

**FURTHER ASSESSMENT OF  
GROUNDWATER QUALITY - ASH PONDS  
TALLAWARRA LANDS, YALLAH BAY  
ROAD, YALLAH, NSW**

Prepared for:

TRUenergy  
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13 September 2010

TRUenergy  
Level 33, 385 Bourke Street  
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**Attention: Anthony Savenkov**

Dear Anthony

**RE: FURTHER ASSESSMENT OF GROUNDWATER QUALITY - ASH PONDS  
TALLAWARRA LANDS, YALLAH BAY ROAD, YALLAH, NSW**

We are pleased to present our report for the above site.

We draw your attention to the attached sheets titled "Important Information about your Coffey Environmental Report". These sheets should be read in conjunction with this report.

Thank you for your commission for this work and we look forward to the opportunity of being of assistance again in the future. Should you have any questions in relation to the report, please do not hesitate to contact the undersigned.

For and on behalf of Coffey Environments Pty Ltd



MANUEL FERNANDEZ  
Associate Environmental Engineer

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Important Information About Your Coffey Environmental Report

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Table LR2: Summary of Laboratory Results for Groundwater and Surface Water Samples for Previous and Current Coffey Assessments

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Figure 2: Site Layout Plan Showing Approximate Sampling Locations on 2010 Aerial Photograph

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Appendix A: Borehole Log

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## ABBREVIATIONS

<b>AHD</b>	Australian Height Datum
<b>ANZECC</b>	Australian and New Zealand Environment and Conservation Council
<b>Bgs</b>	below ground surface
<b>COC</b>	Chain of Custody
<b>DECC</b>	Department of Environment and Climate Change (NSW)
<b>DECCW</b>	Department of Environment, Climate Change and Water (NSW)
<b>DO</b>	Dissolved Oxygen
<b>EC</b>	Electrical Conductivity
<b>Eh</b>	Oxidation/Reduction Potential
<b>GIL</b>	Groundwater Investigation Level
<b>IP</b>	Interface Probe
<b>LOR</b>	Limit of Reporting
<b>µg/L</b>	micrograms per litre
<b>mg/L</b>	milligrams per litre
<b>MW</b>	Monitoring Well
<b>NATA</b>	National Association of Testing Authorities
<b>NEPM</b>	National Environment Protection Measure
<b>NSW EPA</b>	Environment Protection Authority of New South Wales
<b>Ppm</b>	parts per million
<b>ppmv</b>	parts per million by volume
<b>QA</b>	Quality Assurance
<b>QC</b>	Quality Control
<b>RL</b>	Reduced Level

## ABBREVIATIONS

<b>RPD</b>	Relative Percent Difference
<b>SGS</b>	SGS Environmental Pty Ltd
<b>SOP</b>	Standard Operating Procedures
<b>SWL</b>	Static Water Level
<b>TDS</b>	Total Dissolved Solid
<b>TOC</b>	Top of Casing

## 1 INTRODUCTION

### 1.1 General

Coffey Environments Australia Pty Ltd (Coffey Environments) was commissioned by TRUenergy Tallawarra Pty Ltd (TRUenergy) to carry out further assessment of groundwater quality at the former ash pond areas of the Tallawarra Lands surrounding the Tallawarra Power Station, Yallah Bay Road, Yallah, NSW, hereafter referred to as the 'site' (Figure 1). The work was completed generally in accordance with our proposal, ENAUWOLL04009AB-P01, dated 16 August 2010. This report presents the results of the further assessment of groundwater quality.

Coffey Environments recently completed a geotechnical, contamination and groundwater assessment of the Tallawarra lands (Report Ref: ENVIWOLL00250AB-R03, dated 30 July 2010). With respect to groundwater quality, the assessment identified elevated concentrations of heavy metals (including arsenic, copper, nickel and zinc) and ammonia above the adopted investigation levels for protection of aquatic ecosystems. The report recommended further assessment of the significance of these exceedences.

The objective of this investigation was to provide a further level of assessing the significance of the heavy metal and ammonia exceedences recorded in the groundwater.

This report should be read with reference to the earlier Coffey Environments report.

### 1.2 Scope of Work

The following scope of work was carried out to meet the project objective:

- Installation and sampling of groundwater from one groundwater monitoring well in a location inferred to be away from the influence of the ash ponds, but within an alluvial/estuarine environment;
- Collection of groundwater samples from eight of the recently installed wells;
- Collection of a groundwater sample from a well located in the western part of the site that was installed by others and has previously been monitored;
- Collection of four surface water samples along Duck Creek (includes 1 background sample from a location upstream of potential impact from the ash pond areas);
- Collection of two background surface water Lake samples in a locality unlikely to be influenced from the ash ponds (approximately 2km north of the ash ponds);
- Laboratory analysis of groundwater and surface water samples for dissolved heavy metals (arsenic, copper, nickel and zinc), ammonia, nitrate and nitrite. The following parameters were also measured in the field – pH, temperature, redox potential ( $E_h$ ), dissolved oxygen (DO) and electrical conductivity (EC);
- Review of background data, including comparison to adopted investigation levels, comparison to previous monitoring data and review of the groundwater and aquatic chemistry and background conditions; and

- Preparation of this report summarising the results of fieldwork, presenting and interpreting analytical results and findings, comparing contaminant concentrations to applicable guidelines and assessing the significance of the heavy metal and ammonia concentrations with respect to the local environment.

## 2 METHODOLOGY

The methodology for this assessment included:

1. Repeating groundwater quality assessment at existing locations;
2. Augmenting this information by obtaining relevant data for the adjacent aquatic environments and background / upgradient locations;
3. Assessing the data obtained and providing an assessment of the significance of the exceedences or if further assessment is required.

As discussed in the conclusions section of our previous report, assessment of background groundwater quality within a similar estuarine environment would be one of the first steps in assessing the significance of the exceedences. Background groundwater quality was not assessed during the previous assessment and it cannot be ruled out that some or all of the metals and ammonia measured could be associated with the surrounding natural environment. Assessment of background groundwater quality is also recommended in the ANZECC guidelines. One new monitoring well (MW10) was placed within Zone 2C which is an area assessed likely to be underlain by alluvial/estuarine soils and to be away from influences of the ash ponds. One groundwater sample was also collected from a well located to the west of the ash ponds, that has been monitored historically (TAGM/D1).

In addition to this, it was also considered worthwhile collecting data on the levels of these contaminants within the receiving water bodies near the ash ponds (Duck Creek and Lake Illawarra) at likely discharge points. Additionally, in order to assess the significance of discharges to this area, samples were collected from background locations in Duck Creek and Lake Illawarra to assess background concentrations in the receiving environment and also what may be 'flushing' into these systems from the upstream catchments (from outside the site).

Another round of groundwater sampling from wells installed as part of our previous assessment was considered useful to confirm the concentrations and also to enable a comparison to other data and remove uncertainties with respect to temporal variations etc.

### **3 GROUNDWATER AND SURFACE WATER INVESTIGATION LEVELS**

The investigation levels for groundwater and surface water used in this assessment were the same as those used in our recent assessment report, and are based on the Australia and New Zealand Environment and Conservation Council (ANZECC) *Guidelines for Fresh and Marine Water Quality 2000* (ANZECC 2000). These guidelines are considered applicable for the protection of marine water ecosystems of the receiving waters. As the receiving waters are in an estuarine environment, trigger values for marine water have been adopted.

The adopted criteria are summarised in the results table LR1.

## **4 FIELD AND LABORATORY INVESTIGATIONS**

### **4.1 Field Investigations**

Field investigations were carried out between 17 and 25 August 2010 in the full time presence of an environmental scientist from Coffey Environments Wollongong Office. Monitoring well MW10 was installed on 17 August 2010. Groundwater and surface water samples were collected on 24 and 25 August 2010.

### **4.2 Groundwater Monitoring Well Installation**

Groundwater monitoring well MW10 was installed within Zone 2(C) in a location inferred to be away from the influence of the ash ponds, but within an alluvial/estuarine environment.

A trailer mounted drilling rig was used to install MW10, from which the subsurface conditions were logged and groundwater conditions noted. The drill rig used a 100mm diameter solid stem auger fitted with a hardened steel V-bit. The well location was extended approximately 3.4m past the level where initial groundwater inflows were observed with the groundwater monitoring well installed to a depth of 4.5m. The lower 3.0m section of the well was screened with 50mm machine slotted, Class 18, threaded PVC. Blank (unslotted) Class 18 PVC was used to case the well to ground surface. Coarse sand was placed within the well annulus to a level of 0.4m above the top of the slotted screen, followed by an annular seal of granular bentonite pellets. Concrete was then placed to the surface. The top of the well was completed with a steel monument.

The log of the well, along with well completion details, is presented in Appendix A.

MW10 was developed following installation. Approximately 15 litres of water was removed, at which point the well went dry with steady recharge noted. Water clarity did not improve following well development, but the amount of fine sediment in the water was reduced.

The approximate location of MW10, relative to existing surface features and previously installed groundwater monitoring wells, is shown in Figure 2. The location and elevation (ground level and top of casing) of the groundwater monitoring well MW10 were not surveyed, but were located using a handheld GPS.

### **4.3 Groundwater Sampling**

Monitoring well MW10 was allowed to stabilise for at least 7 days prior to sampling being carried out. Monitoring of groundwater from monitoring wells MW1 to MW6, MW8 to MW10 and TAGM/1 was carried out on the 24 and 25 August 2010. Standing water levels were checked using an electronic probe prior to sampling.

Typically two well volumes were removed from all wells during purging, where practicable. The volume was less at locations MW6 and MW8, where only one well volume was removed before they went dry. Monitoring well TAGM/D1 was recorded to have a total depth of 2.84m and contained approximately 0.18m of water within the bottom of the well. Due to the relatively small amount of groundwater in the base of this well and as it was likely to bail dry, this well was not purged and the water was placed directly into sample containers. The water from this well was noted as having a significant amount of sediment and decaying leaf matter.

Field parameters recorded during the well purging included temperature, pH, EC, DO and  $E_h$  using a calibrated water quality meter.

The monitoring wells were developed, purged and sampled using similar procedures as described in our previous report using a dedicated disposable plastic bailer or wattera tubing. The groundwater samples were placed into appropriately preserved containers supplied by the contract laboratory. The groundwater sample for heavy metals analysis was filtered in the field with a 0.45 $\mu$ m filter. The groundwater samples were immediately stored in a chest cooled with ice.

#### **4.4 Surface Water Sampling**

Surface water sampling was carried out at six locations, designated SW1 to SW6 as follows:

- SW1 – Within Duck Creek in inferred upstream location (upstream of inferred influences from the ash ponds)
- SW2 – Within Duck Creek, downslope of Ash Pond 3 (close to the point where the former Wollingurry Creek use to discharge)
- SW3 – Within Duck Creek, downslope of Ash Ponds 1 and 2 (opposite MW5)
- SW4 – At the mouth of Duck Creek where it discharges into Lake Illawarra
- SW5 and SW6 – Within Lake Illawarra approximately 2km to the north of the Ash Ponds in an area inferred to be away from the influence of the ash ponds

Field parameters were measured at each location using a calibrated multi-parameter water quality meter (ph, EC, DO and  $E_h$ ). The water sample was collected with a telescopic sampler which was washed with a phosphate free detergent, rinsed with potable water followed by rinsing with distilled water between sampling locations.

