAND with minor silt and roots.							Grassed surface No odour.
.4	Natural: Dark grey CLAY (saturated layer)			S	6	0		No odour.
1.2				S	7	0		Slight H2S.
1.4	End of hole: 1.4 metres in natural material.							
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP23	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Natural: Brown SILTY CLAY (topsoil)							Grassed surface
.2	Natural: Loose, yellow/brown/orange SAND with roots, and some hard, dark grey clay inclusions (<5 cm, 10%).							No odour throughout.
.4								
.6			■	M	6	0		
.8								
1								
1.2								
1.4	End of hole: 1.4 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP24	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Tree roots at surface							
	Natural: Loose, dark brown SAND with roots.			M	6.5	0		No odour throughout.
.2								
.4								
	Natural: Loose, yellow SAND with minor roots.							
.6								
			—	M				No odour.
.8								
1	End of hole: 1.0 metre in natural material.							
1.2								
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP25	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Natural: Dark brown SILTY CLAY (topsoil).			D				Grassed surface. No odour throughout.
.2	Natural: Loose, yellow/brown SAND with minor dark brown clay lenses.							
.4				M	5.5	0		
.6								
.8								
1								
1.2	End of hole: 1.2 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP26	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Firm to loose, dark brown silty gravelly CLAY; gravels are angular (40%).							
.2	FIll: WASTE - Loose, dark brown, SILTY CLAY with demolition rubble (50%) consisting of tiles, brick, wood, plastic, glass fragments (20%), wire and metal bars (50%).			D	7.5	0		No odour.
.4								
.6								
.8								
1								
1.2				M	8.5	0		No odour.
1.4	Tree trunk encountered (1.3 x 0.4 m)							
1.6								
1.8								
2								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP26	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
2	Natural: Stiff, sticky dark grey CLAY with minor angular gravel.			M/W	8	0		No odour.
2.2	End of hole: 2.2 metres in natural material.							
2.4								
2.6								
2.8								
3								
3.2								
3.4								
3.6								
3.8								
4								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP27	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, yellow/brown silty GRAVEL (70%, <0.2 cm)							
	Layer of hard yellow clay with gravel		—	D				No odour.
.2	Fill: WASTE - Mixed grey/yellow/brown silt, gravel and clay with rubbish including broken glass bottles, plastic bottles, rock fragments (gravel to boulder sized)							
.4								
.6			—	D				
.8	Car body part							
1								
	Minor putrescibles (bone, plastic bags)							
1.2								
1.4								
			■	M	8	0		No odour.
1.6								
1.8								
2								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP27	LOGGED BY:
EASTING: -	DRILL TYPE: Backhoe		A.Plioplis
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED:
ELEVATION: -	DATE FINISHED: 23/1/2013		C. Pitman

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	SAMPLES Moisture	SAMPLES pH	SAMPLES PID (ppm)	SAMPLES Water Level	COMMENTS
2								
2.2								
2.4	Fill: WASTE - black/brown clayey SAND with rubbish (tile fragments) - saturated							
2.6			—	S				
2.8								
3			■	S	7	0		Chemical odour.
3.2	End of hole: 3.2 metres in waste material - hole collapsing due to inflow of water.							
3.4								
3.6								
3.8								
4								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP28	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Dark brown, clayey SILT with rootlets (topsoil).			M	7	0		No odour.
.2	Fill: Firm, dark brown, SILTY CLAY with some gravel, tile and rock fragments (5%) and plastics (e.g. black electrical pipe).							
.4								
.6								
.8								
1				D	6.5	0		No odour.
	Natural: Loose, yellow/light brown SAND.			M	7	0		No odour.
1.2	End of hole: 1.2 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP29	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/2

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, dark brown SILTY SAND with gravel (topsoil).							Grassed surface
.2				M	6.5	2-25		No odour throughout
.4	FIll: WASTE - Loose, light brown SAND, fine grained, with angular to rounded gravels and boulders (60%), rubbish including old cans, material (clothing), glass pieces, plastic bags, tiles, broken ceramic and metal pipes and rootlets.							
.6				M				
.8				M	7			
1				M	6	0		
1.2								
1.4								
1.6								
1.8								
2	Brick fragments (<10 cm, 50%) and star pickets							

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP29	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
2				M		144		
2.2				M		85		
2.4	Natural: Stiff, sticky, dark grey SANDY CLAY.			M		14.9		
	End of hole: 2.5 metres in natural material.							
2.6								
2.8								
3								
3.2								
3.4								
3.6								
3.8								
4								

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP30	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 23/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 23/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1 / 1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, dark brown SANDY SILT with one tile fragment (topsoil)							Grassed surface. No odour throughout.
.2			—	M	6			
.4	Natural: Light brown SAND with occasional dark grey clay.							
.6				M	6.5			
.8								
1								
1.2								
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP31	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed

Moisture: M=Moist D=Dry S=Saturated

Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Fill: Loose, dark brown SANDY SILT (topsoil).			M				
.2	Natural: Dark brown SAND, fine grained, with minor yellow/grey clay.							
.4				M	7	0		No odour.
.6								
.8								
1								
1.2	End of hole: 1.2 metres in natural material.							
1.4								
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

LOCATION: Tamarind Drive, Ballina, NSW	JOB No. 512017	TESTPIT LOG: TP32	LOGGED BY: A.Plioplis
EASTING: -	DRILL TYPE: Backhoe		
NORTHING: -	DATE STARTED: 22/1/2013	CLIENT: Geolink	APPROVED: C. Pitman
ELEVATION: -	DATE FINISHED: 22/1/2013		

Sample: Disturbed; Undisturbed
Moisture: M=Moist D=Dry S=Saturated
Groundwater: Water Strike; Standing Water Level

PAGE #: 1/1

Depth (metres)	STRATIGRAPHY	GRAPHIC LOG	SAMPLES Type	Moisture	pH	PID (ppm)	Water Level	COMMENTS
0	Natural: Loose, dark brown SANDY SILT (topsoil)		—	M	6.5	0		
.2	Grading to brown SAND.							No odour.
.4								
.6	Natural: Loose, yellow/dark brown SAND with some clay (2%).		■	M	6.5	0		No odour.
.8								
1								
1.2								
1.4	End of hole: 1.3 metres in natural material.							
1.6								
1.8								
2								

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

APPENDIX B QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

The aim of quality control and quality assurance (QA/QC) is to deliver data that is:

- representative of what is sampled;
- precise;
- accurate; and
- reproducible.

As investigations involve both field and laboratory QA/QC, these are similarly divided. The objective of this document is to evaluate and identify the data quality objectives (DQOs) and the data quality indicators (DQIs), which are used to assess whether the DQOs have been met.

All surface water, groundwater and soil sampling procedures to be followed are described in full in our *Soil, gas and groundwater sampling manual (*Environmental Earth Sciences Ltd 2009). This document should be referred to for field procedures for sampling and conveyance. Copies are available for inspection if required.

The NSW guideline documents used in the evaluation of the data set for this investigation are:

- Australian and New Zealand Environment and Conservation Council 1992, *Australian and New Zealand Guidelines for the assessment and management of contaminated sites,* Australia and New Zealand Environment Council, National Health and Medical Research Council, Melbourne, Vic;
- Department of Environment and Conservation NSW 2006, *Contaminated sites: Guidelines for NSW Site Auditors Scheme*, 2nd edition, Department of Environment and Conservation NSW, Sydney, NSW;
- National Environment Protection Council (NEPC) 1999, *National environment protection (assessment of site contamination) measure*, National Environment Protection Council, Adelaide, SA;
- NSW Environment Protection Authority (EPA) 1995, *Contaminated sites: Sampling design guidelines,* EPA NSW, Chatswood, NSW; and
- NSW EPA 1997, *Contaminated sites: Guidelines for consultants reporting on contaminated sites,* EPA NSW, Chatswood, NSW.
- Standards Australia 2005, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds*, (AS 4482.1), Standards Australia, Sydney, NSW; and
- Standards Australia 1999, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 2: Volatile substances*, (AS 4482.2), Standards Australia, Homebush, NSW.

Data quality is typically discussed in terms of precision, accuracy, representativeness, comparability and completeness. These are referred to as the PARCC parameters. The PARCC (and additional QA) parameters are discussed within this report.

The following items form part of the QA/QC appendix:

- repeatability;
- precision;
- accuracy;
- representativeness;
- completeness;
- comparability;
- sensitivity;
- holding times;
- blanks; and
- procedures for anomalous samples and confirmation checking.

1.2 Background

The terms “quality assurance” and “quality control” are often confused. In any program, quality control is required before assurance can be put in place. With respect to laboratory analysis activities, these terms are defined as follows:

Quality Assurance (QA) is “a set of activities intended to establish confidence that quality requirements will be met” (AS/NZS ISO 9000:2005).

This encompasses all actions, procedures, checks and decisions undertaken to ensure the accuracy and reliability of analysis results. It includes routine procedures which ensure proper sample control, data transfer, instrument calibration, the decisions required to select and properly train staff, select equipment and analytical methods, and the day to day judgements resulting from regular scrutiny and maintenance of the laboratory system.

Quality Control (QC) is “a set of activities intended to ensure that quality requirements are actually being met” (AS/NZS ISO 9000:2005). In other words, the operational techniques and activities that are used to fulfil the requirements for quality.

These are the components of QA which serve to monitor and measure the effectiveness of other QA procedures by comparison with previously decided objectives. They include measurement of the quality of reagents, cleanliness of apparatus, accuracy and precision of methods and instrumentation, and reliability of all of these factors as implemented in a given laboratory from day to day.

A complete discussion of either of these terms or the steps for implementing them is beyond the scope of this document. It is widely recognised, however, that adoption of sound laboratory QA and QC procedures is essential and readers are referred to documentation available from the National Association of Testing Authorities (NATA), if further information is required.

2 QUALITY CONTROL AND QUALITY ASSURANCE

2.1 Measurement data quality objectives

Step 7 of the DQO process (Section 3.0 of the main report) is a focus on the quality of the information by measurement, that is, measurement data quality objectives (MDQOs). The aim of a quality control and quality assurance (QA/QC) is to deliver data that is representative of what is sampled, precise, accurate and reproducible. As investigations involve both field and laboratory QA/QC, these are similarly divided. The objective of this section is to provide the MDQOs and the measurement data quality indicators (MDQIs), which will be used to establish whether the DQOs have been met.

All soil sampling procedures generally need to be undertaken according to a standard procedure, for example those procedures set out in:

- National Environment Protection Council (NEPC) 1999, *National environment protection (assessment of site contamination) measure*, National Environment Protection Council, Adelaide, SA;
- NSW Environment Protection Authority (EPA) 1995, *Contaminated sites: Sampling design guidelines,* EPA NSW, Chatswood, NSW;
- NSW EPA 1994, *Contaminated sites: Guidelines for the assessment of service station sites,* EPA NSW, Chatswood, NSW.
- NSW EPA 1997, *Contaminated sites: Guidelines for consultants reporting on contaminated sites,* EPA NSW, Chatswood, NSW.
- Standards Australia, 2005, Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds, (AS 4482.1), Standards Australia, Sydney, NSW; and
- Standards Australia, 1999, Guide to the investigation and sampling of sites with potentially contaminated soil, Part 2: Volatile substances, (AS 4482.2), Standards Australia, Homebush, NSW.

Measurement data quality is typically discussed in terms of precision, accuracy, representativeness, comparability and completeness. Although not necessarily considered in list order, the following items should form part of the QA/QC data evaluation:

- Measured Parameters: precision, accuracy, repeatability (comparability), blanks; and
- Assessed Parameters: completeness, representative of site conditions, sensitivity, and holding times.

The laboratories used should be NATA accredited for the analytical methods performed. Containers, sample preservation (if necessary) and holding times should be consistent with industry practices as set out in NEPM and as defined by ASTM.

The QA parameters selected and the criteria used to evaluate the analytical data are defined below and presented in Table 2 of this report.

2.1.1 Repeatability (Field collected intra-laboratory duplicates)

These samples provide a check on the analytical performance of the laboratory. At least 5 percent of soil samples (1 in 20) per day of sampling from a site are collected in duplicate. For comparability of data, it is important that there is little delay in the sample submission. For split samples, because of error associated with field splitting, an RPD of between 80 and 150% (depending on the substance) will be allowed as the MDQI. Soil heterogeneity due to the "nugget effect" could result in significantly greater difference, particularly for metals. Consequently, samples with the most observable field homogeneity are selected.

Any value >50% RPD will be noted and discussed, as per Standards Australia requirements, with respect to its acceptability for inclusion in the data-set.

2.1.2 Precision

Precision is a measure of the reproducibility of results, and is assessed on the basis of agreement between a set of replicate results obtained from duplicate analyses. The precision of a duplicate determination can be measured as relative percentage difference (RPD), and is calculated from the following equation:

$$RPD = \left[\frac{X1 - X2}{\left(\frac{X1 + X2}{2} \right)} \right] \times 100$$

where: X1 is the first duplicate value

X2 is the second duplicate value

The field blind and split duplicate results and calculated RPDs are presented in Table 1, Table 2, Table 3 and Table 4 for organics and Table 5, Table 6, Table 7 and Table 8. All results are considered to be within the acceptable range.

2.1.3 Accuracy

Accuracy is a measure of the agreement between an experimental determination and the true value of the parameter being measured. The determination of accuracy can be achieved through the analysis of known reference materials or assessed by the analysis of matrix spikes. Accuracy is measured in terms of percentage recovery as defined by the following equation:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where: %R = percentage recovery of the spike

SSR = spiked sample result

SR = sample result (native)

SA = spike added

Laboratories calculate percentage recoveries of spiked compounds, which are evaluated against control or acceptance limits taken from the appropriate method or the Contract Laboratory Program Statement of Work. If the spike recovery for a sample does not fall within the prescribed control limits, laboratory based corrective action is required.

Surrogate spikes consist of spiking non-target compounds into the sample prior to analysis. The spiked compounds are expected to behave during analysis in the same way as the target compounds. Every sample is spiked prior to extraction or analysis with surrogate compounds that are representative of the analysis. If surrogate spike recovery does not meet the prescribed control limits, samples should be reanalysed.

For inorganic analyses, certified reference materials are analysed (for SAL this is AGAL-10).

2.1.4 Representativeness

Data Point Evaluation

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

Representativeness is primarily dependent on the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handling and analysis protocols, and use of proper chain-of-custody and documentation procedures. Blanks, holding times and field duplicates are all QA parameters that can assist in the analysis of representativeness for data point evaluation and will need to be analysed as part of the measurement data quality assessment.

Data Set Evaluation

Whether the data is representative of the site is checked in part by undertaking an evaluation of the whole data set to establish the data is compatible. Data compatibility is authenticated by confirming that the laws of chemistry are upheld (i.e. nitrate is not present when Eh is -250 mV), that intra-laboratory analysis relationships are consistent (i.e. BTEX is a subset of the TPH C_6-C_9 fraction), that observations and field measurements are in agreement with other field data and the laboratory data and that results are consistent with the geology, history and logic.

2.1.5 Completeness

The following information is required to check for completeness of data sets:

- chain-of-custody forms (completed by Environmental Earth Sciences and the laboratory);
- sample receipt forms;
- all requested sample results reported;
- all blank data reported;
- all laboratory duplicates reported and relative percent differences (RPDs) calculated;
- all surrogate spike data reported;
- all matrix spike data reported; and

- NATA stamp on reports.

2.1.6 Comparability

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity, sampling procedures) under which separate sets of data are produced to ensure minimal common error. Data comparability should be demonstrated by the use of standardised sampling and analysis procedures. Data comparability was maintained by undertaking the investigations as follows:

- sampling during the investigation was conducted by trained Environmental Earth Sciences field team using Environmental Earth Sciences' standard operating procedures;
- all soil samples were collected from an excavator bucket or by hand from the ground surface; and
- the same laboratories (NMI and SAL) were used for organic and inorganic analysis for all relevant samples using the same NATA approved analytical methods. Split samples were sent to ALS for organic and inorganic analysis (also NATA approved).

2.1.7 Sensitivity

When interferences are present in the sample, a loss of sensitivity can occur resulting in an increase in the method detection limit. In some instances (e.g. where one or more compounds have particularly high concentrations) the sample must be diluted for analysis. This increases the method detection limit by the dilution factor.

The detection limits achieved by the laboratory, when adjusted for dry weight and interferences from the presence of other chemicals within the sampled matrix, must be less than half the site criteria for all analytes tested (i.e. 2 x LOR <site criteria).

2.1.8 Blanks

To meet the QC acceptance criteria, laboratory blanks should have no detectable concentrations of the target compounds. Trip blanks (taken to and returned from the field) and rinsate blanks (taken in the field) will only be necessary for analysing dissolved metals and volatile organic compounds in water samples where the threshold value is near the detection limit for an individual compound or element.

2.1.9 Holding times

Where standard holding times are exceeded, a discussion, using professional judgement, as to the integrity of the data will be required, taking into account such factors as field storage, laboratory storage and even sample bottle characteristics.

2.1.10 Procedures for anomalous samples and confirmation checking

All results should be checked for discrepancies by the project manager against the anticipated results and all other results within 8 hours of receipt of the results from the laboratory.