The surface water samples were placed into appropriately preserved containers supplied by the contract laboratory. The surface water sample for heavy metals analysis was filtered in the field with a 0.45 $\mu$ m filter. The surface water samples were immediately stored in a chest cooled with ice.

Surface water samples were purposely collected at the lower end of the tide so that the samples were more representative of discharges from the creek and potentially groundwater rather than being influenced by tidal waters moving upstream in the creek.

## 4.5 Field Quality Control Procedures

The field quality control consisted of the following:

- Sampling was performed generally in accordance with the procedures outlined in Coffey Environments relevant standard operating procedures, which are based on industry accepted protocols for environmental sampling. This was carried out by trained and experienced environmental scientist. Sampling staff had undergone Coffey Environments internal training procedures in accordance with the Coffey Environments standard operating procedures and supervised field training;
- Calibration of field instruments in accordance with manufacturer's instructions;
- Collection and analysis of one blind coded duplicate groundwater sample DJD001 (duplicate of primary sample MW01) for ammonia, nitrate, nitrite and heavy metals (arsenic, copper, nickel and zinc);
- Collection and analysis of one blind coded triplicate groundwater sample DJD002 (triplicate of primary sample MW01) for ammonia, nitrate, nitrite and heavy metals (arsenic, copper, nickel and zinc). This sample was sent for inter laboratory analysis;
- Samples were transported in ice-cooled chests to the contract laboratory, SGS Environmental Services Pty Ltd (SGS) in Sydney, which is NATA accredited for the analysis performed, under chain of custody conditions. The triplicate sample was transported to MGT Environmental Consulting Pty Ltd (MGT) in Sydney under the same conditions as the primary samples. MGT is also NATA accredited for the analysis performed. Copies of the chain of custodies are included in Appendix B.

## 4.6 Laboratory Analysis

The groundwater and surface water samples were tested for ammonia, and heavy metals (arsenic, copper, nickel and zinc) as these were the main parameters noted to exceed the adopted criteria in the previous assessment. In addition nitrate and nitrite were also selected for analysis. The laboratory results are discussed in Section 5.2 and the laboratory reports are presented in Appendix B.

## 5 RESULTS

### 5.1 Observations

The following observations were made during sample collection:

- Typically, surface water samples were relatively clear, except for SW3 where the water was slightly cloudy.
- Typically, the groundwater samples were slightly cloudy to turbid.
- The colour of the groundwater at MW01, MW03, MW09 and MW10 was generally brown to pale orange brown.
- The colour of the groundwater at MW02, MW04, MW05, MW06, MW08 was generally grey to grey brown.
- The colour of the water at TAGM/D1 was dark brown with a relatively high amount of sediment and decaying plant matter.
- No visual evidence of oily sheens or hydrocarbon odours were apparent during sampling.
- Brackish type odours were noted at the surface water sampling locations SW2 to SW6, consistent with sea water.
- Slight brackish odours were noted at the groundwater monitoring well locations MW01, MW02, MW04, MW05 and MW09.
- A strong decaying organic matter odour was noted at the well location TAGM/D1. A relatively small amount of water was noted to be present in the well with slow recharge noted.
- Trace amounts of what was inferred to be an orange coloured algae floating at the top of the bailer were noted at MW01 which was not apparent during the previous sampling event.

### 5.2 Laboratory Results

The laboratory results are summarised in Table LR1 and are also shown in Figure 3. The laboratory certificates are included in Appendix B.

#### 5.2.1 Data Validation

The data were assessed against predetermined Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) (completeness, comparability, representativeness, precision, and accuracy) for both field and laboratory procedures and results. A data validation report has been prepared and is included in appendix C.

Based on the assessment, it is considered that the data collected for this assessment is adequate and meets the DQOs and DQIs.

#### 5.2.2 Field Quality Parameters – Groundwater

Groundwater quality parameters measured in the field are presented in Table LR1 and summarised below.

- Dissolved oxygen (DO) measurements ranged between 0.88 mg/L (TAGM/D1) and 8.11 mg/L (MW8);
- Redox potential ( $E_h$ ) measurements ranged between -104 mV (MW2) and +228 mV (MW9);

- Electrical conductivity (EC) measurements ranged between 0.55 mS/cm (TAGM/D1) and 53.80 mS/cm (MW6) (equivalent TDS of about 365mg/L to 36,046mg/L);
- pH measurements ranged between 4.10 (MW9) and 7.14(MW1 and MW2); and
- Temperature measurements ranged between 13.5°C (MW6) and 19.0°C (MW1 and MW3)

### **5.2.3 Field Quality Parameters – Surface Water**

Surface water quality parameters measured in the field are presented in Table LR1 and summarised below.

- Dissolved oxygen (DO) measurements ranged between 7.50 mg/L (SW3) and 10.74 mg/L (SW06);
- Redox potential ( $E_h$ ) measurements ranged between +20 mV (SW4) and +161 mV (MW6);
- Electrical conductivity (EC) measurements ranged between 11.00 mS/cm (SW1) and 51.80 mS/cm (SW6);
- pH measurements ranged between 6.54 (SW6) and 8.29 (SW5); and
- Temperature measurements ranged between 14.4°C (SW4) and 19.8°C (SW5)

### **5.2.4 Comparison of Laboratory Results to Groundwater and Surface Water Investigation Levels (GILs)**

Table LR1 summarised the laboratory results and compares the results to the adopted investigation levels. Exceedances above the adopted investigation levels are shown in the table. Various exceedances of the adopted investigation levels were recorded for heavy metals and ammonia at background locations, within ash ponds and downslope locations.

Table LR2 includes results from our previous assessment for comparison purposes.

## 6 DISCUSSION

The results of the additional sampling indicate exceedances of heavy metals and ammonia above the adopted investigation levels at background locations, within the ash ponds and inferred down gradient locations.

Background water quality was assessed at five locations:

- MW10 – a new monitoring well installed in Zone 2C within an alluvial/estuarine area
- TAGM/D1 – a former monitoring well on the northern side of Duck Creek
- SW1 – surface water upstream location of Duck Creek
- SW5 & SW6 – surface water within Lake Illawarra at a location away from the influence of the ash ponds

Monitoring well MW10 was installed in an area inferred to away from the direct influence of the ash ponds and also within an area underlain by alluvial/estuarine soils. The log of the well confirms that alluvial/estuarine soils were present at this location. Analytical results from this well recorded elevated arsenic, nickel and zinc concentrations, above the adopted investigation levels. Ammonia was recorded at this location, but below the adopted investigation level at a concentration of 340 µg/L.

A previously installed monitoring well, TAGM/D1 was also sampled and recorded elevated copper, nickel and zinc concentrations, above the adopted investigation levels. Ammonia was recorded at this location, but below the adopted investigation level at a concentration of 340µg/L. We note that the installation details of this well and subsurface conditions are not known therefore the data from this well should be regarded as indicative only.

Surface water in an upstream location of Duck Creek (away from the expected influence of the ash ponds) and surface water within the lake also recorded heavy metal exceedances, but not ammonia.

Table 1 below summarises the concentration ranges in the background locations and compares those to groundwater within the ash ponds, groundwater downslope of the ash ponds and surface water locations from the August 2010 monitoring event.

**TABLE 1: SUMMARY OF CONCENTRATION RANGES (µg/L)**

Analyte	Threshold Concentration <sup>1</sup>	Background Concentration Ranges (SW1, SW5, SW6 & MW10)	Groundwater Concentration Ranges within Ash Ponds (MW3, MW4, MW6 & MW8)	Groundwater Concentration Ranges Downslope of Ash Ponds (MW1, MW2, MW5 & MW9)	Surface water Concentration Ranges (excluding background locations) (SW2, SW3 & SW4)
As	2.3 <sup>a</sup>	2 - <b>8</b>	4 - <b><u>110</u></b>	4 - <b><u>21</u></b>	7
Cu	1.3	<1 - <b>67</b>	<1 - 3	<1 - 12	<1
Ni	7	5 - 14	11 - <b><u>87</u></b>	4 - <b><u>49</u></b>	10 - 11
Zn	15	<b>20 - 490</b>	<b>61 - 170</b>	<b>53 - 270</b>	<b>25 - 41</b>
Ammonia	910	11 - 430	390 - <b><u>7,300</u></b>	<b><u>950 - 12,000</u></b>	250 - 340

1. Based on ANZECC/ARMCANZ (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Fresh water, South Eastern Australia, slightly to moderately disturbed system, 95% of species protected)

1a. Recommended 99% protection level used.

- Values in **bold** – exceed adopted threshold concentration

- Underlined values – exceed the higher of the recorded background concentrations

<sup>a</sup> Low reliability trigger value

The above table shows that higher concentrations were generally recorded within or downslope of the ash ponds within groundwater. Although some exceedances of the adopted investigation levels were noted in surface water within Duck Creek, the concentrations recorded were within the background ranges. Each contaminant is discussed further below:

### **Arsenic**

The highest arsenic concentrations were recorded within the groundwater in the ash ponds and the ranges in Table 1 show a decreasing concentration trend downslope of the ash ponds. Arsenic concentrations in surface water within Duck Creek were recorded to be 7 µg/L which, although above the adopted investigation level, is within the recorded background ranges. We note that the investigation level adopted for arsenic is a low reliability trigger value and assumes the arsenic is in form of As(III), and is noted in the ANZECC guidelines as being only an indicative interim working level. This trigger value is therefore likely to be conservative.

### **Copper**

Copper was recorded at concentrations within background ranges. Copper was recorded below the reporting limit and below the adopted investigation level within downslope locations in Duck Creek.

### **Nickel**

The highest arsenic concentrations were recorded within the groundwater of the ash ponds and the ranges in Table 1 show a decreasing concentration trend downslope of the ash ponds. Nickel concentrations in surface water within Duck Creek were recorded to range between 10µg/L and 11µg/L, which although above the adopted investigation level of 7µg/L, is within the recorded background ranges.

### **Zinc**

The highest arsenic concentrations were recorded in groundwater downslope of the ash ponds in MW9. Zinc concentrations in surface water within Duck Creek were recorded to range between 25µg/L and 41µg/L, which although above the adopted investigation level of 15µg/L, is within the recorded background ranges.

Based on the concentrations of metals recorded in groundwater within and downslope of the ash ponds, it is likely that the ash, coalwash and/or fill used in the ash ponds can contribute to the observed higher metal concentrations in the groundwater. These exceedances however do not appear to be translating to the receiving surface water environment where concentrations are generally within background ranges.

### **Ammonia**

The highest ammonia concentrations were recorded in groundwater downslope of the ash ponds. Ammonia was recorded at background locations, but was typically low compared to concentrations within and downslope of the ash ponds, suggesting that the greater proportion of the ammonia is not likely to be associated with the natural environment. Some of the ammonia is likely to be attributed to the ash deposits within the ponds and also the coalwash fill used in and around the embankments of the ash ponds. Wollongong City Council has reported that ammonia in groundwater has been identified at a nearby coal wash emplacement area and is associated with the reduction of total nitrogen present within the coal wash. There is also reports that ammonia conditioning was used at the former Tallawarra power station (at least as a pilot trial) as a means of controlling air emissions (University of

Wollongong , 1995). This conditioning may have resulted in ammoniated ash. Similar to the metals, the ammonia concentrations recorded within Duck Creek were similar to background concentrations and below the adopted investigation level.

Based on the current level of information, the fate and transport mechanisms for the metals and ammonia are not well understood. It is possible that the transport of contaminants to surface water may be retarded by the presence of clayey subsoils and the bund walls of the ponds. However, sampling along Duck Creek has suggested that the elevated metal and ammonia concentrations in groundwater do not appear to be significantly influencing concentrations in this receiving water body. Duck Creek is a much smaller water body than Lake Illawarra and contaminant concentrations would be expected to be noted to a greater extent in this system, therefore representing a worst case scenario.

A report prepared by CSIRO in 1992 which reviewed the impact of the Tallawarra Power Station on Lake Illawarra, concluded the following which supports the above:

*'While the Tallawarra Power Station has been a source of trace elements and ash to Lake Illawarra, and have accumulated in lake sediments in the vicinity of the station, the concentrations are not abnormally high and on the basis of the available evidence there is not likely to be any significant impact on aquatic biota.'*

*'There is no evidence that power station cooling water has been a major source of nutrients, nor is there evidence that the power station has had any demonstrable and general effect on nutrient dynamics in the lake.'*

*'The power station apart from its visual impact has had no significant impact on the beneficial amenity of the lake.'*

## **7 CONCLUSIONS**

The results of this assessment have indicated that background groundwater and surface water have a base load of heavy metals and ammonia, with metal concentrations which exceed the adopted trigger values (ANZECC 2000). Heavy metal and ammonia concentrations in groundwater within and downslope of the ash ponds were generally higher than background concentrations. However, these exceedances do not appear to be translating to the receiving surface water environment where concentrations are generally within background ranges. Based on the age of the ash ponds, it is considered unlikely that there would be significant changes in surface water quality into the future.

We would recommend that any future disturbance to the ash ponds should take into consideration the groundwater issues and ensure that the disturbances avoid creating preferential pathways for groundwater to discharge directly into the surrounding receiving environment.

## **8 LIMITATIONS**

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition at the areas of the site assessed at the time the investigations were carried out.

Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

This report should be read in conjunction with the attached sheet entitled 'Important Information About Your Coffey Environmental Report'

## 9 REFERENCES

1. ANZECC (1992) Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment & Conservation Council
2. Coffey Environments (2010) Geotechnical, Contamination and Groundwater Investigation (Ref: ENVIWOLL00250AB-R04)
3. CSIRO Australia (1992) A Review of the Impact of Tallawarra Power Station on Lake Illawarra (Ref: CET/LH/IR035, dated November 1992)
4. University of Wollongong (1995) Recent Sediments in Lake Illawarra – Implications for Management.

## Important information about your **Coffey** Environmental Report

Uncertainties as to what lies below the ground on potentially contaminated sites can lead to remediation costs blow outs, reduction in the value of the land and to delays in the redevelopment of land. These uncertainties are an inherent part of dealing with land contamination. The following notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

### **Your report has been written for a specific purpose**

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Your report has been developed on the basis of a specific purpose as understood by Coffey and applies only to the site or area investigated. For example, the purpose of your report may be:

- To assess the environmental effects of an on-going operation.
- To provide due diligence on behalf of a property vendor.
- To provide due diligence on behalf of a property purchaser.
- To provide information related to redevelopment of the site due to a proposed change in use, for example, industrial use to a residential use.
- To assess the existing baseline environmental, and sometimes geological and hydrological conditions or constraints of a site prior to an activity which may alter the sites environmental, geological or hydrological condition.

For each purpose, a specific approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible, quantify risks that both recognised and unrecognised contamination pose to the proposed activity. Such risks may be both financial (for example, clean up costs or limitations to the site use) and physical (for example, potential health risks to users of the site or the general public).

### **Scope of Investigations**

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The work was conducted, and the report has been prepared, in response to specific instructions from the client to whom this report is addressed, within practical time and budgetary constraints, and in reliance on certain data and information made available to Coffey. The analyses, evaluations, opinions and conclusions presented in this report are based on those instructions, requirements, data or information, and they could change if such instructions etc. are in fact inaccurate or incomplete.

### **Subsurface conditions can change**

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Subsurface conditions are created by natural processes and the activity of man and may change with time. For example, groundwater levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project and/or on the property.

### **Interpretation of factual data**

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Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from indirect field measurements and sometimes other reports on the site are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of Coffey through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other problems encountered on site.

## Important information about your **Coffey** Environmental Report

### **Your report will only give preliminary recommendations**

---

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered with redevelopment or on-going use of the site. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

### **Your report is prepared for specific purposes and persons**

---

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. In particular, a due diligence report for a property vendor may not be suitable for satisfying the needs of a purchaser. Your report should not be applied for any purpose other than that originally specified at the time the report was issued.

### **Interpretation by other professionals**

---

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other professionals who are affected by the report. Have Coffey explain the report implications to professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

### **Data should not be separated from the report**

---

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel), field testing and laboratory evaluation of field samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

### **Contact Coffey for additional assistance**

---

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to land development and land use. It is common that not all approaches will be necessarily dealt with in your environmental site assessment report due to concepts proposed at that time. As a project progresses through planning and design toward construction and/or maintenance, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

### **Responsibility**

---

Environmental reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

# Tables

## **Further Assessment of Groundwater Quality - Ash Ponds Tallowarra Lands, Yallah Bay Road, Yallah, NSW**

**TABLE LR1:**  
**SUMMARY OF LABORATORY RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES**  
**Heavy Metals, Ammonia, Nitrite, Nitrate and Field Measurements**

(All results in ug/L, unless otherwise stated)

Sample ID	THRESHOLD CONCENTRATIONS	MW1	DJD001	DJD002	MW2	MW3	MW4	MW5	MW6	MW8	MW9	MW10	TAGM/D1
Material		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Unit Screened		Alluvial/Estuarine	Duplicate of MW01	Triplicate of MW01	Alluvial/Estuarine (Sand)	Alluvial/Residual/ XW Sandstone	Alluvial/ Estuarine (connected with fill)	Alluvial/Estuarine (Clay)	Alluvial/Estuarine (Clay)	Fill (Ash)	Fill (Ash)	Alluvial/Estuarine (Clay)	Alluvial/Estuarine (Clay)
24-Aug-10	25-Aug-10	25-Aug-10	25-Aug-10	25-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24/08/2010	25-Aug-10	25-Aug-10	25-Aug-10	24-Aug-10	24-Aug-10
<b>HEAVY METALS (DISSOLVED)</b>													
Arsenic	2.3 <sup>1b</sup>	4	4	1	10	4	5	13	110	30	21	3	2
Copper	1.3 <sup>1</sup>	<1	<1	<1	<1	<1	3	12	<1	2	6	<1	67
Nickel	7 <sup>1d</sup>	5	4	<1	4	45	11	12	76	87	49	14	14
Zinc	15 <sup>1</sup>	35	57	50	53	170	69	87	61	81	270	47	490
<b>NUTRIENTS</b>													
Ammonia (N)	910 <sup>1</sup>	12000	11000	11000	950	390	7300	12000	6700	1300	1300	430	11
Nitrate	700	<100	<100	70	<100	<50	<50	<250	<250	450	<250	<25	12000
Nitrite		<5	<5	30	<5	<5	<5	<5	120	42	<5	<5	670
<b>FIELD MEASUREMENTS</b>													
Dissolved Oxygen (mg/L)	9.2 <sup>3</sup>	5.42	-	-	4.91	4.88	4.66	4.36	6.36	8.11	5.51	5.61	0.88
Electrical conductivity (mS/cm)		23.80	-	-	18.76	11.12	12.11	48.60	53.80	26.00	40.30	7.49	0.55
pH (Units)	8-8.4 <sup>4</sup>	7.14	-	-	7.14	4.81	6.42	6.56	6.99	6.36	4.1	6.42	5.43
Redox (mV)		-63	-	-	-104	126	-89	-68	-40	-42	228	-29	29
Temp (°C)		19.0	-	-	17.0	19.0	18.2	17.4	13.5	14.1	12.2	15.0	15.3

Sample ID	THRESHOLD CONCENTRATIONS	SW1	SW2	SW3	SW4	SW5	SW6
Material		Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Unit Screened		-	-	-	-	-	-
24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	25-Aug-10	25-Aug-10
<b>HEAVY METALS (DISSOLVED)</b>							
Arsenic	2.3 <sup>1b</sup>	2	7	7	7	8	8
Copper	1.3 <sup>1</sup>	2	<1	<1	<1	<1	<1
Nickel	7 <sup>1d</sup>	5	11	10	11	11	11
Zinc	15 <sup>1</sup>	76	25	41	37	29	20
<b>NUTRIENTS</b>							
Ammonia (N)	910 <sup>1</sup>	100	340	250	250	230	200
Nitrate	700	8	<250	<250	<250	<250	<250
Nitrite		<5	<5	<5	<5	<5	<5
<b>FIELD MEASUREMENTS</b>							
Dissolved Oxygen (mg/L)	9.2 <sup>3</sup>	8.85	7.92	7.5	8.34	9.58	10.74
Electrical conductivity (mS/cm)		11.00	44.80	45.20	46.70	50.10	51.80
pH (Units)	8-8.4 <sup>4</sup>	7.56	8.22	8.21	8.20	8.29	6.54
Redox (mV)		52	77	60	20	152	161
Temp (°C)		14.7	16.7	15.1	14.4	19.8	19.0

NOTES:

**Bold**

Concentration exceeds the Threshold Criteria

<sup>1</sup> Based on ANZECC/ARMCANZ (2000), Australian and New Zealand Guidelines For Fresh and Marine Water Quality (Fresh water, South Eastern Australia, slightly to moderately disturbed system, 95% of species protected)

<sup>1a</sup> Low reliability trigger values

<sup>1b</sup> Low reliability trigger value for As(III) used

<sup>1d</sup> Recommended 99% protection level used.