Any result that is considered by the supervising scientist to be unusually high or at variance with other results is automatically reanalysed. A significantly different result requires immediate remedial action on the whole sample batch (retesting or using an alternative analytical method) at the laboratory's expense.
After appropriate checking by laboratories, all sample analysis result work-sheets, including those of duplicates and replicate analyses, should be checked by the consultant.

Soil (for the purpose of laboratory analysis) is defined as the portion that passes through a 2 mm sieve when air dry. The retained gravel fraction is assumed to be inert. Analysis is undertaken on the less than 2 mm fraction where possible. This procedure is not possible for organics, and original laboratory sheets are reported on an 'as received' basis unless a correction has been applied.

All results of chemical analysis are analysed on an air dry weight basis and reported on an oven (105°C) dry weight basis, unless specified otherwise. All samples should be adjusted for moisture content when not reported on an oven dry basis.

Once confirmation checking is completed the final laboratory report is issued.

For blind duplicates, if one sample has more than two analytes exceeding the data quality objectives, the sample is carefully checked. If the error is not apparent, the sample is rejected. If more than three samples are rejected all the samples collected at that time are rejected. These samples are then re-sampled and reanalysed.

2.2 Field QA/QC

2.2.1 Details of sampling team

Fieldwork was conducted over a 3-day period using the following sampling teams:

- Site inspection: Christine Pitman; and
- Soil sampling: Alice Plioplis and Christine Pitman.

4.2.2 Sampling controls

Decontamination procedures carried out between sampling events
Sampling equipment was limited to disposable gloves (changed at least between location and between contaminated layers) and a spatula for surface samples. The spatula was scraped clean between surface sample locations to ensure excess soil was removed.

Sample notation details
The borehole logs details for each sample collected (including time, location, initials of sampler, duplicate locations, duplicate type and field screening details) are presented in Appendix A. The chemical analyses performed on each sample are presented on the chain of custody documentation (Appendix C) which also identify for each sample – the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method (if any), departure time from the site and dispatch courier.

2.2.2 Duplicate sampling

Duplicate samples were collected at a rate of one duplicate per approximately 8 samples collected (~13%). The number of duplicates collected and analysed for each analytical method is provided in the main report, while duplicate analysis results are presented in Table 5.

TABLE 1 SOIL FIELD BLIND DUPLICATE RESULTS – FD1 ORGANICS

Analyte	MDL	TP7 0.5-0.7	FD1	RPD	FD1	RPD
		NMI - primary	NMI - intra- duplicate	NMI	ALS - Inter- duplicate	ALS
BTEX						
Benzene	0.5/0.2	<0.5	<0.5	NC	<0.2	NC
Toluene	0.5	<0.5	<0.5	NC	<0.5	NC
Ethyl Benzene	0.5	<0.5	<0.5	NC	<0.5	NC
m, p - Xylene	1/0.5	<1	<1	NC	<0.5	NC
o - Xylene	0.5	<0.5	<0.5	NC	<0.5	NC
Total Petroleum Hydrocarbons						
C_6 - C_9	25/10	<25	<25	NC	<10	NC
C_{10} - C_{14}	50	<50	<50	NC	<50	NC
C_{15} - C_{28}	100	<100	<100	NC	<100	NC
C_{29} - C_{36}	100	<100	<100	NC	<100	NC
C_{10} - C_{40}	50	ND	ND	-	<50	NC

Notes:

1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <100-150% for low level (5x – 10 x MDL); and
    c. <80-130% for medium to high level (>10x MDL).

TABLE 2 SOIL FIELD BLIND DUPLICATE RESULTS – FD2 ORGANICS

Analyte	MDL	TP9 0.1-0.2	FD2	RPD	FD2	RPD
		NMI - primary	NMI - intra-duplicate	NMI	ALS - Inter-duplicate	ALS
Polycyclic Aromatic Hydrocarbons						
Naphthalene	0.5	<0.5	<0.5	NC	<0.5	NC
Acenaphthylene	0.5	<0.5	<0.5	NC	<0.5	NC
Acenaphthene	0.5	<0.5	<0.5	NC	<0.5	NC
Fluorene	0.5	<0.5	<0.5	NC	<0.5	NC
Phenanthrene	0.5	<0.5	<0.5	NC	<0.5	NC
Anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Fluoranthene	0.5	<0.5	<0.5	NC	<0.5	NC
Pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Benz(a)anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Chrysene	0.5	<0.5	<0.5	NC	<0.5	NC
Benzo(b)&(k)fluoranthene	1	<1	<1	NC	<1	NC
Benzo(a)pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Indeno(1,2,3-cd)pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Dibenzo(a,h)anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Benzo(g,h,i)perylene	0.5	0.63	0.63	0.00	<0.5	NC
Total PAH	-	0.63	0.63	0.00	<0.5	NC
Total Petroleum Hydrocarbons						
C_6 - C_9	25	<25	<25	NC	<10	NC
C_{10} - C_{14}	50	<50	<50	NC	<50	NC
C_{15} - C_{28}	100	<100	<100	NC	<100	NC
C_{29} - C_{36}	100	120	140	15.38	<100	NC
C_{10} - C_{40}	-	120	140	15.38	<50	NC

Notes:

1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <100-150% for low level (5x – 10 x MDL); and
    c. <80-130% for medium to high level (>10x MDL).

TABLE 3 SOIL FIELD BLIND DUPLICATE RESULTS – FD3 ORGANICS

Analyte	MDL	TP15 0.2-0.3	FD3	RPD	FD3	RPD
		NMI - primary	NMI - intra-duplicate	NMI	ALS - Inter-duplicate	ALS
Monocyclic Aromatic Hydrocarbons						
Benzene	1	<1	<1	NC	<0.2	NC
Toluene	1	<1	<1	NC	<0.5	NC
Ethylbenzene	1	<1	<1	NC	<0.5	NC
m & p-Xylenes	2	<2	<2	NC	<0.5	NC
o-Xylene	1	<1	<1	NC	<0.5	NC
Styrene	1	<1	<1	NC	<0.5	NC
Isopropylbenzene	1	<1	<1	NC	<0.5	NC
n-Propylbenzene	1	<1	<1	NC	<0.5	NC
1,3,5-Trimethylbenzene	1	<1	<1	NC	<0.5	NC
tert-Butylbenzene	1	<1	<1	NC	<0.5	NC
1,2,4-Trimethylbenzene	1	<1	<1	NC	<0.5	NC
sec-Butylbenzene	1	<1	<1	NC	<0.5	NC
4-Isopropyltoluene	1	<1	<1	NC	<0.5	NC
n-Butylbenzene	1	<1	<1	NC	<0.5	NC
Halogenated Aliphatic Hydrocarbons						
Chloromethane	5	<5	<5	NC	<5	NC
Vinyl chloride	2	<2	<2	NC	<5	NC
Bromomethane	5	<5	<5	NC	<5	NC
Chloroethane	5	<5	<5	NC	<5	NC
Trichlorofluoromethane	1	<1	<1	NC	<5	NC
1,1-Dichloroethane	1	<1	<1	NC	<0.5	NC
Dichloromethane	1	<1	<1	NC	<0.5	NC
trans-1,2-Dichloroethene	1	<1	<1	NC	<0.5	NC
1,1-Dichloroethene	1	<1	<1	NC	<0.5	NC
2,2-Dichloropropane	1	<1	<1	NC	-	-
cis-1,2-Dichloroethene	1	<1	<1	NC	<0.5	NC
Bromochloromethane	1	<1	<1	NC		NC
1,1,1-Trichloroethane	1	<1	<1	NC	<0.5	NC
Carbon tetrachloride	1	<1	<1	NC	<0.5	NC

Analyte	MDL	TP15 0.2-0.3	FD3	RPD	FD3	RPD
		NMI - primary	NMI - intra-duplicate	NMI	ALS - Inter-duplicate	ALS
1,1-Dichloropropene	1	<1	<1	NC	-	NC
1,2-Dichloroethane	1	<1	<1	NC	<0.5	NC
Trichloroethene	1	<1	<1	NC	<0.5	NC
1,2-Dichloropropane	1	<1	<1	NC	-	
Dibromomethane	1	<1	<1	NC	<0.5	NC
cis-1,3-Dichloropropene	1	<1	<1	NC	-	-
trans-1,3-Dichloropropene	1	<1	<1	NC	<0.5	NC
1,1,2-Trichloroethane	1	<1	<1	NC	<0.5	NC
Tetrachloroethene	1	<1	<1	NC	<0.5	NC
1,3-Dichloropropane	1	<1	<1	NC	<0.5	NC
1,2-Dibromoethane	1	<1	<1	NC	<0.5	NC
1,1,1,2-Tetrachloroethane	1	<1	<1	NC	<0.5	NC
1,1,2,2-Tetrachloroethane	1	<1	<1	NC	<0.5	NC
1,2,3-Trichloropropane	1	<1	<1	NC	<0.5	NC
1,2-Dibromo-3-chloropropane	1	<1	<1	NC	<0.5	NC
Hexachlorobutadiene	1	<1	<1	NC	<0.5	NC
Halogenated Aromatic Hydrocarbons						
Chlorobenzene	1	<1	<1	NC	<0.5	NC
Bromobenzene	1	<1	<1	NC	<0.5	NC
2-Chlorotoluene	1	<1	<1	NC	<0.5	NC
4-Chlorotoluene	1	<1	<1	NC	<0.5	NC
1,3-Dichlorobenzene	1	<1	<1	NC	<0.5	NC
1,4-Dichlorobenzene	1	<1	<1	NC	<0.5	NC
1,2-Dichlorobenzene	1	<1	<1	NC	<0.5	NC
1,2,4-Trichlorobenzene	1	<1	<1	NC	<0.5	NC
1,2,3-Trichlorobenzene	1	<1	<1	NC	<0.5	NC
1,2,3,4-Tetrachlorobenzene	1	<1	<1	NC	-	-
Trihalomethanes						
Chloroform	1	<1	<1	NC	<0.5	NC
Bromodichloromethane	1	<1	<1	NC	<0.5	NC

Analyte	MDL	TP15 0.2-0.3	FD3	RPD	FD3	RPD
		NMI - primary	NMI - intra-duplicate	NMI	ALS - Inter-duplicate	ALS
Dibromochloromethane	1	<1	<1	NC	<0.5	NC
Bromoform	1	<1	<1	NC	<0.5	NC
Polycyclic Aromatic Hydrocarbons (volatile)						
Naphthalene	1	<1	<1	NC	-	-
Oxygenated Compounds						
Acetone	5	<5	<5	NC	-	-
2-Butanone (MEK)	5	<5	<5	NC	<5	NC
2-Hexanone (MBK)	5	<5	<5	NC	<5	NC
4-Methyl-2-pentanone (MIBK)	5	<5	<5	NC	<5	NC
Methyl tert-Butyl Ether (MTBE)	5	<5	<5	NC	-	-
Vinylacetate	5	<5	<5	NC	<5	NC
Other Compounds						
Carbon disulfide	5	<5	<5	NC	<0.5	NC

Notes:

1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <100-150% for low level (5x – 10 x MDL); and
    c. <80-130% for medium to high level (>10x MDL).

TABLE 4 SOIL FIELD BLIND DUPLICATE RESULTS – FD4 ORGANICS

Analyte	MDL	SS5 0.0-0.1	FD4	RPD	FD4	RPD
		NMI - primary	NMI - intra-duplicate	NMI	ALS - Inter-duplicate	ALS
Polycyclic Aromatic Hydrocarbons						
Naphthalene	0.5	<0.5	<0.5	NC	<0.5	NC
Acenaphthylene	0.5	<0.5	<0.5	NC	<0.5	NC
Acenaphthene	0.5	<0.5	<0.5	NC	<0.5	NC
Fluorene	0.5	<0.5	<0.5	NC	<0.5	NC
Phenanthrene	0.5	<0.5	<0.5	NC	<0.5	NC
Anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Fluoranthene	0.5	<0.5	<0.5	NC	<0.5	NC
Pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Benz(a)anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Chrysene	0.5	<0.5	<0.5	NC	<0.5	NC
Benzo(b)&(k)fluoranthene	1	<1	<1	NC	<1	NC
Benzo(a)pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Indeno(1,2,3-cd)pyrene	0.5	<0.5	<0.5	NC	<0.5	NC
Dibenzo(a,h)anthracene	0.5	<0.5	<0.5	NC	<0.5	NC
Benzo(g,h,i)perylene	0.5	<0.5	<0.5	NC	<0.5	NC
Total PAH	-	0	0	NC	<0.5	NC
Total Petroleum Hydrocarbons						
C_6 - C_9	25	<25	<25	NC	<10	NC
C_{10} - C_{14}	50	<50	<50	NC	90	NC
C_{15} - C_{28}	100	260	230	12.24	1,530	***141.90***
C_{29} - C_{36}	100	370	440	17.28	1,180	*104.52*
C_{10} – C_{36}	-	630	670	6.15	2,800	*126.53*

Notes:

1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. **bold** values indicated exceedance of acceptance criteria;
6. *italicised* values indicate RPD is >50 % trigger value;
7. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <100-150% for low level (5x – 10 x MDL); and
    c. <80-130% for medium to high level (>10x MDL).

TABLE 5 SOIL FIELD BLIND DUPLICATE RESULTS – FD1 INORGANICS

Analyte	MDL	TP7 0.5-0.7	FD1	RPD	FD1	RPD
		SAL - primary	SAL - intra- duplicate	SAL	ALS - Inter- duplicate	ALS
Cu	0.5/5	4.5	5	10.53	10	***75.86***
Pb	0.5/5	9	10	10.53	9	0.00
Zn	0.5/5	27	26	3.77	50	***59.74***
Cd	0.5/1	<0.5	<0.5	NC	<1	NC
Cr	0.5/2	17	17	0.00	50	***98.51***
Ni	0.5/2	8	8.5	6.06	19	***81.48***
As	0.5/5	3	3.5	15.38	5	*50.00*
Hg	0.005	0.035	0.03	15.38	-	-

Notes:
1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. - not tested
6. **bold** values indicated exceedance of acceptance criteria;
7. *italicised* values indicate RPD is >50 % trigger value;
8. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <80% for low level (5x – 10 x MDL); and
    c. <50% for medium to high level (>10x MDL).

TABLE 6 SOIL FIELD BLIND DUPLICATE RESULTS – FD2 INORGANICS

Analyte	MDL	TP9 0.1-0.2	FD2	RPD	FD2	RPD
		SAL - primary	SAL - intra- duplicate	SAL	ALS - Inter- duplicate	ALS
Cu	0.5/5	13	12	8.00	16	20.69
Pb	0.5/5	28	27	3.64	30	6.90
Zn	0.5/5	84	86	2.35	105	22.22
Cd	0.5/1	<0.5	<0.5	NC	<1	NC
Cr	0.5/2	5	6	18.18	7	33.33
Ni	0.5/2	10	10	0.00	7	35.29
As	0.5/5	4	4	0.00	<5	-
Hg	0.005	0.035	0.03	15.38	-	-

Notes:
1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. - not tested
6. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <80% for low level (5x – 10 x MDL); and
    c. <50% for medium to high level (>10x MDL).

TABLE 7 SOIL FIELD BLIND DUPLICATE RESULTS – FD3 INORGANICS

Analyte	MDL	TP15 0.2-0.3	FD3	RPD	FD3	RPD
		SAL - primary	SAL - intra- duplicate	SAL	ALS - Inter- duplicate	ALS
Cu	0.5/5	34	7.5	***127.71***	26	26.67
Pb	0.5/5	47	36	26.51	58	20.95
Zn	0.5/5	57	38	40.00	100	***54.78***
Cd	0.5/1	<0.5	<0.5	NC	<1	NC
Cr	0.5/2	11	9.5	14.63	19	***53.33***
Ni	0.5/2	8.5	7	19.35	16	***61.22***
As	0.5/5	3.5	3.5	0.00	6	***52.63***
Hg	0.005	0.06	0.035	*52.63*	-	-

Notes:
1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. - not tested
6. **bold** values indicated exceedance of acceptance criteria;
7. *italicised* values indicate RPD is >50 % trigger value;
8. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <80% for low level (5x – 10 x MDL); and
    c. <50% for medium to high level (>10x MDL).

TABLE 8 SOIL FIELD BLIND DUPLICATE RESULTS – FD4 INORGANICS

Analyte	MDL	SS5 0.0-0.1	FD4	RPD	FD4	RPD
		SAL - primary	SAL - intra- duplicate	SAL	ALS - Inter- duplicate	ALS
Cu	0.5/5	23	25	8.33	41	***56.25***
Pb	0.5/5	100	105	4.88	167	***50.19***
Zn	0.5/5	250	260	3.92	392	44.24
Cd	0.5/1	0.5	0.5	0	<1	NC
Cr	0.5/2	13	15	14.29	30	***79.07***
Ni	0.5/2	11	11	0.00	14	24.00
As	0.5/5	4.5	4	11.76	9	***66.67***
Hg	0.005	0.03	0.03	0.00	-	-

Notes:
1. MDL – method detection limit;
2. RPD relative percentage difference;
3. NC - not calculable;
4. all units in mg/kg;
5. - not tested
6. **bold** values indicated exceedance of acceptance criteria;
7. *italicised* values indicate RPD is >50 % trigger value;
8. Acceptance Criteria (see Table 2 in body of report);
    a. no limit applies to <5x MDL;
    b. <80% for low level (5x – 10 x MDL); and
    c. <50% for medium to high level (>10x MDL).

Duplicate samples were split using two separate methods. In the case of non-volatile samples, the soil sample was mixed and then distributed between two bags.

For volatile samples, soil was collected from the stockpiled material directly from the excavator bucket, from a piece of undisturbed soil where possible and placed immediately in two clean glass jars. The field scientists typically attempt to disturb soils as little as possible due to the high potential for loss of volatiles.

Blanks, spikes and rinsate samples
The scope of this project did not include analysis of trip and field blanks, background samples, rinsate samples or laboratory prepared trip spikes for the soil sampling program. Environmental Earth Sciences NNSW did not consider analysis of trip blanks, rinsate blanks or trip spikes necessary for the following reasons:

- a **trip blank** is used to document contamination attributable to shipping procedures for volatile components. For this project shipping was closely monitored, with collected samples immediately placed upright within a chilled and darkened cooler and passed directly from the field scientist to the courier. This process is documented within the chain of custody documentation. A field blank is used to document contamination attributable to field handling. The measurement of volatiles present within samples due to field handling procedure is a measurement of false positives. False positives are not considered to be a major concern due to the industrial nature of the site.
- **rinsate samples** are a measure of potential cross contamination between samples due to contamination on sampling equipment. Rinsate samples were not collected as disposable gloves were used between sampling locations (and individual samples) and the spatula was scraped clean when undertake surface sampling.
- laboratory prepared **trip spikes** are used to measure potential volatile contaminant loss due to transport and field handling procedures. Environmental Earth Sciences NNSW follows strict sample handling procedures and consider the potential for volatile loss during handling and transport to be low. Furthermore the use of laboratory prepared trip spikes is difficult to control on a site such as this where the soil matrix is considerably varied. The ability of a laboratory prepared trip spike to accurately represent the matrix of fill samples collected from the site is thought to limit the usefulness of the data. For these reasons project laboratory prepared trip spikes were not used for this project.

2.2.3 Field instrument calibration

A photoionisation detector (PID) and a landfill gas analyser were used for the soil sampling program. The PID was bump tested prior to use which indicated that the sensors were in good condition. The PID is calibrated on a regular basis by Environmental Earth Sciences NSW staff.

A calibration record for the landfill gas analyser is attached in Appendix D.

2.3 Laboratory QA/QC

Organic analysis for this project was completed by the National Measurement Institute (NMI) and inorganic analysis was completed by Sydney Analytical Laboratories (SAL). Both laboratories are accredited by NATA for the methods used, details of this accreditation can

be viewed at http://www.nata.asn.au/, while details of the samples sent to each laboratory and the analysis requested are contained in the chain of custody documentation held in Appendix C. The analytical methods are noted on the laboratory transcripts. The collection date of samples, laboratory extraction date and allowable holding time are presented in Table 9. All analysis was completed within the allowable holding times.

SAL complete a laboratory blank a laboratory duplicate and analysis of a certified reference material. These results are reported in SAL report SAL24504 (Appendix C). All intra-laboratory trials completed by SAL were within the acceptance criteria set by the laboratory.

TABLE 9 HOLDING TIMES

Analyte - Soil	Dates			Allowable holding time	Conclusion
	Collected	Extracted	Analysed		
Metals	22-23/01/13	-	7/02/13	6 months	Acceptable
Hg	22-23/01/13	-	7/02/13	28 days	Acceptable
TPH C_6-C_{36}	22-23/01/13	31/01/13	31/01/13	14 days	Acceptable
PAH	22-23/01/13	31/01/13	31/01/13	14 days	Acceptable
Volatile organics	22-23/01/13	31/01/13	31/01/13	14 days	Acceptable
Semi-volatile organics	22-23/01/13	31/01/13	31/01/13	14-30 days	Acceptable

NMI complete laboratory control samples, laboratory blanks, sample duplicates, surrogate spikes and matrix spikes. These results are presented in the NMI reports RN955243, RN955245, RN955246 and RN955248 (Appendix C).

These reports include details of surrogates and spikes used, percent recoveries of surrogates and spikes used, the instrument detection limits, the method detection limits, the practical quantification limits and the reference samples results.

2.4 QA/QC data evaluation

Up to 13 RPD exceedances were detected for inter-laboratory duplicates, and 2 for intra-laboratory duplicates. These were all for heavy metals, with the exception of one inter-laboratory duplicate for C_{15}-C_{28}.

Fill material can be heterogeneous, with heavy metals typically forming in clusters, thus it is expected that some variety will be encountered within samples. In addition, different laboratories place samples within extraction liquids for varying amount of time, which may produce slightly different results. This may be the case for heavy metals in the natural material of sample and duplicate TP7 (0.5-0.7) and FD1, where exceedances were noted for heavy metals in the inter-laboratory duplicate.

For the organic analyte exceedance, the sample was collected from an area were a thin layer of pitch (~3 cm) overlay the fill material and it is possible that some fill material was collected for the inter-laboratory duplicate that was in contact with this. The intra-laboratory duplicate did not display the same difference.

All results adhered to chemical laws or were not outside logical explanation. Metal and pH levels in natural soil were within the expected range.

Extraction and analysis of samples were all within the relevant prescribed holding times. The internal laboratory control results (blanks, duplicates and spikes) are considered to be acceptable.

Based on information presented in Sections 4.1, 4.2 and 4.3 it can be confidently stated that the MDQO's for this project have been met and the data set is considered to be reliable.

3 QAQC APPENDIX REFERENCES

American Public Health Association (APHA) 2005, *Standard methods for the examination of water and waste-water*, 21st edition, APHA, Washington DC.

Australian and New Zealand Environment and Conservation Council 1992, *Australian and New Zealand Guidelines for the assessment and management of contaminated sites,* Australia and New Zealand Environment Council, National Health and Medical Research Council, Melbourne, Victoria.

Australian/New Zealand Standard 2008, *Quality management systems - Requirements* (AS/NZS ISO 9001:2008) Standards Australia/Standards New Zealand, Sydney/Wellington.

Environmental Earth Sciences 2009, *Soil, gas and groundwater sampling manual,* Unpublished.

International Organisation for Standardisation 2005, *Quality management systems – Fundamentals and vocabulary*, (ISO 9000:2005).Lock, WH 1996, *Composite sampling*, National Environmental Health Forum (NEHF), Adelaide, SA.

National Environment Protection Council (NEPC) 1999, *National environment protection (assessment of site contamination) measure*, National Environment Protection Council, Adelaide, SA.

NSW Department of Environment and Conservation (2006), *Contaminated sites: Guidelines for NSW Site Auditors Scheme* (2nd edition).

NSW Environment Protection Authority (EPA) 1995, *Contaminated sites: Sampling design guidelines,* EPA NSW, Chatswood, NSW.

NSW EPA 1994, *Contaminated sites: Guidelines for the assessment of service station sites,* EPA NSW, Chatswood, NSW.

NSW EPA 1997, *Contaminated sites: Guidelines for consultants reporting on contaminated sites,* EPA NSW, Chatswood, NSW.

Rayment, GE & Higginson, FR 1992, *Australian laboratory handbook of soil and water chemical methods*, Inkarta Press, Melbourne.

Standards Australia, 2005, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds*, (AS 4482.1), Standards Australia, Sydney, NSW.

Standards Australia, 1999, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 2: Volatile substances*, (AS4482.2), Standards Australia, Homebush, NSW.

APPENDIX C LABORATORY TRANSCRIPTS AND CHAIN OF CUSTODY FORMS

REPORT OF ANALYSIS

Report No. RN955243

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002176	TP1 0.0-0.1	SOIL BALLINA JOB 512017 22/01/13
N13/002180	TP6 0.4-0-5	SOIL BALLINA JOB 512017 22/01/13
N13/002181	TP6 1.1-1-2	SOIL BALLINA JOB 512017 22/01/13
N13/002182	TP7 0.5-0.7	SOIL BALLINA JOB 512017 22/01/13

Lab Reg No.		N13/002176	N13/002180	N13/002181	N13/002182	
Sample Reference	Units	TP1 0.0-0.1	TP6 0.4-0-5	TP6 1.1-1-2	TP7 0.5-0.7	Method
BTEX						
Benzene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Toluene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Ethyl Benzene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
m, p - Xylene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1121
o - Xylene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Surrogate: TOL-D8	%REC	103	102	103	103	NGCMS_1121
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25	< 25	< 25	< 25	NGCMS_1121
TPH C10 - C14	mg/kg	< 50	< 50	< 50	< 50	NGCMS_1112
TPH C15 - C28	mg/kg	< 100	< 100	< 100	< 100	NGCMS_1112
TPH C29 - C36	mg/kg	< 100	< 100	< 100	< 100	NGCMS_1112
Surrogate: TOL-D8	%REC	103	102	103	103	NGCMS_1121
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955243

Lab Reg No.		N13/002176	N13/002180	N13/002181	N13/002182	
Sample Reference	Units	TP1 0.0-0.1	TP6 0.4-0-5	TP6 1.1-1-2	TP7 0.5-0.7	Method
Trace Elements						
Total Solids	%	84.7	68.9	86.0	72.8	NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955243

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002186	TP10 0.4-0.5	SOIL BALLINA JOB 512017 22/01/13
N13/002187	TP11 0.7-0.8	SOIL BALLINA JOB 512017 22/01/13
N13/002189	TP12 0.6-0.7	SOIL BALLINA JOB 512017 22/01/13
N13/002192	FD1	SOIL BALLINA JOB 512017 22/01/13

Lab Reg No.		N13/002186	N13/002187	N13/002189	N13/002192	
Sample Reference	Units	TP10 0.4-0.5	TP11 0.7-0.8	TP12 0.6-0.7	FD1	Method
BTEX						
Benzene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Toluene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Ethyl Benzene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
m, p - Xylene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1121
o - Xylene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1121
Surrogate: TOL-D8	%REC	102	101	103	100	NGCMS_1121
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25	< 25	25	< 25	NGCMS_1121
TPH C10 - C14	mg/kg	< 50	< 50	520	< 50	NGCMS_1112
TPH C15 - C28	mg/kg	660	< 100	1600	< 100	NGCMS_1112
TPH C29 - C36	mg/kg	270	< 100	450	< 100	NGCMS_1112
Surrogate: TOL-D8	%REC	102	101	103	100	NGCMS_1121
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955243

Lab Reg No.		N13/002186	N13/002187	N13/002189	N13/002192	
Sample Reference	Units	TP10 0.4-0.5	TP11 0.7-0.8	TP12 0.6-0.7	FD1	Method
Trace Elements						
Total Solids	%	89.1	93.8	82.0	73.5	NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955243

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002202	SS1 0.0-0.1	SOIL BALLINA JOB 512017 23/01/13
N13/002204	SS6 0.0-0.1	SOIL BALLINA JOB 512017 23/01/13

Lab Reg No.		N13/002202	N13/002204			
Sample Reference	Units	SS1 0.0-0.1	SS6 0.0-0.1			Method
BTEX						
Benzene	mg/kg	< 0.5	< 0.5			NGCMS_1121
Toluene	mg/kg	< 0.5	< 0.5			NGCMS_1121
Ethyl Benzene	mg/kg	< 0.5	< 0.5			NGCMS_1121
m, p - Xylene	mg/kg	< 1	< 1			NGCMS_1121
o - Xylene	mg/kg	< 0.5	< 0.5			NGCMS_1121
Surrogate: TOL-D8	%REC	100	102			NGCMS_1121
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25	< 25			NGCMS_1121
TPH C10 - C14	mg/kg	< 50	< 50			NGCMS_1112
TPH C15 - C28	mg/kg	< 100	110			NGCMS_1112
TPH C29 - C36	mg/kg	< 100	400			NGCMS_1112
Surrogate: TOL-D8	%REC	100	102			NGCMS_1121
Dates						
Date extracted		31-JAN-2013	31-JAN-2013			
Date analysed		31-JAN-2013	31-JAN-2013			

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955243

Lab Reg No.		N13/002202	N13/002204			
Sample Reference	Units	SS1 0.0-0.1	SS6 0.0-0.1			Method
Trace Elements						
Total Solids	%	94.8	88.3			NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

All results are expressed on a dry weight basis.

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: RN954893 RN955202

REPORT OF ANALYSIS

Report No. RN955245

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002177	TP4 0.1-0.2	SOIL BALLINA JOB 512017 22/01/13
N13/002178	TP5 0.1-0.2	SOIL BALLINA JOB 512017 22/01/13
N13/002183	TP8 0.2-0.3	SOIL BALLINA JOB 512017 22/01/13
N13/002184	TP9 0.1-0.2	SOIL BALLINA JOB 512017 22/01/13

Lab Reg No.		N13/002177	N13/002178	N13/002183	N13/002184	
Sample Reference	Units	TP4 0.1-0.2	TP5 0.1-0.2	TP8 0.2-0.3	TP9 0.1-0.2	Method
Polycyclic Aromatic Hydrocarbons						
Naphthalene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Acenaphthylene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Acenaphthene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Fluorene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Phenanthrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Fluoranthene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benz(a)anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Chrysene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benzo(b)&(k)fluoranthene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1111
Benzo(a)pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Dibenzo(a,h)anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benzo(g,h,i)perylene	mg/kg	< 0.5	< 0.5	< 0.5	0.63	NGCMS_1111
Surrogate: TER-D14	%REC	95	97	99	100	NGCMS_1111
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25	< 25	< 25	< 25	NGCMS_1121
TPH C10 - C14	mg/kg	< 50	< 50	< 50	< 50	NGCMS_1112
TPH C15 - C28	mg/kg	< 100	< 100	< 100	< 100	NGCMS_1112
TPH C29 - C36	mg/kg	< 100	< 100	< 100	120	NGCMS_1112
Surrogate: TOL-D8	%REC	102	102	103	103	NGCMS_1121
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

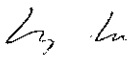
REPORT OF ANALYSIS

Lab Reg No.		N13/002177	N13/002178	N13/002183	N13/002184	
Sample Reference	Units	TP4 0.1-0.2	TP5 0.1-0.2	TP8 0.2-0.3	TP9 0.1-0.2	Method

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

Lab Reg No.		N13/002177	N13/002178	N13/002183	N13/002184	
Sample Reference	Units	TP4 0.1-0.2	TP5 0.1-0.2	TP8 0.2-0.3	TP9 0.1-0.2	Method
Trace Elements						
Total Solids	%	92.0	89.3	83.6	93.9	NT2_49



Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955245

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002188	TP12 0.2-0.3	SOIL BALLINA JOB 512017 22/01/13
N13/002193	FD2	SOIL BALLINA JOB 512017 22/01/13
N13/002203	SS5 0.0-0.1	SOIL BALLINA JOB 512017 23/01/13
N13/002205	FD4	SOIL BALLINA JOB 512017 23/01/13

Lab Reg No.		N13/002188	N13/002193	N13/002203	N13/002205	
Sample Reference	Units	TP12 0.2-0.3	FD2	SS5 0.0-0.1	FD4	Method
Polycyclic Aromatic Hydrocarbons						
Naphthalene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Acenaphthylene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Acenaphthene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Fluorene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Phenanthrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Fluoranthene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benz(a)anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Chrysene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benzo(b)&(k)fluoranthene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1111
Benzo(a)pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Dibenzo(a,h)anthracene	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	NGCMS_1111
Benzo(g,h,i)perylene	mg/kg	< 0.5	0.63	< 0.5	< 0.5	NGCMS_1111
Surrogate: TER-D14	%REC	111	106	99	103	NGCMS_1111
Total Petroleum Hydrocarbons						
TPH C6 - C9	mg/kg	< 25	< 25	< 25	< 25	NGCMS_1121
TPH C10 - C14	mg/kg	< 50	< 50	< 50	< 50	NGCMS_1112
TPH C15 - C28	mg/kg	< 100	< 100	260	230	NGCMS_1112
TPH C29 - C36	mg/kg	< 100	140	370	440	NGCMS_1112
Surrogate: TOL-D8	%REC	102	101	101	102	NGCMS_1121
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

REPORT OF ANALYSIS

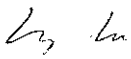
Report No. RN955245

Lab Reg No.		N13/002188	N13/002193	N13/002203	N13/002205	
Sample Reference	Units	TP12 0.2-0.3	FD2	SS5 0.0-0.1	FD4	Method

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

Lab Reg No.		N13/002188	N13/002193	N13/002203	N13/002205	
Sample Reference	Units	TP12 0.2-0.3	FD2	SS5 0.0-0.1	FD4	Method
Trace Elements						
Total Solids	%	83.5	94.4	90.5	91.9	NT2_49



Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

All results are expressed on a dry weight basis.

ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: RN954893 RN955202

REPORT OF ANALYSIS

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002179	TP6 0.3	SOIL BALLINA JOB 512017 22/01/13
N13/002191	TP15 0.2-0.3	SOIL BALLINA JOB 512017 22/01/13
N13/002194	FD3	SOIL BALLINA JOB 512017 22/01/13
N13/002196	TP20 2.0-2.1	SOIL BALLINA JOB 512017 22/01/13

Lab Reg No.		N13/002179	N13/002191	N13/002194	N13/002196	
Sample Reference	Units	TP6 0.3	TP15 0.2-0.3	FD3	TP20 2.0-2.1	Method
Monocyclic Aromatic Hydrocarbons NMI 1120 Screen						
Benzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Toluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Ethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
m & p-Xylenes	mg/kg	< 2	< 2	< 2	< 2	NGCMS_1120
o-Xylene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Styrene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Isopropylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
n-Propylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3,5-Trimethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
tert-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,4-Trimethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
sec-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
4-Isopropyltoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
n-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Chloromethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Vinyl chloride	mg/kg	< 2	< 2	< 2	< 2	NGCMS_1120
Bromomethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Chloroethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Trichlorofluoromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dichloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
trans-1,2-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
2,2-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
cis-1,2-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromochloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,1-Trichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002179	N13/002191	N13/002194	N13/002196	
Sample Reference	Units	TP6 0.3	TP15 0.2-0.3	FD3	TP20 2.0-2.1	Method
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Carbon tetrachloride	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Trichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dibromomethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
cis-1,3-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
trans-1,3-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,2-Trichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Tetrachloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dibromoethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,1,2-Tetrachloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,2,2-Tetrachloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3-Trichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dibromo-3-chloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Hexachlorobutadiene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Halogenated Aromatic Hydrocarbons NMI 1120 Screen						
Chlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
2-Chlorotoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
4-Chlorotoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,4-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,4-Trichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3-Trichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3,4-Tetrachlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Trihalomethanes NMI 1120 Screen						
Chloroform	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromodichloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dibromochloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromoform	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Polycyclic Aromatic Hydrocarbons(volatile) NMI 1120 Screen						
Naphthalene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Oxygenated Compounds NMI 1120 Screen						
Acetone	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
2-Butanone (MEK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
2-Hexanone (MBK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
4-Methyl-2-pentanone (MIBK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Methyl tert-Butyl Ether (MTBE)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Vinylacetate	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Other Compounds NMI 1120 Screen						
Carbon disulfide	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002179	N13/002191	N13/002194	N13/002196	
Sample Reference	Units	TP6 0.3	TP15 0.2-0.3	FD3	TP20 2.0-2.1	Method
Other Compounds NMI 1120 Screen						
Surrogate: DBFM	%REC	116	116	111	109	NGCMS_1120
Surrogate: TOL-D8	%REC	116	94	110	114	NGCMS_1120
Surrogate: 4-BFB	%REC	89	96	89	87	NGCMS_1120
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

Lab Reg No.		N13/002179	N13/002191	N13/002194	N13/002196	
Sample Reference	Units	TP6 0.3	TP15 0.2-0.3	FD3	TP20 2.0-2.1	Method
Trace Elements						
Total Solids	%	86.8	83.0	82.4	89.3	NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002197	TP21 1.4-1.5	SOIL BALLINA JOB 512017 23/01/13
N13/002198	TP26 1.1-1.2	SOIL BALLINA JOB 512017 23/01/13
N13/002199	TP27 3.0-3.1	SOIL BALLINA JOB 512017 23/01/13
N13/002200	TP28 0.9-1.0	SOIL BALLINA JOB 512017 23/01/13

Lab Reg No.		N13/002197	N13/002198	N13/002199	N13/002200	
Sample Reference	Units	TP21 1.4-1.5	TP26 1.1-1.2	TP27 3.0-3.1	TP28 0.9-1.0	Method
Monocyclic Aromatic Hydrocarbons NMI 1120 Screen						
Benzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Toluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Ethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
m & p-Xylenes	mg/kg	< 2	< 2	< 2	< 2	NGCMS_1120
o-Xylene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Styrene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Isopropylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
n-Propylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3,5-Trimethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
tert-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,4-Trimethylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
sec-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
4-Isopropyltoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
n-Butylbenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Chloromethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Vinyl chloride	mg/kg	< 2	< 2	< 2	< 2	NGCMS_1120
Bromomethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Chloroethane	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Trichlorofluoromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dichloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
trans-1,2-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
2,2-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
cis-1,2-Dichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromochloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,1-Trichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002197	N13/002198	N13/002199	N13/002200	
Sample Reference	Units	TP21 1.4-1.5	TP26 1.1-1.2	TP27 3.0-3.1	TP28 0.9-1.0	Method
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Carbon tetrachloride	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Trichloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dibromomethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
cis-1,3-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
trans-1,3-Dichloropropene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,2-Trichloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Tetrachloroethene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3-Dichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dibromoethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,1,2-Tetrachloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,1,2,2-Tetrachloroethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3-Trichloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dibromo-3-chloropropane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Hexachlorobutadiene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Halogenated Aromatic Hydrocarbons NMI 1120 Screen						
Chlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
2-Chlorotoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
4-Chlorotoluene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,3-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,4-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2-Dichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,4-Trichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3-Trichlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
1,2,3,4-Tetrachlorobenzene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Trihalomethanes NMI 1120 Screen						
Chloroform	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromodichloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Dibromochloromethane	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Bromoform	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Polycyclic Aromatic Hydrocarbons(volatile) NMI 1120 Screen						
Naphthalene	mg/kg	< 1	< 1	< 1	< 1	NGCMS_1120
Oxygenated Compounds NMI 1120 Screen						
Acetone	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
2-Butanone (MEK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
2-Hexanone (MBK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
4-Methyl-2-pentanone (MIBK)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Methyl tert-Butyl Ether (MTBE)	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Vinylacetate	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120
Other Compounds NMI 1120 Screen						
Carbon disulfide	mg/kg	< 5	< 5	< 5	< 5	NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002197	N13/002198	N13/002199	N13/002200	
Sample Reference	Units	TP21 1.4-1.5	TP26 1.1-1.2	TP27 3.0-3.1	TP28 0.9-1.0	Method
Other Compounds NMI 1120 Screen						
Surrogate: DBFM	%REC	110	112	110	105	NGCMS_1120
Surrogate: TOL-D8	%REC	116	114	112	117	NGCMS_1120
Surrogate: 4-BFB	%REC	88	89	90	90	NGCMS_1120
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013	31-JAN-2013	

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

Lab Reg No.		N13/002197	N13/002198	N13/002199	N13/002200	
Sample Reference	Units	TP21 1.4-1.5	TP26 1.1-1.2	TP27 3.0-3.1	TP28 0.9-1.0	Method
Trace Elements						
Total Solids	%	65.3	80.4	70.6	91.9	NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002201	TP29 2.0-2.1	SOIL BALLINA JOB 512017 23/01/13

Lab Reg No.		N13/002201				
Sample Reference	Units	TP29 2.0-2.1				Method
Monocyclic Aromatic Hydrocarbons NMI 1120 Screen						
Benzene	mg/kg	< 1				NGCMS_1120
Toluene	mg/kg	< 1				NGCMS_1120
Ethylbenzene	mg/kg	< 1				NGCMS_1120
m & p-Xylenes	mg/kg	< 2				NGCMS_1120
o-Xylene	mg/kg	< 1				NGCMS_1120
Styrene	mg/kg	< 1				NGCMS_1120
Isopropylbenzene	mg/kg	< 1				NGCMS_1120
n-Propylbenzene	mg/kg	< 1				NGCMS_1120
1,3,5-Trimethylbenzene	mg/kg	< 1				NGCMS_1120
tert-Butylbenzene	mg/kg	< 1				NGCMS_1120
1,2,4-Trimethylbenzene	mg/kg	< 1				NGCMS_1120
sec-Butylbenzene	mg/kg	< 1				NGCMS_1120
4-Isopropyltoluene	mg/kg	< 1				NGCMS_1120
n-Butylbenzene	mg/kg	< 1				NGCMS_1120
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Chloromethane	mg/kg	< 5				NGCMS_1120
Vinyl chloride	mg/kg	< 2				NGCMS_1120
Bromomethane	mg/kg	< 5				NGCMS_1120
Chloroethane	mg/kg	< 5				NGCMS_1120
Trichlorofluoromethane	mg/kg	< 1				NGCMS_1120
1,1-Dichloroethane	mg/kg	< 1				NGCMS_1120
Dichloromethane	mg/kg	< 1				NGCMS_1120
trans-1,2-Dichloroethene	mg/kg	< 1				NGCMS_1120
1,1-Dichloroethene	mg/kg	< 1				NGCMS_1120
2,2-Dichloropropane	mg/kg	< 1				NGCMS_1120
cis-1,2-Dichloroethene	mg/kg	< 1				NGCMS_1120
Bromochloromethane	mg/kg	< 1				NGCMS_1120
1,1,1-Trichloroethane	mg/kg	< 1				NGCMS_1120
Carbon tetrachloride	mg/kg	< 1				NGCMS_1120
1,1-Dichloropropene	mg/kg	< 1				NGCMS_1120
1,2-Dichloroethane	mg/kg	< 1				NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002201				
Sample Reference	Units	TP29 2.0-2.1				Method
Halogenated Aliphatic Hydrocarbons NMI 1120 Screen						
Trichloroethene	mg/kg	< 1				NGCMS_1120
1,2-Dichloropropane	mg/kg	< 1				NGCMS_1120
Dibromomethane	mg/kg	< 1				NGCMS_1120
cis-1,3-Dichloropropene	mg/kg	< 1				NGCMS_1120
trans-1,3-Dichloropropene	mg/kg	< 1				NGCMS_1120
1,1,2-Trichloroethane	mg/kg	< 1				NGCMS_1120
Tetrachloroethene	mg/kg	< 1				NGCMS_1120
1,3-Dichloropropane	mg/kg	< 1				NGCMS_1120
1,2-Dibromoethane	mg/kg	< 1				NGCMS_1120
1,1,1,2-Tetrachloroethane	mg/kg	< 1				NGCMS_1120
1,1,2,2-Tetrachloroethane	mg/kg	< 1				NGCMS_1120
1,2,3-Trichloropropane	mg/kg	< 1				NGCMS_1120
1,2-Dibromo-3-chloropropane	mg/kg	< 1				NGCMS_1120
Hexachlorobutadiene	mg/kg	< 1				NGCMS_1120
Halogenated Aromatic Hydrocarbons NMI 1120 Screen						
Chlorobenzene	mg/kg	< 1				NGCMS_1120
Bromobenzene	mg/kg	< 1				NGCMS_1120
2-Chlorotoluene	mg/kg	< 1				NGCMS_1120
4-Chlorotoluene	mg/kg	< 1				NGCMS_1120
1,3-Dichlorobenzene	mg/kg	< 1				NGCMS_1120
1,4-Dichlorobenzene	mg/kg	< 1				NGCMS_1120
1,2-Dichlorobenzene	mg/kg	< 1				NGCMS_1120
1,2,4-Trichlorobenzene	mg/kg	< 1				NGCMS_1120
1,2,3-Trichlorobenzene	mg/kg	< 1				NGCMS_1120
1,2,3,4-Tetrachlorobenzene	mg/kg	< 1				NGCMS_1120
Trihalomethanes NMI 1120 Screen						
Chloroform	mg/kg	< 1				NGCMS_1120
Bromodichloromethane	mg/kg	< 1				NGCMS_1120
Dibromochloromethane	mg/kg	< 1				NGCMS_1120
Bromoform	mg/kg	< 1				NGCMS_1120
Polycyclic Aromatic Hydrocarbons(volatile) NMI 1120 Screen						
Naphthalene	mg/kg	< 1				NGCMS_1120
Oxygenated Compounds NMI 1120 Screen						
Acetone	mg/kg	< 5				NGCMS_1120
2-Butanone (MEK)	mg/kg	< 5				NGCMS_1120
2-Hexanone (MBK)	mg/kg	< 5				NGCMS_1120
4-Methyl-2-pentanone (MIBK)	mg/kg	< 5				NGCMS_1120
Methyl tert-Butyl Ether (MTBE)	mg/kg	< 5				NGCMS_1120
Vinylacetate	mg/kg	< 5				NGCMS_1120
Other Compounds NMI 1120 Screen						
Carbon disulfide	mg/kg	< 5				NGCMS_1120
Surrogate: DBFM	%REC	106				NGCMS_1120
Surrogate: TOL-D8	%REC	115				NGCMS_1120

REPORT OF ANALYSIS

Lab Reg No.		N13/002201				
Sample Reference	Units	TP29 2.0-2.1				Method
Other Compounds NMI 1120 Screen						
Surrogate: 4-BFB	%REC	90				NGCMS_1120
Dates						
Date extracted		31-JAN-2013				
Date analysed		31-JAN-2013				

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

Lab Reg No.		N13/002201				
Sample Reference	Units	TP29 2.0-2.1				Method
Trace Elements						
Total Solids	%	86.4				NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

All results are expressed on a dry weight basis.

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: RN954893 RN955202

REPORT OF ANALYSIS

Report No. RN955248

Client	: Environmental & Earth Sciences NSW	Job No.	: ENVI55/130125
	PO BOX 1519	Quote No.	: QT-01970
	BALLINA NSW 2478	Order No.	:
		Date Sampled	:
		Date Received	: 25-JAN-2013
Attention	: CHRISTINE PITMAN	Sampled By	: CLIENT
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N13/002185	TP9 0.5-0.6	SOIL BALLINA JOB 512017 22/01/13
N13/002190	TP13 0.5-0.6	SOIL BALLINA JOB 512017 22/01/13
N13/002195	TP18 06-0.7	SOIL BALLINA JOB 512017 22/01/13

Lab Reg No.		N13/002185	N13/002190	N13/002195		
Sample Reference	Units	TP9 0.5-0.6	TP13 0.5-0.6	TP18 06-0.7		Method
Polycyclic Aromatic Hydrocarbons NMI 1122 Screen						
Acenaphthylene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Naphthalene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Acenaphthene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Fluorene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Phenanthrene	mg/kg	< 1	< 1	2.4		NGCMS_1122
Anthracene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Fluoranthene	mg/kg	< 1	< 1	2.9		NGCMS_1122
Pyrene	mg/kg	< 1	< 1	3.5		NGCMS_1122
Benz(a)anthracene	mg/kg	< 1	< 1	1.9		NGCMS_1122
Chrysene	mg/kg	< 1	< 1	2.0		NGCMS_1122
Benzo(b,k)fluoranthene	mg/kg	< 2	< 2	2.7		NGCMS_1122
Benzo(a)pyrene	mg/kg	< 1	< 1	2.2		NGCMS_1122
Indeno(1,2,3-cd)pyrene	mg/kg	< 1	< 1	1.2		NGCMS_1122
Dibenz(a,h)anthracene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Benzo(g,h,i)perylene	mg/kg	< 1	< 1	1.2		NGCMS_1122
Phenols NMI 1122 Screen						
Phenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
2-Chlorophenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
2-Methylphenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
3&4-Methylphenol	mg/kg	< 2	< 2	< 2		NGCMS_1122
2-Nitrophenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
2,4-Dimethylphenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
2,4-Dichlorophenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
2,6-Dichlorophenol	mg/kg	< 1	< 1	< 1		NGCMS_1122
4-Chloro-3-methylphenol	mg/kg	< 2	< 2	< 2		NGCMS_1122
2,4,5-Trichlorophenol	mg/kg	< 2	< 2	< 2		NGCMS_1122
2,4,6-Trichlorophenol	mg/kg	< 2	< 2	< 2		NGCMS_1122
2,3,4,6-Tetrachlorophenol	mg/kg	< 2	< 2	< 2		NGCMS_1122
Pentachlorophenol	mg/kg	< 2	< 2	< 2		NGCMS_1122