<sup>3</sup> ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Table 3.3.3

<sup>4</sup> ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Table 3.3.2

ID Insufficient data to derive a reliable trigger value

ND Not Detected

- Not Analysed

LOR Limit of Reporting

See original laboratory reports for detection limits

\* Field or laboratory duplicate sample which was higher than the primary sample concentration

TABLE LR2:

## SUMMARY OF LABORATORY RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES FOR PREVIOUS AND CURRENT COFFEY

## Heavy Metals, Ammonia, Nitrite, Nitrate and Field Measurements

(All results in ug/L, unless otherwise stated)

Sample ID Material	THRESHOLD CONCENTRATIONS	MW1 Groundwater		MW2 Groundwater		MW3 Groundwater		MW4 Groundwater		MW5 Groundwater		MW6 Groundwater	
		Alluvial/Estuarine		Alluvial/Estuarine (Sand)		Alluvial/Residual/ XW Sandstone		Alluvial/Estuarine (connected with fill)		Alluvial/Estuarine (Clay)		Fill (Ash)	
Unit Screened		25-Jun-10	25-Aug-10	25-Jun-10	25-Aug-10	25-Jun-10	24-Aug-10	25-Jun-10	24-Aug-10	24-Jun-10	24/08/2010	24-Jun-10	25-Aug-10
<b>HEAVY METALS (DISSOLVED)</b>													
Arsenic	2.3 <sup>1b</sup>	<10	<b>4</b>	<10	<b>10</b>	<10	<b>4</b>	<10	<b>5</b>	<b>23</b>	<b>13</b>	<b>190</b>	<b>110</b>
Copper	1.3 <sup>1</sup>	<10	<1	<10	<1	<10	<1	<10	<b>3</b>	<b>32</b>	<b>12</b>	<b>29</b>	<1
Nickel	7 <sup>1d</sup>	<10	5	<10	4	<b>44</b>	<b>45</b>	<10	<b>11</b>	<b>13</b>	<b>12</b>	<b>26</b>	<b>76</b>
Zinc	15 <sup>1</sup>	<b>94</b>	<b>57*</b>	<b>63</b>	<b>53</b>	<b>130</b>	<b>170</b>	<b>110</b>	<b>69</b>	<b>100</b>	<b>87</b>	<b>140</b>	<b>61</b>
<b>NUTRIENTS</b>													
Ammonia (N)	910 <sup>1</sup>	<b>11000</b>	<b>12000</b>	870	<b>950</b>	330	390	<b>6500</b>	<b>7300</b>	<b>10000</b>	<b>12000</b>	<b>6300</b>	<b>6700</b>
Nitrate	700		70*		<100		<50		<50		<250		<250
Nitrite			30*		<5		<5		<5		<5		120
<b>FIELD MEASUREMENTS</b>													
Dissolved Oxygen (mg/L)	9.2 <sup>3</sup>	2.6	5.42	3.03	4.91	2.08	4.88	2.01	4.66	3.9	4.36	3.72	6.36
Electrical conductivity (mS/cm)		8070	23.80	17650	18.76	9920	11.12	12070	12.11	46200	48.60	31800	53.80
pH (Units)	8-8.4 <sup>4</sup>	<b>7.31</b>	<b>7.14</b>	<b>7.22</b>	<b>7.14</b>	<b>5.18</b>	<b>4.81</b>	<b>6.36</b>	<b>6.42</b>	<b>6.53</b>	<b>6.56</b>	<b>6.77</b>	<b>6.99</b>
Redox (mV)		-116	-63	-96	-104	108	126	-59	-89	-73	-68	3	-40
Temp (°C)		20.8	19.0	20.0	17.0	20.5	19.0	20.7	18.2	18.3	17.4	15.3	13.5

Sample ID Material	THRESHOLD CONCENTRATIONS	MW8 Groundwater		MW9 Groundwater		MW10 Groundwater	TAGM/1 Groundwater	SW1 Surface Water	SW2 Surface Water	SW3 Surface Water	SW4 Surface Water	SW5 Surface Water	SW6 Surface Water
		Fill (Ash)		Alluvial/Estuarine (Clay)		Alluvial/Estuarine (Clay)	Alluvial?	-	-	-	-	-	-
Unit Screened		24-Jun-10	25-Aug-10	24-Jun-10	25-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	25-Aug-10	25-Aug-10
<b>HEAVY METALS (DISSOLVED)</b>													
Arsenic	2.3 <sup>1b</sup>	<b>73</b>	<b>30</b>	<b>17</b>	<b>21</b>	<b>3</b>	2	2	<b>7</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>8</b>
Copper	1.3 <sup>1</sup>	<b>29</b>	<b>2</b>	<b>35</b>	<b>6</b>	<1	<b>67</b>	<b>2</b>	<1	<1	<1	<1	<1
Nickel	7 <sup>1d</sup>	<b>200</b>	<b>87</b>	<b>59*</b>	<b>49</b>	<b>14</b>	<b>14</b>	5	<b>11</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>11</b>
Zinc	15 <sup>1</sup>	<b>130</b>	<b>81</b>	<b>170</b>	<b>270</b>	<b>47</b>	<b>490</b>	<b>76</b>	<b>25</b>	<b>41</b>	<b>37</b>	<b>29</b>	<b>20</b>
<b>NUTRIENTS</b>													
Ammonia (N)	910 <sup>1</sup>	<b>1600</b>	<b>1300</b>	<b>1200</b>	<b>1300</b>	430	11	100	340	250	250	230	200
Nitrate	700		450		<250	<25	<b>12000</b>	8	<250	<250	<250	<250	<250
Nitrite			42		<5	<5	670	<5	<5	<5	<5	<5	<5
<b>FIELD MEASUREMENTS</b>													
Dissolved Oxygen (mg/L)	9.2 <sup>3</sup>	4.6	8.11	6.22	5.51	5.61	0.88	8.85	7.92	7.5	8.34	<b>9.58</b>	<b>10.74</b>
Electrical conductivity (mS/cm)		26400	26.00	37500	40.30	7.49	0.55	11.00	44.80	45.20	46.70	50.10	51.80
pH (Units)	8-8.4 <sup>4</sup>	<b>6.84</b>	<b>6.36</b>	<b>4.21</b>	<b>4.1</b>	<b>6.42</b>	<b>5.43</b>	<b>7.56</b>	8.22	8.21	8.20	8.29	<b>6.54</b>
Redox (mV)		-17	-42	199	228	-29	29	52	77	60	20	152	161
Temp (°C)		18.5	14.1	18.7	12.2	15.0	15.3	14.7	16.7	15.1	14.4	19.8	19.0

## NOTES:

**Bold** Concentration exceeds the Threshold Criteria<sup>1</sup> Based on ANZECC/ARMCANZ (2000), Australian and New Zealand Guidelines For Fresh and Marine Water Quality (Fresh water, South Eastern Australia, slightly to moderately disturbed system, 95% of species protected)<sup>1a</sup> Low reliability trigger values<sup>1b</sup> Low reliability trigger value for meta xylene and As(III) used<sup>1d</sup> Recommended 99% protection level used.<sup>3</sup> ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Table 3.3.3<sup>4</sup> ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Table 3.3.2

ID Insufficient data to derive a reliable trigger value

ND Not Detected

- Not Analysed

LOR Limit of Reporting

See original laboratory reports for detection limits

\* Field or laboratory duplicate sample which was higher than the primary sample concentration

**TABLE LR3:  
SUMMARY OF RESULTS WITH COMPARISON TO BACKGROUND LEVELS  
Heavy Metals and Ammonia**

(All results in ug/L, unless otherwise stated)

Sample ID	HIGHER OF BACKGROUND CONCENTRATION / TRIGGER VALUE	MW1		MW2		MW3		MW4		MW5		MW6	
Material		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
Unit Screened		Alluvial/Estuarine		Alluvial/Estuarine (Sand)		Alluvial/Residual/ XW Sandstone		Alluvial/Estuarine (connected with fill)		Alluvial/Estuarine (Clay)		Fill (Ash)	
24-Aug-10		25-Jun-10	25-Aug-10	25-Jun-10	25-Aug-10	25-Jun-10	24-Aug-10	25-Jun-10	24-Aug-10	24-Jun-10	24/08/2010	24-Jun-10	25-Aug-10
Arsenic	8	<10	4	<10	<b>10</b>	<10	4	<10	5	<b>23</b>	<b>13</b>	<b>190</b>	<b>110</b>
Copper	67	<10	<1	<10	<1	<10	<1	<10	3	32	12	29	<1
Nickel	14	<10	5	<10	4	<b>44</b>	<b>45</b>	<10	11	13	12	<b>26</b>	<b>76</b>
Zinc	490	94	57*	63	53	130	170	110	69	100	87	140	61
Ammonia (N)	910	<b>11000</b>	<b>12000</b>	870	<b>950</b>	330	390	<b>6500</b>	<b>7300</b>	<b>10000</b>	<b>12000</b>	<b>6300</b>	<b>6700</b>

Sample ID	HIGHER OF BACKGROUND CONCENTRATION / TRIGGER VALUE	MW8		MW9		MW10	TAGM/1	SW1	SW2	SW3	SW4	SW5	SW6
Material		Groundwater		Groundwater		Groundwater	Groundwater	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Unit Screened		Fill (Ash)		Alluvial/Estuarine (Clay)		Alluvial/Estuarine (Clay)	Alluvial?	-	-	-	-	-	-
24-Aug-10		24-Jun-10	25-Aug-10	24-Jun-10	25-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	24-Aug-10	25-Aug-10	25-Aug-10
Arsenic	8 <sup>1</sup>	<b>73</b>	<b>30</b>	<b>17</b>	<b>21</b>	3	2	2	7	7	7	8	8
Copper	67 <sup>1</sup>	29	2	35	6	<1	67	2	<1	<1	<1	<1	<1
Nickel	14 <sup>1</sup>	<b>200</b>	<b>87</b>	<b>59*</b>	<b>49</b>	14	14	5	11	10	11	11	11
Zinc	490 <sup>1</sup>	130	81	170	270	47	490	76	25	41	37	29	20
Ammonia (N)	910 <sup>2</sup>	<b>1600</b>	<b>1300</b>	<b>1200</b>	<b>1300</b>	430	11	100	340	250	250	230	200

NOTES:

**Bold** Concentration exceeds the Threshold Criteria

<sup>1</sup> Higher background concentration

<sup>2</sup> Based on ANZECC/ARMCANZ (2000), Australian and New Zealand Guidelines For Fresh and Marine Water Quality (Fresh water, South Eastern Australia, slightly to moderately disturbed system, 95% of species protected)