REPORT OF ANALYSIS

Lab Reg No.		N13/002185	N13/002190	N13/002195		
Sample Reference	Units	TP9 0.5-0.6	TP13 0.5-0.6	TP18 06-0.7		Method
Phthalates NMI 1122 Screen						
Dimethyl phthalate	mg/kg	< 1	< 1	< 1		NGCMS_1122
Diethyl phthalate	mg/kg	< 1	< 1	< 1		NGCMS_1122
Di-n-butyl phthalate	mg/kg	< 1	< 1	< 1		NGCMS_1122
Butyl benzyl phthalate	mg/kg	< 1	< 1	< 1		NGCMS_1122
Bis(2-ethylhexyl) phthalate	mg/kg	< 2	< 2	< 2		NGCMS_1122
Di-n-octyl phthalate	mg/kg	< 1	< 1	< 1		NGCMS_1122
Chlorinated Hydrocarbons NMI 1122 Screen						
2-Chloronaphthalene	mg/kg	< 2	< 2	< 2		NGCMS_1122
1,4-Dichlorobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
1,2-Dichlorobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
1,3-Dichlorobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
Hexachlorobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
1,2,4-Trichlorobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
Hexachloroethane	mg/kg	< 2	< 2	< 2		NGCMS_1122
Hexachlorocyclopentadiene	mg/kg	< 2	< 2	< 2		NGCMS_1122
Hexachloro-1,3-butadiene	mg/kg	< 2	< 2	< 2		NGCMS_1122
Ethers NMI 1122 Screen						
4-Bromophenyl phenyl ether	mg/kg	< 2	< 2	< 2		NGCMS_1122
4-Chlorophenyl phenyl ether	mg/kg	< 2	< 2	< 2		NGCMS_1122
Bis(2-chloroethyl)ether	mg/kg	< 2	< 2	< 2		NGCMS_1122
Bis(2-chloroethoxy)methane	mg/kg	< 2	< 2	< 2		NGCMS_1122
Bis(2-chloroisopropyl)ether	mg/kg	< 2	< 2	< 2		NGCMS_1122
Amines Nitroaromatics & Nitrosamines NMI 1122 Screen						
Azobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
2,4-Dinitrotoluene	mg/kg	< 2	< 2	< 2		NGCMS_1122
2,6-Dinitrotoluene	mg/kg	< 2	< 2	< 2		NGCMS_1122
Nitrobenzene	mg/kg	< 2	< 2	< 2		NGCMS_1122
N-Nitrosodimethylamine	mg/kg	< 2	< 2	< 2		NGCMS_1122
N-Nitrosodiphenylamine	mg/kg	< 2	< 2	< 2		NGCMS_1122
N-Nitrosodi-n-propylamine	mg/kg	< 2	< 2	< 2		NGCMS_1122
Aniline	mg/kg	< 2	< 2	< 2		NGCMS_1122
4-Chloroaniline	mg/kg	< 2	< 2	< 2		NGCMS_1122
2-Nitroaniline	mg/kg	< 2	< 2	< 2		NGCMS_1122
3-Nitroaniline	mg/kg	< 2	< 2	< 2		NGCMS_1122
4-Nitroaniline	mg/kg	< 2	< 2	< 2		NGCMS_1122
Organochlorine Pesticides NMI 1122 Screen						
Aldrin	mg/kg	< 2	< 2	< 2		NGCMS_1122
a-BHC	mg/kg	< 2	< 2	< 2		NGCMS_1122
b-BHC	mg/kg	< 2	< 2	< 2		NGCMS_1122
g-BHC (Lindane)	mg/kg	< 2	< 2	< 2		NGCMS_1122
d-BHC	mg/kg	< 2	< 2	< 2		NGCMS_1122
4,4 '-DDD	mg/kg	< 2	< 2	< 2		NGCMS_1122
4,4 '-DDE	mg/kg	< 2	< 2	< 2		NGCMS_1122

REPORT OF ANALYSIS

Lab Reg No.		N13/002185	N13/002190	N13/002195		
Sample Reference	Units	TP9 0.5-0.6	TP13 0.5-0.6	TP18 06-0.7		Method
Organochlorine Pesticides NMI 1122 Screen						
4,4 '-DDT	mg/kg	< 2	< 2	< 2		NGCMS_1122
Dieldrin	mg/kg	< 2	< 2	< 2		NGCMS_1122
Endosulphan I	mg/kg	< 2	< 2	< 2		NGCMS_1122
Endosulphan II	mg/kg	< 2	< 2	< 2		NGCMS_1122
Endosulfan sulphate	mg/kg	< 2	< 2	< 2		NGCMS_1122
Endrin	mg/kg	< 2	< 2	< 2		NGCMS_1122
Endrin Aldehyde	mg/kg	< 2	< 2	< 2		NGCMS_1122
Heptachlor	mg/kg	< 2	< 2	< 2		NGCMS_1122
Heptachlorepoxide	mg/kg	< 2	< 2	< 2		NGCMS_1122
Organophosphate Pesticides NMI 1122 Screen						
Dimethoate	mg/kg	< 2	< 2	< 2		NGCMS_1122
Diazinon	mg/kg	< 2	< 2	< 2		NGCMS_1122
Fenitrothion	mg/kg	< 2	< 2	< 2		NGCMS_1122
Malathion	mg/kg	< 2	< 2	< 2		NGCMS_1122
Chlorpyrifos	mg/kg	< 2	< 2	< 2		NGCMS_1122
Ethion	mg/kg	< 2	< 2	< 2		NGCMS_1122
Dates						
Date extracted		31-JAN-2013	31-JAN-2013	31-JAN-2013		
Date analysed		31-JAN-2013	31-JAN-2013	31-JAN-2013		
Other Compounds NMI 1122 Screen						
Dichlorobenzidine	mg/kg	< 2	< 2	< 2		NGCMS_1122
2-Methylnaphthalene	mg/kg	< 1	< 1	< 1		NGCMS_1122
Isophorone	mg/kg	< 2	< 2	< 2		NGCMS_1122
Benzyl alcohol	mg/kg	< 2	< 2	< 2		NGCMS_1122
Carbazole	mg/kg	< 2	< 2	< 2		NGCMS_1122
Dibenzofuran	mg/kg	< 2	< 2	< 2		NGCMS_1122
Surrogate: PHENOL-D6	%REC	59	52	75		NGCMS_1122
Surrogate: 1,2-DCB-D4	%REC	77	88	120		NGCMS_1122
Surrogate: TER-D14	%REC	106	115	132		NGCMS_1122

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

4-FEB-2013

REPORT OF ANALYSIS

Report No. RN955248

Lab Reg No.		N13/002185	N13/002190	N13/002195		
Sample Reference	Units	TP9 0.5-0.6	TP13 0.5-0.6	TP18 06-0.7		Method
Trace Elements						
Total Solids	%	75.2	80.7	86.7		NT2_49

Ling Shuang Lu, Analyst
Inorganics - NSW
Accreditation No. 198

4-FEB-2013

All results are expressed on a dry weight basis.

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Accredited for compliance with ISO/IEC 17025.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: RN954893 RN955202

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental & Earth Sciences NSW

NMI QA Report No: ENVI55/130125 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
BTEX				**N13/002183**				**N13/002183**
Benzene	NGCMS_1121	0.5	<0.5	<0.5	<0.5	-	93	105
Toluene	NGCMS_1121	0.5	<0.5	<0.5	<0.5	-	92	103
Ethyl Benzene	NGCMS_1121	0.5	<0.5	<0.5	<0.5	-	94	99
m, p - Xylene	NGCMS_1121	1	<1	<1	<1	-	96	106
o-Xylene	NGCMS_1121	0.5	<0.5	<0.5	<0.5	-	89	94
TPH				**N13/002183**				**N13/002183**
TPH C6-C9	NGCMS_1121	25	<25	<25	<25	-	93	102
TPH				**N13/002178**				**N13/002180**
TPH C10-C14	NGCMS_1112	50	<50	<50	<50	-	107	80
TPH C15-C28	NGCMS_1112	100	<100	<100	<100	-	102	95
TPH C29-C36	NGCMS_1112	100	<100	<100 #	120	18	-	-
Surrogate: TOL-D8	NGCMS_1121	-	-	103	102	1.0	100	99
PAH				**N13/002178**				**N13/002190**
Naphthalene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	105	101
Acenaphthylene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Acenaphthene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Fluorene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	104	126
Phenanthrene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	108	111
Anthracene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Fluoranthene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Pyrene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Benz[a]anthracene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Chrysene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	100	69
Benzo[b]&[k]fluoranthene	NGCMS_1111	1	<1	<1	<1	-	-	-
Benzo[a]pyrene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	104	108
Indeno[1_2_3-cd]pyrene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Dibenz[ah]anthracene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	110	90
Benzo[ghi]perylene	NGCMS_1111	0.5	<0.5	<0.5	<0.5	-	-	-
Surrogate: TER-D14	NGCMS_1111	-	-	97	93	4.2	95	116
Phenols				**N13/002178**				**N13/002190**
Phenol	NGCMS_1111	1	<1	<1	<1	-	108	61
2-Chlorophenol	NGCMS_1111	1	<1	<1	<1	-	-	-
2-Methyl phenol	NGCMS_1111	1	<1	<1	<2	-	-	-
3 & 4-methyl phenol	NGCMS_1111	2	<2	<2	<1	-	106	103
2-Nitrophenol	NGCMS_1111	1	<1	<1	<1	-	-	-
2,4-Dimethyl phenol	NGCMS_1111	1	<1	<1	<1	-	-	-
2,4-Dichlorophenol	NGCMS_1111	1	<1	<1	<1	-	-	-
2,6-Dichlororphenol	NGCMS_1111	1	<1	<1	<1	-	103	76
4-Chloro-3-methyl phenol	NGCMS_1111	2	<2	<2	<2	-	-	-
2,4,5-Trichlorophenol	NGCMS_1111	2	<2	<2	<2	-	-	-
2,4,6-Trichlorophenol	NGCMS_1111	2	<2	<2	<2	-	-	-
2,3,4,6-Tetrachlorophenol	NGCMS_1111	2	<2	<2	<2	-	-	-
Pentachlorophenol	NGCMS_1111	2	<2	<2	<2	-	114	59
Surrogate: PHENOL-D6	NGCMS_1111	-	-	109	123	12	104	70

TPH C29-C36 was detected in Sample N13/002178 at just below the Limit of Reporting.

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 70-130% (BTEX and TPH C_6-C_9); 50-150% (PAH and TPH C10-C36); 40-150% (Phenols)
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **4/02/2013**

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental & Earth Sciences NSW

NMI QA Report No: ENVI55/130125 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
Monocyclic Aromatic Hydrocarbons				N13/002191				N13/002191
Benzene	NGCMS_1120	1	<1	<1	<1	-	86	93
Toluene	NGCMS_1120	1	<1	<1	<1	-	101	96
Ethylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
m,p-Xylene	NGCMS_1120	2	<2	<2	<2	-	-	-
o-Xylene	NGCMS_1120	1	<1	<1	<1	-	-	-
Styrene	NGCMS_1120	1	<1	<1	<1	-	-	-
Isopropylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
n-Propylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,3,5-Trimethylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
tert-Butylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2,4-Trimethylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
sec-Butylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
4-Isopropyltoluene	NGCMS_1120	1	<1	<1	<1	-	-	-
n-Butylbenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
Halogenated Aliphatic Hydrocarbons								
Chloromethane	NGCMS_1120	2	<2	<2	<2	-	-	-
Vinyl chloride	NGCMS_1120	5	<5	<5	<5	-	-	-
Bromomethane	NGCMS_1120	5	<5	<5	<5	-	-	-
Chloroethane	NGCMS_1120	5	<5	<5	<5	-	-	-
Trichlorofluoromethane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1-Dichloroethene	NGCMS_1120	1	<1	<1	<1	-	96	85
Dichloromethane	NGCMS_1120	1	<1	<1	<1	-	-	-
trans-1,2-Dicloroethene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1-Dichloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
2,2-Dichloropropane	NGCMS_1120	1	<1	<1	<1	-	-	-
cis-1,2-Dichloroethene	NGCMS_1120	1	<1	<1	<1	-	-	-
Bromochloromethane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1,1-Trichloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
Carbon tetrachloride	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1-Dichloropropene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2-Dichloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
Trichloroethene	NGCMS_1120	1	<1	<1	<1	-	95	87
1,2-Dichloropropane	NGCMS_1120	1	<1	<1	<1	-	-	-
Dibromomethane	NGCMS_1120	1	<1	<1	<1	-	-	-
cis-1,3-Dichloropropene	NGCMS_1120	1	<1	<1	<1	-	-	-
trans-1,3-Dichloropropene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1,2-Trichloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
Tetrachloroethene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,3-Dichloropropane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2-Dibromoethane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1,1,2-Tetrachloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,1,2,2-Tetrachloroethane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2,3-Trichloropropane	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2-Dibromo-3-chloropropane	NGCMS_1120	1	<1	<1	<1	-	-	-
Hexachlorobutadiene	NGCMS_1120	1	<1	<1	<1	-	-	-

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Organics Section								
Halogenated Aromatic Hydrocarbons				N13/002191				N13/002191
Chlorobenzene	NGCMS_1120	1	<1	<1	<1	-	99	96
Bromobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
2-Chlorotoluene	NGCMS_1120	1	<1	<1	<1	-	-	-
4-Chlorotoluene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,3-Dichlorobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,4-Dichlorobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2-Dichlorobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2,4-Trichlorobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
1,2,3-Trichlorobenzene	NGCMS_1120	1	<1	<1	<1	-	-	-
Trihalomethanes	NGCMS_1120	1	<1	<1	<1	-	-	-
Chloroform	NGCMS_1120	1	<1	<1	<1	-	91	90
Bromodichloromethane	NGCMS_1120	1	<1	<1	<1	-	-	-
Dibromochloromethane	NGCMS_1120	1	<1	<1	<1	-	-	-
Bromoform	NGCMS_1120	1	<1	<1	<1	-	-	-
PAH (volatile)								
Naphthalene	NGCMS_1120	1	<1	<1	<1	-	-	-
Oxygenated Compounds								
Acetone	NGCMS_1120	5	<5	<5	<5	-	-	-
Vinylacetate	NGCMS_1120	5	<5	<5	<5	-	-	-
2-Butanone (MEK)	NGCMS_1120	5	<5	<5	<5	-	-	-
4-Methyl-2-pentanone (MIBK)	NGCMS_1120	5	<5	<5	<5	-	-	-
2-Hexanone (MBK	NGCMS_1120	5	<5	<5	<5	-	-	-
Methyl tert-Butyl Ether (MTBE)	NGCMS_1120	5	<5	<5	<5	-	-	-
Sulfonated Compounds								
Carbon disulfide	NGCMS_1120	5	<5	<5	<5	-	-	-
Surrogate: DBFM	NGCMS_1120	-	-	116	103	12	100	105
Surrogate: TOL-D8	NGCMS_1120	-	-	94	106	12	107	106
Surrogate: 4-BFB	NGCMS_1120	-	-	96	97	1.0	107	113

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 70-130%
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **4/02/2013**

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: Environmental & Earth Sciences NSW

NMI QA Report No: ENVI55/130125 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
PAHs				**N13/002178**				**N13/002190**
Naphthalene	NGCMS_1122	1	<1	<1	<1	-	105	101
Acenaphthylene	NGCMS_1122	1	<1	<1	<1	-	-	-
Acenaphthene	NGCMS_1122	1	<1	<1	<1	-	-	-
Fluorene	NGCMS_1122	1	<1	<1	<1	-	104	126
Phenanthrene	NGCMS_1122	1	<1	<1	<1	-	108	111
Anthracene	NGCMS_1122	1	<1	<1	<1	-	-	-
Fluoranthene	NGCMS_1122	1	<1	<1	<1	-	-	-
Pyrene	NGCMS_1122	1	<1	<1	<1	-	-	-
Benz[a]anthracene	NGCMS_1122	1	<1	<1	<1	-	-	-
Chrysene	NGCMS_1122	1	<1	<1	<1	-	100	69
Benzo[b,k]fluoranthene	NGCMS_1122	2	<2	<2	<2	-	-	-
Benzo[a]pyrene	NGCMS_1122	1	<1	<1	<1	-	104	108
Indeno[1,2,3-cd]pyrene	NGCMS_1122	1	<1	<1	<1	-	-	-
Dibenz[a,h]anthracene	NGCMS_1122	1	<1	<1	<1	-	110	90
Benzo[g,h,i]perylene	NGCMS_1122	1	<1	<1	<1	-	-	-
Phenols				**N13/002178**				**N13/002190**
Phenol	NGCMS_1122	1	<1	<1	<1	-	108	61
2-Chlorophenol	NGCMS_1122	1	<1	<1	<1	-	-	-
2-Methyl phenol	NGCMS_1122	1	<1	<1	<2	-	-	-
3 & 4-methyl phenol	NGCMS_1122	2	<2	<2	<1	-	106	103
2-Nitrophenol	NGCMS_1122	1	<1	<1	<1	-	-	-
2,4-Dimethyl phenol	NGCMS_1122	1	<1	<1	<1	-	-	-
2,4-Dichlorophenol	NGCMS_1122	1	<1	<1	<1	-	-	-
2,6-Dichlororphenol	NGCMS_1122	1	<1	<1	<1	-	103	76
4-Chloro-3-methyl phenol	NGCMS_1122	2	<2	<2	<2	-	-	-
2,4,5-Trichlorophenol	NGCMS_1122	2	<2	<2	<2	-	-	-
2,4,6-Trichlorophenol	NGCMS_1122	2	<2	<2	<2	-	-	-
2,3,4,6-Tetrachlorophenol	NGCMS_1122	2	<2	<2	<2	-	-	-
Pentachlorophenol	NGCMS_1122	2	<2	<2	<2	-	114	59
Phthalates								
Dimethylphthalate	NGCMS_1122	1	<1	<1	<1	-	-	-
Diethylphthalate	NGCMS_1122	1	<1	<1	<1	-	-	-
Di-n-butylphthalate	NGCMS_1122	1	<1	<1	<1	-	-	-
Butyl benzyl phthalate	NGCMS_1122	1	<1	<1	<1	-	-	-
Bis(2-ethylhexyl)phthalate	NGCMS_1122	2	<2	<2	<2	-	-	-
Di-n-octyl phthalate	NGCMS_1122	1	<1	<1	<1	-	-	-
Chlorinated Hydrocarbons								
2-Chloronaphthalene	NGCMS_1122	2	<2	<2	<2	-	-	-
1,4-Dichlorobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
1,2-Dichlorobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
1,3-Dichlorobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
Hexachlorobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
1,2,4-Trichlorobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
Hexachloroethane	NGCMS_1122	2	<2	<2	<2	-	-	-
Hexachlorocyclopentadiene	NGCMS_1122	2	<2	<2	<2	-	-	-
Hexachloro-1,3-butadiene	NGCMS_1122	2	<2	<2	<2	-	-	-
Ethers								
4-Bromophenyl phenyl ether	NGCMS_1122	2	<2	<2	<2	-	-	-
4-Chlorophenyl phenyl ether	NGCMS_1122	2	<2	<2	<2	-	-	-
Bis(2-chloroethyl) ether	NGCMS_1122	2	<2	<2	<2	-	-	-
Bis(2-chloroethoxy)methane	NGCMS_1122	2	<2	<2	<2	-	-	-
Bis(2-chloroisopropyl)ether	NGCMS_1122	2	<2	<2	<2	-	-	-