See original laboratory reports for detection limits

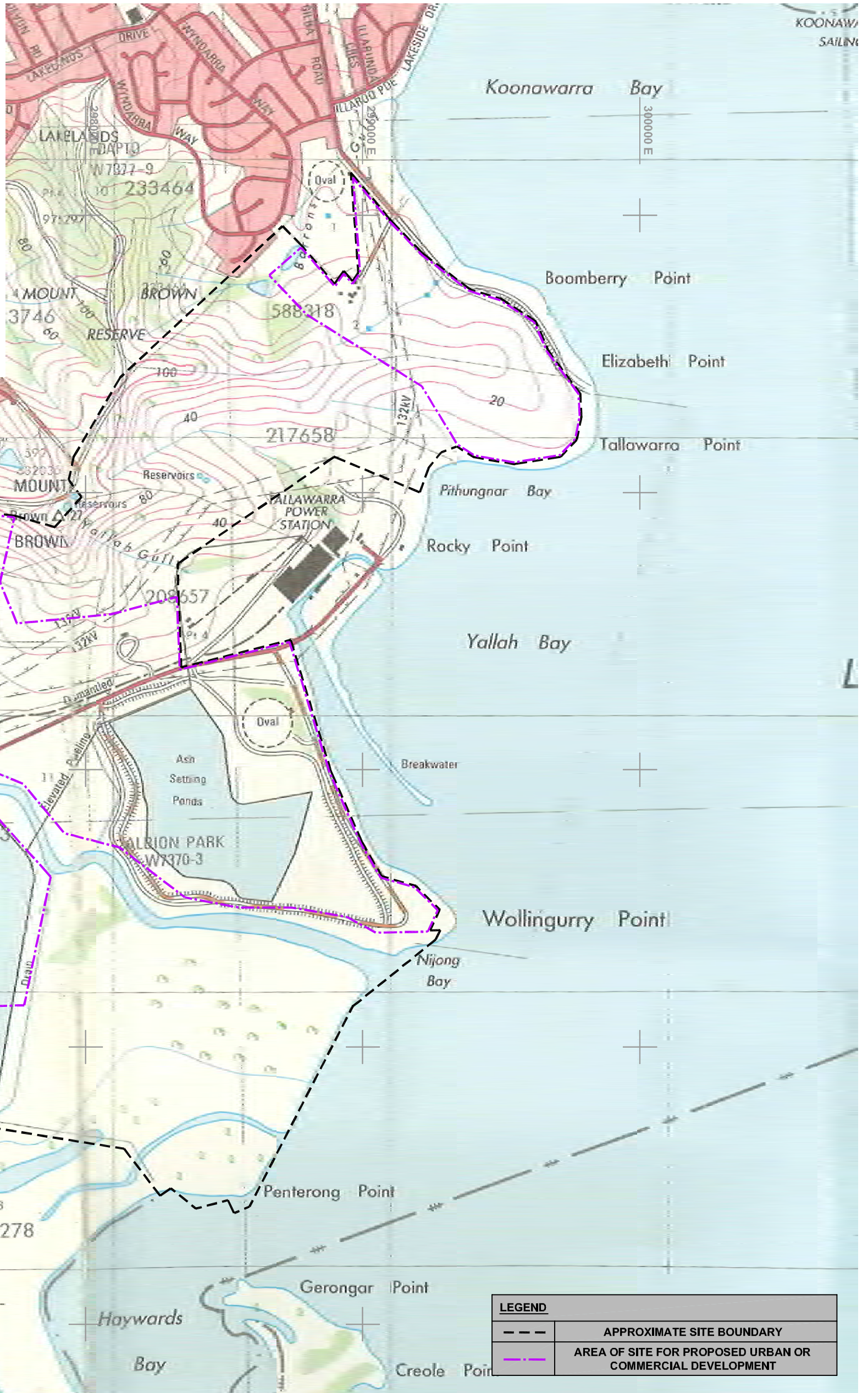
\* Field or laboratory duplicate sample which was higher than the primary sample concentration

# Figures

## **Further Assessment of Groundwater Quality - Ash Ponds Tallowarra Lands, Yallah Bay Road, Yallah, NSW**

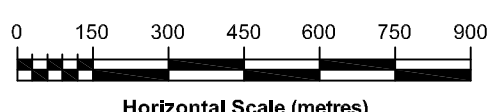


REGIONAL MAP (1:500,000)



LEGEND	
---	APPROXIMATE SITE BOUNDARY
---	AREA OF SITE FOR PROPOSED URBAN OR COMMERCIAL DEVELOPMENT

TOPOGRAPHIC IMAGE SOURCE: ALBION PARK 9028-1-N TOPOGRAPHIC MAP 1:25,000 2<sup>nd</sup> Ed, CENTRAL MAPPING AUTHORITY OF NSW, 1986  
 AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 2010  
 AERIAL IMAGE ©: DIGITAL GLOBE 2010

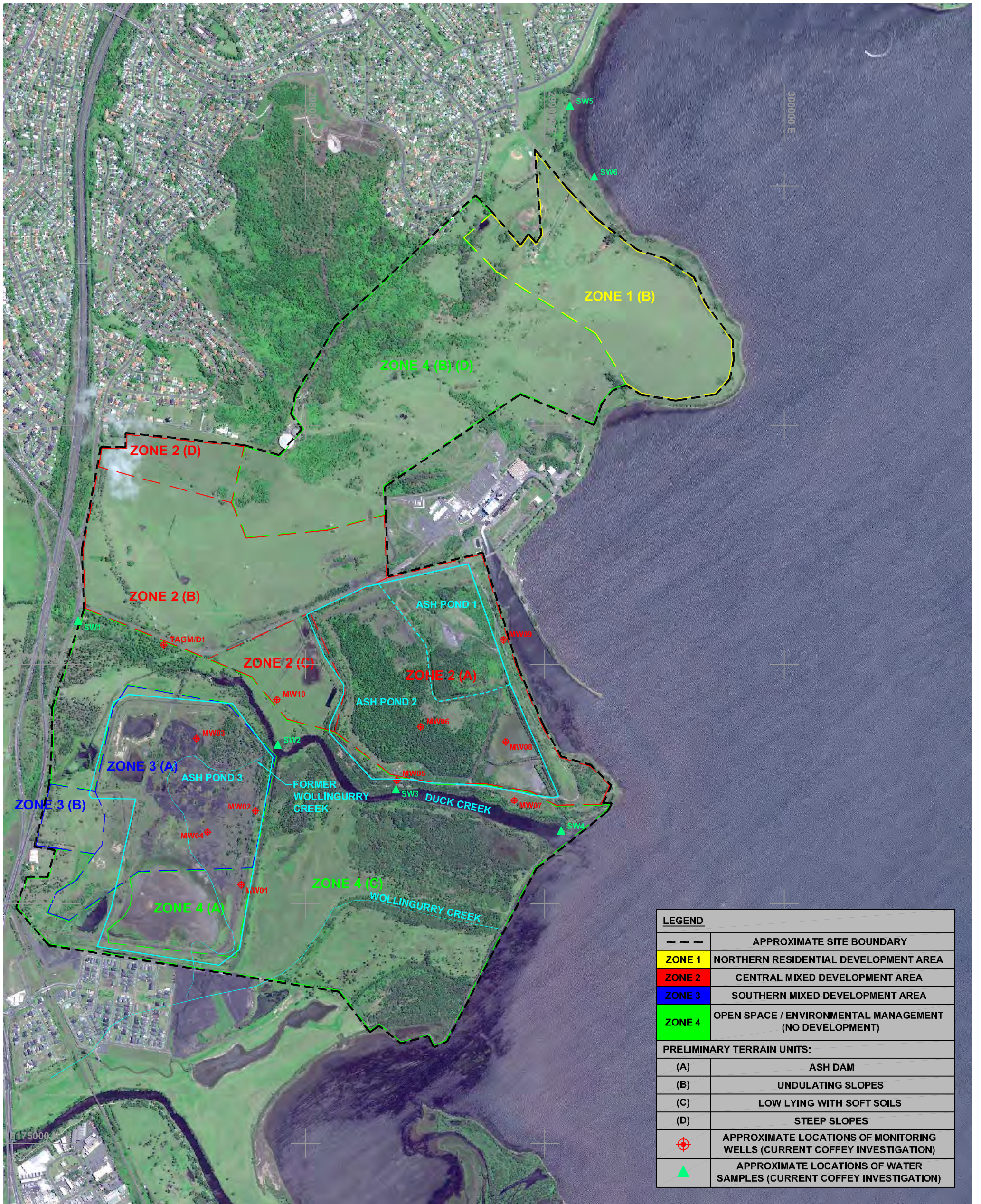


Horizontal Scale (metres)

drawn	DJD / LT
approved	JMF
date	31/08/10
scale	1:15 000
original size	A3

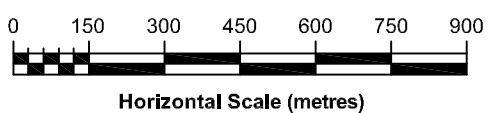


client:	TRUENERGY TALLAWARRA	
project:	FURTHER ASSESSMENT OF GROUNDWATER QUALITY - ASH PONDS TALLAWARRA LANDS, YALLAH, NSW	
title:	SITE LOCALITY PLAN	
project no:	ENAUWOLL04009AB-R01	figure no: FIGURE 1



LEGEND	
---	APPROXIMATE SITE BOUNDARY
ZONE 1	NORTHERN RESIDENTIAL DEVELOPMENT AREA
ZONE 2	CENTRAL MIXED DEVELOPMENT AREA
ZONE 3	SOUTHERN MIXED DEVELOPMENT AREA
ZONE 4	OPEN SPACE / ENVIRONMENTAL MANAGEMENT (NO DEVELOPMENT)
PRELIMINARY TERRAIN UNITS:	
(A)	ASH DAM
(B)	UNDULATING SLOPES
(C)	LOW LYING WITH SOFT SOILS
(D)	STEEP SLOPES
⊕	APPROXIMATE LOCATIONS OF MONITORING WELLS (CURRENT COFFEY INVESTIGATION)
▲	APPROXIMATE LOCATIONS OF WATER SAMPLES (CURRENT COFFEY INVESTIGATION)

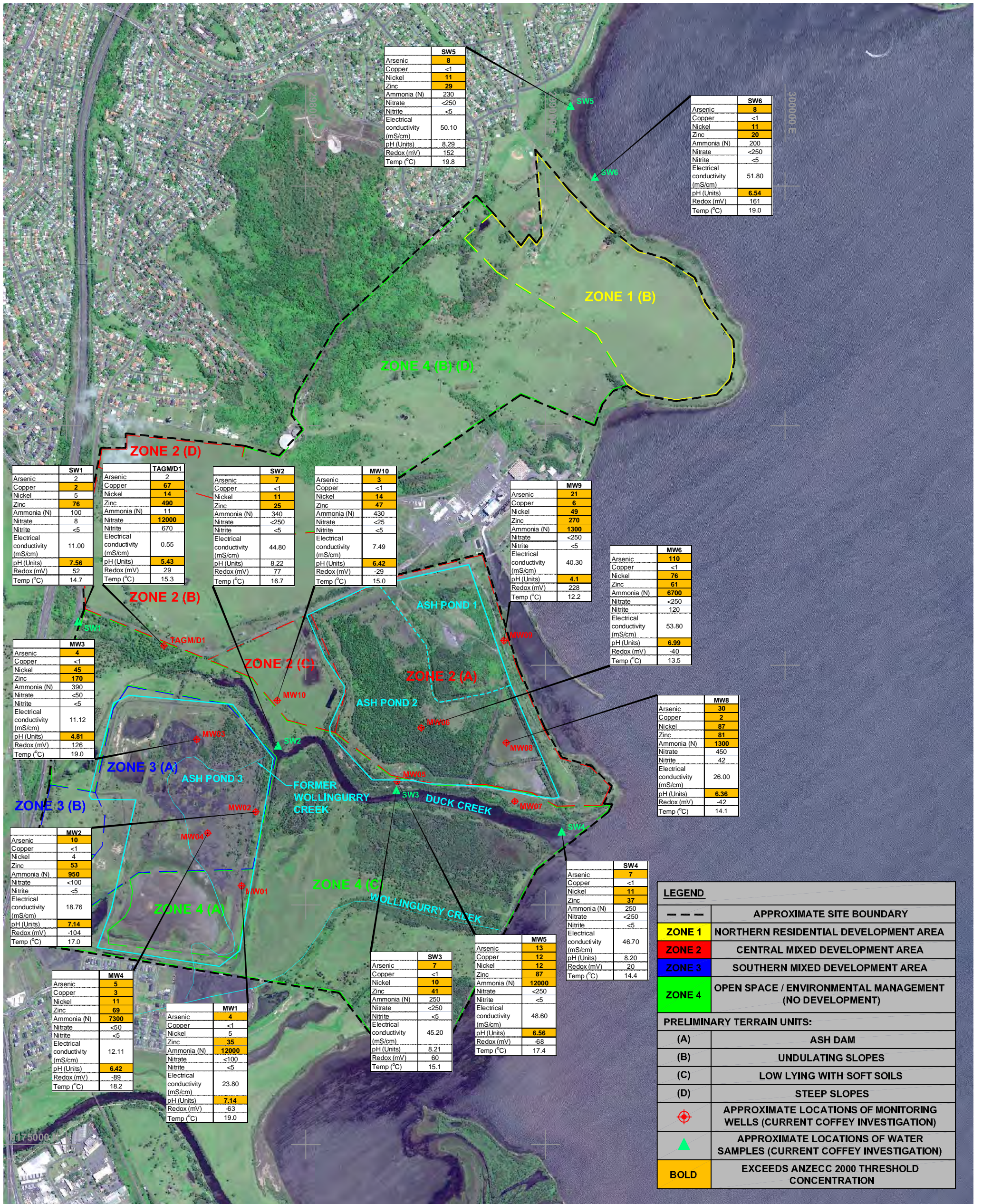
AERIAL IMAGE SOURCE: WOLLONGONG CITY COUNCIL 2010



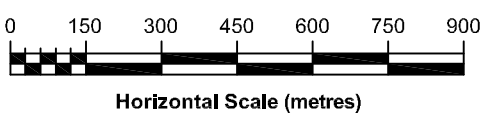
drawn	DJD / LT
approved	JMF
date	31/08/10
scale	1:15 000
original size	A3

**coffey**  
environments  
SPECIALISTS IN ENVIRONMENTAL,  
SOCIAL AND SAFETY PERFORMANCE

client:	TRUENERGY TALLAWARRA
project:	FURTHER ASSESSMENT OF GROUNDWATER QUALITY - ASH PONDS TALLAWARRA LANDS, YALLAH, NSW
title:	SITE LAYOUT PLAN SHOWING APPROXIMATE SAMPLING LOCATIONS ON 2010 AERIAL PHOTOGRAPH
project no:	ENAUWOLL04009AB-R01
figure no:	FIGURE 2



AERIAL IMAGE SOURCE: WOLLONGONG CITY COUNCIL 2010



Horizontal Scale (metres)

drawn DJD / LT

approved JMF

date 06/09/10

scale 1:15 000

original size A3

**coffey**  
environments  
SPECIALISTS IN ENVIRONMENTAL,  
SOCIAL AND SAFETY PERFORMANCE

client: TRUENERGY TALLAWARRA

project: FURTHER ASSESSMENT OF GROUNDWATER QUALITY  
- ASH PONDS  
TALLAWARRA LANDS, YALLAH, NSW

title: SUMMARY RESULTS

project no: ENAUWOLL04009AB-R01

figure no: FIGURE 3

# Appendix A Borehole Log

**Further Assessment of Groundwater Quality - Ash Ponds  
Tallowarra Lands, Yallah Bay Road, Yallah, NSW**

# Engineering Log - Piezometer

 Client: **TRUenery Tallawarra**

 Date started: **17.8.2010**

Principal:

 Date completed: **17.8.2010**

 Project: **Further Assessment Of Groundwater Quality - Ash Pond**

 Logged by: **DJD**

 Borehole Location: **Yallah Bay Road, Yallah NSW**

 Checked by: **JMF**

drill model & mounting: Gemco 210B, Trailer	Easting:	slope: -90°	R.L. Surface:	Not Measured
hole diameter: 100	Northing:	bearing:	datum:	Not Measured

drilling information					material substance							
method	penetration	support	water	notes samples, tests, etc	well details	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
ADV	1 2 3	N							<b>TOPSOIL; CLAY:</b> Medium plasticity, dark brown, with some silt.	Wp	F	TOPSOIL No odour
						0.5		CL	<b>CLAY:</b> Medium plasticity, brown/yellow, with a trace of silt.	W	F/St	ALLUVIAL No odour
			24/08/10					SC	<b>Clayey SAND:</b> Fine to coarse grained, pale brown, medium plasticity clay.		L/MD	
						1.0		CL	<b>CLAY:</b> Medium plasticity, orange/brown, with some silt, with a trace of fine to coarse grained sand.	Wp	F/St	
								GC	<b>Clayey GRAVEL:</b> Fine to medium grained, orange/brown, medium plasticity clay.	W	L/MD	
						1.5		SC	<b>Clayey SAND:</b> Fine to coarse grained, pale grey, medium plasticity clay.  ...Becoming orange-clay at 1.65m.	M/W	MD	ALLUVIAL/ESTUARINE Slight organic/brackish odour
						2.0						
						2.5		SC	<b>Clayey SAND:</b> Fine to coarse grained, grey, medium plasticity clay.	W	L/MD	
						3.0		CL	<b>Clayey SAND:</b> Fine to coarse grained, dark grey, medium plasticity clay. <b>Sandy CLAY:</b> Low to medium plasticity, dark grey, fine to coarse grained sand, with a trace of rootlets.	>Wp	S/F	ESTUARINE Organic/brackish odour
						3.5						
						4.0						

<b>method</b> AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	<b>support</b> C casing N nil  <b>penetration</b> 1 2 3 4 no resistance ranging to refusal  <b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▼ water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet Wp plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
---	---	---	---	---

Borehole No. **MW10**

# Engineering Log - Piezometer

Sheet 2 of 2  
Office Job No.: **ENAUWOLLO4009AB**

Client: **TRUenergy Tallawarra**

Date started: **17.8.2010**

Principal:

Date completed: **17.8.2010**

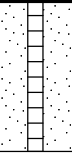

Project: **Further Assessment Of Groundwater Quality - Ash Pond**

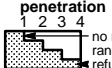



Logged by: **DJD**

Borehole Location: **Yallah Bay Road, Yallah NSW**

Checked by: **JMF**

drill model & mounting: Gemco 210B, Trailer	Easting:	slope: -90°	R.L. Surface:	Not Measured
hole diameter: 100	Northing:	bearing:	datum:	Not Measured

drilling information						material substance						
method	penetration	support	water	notes samples, tests, etc	well details	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
ADV	1 2 3	N				4.5		CL	<b>Sandy CLAY:</b> Low to medium plasticity, dark grey, fine to coarse grained sand, with a trace of rootlets. <i>(continued)</i>	>Wp	S/F	
						5.0			Borehole terminated at 4.5m			
						5.5						
						6.0						
						6.5						
						7.0						
						7.5						
						8.0						

<b>method</b> AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	<b>support</b> C casing N nil  <b>penetration</b> 1 2 3 4  no resistance ranging to refusal  <b>water</b>  10/1/98 water level on date shown  water inflow  water outflow	<b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	<b>classification symbols and soil description</b> based on unified classification system  <b>moisture</b> D dry M moist W wet Wp plastic limit W <sub>L</sub> liquid limit	<b>consistency/density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
---	--	---	---	---

# Appendix B Laboratory Report

**Further Assessment of Groundwater Quality - Ash Ponds  
Tallowarra Lands, Yallah Bay Road, Yallah, NSW**

## ANALYTICAL REPORT

31 August 2010

**Coffey Environments Pty Ltd**

118 Auburn Street  
Wollongong  
NSW 2500

**Attention: Manuel Fernandez**

Your Reference: ENAUWOLL04009AB

Our Reference: SE80920-R

Samples: 17 Waters

Received: 26/08/2010

Preliminary Report Sent: 30/08/10

These samples were analysed in accordance with your written instructions.

***This report cancels and supersedes report No. SE80920 issued on 31/08/10 by SGS Environmental Services due to amendment of report comment.***

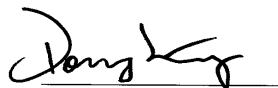
For and on Behalf of:

SGS ENVIRONMENTAL SERVICES

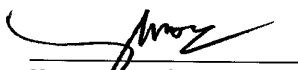
Sample Receipt: Angela Mamalicos AU.SampleReceipt.Sydney@sgs.com

Production Manager: Huong Crawford Huong.Crawford@sgs.com

*Results Approved and/or Authorised by:*



**Dong Liang**  
Quality Manager



**Huong Crawford**  
Metals Signatory



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Anions in water Our Reference:	UNITS	SE80920-R -1	SE80920-R -2	SE80920-R -3	SE80920-R -4	SE80920-R -5
Your Reference	-----	SW1	SW2	SW3	SW4	MW03
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	24/08/2010
Date Extracted		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed		27/08/2010	27/08/2010	27/08/2010	27/08/2010	27/08/2010
Nitrate as N	mg/L	0.008	<0.25	<0.25	<0.25	<0.05

Anions in water Our Reference:	UNITS	SE80920-R -6	SE80920-R -7	SE80920-R -8	SE80920-R -9	SE80920-R -10
Your Reference	-----	MW04	MW05	MW10	TAGM/01	SW5
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	25/08/2010
Date Extracted		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed		27/08/2010	27/08/2010	27/08/2010	27/08/2010	27/08/2010
Nitrate as N	mg/L	<0.05	<0.25	<0.025	12	<0.25

Anions in water Our Reference:	UNITS	SE80920-R -11	SE80920-R -12	SE80920-R -13	SE80920-R -14	SE80920-R -15
Your Reference	-----	SW6	MW01	MW02	MW06	MW08
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		25/08/2010	25/08/2010	25/08/2010	25/08/2010	25/08/2010
Date Extracted		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed		27/08/2010	27/08/2010	27/08/2010	27/08/2010	27/08/2010
Nitrate as N	mg/L	<0.25	<0.1	<0.1	<0.25	0.45

Anions in water Our Reference:	UNITS	SE80920-R -16	SE80920-R -17
Your Reference	-----	MW09	DTD001
Sample Matrix	-----	Water	Water
Date Sampled		25/08/2010	25/08/2010
Date Extracted		26/08/2010	26/08/2010
Date Analysed		27/08/2010	27/08/2010
Nitrate as N	mg/L	<0.25	<0.1



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Inorganics Our Reference:	UNITS	SE80920-R -1	SE80920-R -2	SE80920-R -3	SE80920-R -4	SE80920-R -5
Your Reference	-----	SW1	SW2	SW3	SW4	MW03
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	24/08/2010
Date Extracted (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Ammonia as N	mg/L	0.10	0.34	0.25	0.25	0.39
Date Extracted (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Nitrite as N	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Inorganics Our Reference:	UNITS	SE80920-R -6	SE80920-R -7	SE80920-R -8	SE80920-R -9	SE80920-R -10
Your Reference	-----	MW04	MW05	MW10	TAGM/01	SW5
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	25/08/2010
Date Extracted (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Ammonia as N	mg/L	7.3	12	0.43	11	0.23
Date Extracted (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Nitrite as N	mg/L	<0.0050	<0.0050	<0.0050	0.67	<0.0050

Inorganics Our Reference:	UNITS	SE80920-R -11	SE80920-R -12	SE80920-R -13	SE80920-R -14	SE80920-R -15
Your Reference	-----	SW6	MW01	MW02	MW06	MW08
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		25/08/2010	25/08/2010	25/08/2010	25/08/2010	25/08/2010
Date Extracted (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (Ammonia)		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Ammonia as N	mg/L	0.20	12	0.95	6.7	1.3
Date Extracted (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Date Analysed (NO <sub>2</sub> )		26/08/2010	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Nitrite as N	mg/L	<0.0050	<0.0050	<0.0050	0.12	0.042