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
Amines, Nitroaromatics & Nitrosamines								
Azobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
2,4-Dinitrotoluene	NGCMS_1122	2	<2	<2	<2	-	-	-
2,6-Dinitrotoluene	NGCMS_1122	2	<2	<2	<2	-	-	-
Nitrobenzene	NGCMS_1122	2	<2	<2	<2	-	-	-
N-Nitrosodimethylamine	NGCMS_1122	2	<2	<2	<2	-	-	-
N-Nitrosodiphenylamine	NGCMS_1122	2	<2	<2	<2	-	-	-
N-Nitrosodi-n-propylamine	NGCMS_1122	2	<2	<2	<2	-	-	-
Aniline	NGCMS_1122	2	<2	<2	<2	-	-	-
4-Chloroaniline	NGCMS_1122	2	<2	<2	<2	-	-	-
2-Nitroaniline	NGCMS_1122	2	<2	<2	<2	-	-	-
3-Nitroaniline	NGCMS_1122	2	<2	<2	<2	-	-	-
4-Nitroaniline	NGCMS_1122	2	<2	<2	<2	-	-	-
OC Pesticides								
Aldrin	NGCMS_1122	2	<2	<2	<2	-	-	-
alpha-BHC	NGCMS_1122	2	<2	<2	<2	-	-	-
beta-BHC	NGCMS_1122	2	<2	<2	<2	-	-	-
gamma-BHC	NGCMS_1122	2	<2	<2	<2	-	-	-
delta-BHC	NGCMS_1122	2	<2	<2	<2	-	-	-
4,4'-DDD	NGCMS_1122	2	<2	<2	<2	-	-	-
4,4'-DDE	NGCMS_1122	2	<2	<2	<2	-	-	-
4,4'-DDT	NGCMS_1122	2	<2	<2	<2	-	-	-
Dieldrin	NGCMS_1122	2	<2	<2	<2	-	-	-
a-Endosulphan	NGCMS_1122	2	<2	<2	<2	-	-	-
b-Endosulphan	NGCMS_1122	2	<2	<2	<2	-	-	-
Endosulphan sulphate	NGCMS_1122	2	<2	<2	<2	-	-	-
Endrin	NGCMS_1122	2	<2	<2	<2	-	-	-
Endrin aldehyde	NGCMS_1122	2	<2	<2	<2	-	-	-
Heptachlor	NGCMS_1122	2	<2	<2	<2	-	-	-
Heptachlorepoxide	NGCMS_1122	2	<2	<2	<2	-	-	-
OP Pesticides								
Dimethoate	NGCMS_1122	2	<2	<2	<2	-	-	-
Diazinon	NGCMS_1122	2	<2	<2	<2	-	-	-
Fenitrothion	NGCMS_1122	2	<2	<2	<2	-	-	-
Malathion	NGCMS_1122	2	<2	<2	<2	-	-	-
Chlorpyrifos	NGCMS_1122	2	<2	<2	<2	-	-	-
Ethion	NGCMS_1122	2	<2	<2	<2	-	-	-
Others								
Dichlorobenzidine	NGCMS_1122	2	<2	<2	<2	-	-	-
2-Methylnaphthalene	NGCMS_1122	1	<1	<1	<1	-	-	-
Isophorone	NGCMS_1122	2	<2	<2	<2	-	-	-
Benzyl alcohol	NGCMS_1122	2	<2	<2	<2	-	-	-
Carbazole	NGCMS_1122	2	<2	<2	<2	-	-	-
Dibenzofuran	NGCMS_1122	2	<2	<2	<2	-	-	-
Surrogate PHENOL-D6	NGCMS_1122	-	-	109	123	12	104	70
Surrogate 1,2-DCB-D4	NGCMS_1122	-	-	55	60	7.9	92	84
Surrogate TER-D14	NGCMS_1122	-	-	92	93	1.0	95	116

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 40-150%
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **4/02/2013**

ENV155/13-123
Due 04/02/13 Rv

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 512017 Laboratory: NMI / SAL

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: 1 of 5

No. of samples	Sample ID/ Depth	Anticipated Result (PID/EC reading)	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: TPH/PAH	TPH/BTEX	8260	8270	HOLD		Sample-specific instructions/ notes
✓	TP1 0.0-0.1		22/1/13		✓				✓				N13/002176	
✓	TP1 0.5-0.6		22/1/13		✓							✓		
✓	TP2 0.1-0.3				✓							✓		
✓	TP2 0.9-1.0				✓							✓		
✓	TP3 0.1-0.3				✓							✓		
✓	TP3 0.7-0.8				✓							✓		
✓	TP3 1.4-1.5				✓							✓		
✓	TP4 0.1-0.2				✓			✓					N13/002177	
✓	TP4 0.4-0.5				✓							✓		
✓	TP4 1.1-1.2				✓							✓		
✓	TP5 0.1-0.2				✓			✓					N13/002178	
✓	TP5 0.9-1.0				✓							✓		
✓	TP6 0.3				✓				✓	✓			N13/002179	
✓	TP6 0.4-0.5				✓				✓				N13/002180	
✓	TP6 1.1-1.2				✓				✓				N13/002181	
✓	TP7 0.1-0.3				✓							✓		
✓	TP7 0.5-0.7				✓				✓				N13/002182	
✓	TP8 0.2-0.3				✓			✓					N13/002183	
✓	TP8 0.6-0.8				✓							✓		
✓	TP8 1.2-1.4				✓							✓		
	TOTAL				20									

RECEIVED
25 JAN 2013
BY: Am 16:17

Turn Around *(circle)*: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions: - Warning: samples may contain glass + sharp items

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	C PITMAN		24/1/13	1200
Receiving Lab:				
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com
ENVIRONMENTAL EARTH SCIENCES

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 512017 Laboratory:

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: 2 of 5

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: TPH/BTEX PAH	TPH/BTEX	8260	8270	1400	Sample-specific instructions/ notes
✓	TP9 0.1-0.2		22/1/13		✓			✓					N13/002184
✓	TP9 0.5-0.6				✓						✓		N13/002185
✓	TP9 1.2-1.3				✓							✓	
✓	TP10 0.1-0.2				✓							✓	
✓	TP10 0.4-0.5				✓				✓				N13/002186
✓	TP10 1.0				✓							✓	
✓	TP10 1.4-1.5				✓							✓	
✓	TP11 0.7-0.8				✓				✓				N13/002187
✓	TP11 1.2-1.3				✓							✓	
✓	TP12 0.2-0.3				✓			✓					N13/002188
✓	TP12 0.6-0.7				✓				✓				N13/002189
✓	TP12 1.1-1.2				✓							✓	
✓	TP13 0.5-0.6				✓						✓		N13/002190
✓	TP13 1.1-1.2				✓							✓	
✓	TP14 0.5-0.6				✓							✓	
✓	TP14 1.2-1.3				✓							✓	
✓	TP15 0.2-0.3				✓			✓		✓			N13/002191
✓	TP15 1.1-1.2				✓							✓	
✓	TP22 0.4-0.5				✓							✓	
✓	TP22 1.2-1.4				✓							✓	
	TOTAL				20								

RECEIVED 25 JAN 2013 BY: AM 16:15

Turn Around *(circle)*: **NORMAL / 3 DAYS / 48 HRS / 24 HRS** *(confirm with lab in advance if quick turn-around is required)*

Comments/ Instructions:

Lab Quotation No. *(if applicable)*:

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	C PITMAN		24/1/13	1200
Receiving Lab:				
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com
ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE NOW

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 512017 Laboratory:

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: 3 of 5

No. of samples	Sample ID/ Depth	Anticipated Result (PID/EC reading)	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: TPH/PAH	TPH/BTEX	8260	8270	HOLD	Sample-specific instructions/ notes
✓ 1	TP23 0.6-0.7		22/1/13		✓							✓	
✓ 1	TP24 0.0-0.2		22/1/13		✓							✓	
✓ 1	TP25 0.4-0.5		22/1/13		✓							✓	
✓ 1	TP32 0.6-0.7		22/1/13		✓							✓	
✓ 1	TP31 0.4-0.5		22/1/13		✓							✓	
✓ 1	FD1		22/1/13		✓				✓				N13/002192
✓ 1	FD2		22/1/13		✓			✓					N13/002193
✓ 1	FD3		22/1/13		✓			3		✓			N13/002194
✓ 1	TP16 0.0-0.2		23/1/13		✓							✓	
✓ 1	TP16 1.0-1.1				✓							✓	
✓ 1	TP16 1.9-2.0				✓							✓	
✓ 1	TP17 0.3-0.4				✓							✓	
✓ 1	TP17 1.2-1.3				✓							✓	
✓ 1	TP18 0.1-0.2				✓							✓	
✓ 1	TP18 0.6-0.7				✓						✓		N13/002195
✓ 1	TP18 1.6-1.7				✓							✓	
✓ 1	TP19 0.2-0.3				✓							✓	
✓ 1	TP19 0.6-0.7				✓							✓	
✓ 1	TP19 2.0-2.1				✓							✓	
✓ 1	TP20 2.0-2.1				✓					✓			N13/002196
	TOTAL				20								

RECEIVED 25 JAN 2013 BY: AM 14:15

Turn Around *(circle)*: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions:

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	CPITMAN		24/1/13	1200
Receiving Lab:				
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com
ENVIRONMENTAL EARTH SCIENCES NSW

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: S12017 Laboratory:

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: 4 of 5

No. of samples	Sample ID/ Depth	Anticipated Result / PID/PEC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	TPH / PAH	TPH / BTEX	8260	8270	HOLD	Sample-specific instructions/ notes
✓ 1	TP21 0.5-0.6		23/1/13									✓	
✓ 1	TP21 1.4-1.5		23/1/13							✓			N13/002197
✓ 1	TP21 1.5-1.6		23/1/13									✓	
✓ 1	TP26 1.1-1.2		23/1/13							✓			N13/002198
✓ 1	TP26 2.0-2.1		23/1/13									✓	
✓ 1	TP27 1.5-1.6		23/1/13									✓	
✓ 1	TP27 3.0-3.1		23/1/13							✓			N13/002199
✓ 1	TP28 0.0-0.1		23/1/13									✓	
✓ 1	TP28 0.9-1.0		23/1/13							✓			N13/002200
✓ 1	TP28 1.1-1.2		23/1/13									✓	
✓ 1	TP29 0.1-0.2		23/1/13									✓	
✓ 1	TP29 1.0		23/1/13									✓	
✓ 1	TP29 2.0-2.1		23/1/13							✓			N13/002201
✓ 1	TP29 2.2		23/1/13							[illegible]		✓	
✓ 1	TP29 2.5		23/1/13									✓	
✓ 1	TP30 0.4-0.5		23/1/13									✓	
✓ 1	SS1 0.0-0.1		23/1/13						✓				N13/002202
✓ 1	SS2 0.0-0.1		23/1/13									✓	
✓ 1	SS3 0.0-0.1		23/1/13									✓	
✓ 1	SS4 0.0-0.1		23/1/13									✓	
	TOTAL												

RECEIVED
25 JAN 2013
BY Am 16:15

Turn Around *(circle)*: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions:

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	C PITMAN		24/1/13	1200
Receiving Lab:				
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com
ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE HOW

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 512017 Laboratory:

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: 5 of 5

No. of samples	Sample ID/ Depth	Anticipated Result (PID/EC reading)	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: TPH / PAH	TPH/BTEX	8260	8270	HOLD									Sample-specific instructions/ notes
✓ 1	SS5 0.0-0.1		23/1/13		✓			✓												N13/002203	
✓	TP26 0.1-0.2		23/1/13		✓							✓									
✓	SS6 0.0-0.1		23/1/13		✓				✓											N13/002204	
✓	SS7 0.0-0.1		23/1/13		✓							✓									
✓	SS8 0.0-0.1		23/1/13		✓							✓									
✓	FD4		23/1/13		✓			✓												N13/002205	
	TOTAL							8	10	9	3										

RECEIVED
25 JAN 2013
BY: Am 16:15 C

Turn Around *(circle)*: **NORMAL** / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions:

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	C PITMAN		24/1/13	1200
Receiving Lab:				
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com

ENVIRONMENTAL EARTH SCIENCES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB1301642**	Page	: 1 of 8
Client	: **ENVIRONMENTAL EARTH SCIENCES**	Laboratory	: Environmental Division Brisbane
Contact	: MS CHRISTINE PITMAN	Contact	: Customer Services
Address	: PO BOX 1519 BALLINA NSW, AUSTRALIA 2478	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cpitman@eesi.biz	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 66869744	Telephone	: +61 7 3243 7222
Facsimile	: +61 02 66869755	Facsimile	: +61 7 3243 7218
Project	: 512017	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JAN-2013
Sampler	: C Pitman	Issue Date	: 04-FEB-2013
Site	: Ballina		
		No. of samples received	: 4
Quote number	: EN/010/12	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Minh Wills	Organic Chemist	Brisbane Inorganics
Minh Wills	Organic Chemist	Brisbane Organics
Minh Wills	Organic Chemist	Brisbane Organics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

General Comments

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

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

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

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

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

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

- **Semivolatile TPH: Matrix Spike shows high recovery due to sample heterogeneity. Confirmed by visual inspection.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	FD1	FD2	FD3	FD4	----
				Client sampling date / time	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	----
Compound	CAS Number	LOR	Unit		EB1301642-001	EB1301642-002	EB1301642-003	EB1301642-004	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		28.1	5.4	20.0	25.7	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		5	<5	6	9	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg		50	7	19	30	----
Copper	7440-50-8	5	mg/kg		10	16	26	41	----
Lead	7439-92-1	5	mg/kg		9	30	58	167	----
Nickel	7440-02-0	2	mg/kg		19	7	16	14	----
Zinc	7440-66-6	5	mg/kg		50	105	100	392	----
EP074A: Monocyclic Aromatic Hydrocarbons									
Styrene	100-42-5	0.5	mg/kg		----	----	<0.5	----	----
Isopropylbenzene	98-82-8	0.5	mg/kg		----	----	<0.5	----	----
n-Propylbenzene	103-65-1	0.5	mg/kg		----	----	<0.5	----	----
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg		----	----	<0.5	----	----
sec-Butylbenzene	135-98-8	0.5	mg/kg		----	----	<0.5	----	----
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg		----	----	<0.5	----	----
tert-Butylbenzene	98-06-6	0.5	mg/kg		----	----	<0.5	----	----
p-Isopropyltoluene	99-87-6	0.5	mg/kg		----	----	<0.5	----	----
n-Butylbenzene	104-51-8	0.5	mg/kg		----	----	<0.5	----	----
EP074B: Oxygenated Compounds									
Vinyl Acetate	108-05-4	5	mg/kg		----	----	<5	----	----
2-Butanone (MEK)	78-93-3	5	mg/kg		----	----	<5	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg		----	----	<5	----	----
2-Hexanone (MBK)	591-78-6	5	mg/kg		----	----	<5	----	----
EP074C: Sulfonated Compounds									
Carbon disulfide	75-15-0	0.5	mg/kg		----	----	<0.5	----	----
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg		----	----	<0.5	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg		----	----	<0.5	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg		----	----	<0.5	----	----
EP074E: Halogenated Aliphatic Compounds									

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	FD1	FD2	FD3	FD4	----
				Client sampling date / time	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	----
					EB1301642-001	EB1301642-002	EB1301642-003	EB1301642-004	----
EP074E: Halogenated Aliphatic Compounds - Continued									
Dichlorodifluoromethane	75-71-8	5	mg/kg		----	----	<5	----	----
Chloromethane	74-87-3	5	mg/kg		----	----	<5	----	----
Vinyl chloride	75-01-4	5	mg/kg		----	----	<5	----	----
Bromomethane	74-83-9	5	mg/kg		----	----	<5	----	----
Chloroethane	75-00-3	5	mg/kg		----	----	<5	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg		----	----	<5	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg		----	----	<0.5	----	----
Iodomethane	74-88-4	0.5	mg/kg		----	----	<0.5	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg		----	----	<0.5	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg		----	----	<0.5	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg		----	----	<0.5	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg		----	----	<0.5	----	----
1.1-Dichloropropylene	563-58-6	0.5	mg/kg		----	----	<0.5	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichloroethane	107-06-2	0.5	mg/kg		----	----	<0.5	----	----
Trichloroethene	79-01-6	0.5	mg/kg		----	----	<0.5	----	----
Dibromomethane	74-95-3	0.5	mg/kg		----	----	<0.5	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg		----	----	<0.5	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg		----	----	<0.5	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg		----	----	<0.5	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg		----	----	<0.5	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg		----	----	<0.5	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg		----	----	<0.5	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg		----	----	<0.5	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg		----	----	<0.5	----	----
Pentachloroethane	76-01-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg		----	----	<0.5	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg		----	----	<0.5	----	----
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	0.5	mg/kg		----	----	<0.5	----	----
Bromobenzene	108-86-1	0.5	mg/kg		----	----	<0.5	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg		----	----	<0.5	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg		----	----	<0.5	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg		----	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	FD1	FD2	FD3	FD4	----
				Client sampling date / time	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	----
					EB1301642-001	EB1301642-002	EB1301642-003	EB1301642-004	----
EP074F: Halogenated Aromatic Compounds - Continued									
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg		----	----	<0.5	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg		----	----	<0.5	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg		----	----	<0.5	----	----
EP074G: Trihalomethanes									
Chloroform	67-66-3	0.5	mg/kg		----	----	<0.5	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg		----	----	<0.5	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg		----	----	<0.5	----	----
Bromoform	75-25-2	0.5	mg/kg		----	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(a)pyrene TEQ (WHO)	----	0.5	mg/kg		----	<0.5	----	<0.5	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	**90**	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	**1530**	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	**1180**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	FD1	FD2	FD3	FD4	----
				Client sampling date / time	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	----
					EB1301642-001	EB1301642-002	EB1301642-003	EB1301642-004	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	**2800**	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft									
C6 - C10 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	----	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	**200**	----
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	**2290**	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	**900**	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	**3390**	----
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
EP080: BTEXN									
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP074S: VOC Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	----	**104**	----	----
Toluene-D8	2037-26-5	0.1	%		----	----	**114**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	----	**125**	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	**117**	----	**92.1**	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	**110**	----	**99.0**	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	**80.2**	----	**109**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	**105**	----	**82.6**	----
Anthracene-d10	1719-06-8	0.1	%		----	**108**	----	**92.1**	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	**111**	----	**103**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**89.7**	**96.8**	**97.3**	**94.5**	----
Toluene-D8	2037-26-5	0.1	%		**81.8**	**101**	**96.8**	**97.1**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	FD1	FD2	FD3	FD4	----
			Client sampling date / time	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	24-JAN-2013 12:00	----
Compound	CAS Number	LOR	Unit	EB1301642-001	EB1301642-002	EB1301642-003	EB1301642-004	----
EP080S: TPH(V)/BTEX Surrogates - Continued								
4-Bromofluorobenzene	460-00-4	0.1	%	**109**	**106**	**110**	**99.0**	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	52.7	133.7
Toluene-D8	2037-26-5	60.3	131.1
4-Bromofluorobenzene	460-00-4	59.2	126.6
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	34.8	154.5
2-Chlorophenol-D4	93951-73-6	41.9	152.8
2.4.6-Tribromophenol	118-79-6	26.0	156.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	33.8	156.5
Anthracene-d10	1719-06-8	36.9	153.1
4-Terphenyl-d14	1718-51-0	41.8	172.2
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	52.7	133.7
Toluene-D8	2037-26-5	60.3	131.1
4-Bromofluorobenzene	460-00-4	59.2	126.6

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB1301642**	Page	: 1 of 7
Client	: ENVIRONMENTAL EARTH SCIENCES	Laboratory	: Environmental Division Brisbane
Contact	: MS CHRISTINE PITMAN	Contact	: Customer Services
Address	: PO BOX 1519 BALLINA NSW, AUSTRALIA 2478	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cpitman@eesi.biz	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 66869744	Telephone	: +61 7 3243 7222
Facsimile	: +61 02 66869755	Facsimile	: +61 7 3243 7218
Project	: 512017	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Ballina		
C-O-C number	: ----	Date Samples Received	: 25-JAN-2013
Sampler	: C Pitman	Issue Date	: 04-FEB-2013
Order number	: ----		
		No. of samples received	: 4
Quote number	: EN/010/12	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil miscellaneous glass jar (EA055-103)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**----**	----	----	**29-JAN-2013**	07-FEB-2013	✓
EG005T: Total Metals by ICP-AES							
Soil miscellaneous glass jar (EG005T)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**30-JAN-2013**	23-JUL-2013	✓	**30-JAN-2013**	23-JUL-2013	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil miscellaneous glass jar (EP071)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**31-JAN-2013**	07-FEB-2013	✓	**01-FEB-2013**	12-MAR-2013	✓
EP074D: Fumigants							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP074E: Halogenated Aliphatic Compounds							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP074F: Halogenated Aromatic Compounds							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP074A: Monocyclic Aromatic Hydrocarbons							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP074B: Oxygenated Compounds							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP074C: Sulfonated Compounds							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP074G: Trihalomethanes							
Soil miscellaneous glass jar (EP074)							
FD3	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil miscellaneous glass jar (EP075(SIM))							
FD2, FD4	**24-JAN-2013**	**31-JAN-2013**	07-FEB-2013	✓	**01-FEB-2013**	12-MAR-2013	✓
EP080: BTEX							
Soil miscellaneous glass jar (EP080)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP080: BTEXN							
Soil miscellaneous glass jar (EP080)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft							
Soil miscellaneous glass jar (EP080)							
FD1, FD2, FD3, FD4	**24-JAN-2013**	**29-JAN-2013**	07-FEB-2013	✓	**31-JAN-2013**	07-FEB-2013	✓

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(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	1	**100.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)
Volatile Organic Compounds	EP074	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP074E: Halogenated Aliphatic Compounds	3207911-025	----	**Dichlorodifluoromethane**	75-71-8	68.4 %	84-127%	**Recovery less than lower control limit**
EP074E: Halogenated Aliphatic Compounds	3207911-025	----	**Chloromethane**	74-87-3	134 %	67-128%	**Recovery greater than upper control limit**
EP074E: Halogenated Aliphatic Compounds	3207911-025	----	**Iodomethane**	74-88-4	111 %	56-111%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EB1301587-001	Anonymous	**Chromium**	7440-47-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EB1301587-001	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EB1301587-002	Anonymous	**Pyrene**	129-00-0	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP080/071: Total Petroleum Hydrocarbons	EB1301587-002	Anonymous	**C15 - C28 Fraction**	----	312 %	70-130%	**Recovery greater than upper data quality objective**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	EB1301587-002	Anonymous	**>C16 - C34 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB1301642**	Page	: 1 of 11
Client	: **ENVIRONMENTAL EARTH SCIENCES**	Laboratory	: Environmental Division Brisbane
Contact	: MS CHRISTINE PITMAN	Contact	: Customer Services
Address	: PO BOX 1519 BALLINA NSW, AUSTRALIA 2478	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: cpitman@eesi.biz	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 66869744	Telephone	: +61 7 3243 7222
Facsimile	: +61 02 66869755	Facsimile	: +61 7 3243 7218
Project	: 512017	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Ballina		
C-O-C number	: ----	Date Samples Received	: 25-JAN-2013
Sampler	: C Pitman	Issue Date	: 04-FEB-2013
Order number	: ----		
		No. of samples received	: 4
Quote number	: EN/010/12	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Minh Wills	Organic Chemist	Brisbane Inorganics
Minh Wills	Organic Chemist	Brisbane Organics
Minh Wills	Organic Chemist	Brisbane Organics
Stephen Hislop	Senior Inorganic Chemist	Brisbane Inorganics

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.

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 2704047)									
EB1301572-003	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	22.5	23.3	3.2	0% - 20%
EB1301587-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	36.4	36.3	0.4	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 2704026)									
EB1301473-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	2	4	33.9	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	849	904	6.2	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	9	20	74.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	104	116	10.8	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	43	68	45.8	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	771	845	9.2	0% - 20%
EB1301642-002	FD2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	12	56.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	9	27.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	20	20.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	30	29	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	105	101	3.6	0% - 20%
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	0.0	No Limit
EP074C: Sulfonated Compounds (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074D: Fumigants (QC Lot: 2703997)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP074D: Fumigants (QC Lot: 2703997) - continued									
EB1301642-003	FD3	EP074: 2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: 1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	0.7	38.6	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Chloromethane	74-87-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Bromomethane	74-83-9	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Chloroethane	75-00-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP074F: Halogenated Aromatic Compounds (QC Lot: 2703997) - continued									
EB1301642-003	FD3	EP074: 1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 2703997)									
EB1301642-003	FD3	EP074: Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 2704023)									
EB1301587-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (WHO)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2703996)									
EB1301587-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EB1301642-003	FD3	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 2704022)									
EB1301587-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EB1301601-004	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2703996)									
EB1301587-001	Anonymous	EP080: C6 - C10 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2703996) - continued									
EB1301642-003	FD3	EP080: C6 - C10 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QC Lot: 2704022)									
EB1301587-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EB1301601-004	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 2703996)									
EB1301587-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EB1301642-003	FD3	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	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 Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 2704026)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	110	77	127
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	76	122
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	112	73	127
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	112	80	122
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	110	77	121
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	111	80	126
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	110	77	127
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 2703997)								
EP074: Styrene	100-42-5	0.5	mg/kg	<0.5	1 mg/kg	82.8	62	108
EP074: Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	1 mg/kg	86.1	66	111
EP074: n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	1 mg/kg	83.3	62	108
EP074: 1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	1 mg/kg	83.7	68	107
EP074: sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	1 mg/kg	83.6	67	110
EP074: 1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	1 mg/kg	84.7	68	110
EP074: tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	1 mg/kg	85.4	66	110
EP074: p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	1 mg/kg	84.3	66	112
EP074: n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	1 mg/kg	83.2	66	110
EP074B: Oxygenated Compounds (QCLot: 2703997)								
EP074: Vinyl Acetate	108-05-4	5	mg/kg	<5	10 mg/kg	72.9	64	113
EP074: 2-Butanone (MEK)	78-93-3	5	mg/kg	<5	10 mg/kg	90.5	60	130
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	10 mg/kg	82.4	56	107
EP074: 2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	10 mg/kg	81.6	57	113
EP074C: Sulfonated Compounds (QCLot: 2703997)								
EP074: Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	1 mg/kg	93.1	62	111
EP074D: Fumigants (QCLot: 2703997)								
EP074: 2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	1 mg/kg	82.2	51	130
EP074: 1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	1 mg/kg	83.4	60	112
EP074: cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	2 mg/kg	82.3	58	114
EP074: trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	2 mg/kg	78.5	55	117
EP074: 1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	1 mg/kg	84.8	63	113
EP074E: Halogenated Aliphatic Compounds (QCLot: 2703997)								
EP074: Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	10 mg/kg	# 68.4	84	127
EP074: Chloromethane	74-87-3	5	mg/kg	<5	10 mg/kg	# 134	67	128
EP074: Vinyl chloride	75-01-4	5	mg/kg	<5	10 mg/kg	124	66	132

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP074E: Halogenated Aliphatic Compounds (QCLot: 2703997) - continued								
EP074: Bromomethane	74-83-9	5	mg/kg	<5	10 mg/kg	115	56	121
EP074: Chloroethane	75-00-3	5	mg/kg	<5	10 mg/kg	101	72	120
EP074: Trichlorofluoromethane	75-69-4	5	mg/kg	<5	10 mg/kg	97.7	62	123
EP074: 1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	1 mg/kg	80.0	67	114
EP074: Iodomethane	74-88-4	0.5	mg/kg	<0.5	1 mg/kg	# 111	56	111
EP074: trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	1 mg/kg	85.9	59	109
EP074: 1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	1 mg/kg	86.3	54	125
EP074: cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	1 mg/kg	85.9	64	108
EP074: 1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	1 mg/kg	83.9	64	112
EP074: 1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	1 mg/kg	81.6	64	112
EP074: Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	1 mg/kg	84.2	60	115
EP074: 1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	1 mg/kg	84.5	65	109
EP074: Trichloroethene	79-01-6	0.5	mg/kg	<0.5	1 mg/kg	84.0	66	112
EP074: Dibromomethane	74-95-3	0.5	mg/kg	<0.5	1 mg/kg	82.7	64	114
EP074: 1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	1 mg/kg	85.1	63	116
EP074: 1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	1 mg/kg	82.4	68	114
EP074: Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	1 mg/kg	96.8	74	126
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	1 mg/kg	82.6	65	110
EP074: trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	1 mg/kg	70.1	48	130
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	1 mg/kg	91.6	49	130
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	1 mg/kg	80.5	68	108
EP074: 1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	1 mg/kg	79.0	61	121
EP074: Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	1 mg/kg	64.9	42	115
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	1 mg/kg	77.7	54	131
EP074: Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	1 mg/kg	81.4	53	117
EP074F: Halogenated Aromatic Compounds (QCLot: 2703997)								
EP074: Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	1 mg/kg	86.6	68	112
EP074: Bromobenzene	108-86-1	0.5	mg/kg	<0.5	1 mg/kg	85.4	68	109
EP074: 2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	1 mg/kg	85.8	66	106
EP074: 4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	1 mg/kg	84.4	66	106
EP074: 1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	1 mg/kg	84.3	68	108
EP074: 1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	1 mg/kg	84.5	68	106
EP074: 1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	1 mg/kg	81.7	68	108
EP074: 1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	1 mg/kg	79.4	60	113
EP074: 1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	1 mg/kg	79.6	63	113
EP074G: Trihalomethanes (QCLot: 2703997)								
EP074: Chloroform	67-66-3	0.5	mg/kg	<0.5	1 mg/kg	85.8	66	112
EP074: Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	1 mg/kg	82.3	56	116
EP074: Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	1 mg/kg	83.3	62	114

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP074G: Trihalomethanes (QCLot: 2703997) - continued								
EP074: Bromoform	75-25-2	0.5	mg/kg	<0.5	1 mg/kg	86.2	53	122
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2704023)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	5.0 mg/kg	94.7	66	119
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	5.0 mg/kg	106	62	118
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	5.0 mg/kg	91.6	80	121
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	5.0 mg/kg	96.6	71	116
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	5.0 mg/kg	98.1	67	117
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	5.0 mg/kg	101	65	115
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	5.0 mg/kg	109	64	116
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	5.0 mg/kg	108	64	136
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	5.0 mg/kg	111	56	120
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	5.0 mg/kg	115	57	119
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	5.0 mg/kg	110	44	129
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	5.0 mg/kg	102	59	129
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	5.0 mg/kg	104	60	121
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	5.0 mg/kg	86.5	51	135
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	5.0 mg/kg	105	45	134
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	5.0 mg/kg	99.6	53	133
EP075(SIM): Benzo(a)pyrene TEQ (WHO)	----	0.5	mg/kg	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2703996)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	16 mg/kg	99.1	66	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2704022)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	312 mg/kg	91.4	84	117
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	500 mg/kg	93.8	80	118
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2703996)								
EP080: C6 - C10 Fraction	----	10	mg/kg	<10	18.5 mg/kg	99.5	66	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2704022)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	413 mg/kg	97.8	86	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	360 mg/kg	88.3	69	113
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
EP080: BTEXN (QCLot: 2703996)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	102	73	108
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	105	73	111
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	101	67	110
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	100	66	112
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	103	68	110

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 2703996) - continued								
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	103	72	115

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 2704026)							
EB1301587-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	70.4	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	# Not Determined	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	108	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	74.2	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	# Not Determined	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2704023)							
EB1301587-002	Anonymous	EP075(SIM): Acenaphthene	83-32-9	2.5 mg/kg	89.2	70	130
		EP075(SIM): Pyrene	129-00-0	2.5 mg/kg	# Not Determined	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2703996)							
EB1301587-002	Anonymous	EP080: C6 - C9 Fraction	----	8 mg/kg	73.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2704022)							
EB1301587-002	Anonymous	EP071: C10 - C14 Fraction	----	312 mg/kg	94.6	70	130
		EP071: C15 - C28 Fraction	----	500 mg/kg	# 312	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2703996)							
EB1301587-002	Anonymous	EP080: C6 - C10 Fraction	----	8 mg/kg	79.4	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2704022)							
EB1301587-002	Anonymous	EP071: >C10 - C16 Fraction	----	413 mg/kg	108	70	130
		EP071: >C16 - C34 Fraction	----	360 mg/kg	# Not Determined	70	130
EP080: BTEXN (QCLot: 2703996)							
EB1301587-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	97.5	70	130
		EP080: Toluene	108-88-3	2 mg/kg	97.8	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2703996)										
EB1301587-002	Anonymous	EP080: C6 - C9 Fraction	----	8 mg/kg	73.4	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2703996)										
EB1301587-002	Anonymous	EP080: C6 - C10 Fraction	----	8 mg/kg	79.4	----	70	130	----	----
EP080: BTEXN (QCLot: 2703996)										
EB1301587-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	97.5	----	70	130	----	----
		EP080: Toluene	108-88-3	2 mg/kg	97.8	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 2704022)										
EB1301587-002	Anonymous	EP071: C10 - C14 Fraction	----	312 mg/kg	94.6	----	70	130	----	----
		EP071: C15 - C28 Fraction	----	500 mg/kg	# 312	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft (QCLot: 2704022)										
EB1301587-002	Anonymous	EP071: >C10 - C16 Fraction	----	413 mg/kg	108	----	70	130	----	----
		EP071: >C16 - C34 Fraction	----	360 mg/kg	# Not Determined	----	70	130	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 2704023)										
EB1301587-002	Anonymous	EP075(SIM): Acenaphthene	83-32-9	2.5 mg/kg	89.2	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	2.5 mg/kg	# Not Determined	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 2704026)										
EB1301587-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	70.4	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	25 mg/kg	104	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	# Not Determined	----	70	130	----	----
		EG005T: Copper	7440-50-8	50 mg/kg	108	----	70	130	----	----
		EG005T: Lead	7439-92-1	50 mg/kg	74.2	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	103	----	70	130	----	----
		EG005T: Zinc	7440-66-6	50 mg/kg	# Not Determined	----	70	130	----	----