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Inorganics			
Our Reference:	UNITS	SE80920-R -16	SE80920-R -17
Your Reference	-----	MW09	DTD001
Sample Matrix	-----	Water	Water
Date Sampled		25/08/2010	25/08/2010
Date Extracted (Ammonia)		26/08/2010	26/08/2010
Date Analysed (Ammonia)		26/08/2010	26/08/2010
Ammonia as N	mg/L	1.3	11
Date Extracted (NO <sub>2</sub> )		26/08/2010	26/08/2010
Date Analysed (NO <sub>2</sub> )		26/08/2010	26/08/2010
Nitrite as N	mg/L	<0.0050	<0.0050



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Trace HM (ICP-MS)-Dissolved Our Reference:	UNITS	SE80920-R -1	SE80920-R -2	SE80920-R -3	SE80920-R -4	SE80920-R -5
Your Reference	-----	SW1	SW2	SW3	SW4	MW03
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	24/08/2010
Date Extracted (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Date Analysed (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Arsenic	µg/L	2	7	7	7	4
Copper	µg/L	2	<1	<1	<1	<1
Nickel	µg/L	5	11	10	11	45
Zinc	µg/L	76	25	41	37	170

Trace HM (ICP-MS)-Dissolved Our Reference:	UNITS	SE80920-R -6	SE80920-R -7	SE80920-R -8	SE80920-R -9	SE80920-R -10
Your Reference	-----	MW04	MW05	MW10	TAGM/01	SW5
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		24/08/2010	24/08/2010	24/08/2010	24/08/2010	25/08/2010
Date Extracted (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Date Analysed (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Arsenic	µg/L	5	13	3	2	8
Copper	µg/L	3	12	<1	67	<1
Nickel	µg/L	11	12	14	14	11
Zinc	µg/L	69	87	47	490	29

Trace HM (ICP-MS)-Dissolved Our Reference:	UNITS	SE80920-R -11	SE80920-R -12	SE80920-R -13	SE80920-R -14	SE80920-R -15
Your Reference	-----	SW6	MW01	MW02	MW06	MW08
Sample Matrix	-----	Water	Water	Water	Water	Water
Date Sampled		25/08/2010	25/08/2010	25/08/2010	25/08/2010	25/08/2010
Date Extracted (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Date Analysed (Metals-ICPMS)		30/08/2010	30/08/2010	30/08/2010	30/08/2010	30/08/2010
Arsenic	µg/L	8	4	10	110	30
Copper	µg/L	<1	<1	<1	<1	2
Nickel	µg/L	11	5	4	76	87
Zinc	µg/L	20	35	53	61	81



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Trace HM (ICP-MS)-Dissolved Our Reference:	UNITS	SE80920-R -16	SE80920-R -17
Your Reference	-----	MW09	DTD001
Sample Matrix	-----	Water	Water
Date Sampled		25/08/2010	25/08/2010
Date Extracted (Metals-ICPMS)		30/08/2010	30/08/2010
Date Analysed (Metals-ICPMS)		30/08/2010	30/08/2010
Arsenic	µg/L	21	4
Copper	µg/L	6	<1
Nickel	µg/L	49	4
Zinc	µg/L	270	57



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Method ID	Methodology Summary
<b>SEI-038</b>	<p><b>Water Soluble Chloride</b> After carrying out a 1:5 soil:water extraction, an aliquot of the extract is reacted with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference NEPM, Schedule B(3), 401 and APHA 4500Cl-</p> <p><b>Water Soluble Sulphate</b> After carrying out a 1:5 soil:water extraction, sulphate in the extract is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulphate concentration in the sample. Reference NEPM, Schedule B(3), 401 and APHA 4500-SO42-.</p>
<b>SEI-037</b>	Ammonia - Determined by salicylate colourimetric method using Discrete Analyser.
<b>AN277</b>	Nitrite as N - determined by colourimetric technique using discrete analyser. Based on APHA 21st Edition, 4500-NO2-B.
<b>Ext-003</b>	Analysis subcontracted to SGS Environmental Services Perth, NATA Accreditation No. 2562, Site No. 898.



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QUALITY CONTROL	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
Anions in water						Base + Duplicate + %RPD		Duplicate + %RPD
Date Extracted				26/08/10	SE80920-1	26/08/2010    26/08/2010	SE80920-1	26/08/10
Date Analysed				27/08/10	SE80920-1	27/08/2010    27/08/2010	SE80920-1	27/08/10
Nitrate as N	mg/L	0.005	SEI-038	<0.005	SE80920-1	0.008    0.008    RPD: 0	SE80920-1	98%

QUALITY CONTROL	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
Inorganics						Base + Duplicate + %RPD		Duplicate + %RPD
Ammonia as N	mg/L	0.01	SEI-037	<0.01	SE80920-1	0.10    [NT]	LCS	103%
Date Extracted (NO <sub>2</sub> )				26/08/2010	SE80920-1	26/08/2010    26/08/2010	LCS	26/08/2010
Date Analysed (NO <sub>2</sub> )				26/08/2010	SE80920-1	26/08/2010    26/08/2010	LCS	26/08/2010
Nitrite as N	mg/L	0.005	AN277	<0.0050	SE80920-1	<0.0050    <0.0050	LCS	98%

QUALITY CONTROL	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
Trace HM (ICP-MS)-Dissolved						Base + Duplicate + %RPD		Duplicate + %RPD
Date Extracted (Metals-ICPMS)				30/08/2010	[NT]	[NT]	LCS	30/08/2010
Date Analysed (Metals-ICPMS)				30/08/2010	[NT]	[NT]	LCS	30/08/2010
Arsenic	µg/L	1	Ext-003	<1	[NT]	[NT]	LCS	89%
Copper	µg/L	1	Ext-003	<1	[NT]	[NT]	LCS	96%
Nickel	µg/L	1	Ext-003	<1	[NT]	[NT]	LCS	96%
Zinc	µg/L	1	Ext-003	<1	[NT]	[NT]	LCS	98%

QUALITY CONTROL	UNITS	Dup. Sm#	Duplicate
Anions in water			Base + Duplicate + %RPD
Date Extracted		SE80920-10	26/08/2010    26/08/2010
Date Analysed		SE80920-10	27/08/2010    27/08/2010
Nitrate as N	mg/L	SE80920-10	<0.25    <0.25



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QUALITY CONTROL	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Inorganics			
Ammonia as N	mg/L	SE80920-1 0	0.23    0.22    RPD: 4
Date Extracted (NO <sub>2</sub> )		SE80920-1 0	26/08/2010    26/08/2010
Date Analysed (NO <sub>2</sub> )		SE80920-1 0	26/08/2010    26/08/2010
Nitrite as N	mg/L	SE80920-1 0	<0.0050    <0.0050

QUALITY CONTROL	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Anions in water			
Date Extracted		SE80920-1 7	26/08/2010    26/08/2010
Date Analysed		SE80920-1 7	27/08/2010    27/08/2010
Nitrate as N	mg/L	SE80920-1 7	<0.1    <0.1



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**Result Codes**

[INS] : Insufficient Sample for this test	[RPD] : Relative Percentage Difference
[NR] : Not Requested	* : Not part of NATA Accreditation
[NT] : Not tested	[N/A] : Not Applicable
[LOR] : Limit of reporting	

**Report Comments**

Nitrate results- LORs were raised for some samples due to sample's high conductivity, as dilution required, LORs had to be raised accordingly.

Trace metals analysed by SGS-Perth, report No. PE052024 RO.

Samples analysed as received. Solid samples expressed on a dry weight basis.

Date Organics extraction commenced:

NATA Corporate Accreditation No. 2562, Site No 4354

Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans\*)

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**Quality Control Protocol**

**Method Blank:** An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.

**Duplicate:** A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.

**Surrogate Spike:** An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.

**Internal Standard:** Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.

**Laboratory Control Sample:** A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.

**Matrix Spike:** An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

**Quality Acceptance Criteria**

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: <http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf>



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Chain of Custody

Laboratory Quotation / Order No:

Job No: ENVH00104001A Sheet 1 of 1

No: 28595

Dispatch to:  
(Address & Phone No.)

SCS  
16135 Madden Street  
Alexandria NSW

Sampled by:

Daniel Doen

Consigning Officer:

William Wong  
26/6/20

Attention:

Sample Receipt

Project Manager:  
(report results to)

Manuel Fernandez

Courier Service:

Mr Cairns

Consignment Note No:

Relinquished by:

D. Doen

Date:

26/6/10

Time:

7:00

Received by:

CP

Date:

26/6/10

Time:

1030am

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required						Sample Condition on Receipt		
					PAHs	TPHs	MAHs = BTEX	Metals: *	Ammonia	Nitrate		Nitrite	
	WATER	1 x 500ml unpreserved	SW1	24/6/10									
		1 x metals	SW2										
		1 x 250ml H <sub>2</sub> SO <sub>4</sub> preserved	SW3										
			SW4										
			MW03										
			MW04										
			MW05										
			MW10										
			TAGM/01	9									
			SW5	10	25/6/10								
			SW6	11									
			MW01	12									
			MW02	13									
			MW06	14									
			MW08	15									
			MW09	16									
			D70001	17									

\* Customs advised / request

Special Laboratory Instructions:

Heavy Metals \* include As, Cd, Ni, Zn

Detection Limits:

Turnaround Required:

98hr TAT

Received By: **SW** 26/6/10  
 Time: 1030  
 Samples intact  
 Cooler Pack  
 Temperature on Receipt: W/05-107  
 Storage Location: SE-80920  
 SCS #1

Copies: WHITE: Sign on release. YELLOW: If dispatched to Interstate Lab, Lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES

## Client Details

Requested By : **Manuel Fernandez**  
 Client : Coffey Environments Pty Ltd  
 Contact : Manuel Fernandez  
 Address : 118 Auburn Street  
 Wollongong NSW 2500

Email : manuel\_fernandez@coffey.com  
 Telephone : 02 4201 1400  
 Facsimile : 02 4201 1401

Project : ENAUWOLL04009AB  
 Order Number : 28595  
 Samples : 17 Waters

## Laboratory Details

Laboratory : SGS Environmental Services  
 Manager : Edward Ibrahim  
 Address : Unit 16, 33 Maddox Street  
 Alexandria NSW 2015

Email : au.samplereceipt.sydney@sgs.com  
 Telephone : 61 2 8594 0400  
 Facsimile : 61 2 8594 0499

Report No : **SE80920**  
 No. of Samples : 17  
 Due Date : 30/08/2010

Date Instructions Received : 26/08/2010  
 Sample Receipt Date : 26/08/2010

Samples received in good order	: YES	Samples received in correct container:	YES
Samples received without headspace	: YES	Sufficient quantity supplied	: YES
Upon receipt sample temperature	: Cool	Cooling Method	: Ice
Sample containers provided by	: SGS	Samples clearly Labelled	: YES
Turnaround time requested	: 2 Days	Completed documentation received	: YES

Samples will be held for 1 month for water samples and 3 months for soil samples from date of receipt of samples, unless otherwise instructed.

## Comments

Heavy Metals (ICPMS-Dissolved):-Subcontracted to SGS Perth. Instrumentation at SGS Sydney currently out of order. Results expected to be delayed.