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 512017 Laboratory: ALS

Project Manager: Christine Pitman Sampler: C Pitman Site Location: Ballina Sheet: ___ of ___ BQ

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: ALS - SO1 Heavy metals	ALS - SO7	ALS - SO4	ALS - [redacted] SO9	Sample-specific instructions/ notes
1	FD1				✓			✓		✓		
2	FD2				✓			✓	✓			
3	FD3				✓			✓	[redacted]		✓	
4	FD4				✓			✓	✓			
	TOTAL							4	2	1	1	

Environmental Division Brisbane Work Order EB1301642

Telephone : +61-7-3243 7222

Turn Around *(circle)*: **NORMAL / 3 DAYS / 48 HRS / 24 HRS** *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions:

Send report to *(email address)*:

Cc: report to *(email address)*:

	Name	Signature	Date	Time
Sent off Site/Office by:	C. PITMAN		24/1/13	12.00
Receiving Lab:	ALS		25/01/13	12:05
Receiving Lab:				

Phone: (02) 6686 9744
Fax: (02) 6686 9744
PO Box 1519 Ballina NSW 2478
Email: cpitman@environmentalearthsciences.com

ENVIRONMENTAL EARTH SCIENCES
THE KNOW AND THE NOW

SYDNEY ANALYTICAL LABORATORIES

Office:
PO BOX 48
ERMINGTON NSW 2115

Laboratory:
1/4 ABBOTT ROAD
SEVEN HILLS NSW 2147
Telephone: (02) 9838 8903
Fax: (02) 9838 8919
A.C.N. 003 614 695
A.B.N. 81 829 182 852
NATA No: 1884

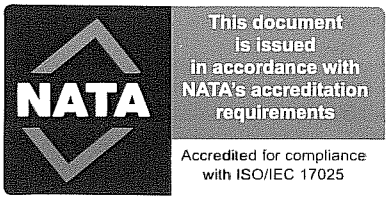
ANALYTICAL REPORT for:

ENVIRONMENTAL & EARTH SCIENCES

PO BOX 380
NORTH SYDNEY 2059

ATTN: C.PITMAN

JOB NO:	SAL24504
CLIENT ORDER:	512017
DATE RECEIVED:	25/01/13
DATE COMPLETED:	07/02/13
TYPE OF SAMPLES:	SOILS
NO OF SAMPLES:	35



.....
Issued on 11/02/13
Lance Smith
(Chief Chemist)

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL24504
CLIENT ORDER: 512017

	SAMPLES	Cu mg/kg	Pb mg/kg	Zn mg/kg	Cd mg/kg	Cr mg/kg
1	TP1/0.5-0.6	12	80	47	<0.5	8.0
2	TP3/0.1-0.3	20	19	60	<0.5	3.5
3	TP4/0.4-0.5	1.5	3.0	4.5	<0.5	2.0
4	TP6/0.4-0.5	7.0	18	48	<0.5	18
5	TP7/0.5-0.7	4.5	9.0	27	<0.5	17
6	TP8/0.2-0.3	15	24	37	<0.5	4.0
7	TP9/0.1-0.2	13	28	84	<0.5	5.0
8	TP10/0.4-0.5	23	24	68	<0.5	4.5
9	TP11/0.7-0.8	19	15	56	<0.5	3.0
10	TP12/1.1-1.2	4.0	7.0	47	<0.5	12
11	TP13/0.5-0.6	22	92	280	<0.5	15
12	TP14/0.5-0.6	9.0	12	35	<0.5	8.5
13	TP15/0.2-0.3	34	47	57	<0.5	11
14	TP22/0.4-0.5	4.0	12	19	<0.5	10
15	TP32/0.6-0.7	2.0	6.0	16	<0.5	5.5
16	TP31/0.4-0.5	2.5	11	23	<0.5	7.0
17	FD1	5.0	10	26	<0.5	17
18	FD2	12	27	86	<0.5	6.0
19	FD3	7.5	36	38	<0.5	9.5
20	TP17/0.3-0.4	21	47	240	<0.5	14
21	TP19/0.2-0.3	10	24	92	<0.5	17
22	TP19/0.6-0.7	19	90	190	<0.5	14
23	TP19/2.0-2.1	7.0	35	34	<0.5	10
24	TP21/0.5-0.6	68	260	620	1.5	18
25	TP26/1.1-1.2	80	350	910	2.5	13
26	TP27/1.5-1.6	60	220	1760	2.5	17
27	TP28/0.9-1.0	4.0	14	28	<0.5	10
28	TP28/1.1-1.2	1.0	1.5	3.0	<0.5	1.0
29	TP29/2.0-2.1	90	460	880	3.5	28
30	TP30/0.4-0.5	12	52	92	0.5	7.0
31	SS2/0.0-0.1	32	17	110	<0.5	6.5
32	SS4/0.0-0.1	30	30	390	0.5	12
33	SS5/0.0-0.1	23	100	250	0.5	13
34	SS6/0.0-0.1	100	270	1960	2.5	26
35	FD4	25	105	260	0.5	15
	BLANK	<0.5	<0.5	<0.5	<0.5	<0.5
DUPLICATES:						
20	TP17/0.3-0.4	23	44	230	<0.5	14
	AGAL-10	22	40	60	10	77
MDL		0.5	0.5	0.5	0.5	0.5
Method Code		M1	M1	M1	M1	M1
Preparation		P3	P3	P3	P3	P3

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL24504
CLIENT ORDER: 512017

	SAMPLES	Ni mg/kg	As mg/kg	Hg mg/kg
1	TP1/0.5-0.6	4.5	3.5	0.080
2	TP3/0.1-0.3	8.0	4.5	0.045
3	TP4/0.4-0.5	1.0	1.5	0.005
4	TP6/0.4-0.5	15	3.5	0.050
5	TP7/0.5-0.7	8.0	3.0	0.035
6	TP8/0.2-0.3	4.5	3.0	0.045
7	TP9/0.1-0.2	10	4.0	0.035
8	TP10/0.4-0.5	12	4.5	0.055
9	TP11/0.7-0.8	9.5	4.0	0.080
10	TP12/1.1-1.2	6.0	3.0	0.040
11	TP13/0.5-0.6	13	5.0	0.13
12	TP14/0.5-0.6	10	3.0	0.015
13	TP15/0.2-0.3	8.5	3.5	0.060
14	TP22/0.4-0.5	7.0	3.0	0.040
15	TP32/0.6-0.7	4.5	2.5	0.010
16	TP31/0.4-0.5	6.5	3.0	0.010
17	FD1	8.5	3.5	0.030
18	FD2	10	4.0	0.030
19	FD3	7.0	3.5	0.035
20	TP17/0.3-0.4	15	5.5	0.085
21	TP19/0.2-0.3	14	4.5	0.030
22	TP19/0.6-0.7	14	6.5	0.085
23	TP19/2.0-2.1	6.5	3.0	0.030
24	TP21/0.5-0.6	20	6.0	0.14
25	TP26/1.1-1.2	14	7.0	0.12
26	TP27/1.5-1.6	23	8.0	0.22
27	TP28/0.9-1.0	7.5	3.0	0.035
28	TP28/1.1-1.2	2.0	0.5	0.005
29	TP29/2.0-2.1	30	6.5	0.12
30	TP30/0.4-0.5	7.5	5.0	0.050
31	SS2/0.0-0.1	5.5	4.0	0.045
32	SS4/0.0-0.1	11	6.5	0.040
33	SS5/0.0-0.1	11	4.5	0.030
34	SS6/0.0-0.1	17	7.5	0.24
35	FD4	11	4.0	0.030
	BLANK	<0.5	<0.5	<0.005
DUPLICATES:				
20	TP17/0.3-0.4	16	5.0	0.080
	AGAL-10	19	20	10.2
MDL		0.5	0.5	0.005
Method Code		M1	M7	M3
Preparation		P3	P3	P1

RESULTS ON DRY BASIS

SYDNEY ANALYTICAL LABORATORIES

LABORATORY DUPLICATE REPORT

JOB NO: SAL24504
CLIENT ORDER: 512017

Sample Number	Analyte	Units	MDL	Sample Result	Duplicate Result	%RPD
TP17/0.3-0.4	Copper	mg/kg	0.5	21	23	9
TP17/0.3-0.4	Lead	mg/kg	0.5	47	44	7
TP17/0.3-0.4	Zinc	mg/kg	0.5	240	230	4
TP17/0.3-0.4	Cadmium	mg/kg	0.5	<0.5	<0.5	0
TP17/0.3-0.4	Chromium	mg/kg	0.5	14	14	0
TP17/0.3-0.4	Nickel	mg/kg	0.5	15	16	6
TP17/0.3-0.4	Arsenic	mg/kg	0.5	5.5	5.0	9
TP17/0.3-0.4	Mercury	mg/kg	0.005	0.085	0.080	6

Acceptance criteria:

RPD <50% for low level (<20xMDL)
RPD <30% for medium level (20-100xMDL)
RPD <15% for high level (>100xMDL)
No limit applies at <2xMDL

MDL = Method Detection Limit

All results are within the acceptance criteria

SYDNEY ANALYTICAL LABORATORIES

CERTIFIED REFERENCE MATERIAL

JOB NO: SAL24504
CLIENT ORDER: 512017

CRM Number	Analyte	Units	CRM Result	Certified Value	%Recovery	Acceptance Criteria %
AGAL-10	Copper	mg/kg	22	23.2	95	85-115
AGAL-10	Lead	mg/kg	40	40.4	99	85-115
AGAL-10	Zinc	mg/kg	60	57.0	105	85-115
AGAL-10	Cadmium	mg/kg	10	9.3	108	80-120
AGAL-10	Chromium	mg/kg	77	82.0	94	80-120
AGAL-10	Nickel	mg/kg	19	17.8	107	80-125
AGAL-10	Arsenic	mg/kg	20	17.2	116	80-125
AGAL-10	Mercury	mg/kg	10.2	11.6	88	80-120

All results are within the acceptance criteria

Note: The hot acid digest does not always determine 'total' metals. Refractory elements such as Iron and Aluminium and some base metals (particularly Chromium) show lower recoveries depending on their form within the sample matrix. Silicates and oxides are normally less soluble than elements in metallic or salt forms. The acceptance criteria for this reference material is based on histories of analyte recoveries using the nitric acid based digestion procedures.

ANALYTICAL REPORT

JOB NO: SAL24504
CLIENT ORDER: 512017

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

P3	Sample dried, jaw crushed and sieved at 1mm
P1	Analysis performed on sample as received
M1	Base Metal - Digestion Method 3050 (HNO_3/H_2O_2) Element determined by APHA 3111B (Flame AAS)
M7	Hydride Element - Digestion Method 7061 (HNO_3/H_2SO_4) Element determined by APHA 3114B (Hydride Generation AAS)
M3	Mercury - Digestion Method 7471 (HNO_3/HCl) Determined by APHA 3112B (Cold Vapour AAS)

APPENDIX D CALIBRATION CERTIFICATES

ThermoFisher SCIENTIFIC

The world leader in serving science

RENTALS

Equipment Report - GEOTECHNICAL INSTRUMENTS GEM2000

This Gas Meter has been performance checked / calibrated* as follows:

Calibration	Cal Value	Reading	Cal Value	Reading	Pass?
CH4	60% vol	60.4 %	0.00% vol	0.0 %	☑
CH4 -check only	2.5%CH4	2.6 %			☑
H2s	25ppm	28 ppm	0 ppm	0 ppm	☑
O2	20.9% vol	20.8 %	0.00% vol	0.0 %	☑
CO	100ppm	101 ppm	0 ppm	0 ppm	☑
CO2	40% vol	39.8 %			☑

Operations Check					
☒	Electrical Safety Tag attached (AS/NZS 3760)	Tag No:.....		Valid to:.....	
☑	Cleaned/checked	☑	In line Filter Check	☑	Battery Status @ 100 %

** Calibration gas traceability information is available upon request.*

Date: 18/01/2013 Checked by: MILENKO

Signed: _____

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☑	☐	Sampling Probe with In-Line Filter
☑	☐	1m of Sampling Tube
☑	☐	Carry Strap
☑	☐	Battery Charger and AC/DC Power Supply
☑	☐	Operating Quick Guide behind foam on lid of case "
☑	☐	Manual behind foam on lid of case "
☑	☐	Spare Inline Filters Qty (1)
☑	☐	Carry case
☑	☐	Data Cable and Software CD or Diskette
☑	☐	Instrument Battery Status @ 100 %
	☐	Check to confirm electrical safety (tag must be valid)
☐	☐	

Processors Signature/ Initials MS

Quote Reference	33724	Condition on return
Customer Ref		
Equipment ID	GEM2000PMC	
Equipment serial no.	GM13934/11	
Return Date	/ /	
Return Time		

AES ACTIVE ENVIRONMENTAL SOLUTIONS

Calibration and Service Report – Gas Monitor

Company:	Environmental Earth Sciences	**Manufacturer:**	RAE Systems	**Serial #:**	**MBA30025N8**
Contact:	Chris Conoley	**Instrument:**	MultiRAE	**Asset #:**	-
Address:	7-9 George Place	**Model:**	Pumped	**Part #:**	MBA3-A1C1R0E-020
	ARTARMON, NSW 2064	**Configuration:**	OFCH VOC	**Sold:**	8/12/2011
Phone:	02 9922 1777	**Wireless:**	-	**Last Cal:**	10/09/2012
Fax:	02 9922 1010	**Network ID:**	-	**Job #:**	**AES.020750**
Email:	cconoley@eesi.biz	**Unit ID:**	-	**Cal Spec:**	OFCH VOC
		Details:	-	**Order #:**	04032

Item	Test	Pass/Fail	Comments	Part Code	S/W
Battery	NiCd, NiMH, Dry cell, Li Ion	✓			
Charger	Charger, Power supply	✓			
	Cradle	-			
Pump	Flow	x	Pump Cleaned > 400 ml/min		
Filter	Filter, fitting, etc	✓	Fitted new filter	002-3022-000	1
Alarms	Audible, visual, vibration	✓			
Display	Operation	✓			
Switches	Operation	✓			
PCB	Operation	✓			
Connectors	Condition	✓			
Firmware	Version	✓	Version: 1.10		
Datalogger	Operation	✓			
Monitor Housing	Condition	✓			
Case	Condition/Type	✓			
Sensors					
Oxygen	O2	✓			
LEL	LEL	✓			
PID	10.6eV	✓			
Toxic 1	CO+H2S	✓			
Toxic 2		-			
Toxic 3		-			
Toxic 4		-			
Toxic 5		-			
Toxic 6		-			
Other		-			
				Calibration	1

Engineer's Report

Pump Cleaned, Flow Checked > 400ml / min.
Unit Calibrated, Unit Serviceable.

Calibration Certificate

Sensor	Type	Serial No:	Span Gas	Concentration	Traceability Lot #	CF	Reading Zero	Reading Span
Oxygen	O2	03420050N5	Air	20.9%	Fresh air		20.9	
			O_2	18.0%	S33239-1			18.0
LEL	LEL	SC03110250N8	Methane	50%LEL	S33239-1		0	50
PID	10.6eV	O3A40077N5	Isobutylene	100ppm	S21306		0	100
Toxic 1	CO+H2S	SC03130099N8	CO	50ppm	S33239-1		0	50
Toxic 2			H2S	10ppm	S33239-1		0	10
Toxic 3								
Toxic 4								
Toxic 5								
Toxic 6								
Other								

Calibrated/Repaired by: **Bill Knobel** Date: **16 January 2013** Next Due: **16 July 2013**

Melbourne- Head Office: Unit 3 266 Bolton Street ELTHAM VIC 3095 T: +(613) 9431 3500 F:+ (613) 9431 3577
Sydney - Office : S14 Lvl 2 6-8 Holden Street ASHFIELD NSW 2131 T: +(612) 9716 5966 F:+ (612) 9716 5988
Perth - Office: Unit 6 41 Holder Way MALAGA WA 6090 T: +(618) 9249 5663 F:+ (618) 9249 5362

sales@aesolutions.com.au www.aesolutions.com.au