To the extent not inconsistent with the other provisions of this document and unless specifically agreed otherwise in writing by SGS, all SGS services are rendered in accordance with the applicable SGS General Conditions of Service accessible at [http://www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) as at the date of this document. Attention is drawn to the limitations of liability and to the clauses of indemnification.

**The signed chain of custody will be returned to you with the original report.**



**SAMPLE RECEIPT ADVICE (SRA) - continued**

Client : Coffey Environments Pty Ltd  
Project : ENAUWOLL04009AB

Report No : SE80920

**Summary of Samples and Requested Analysis**

The table below represents SGS Environmental Service's understanding and interpretation of the customer supplied sample request.

Please indicate ASAP if your request differs from these details.

Testing shall commence immediately as per this table, unless the customer intervenes with a correction prior to testing.

Note that a small X in the table below indicates some testing has not been requested in the package.

Sample No.	Description	No Prep Required	Anions in water	Inorganics	Trace HM (ICP-MS)-Dissolved
1	SW1	X	X	X	X
2	SW2	X	X	X	X
3	SW3	X	X	X	X
4	SW4	X	X	X	X
5	MW03	X	X	X	X
6	MW04	X	X	X	X
7	MW05	X	X	X	X
8	MW10	X	X	X	X
9	TAGM/01	X	X	X	X
10	SW5	X	X	X	X
11	SW6	X	X	X	X
12	MW01	X	X	X	X
13	MW02	X	X	X	X
14	MW06	X	X	X	X
15	MW08	X	X	X	X
16	MW09	X	X	X	X
17	DTD001	X	X	X	X



**SAMPLE RECEIPT ADVICE (SRA) - continued**

Client : Coffey Environments Pty Ltd  
Project : ENAUWOLL04009AB

Report No : SE80920

---

Sample No.	Description
1	SW1
2	SW2
3	SW3
4	SW4
5	MW03
6	MW04
7	MW05
8	MW10
9	TAGM/01
10	SW5
11	SW6
12	MW01
13	MW02
14	MW06
15	MW08
16	MW09
17	DTD001

# CERTIFICATE OF ANALYSIS

**Coffey Environments Pty Ltd Wollongong**  
118 Auburn Street  
Wollongong  
NSW 2500  
Site: ENAUWOLL04009AB

**Report Number:** 274618-F1-B-V1 Page 1 of 5  
**Order Number:**  
**Date Received:** Aug 26, 2010  
**Date Sampled:** Aug 25, 2010  
**Date Reported:** Aug 30, 2010  
**Contact:** Manuel Fernandez

## Methods

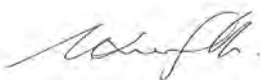
- USEPA 6020 Heavy Metals & USEPA 7470/71 Mercury
- APHA 4500-NH3 Ammonia Nitrogen by FIA
- APHA 4500-NO3 Nitrate Nitrogen by FIA
- APHA 4500-NO2 Nitrite Nitrogen by FIA

## Comments

## Notes

Authorised

**Report Number:**



Michael Wright  
Senior Principal Chemist  
NATA Signatory



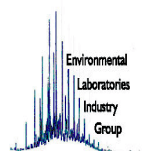
Dan Thompson  
Laboratory Manager NSW



Onur Mehmet  
Client Manager  
NATA Signatory



**NATA Corporate Accreditation Number 1261**  
The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to national standards of measurement. This document shall not be reproduced except in full



**GLOSSARY OF TERMS****UNITS**

<b>mg/kg</b>	milligrams per Kilogram	<b>mg/l</b>	milligrams per litre
<b>ug/l</b>	micrograms per litre	<b>ppm</b>	Parts per million
<b>ppb</b>	Parts per billion	<b>%</b>	Percentage
<b>org/100ml</b>	Organisms per 100 millilitres	<b>NTU</b>	Units

**TERMS**

<b>Dry</b>	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
<b>LOR</b>	Limit of Reporting.
<b>SPIKE</b>	Addition of the analyte to the sample and reported as percentage recovery.
<b>RPD</b>	Relative Percent Difference between two Duplicate pieces of analysis.
<b>LCS</b>	Laboratory Control Sample - reported as percent recovery
<b>CRM</b>	Certified Reference Material - reported as percent recovery
<b>Method Blank</b>	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
<b>Surr - Surrogate</b>	The addition of a like compound to the analyte target and reported as percentage recovery.
<b>Duplicate</b>	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
<b>Batch Duplicate</b>	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
<b>Batch SPIKE</b>	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
<b>USEPA</b>	United States Environment Protection Authority
<b>APHA</b>	American Public Health Association
<b>ASLP</b>	Australian Standard Leaching Procedure (AS4439.3)
<b>TCLP</b>	Toxicity Characteristic Leaching Procedure
<b>COC</b>	Chain of Custody
<b>SRA</b>	Sample Receipt Advice

**QC - ACCEPTANCE CRITERIA**

<b>RPD Duplicates</b>	Results <10 times the LOR : No Limit Results between 10-20 times LOR : RPD must lie between 0-50% Results >20 times LOR : RPD must lie between 0-20%
<b>LCS Recoveries</b>	Recoveries must lie between 70-130% - Phenols 30-130%
<b>CRM Recoveries</b>	Recoveries must lie between 70-130% - Phenols 30-130%
<b>Method Blanks</b>	Not to exceed LOR
<b>SPIKE Recoveries</b>	Recoveries must lie between 70-130% - Phenols 30-130%
<b>Surrogate Recoveries</b>	Recoveries must lie between 50-150% - Phenols 20-130%

**GENERAL COMMENTS**

1. All results in this report supersede any previously corresponded results.
2. All soil results are reported on a dry basis.
3. Samples are analysed on an as received basis.

**QC DATA GENERAL COMMENTS**

1. Where a result is reported as a less than (<), higher than the nominated LOR this is due to either Matrix Interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
7. Polychlorinated Biphenyls are spiked only using Arochlor 1260 in Matrix Spikes and LCS's.
8. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
9. Duplicate RPD's are calculated from raw analytical data thus it is possible to have two two sets of data below the LOR with a positive RPD - eg: LOR 0.1, Result A = <0.1 (raw data is 0.02) & Result B = <0.1 (raw data is 0.03) resulting in a RPD of 40% calculated from the raw data.

**REPORT SPECIFIC NOTES**

<b>Company Name:</b> Coffey Environments Pty Ltd Wollongong	<b>Order No.:</b>	<b>Received:</b>	Aug 26, 2010 12:00
<b>Address:</b> 118 Auburn Street Wollongong NSW 2500	<b>Report #:</b> 274618	<b>Due:</b>	Aug 30, 2010 03:18
	<b>Phone:</b> 02 4201 1400	<b>Priority:</b>	2 Day
	<b>Fax:</b> 02 4201 1401	<b>Contact name:</b>	Manuel Fernandez
<b>Client Job No.:</b> ENAUWOLL04009AB		<b>mgt Client Manager: Onur Mehmet</b>	

Sample Detail					Ammonia(N)	Arsenic	Copper	Nickel	Nitrate (as N)	Nitrite (as N)	Zinc
Laboratory where analysis is conducted											
Oakleigh Laboratory - NATA Site #1254					X	X	X	X	X	X	X
Thornleigh Laboratory - NATA Site #18217											
Clayton Laboratory - NATA Site #1645											
Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
DID002	Aug 25, 2010		Water	T10-AU11878	X	X	X	X	X	X	X

<b>Coffey Environments Pty Ltd Wollongong</b>  118 Auburn Street Wollongong NSW 2500	<b>Client Sample ID</b>		<b>DID002</b>
	<b>Lab Number</b>		<b>T10-AU11878</b>
	<b>Matrix</b>		<b>Water</b>
	<b>Sample Date</b>		<b>Aug 25, 2010</b>
<b>Analysis Type</b>	<b>LOR</b>	<b>Units</b>	
Ammonia(N)	0.01	mg/L	11
Nitrate (as N)	0.02	mg/L	0.07
Nitrite (as N)	0.02	mg/L	0.03
<b>Heavy Metals</b>			
Arsenic	0.001	mg/L	0.001
Copper	0.001	mg/L	< 0.001
Nickel	0.001	mg/L	< 0.001
Zinc	0.001	mg/L	0.050

Coffey Environments Pty Ltd Wollongong							
118 Auburn Street Wollongong NSW 2500	Client Sample ID	DID002	DID002	RPD	SPIKE	LCS	Method blank
	Lab Number	10-AU11878	10-AU11878	10-AU11878	10-AU11878	Batch	Batch
	QA Description		Duplicate	Duplicate % RPD	Spike % Recovery	% Recovery	
	Matrix	Water	Water	Water	Water	Water	Water
	Sample Date	Aug 25, 2010	Aug 25, 2010	Aug 25, 2010	Aug 25, 2010	Aug 25, 2010	Aug 25, 2010
Analysis Type	Units			% RPD	% Recovery	% Recovery	mg/L
Ammonia(N)		-	-	3.0	107	114	< 0.05
Nitrate (as N)		-	-	11	103	102	< 0.02
Nitrite (as N)		-	-	< 1	102	98	< 0.02
Heavy Metals		Batch	Batch	Batch	Batch		
Arsenic		-	-	1.1	110	105	< 0.001
Copper		-	-	< 1	104	109	< 0.001
Nickel		-	-	1.8	117	118	< 0.001
Zinc		-	-	21	118	116	< 0.001

<b>Company Name:</b> Coffey Environments Pty Ltd Wollongong	<b>Order No.:</b>	<b>Received:</b> Aug 26, 2010 12:00
<b>Address:</b> 118 Auburn Street Wollongong NSW 2500	<b>Report #:</b> 274618	<b>Due:</b> Aug 30, 2010 03:18
	<b>Phone:</b> 02 4201 1400	<b>Priority:</b> 2 Day
	<b>Fax:</b> 02 4201 1401	<b>Contact name:</b> Manuel Fernandez
<b>Client Job No.:</b> ENAUWCLL04009AB		<b>mgt Client Manager:</b> Onur Mehmet

Sample Detail					Ammonia(N)	Arsenic	Copper	Nickel	Nitrate (as N)	Nitrite (as N)	Zinc
Laboratory where analysis is conducted											
Oakleigh Laboratory - NATA Site #1254					X	X	X	X	X	X	X
Thornleigh Laboratory - NATA Site #18217											
Clayton Laboratory - NATA Site #1645											
Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
DID002	Aug 26, 2010		Water	T10-AU11878	X	X	X	X	X	X	X





Chain of Custody

Laboratory Quotation / Order No.

Job No: *MAHLS (007) Sheet*

No: 28596

Dispatch to:  
(Address & Phone No.)

*Mr. James W. ...  
1000 ...  
... 2007*

Sampled by:

*D. M. ...*

Consigning Officer:  
Date Dispatched:

*...*

Attention:

*Sample (Wet)*

Project Manager:  
(report results to)

*...*

Courier Service:  
Consignment Note No:

*...*

Relinquished by:

*D. M. ...*

Date:

*...*

Time:

*...*

Received by:

Date:

Time:

Comments

Sample Matrix

Container Type and Preservative

Sample No.

Date Sampled

PAHs

TPHs

MAHs = BTEX

Metals:

Analyses Required

Sample Condition on Receipt

Special Laboratory Instructions:

*...*

Detection Limits:

*...*

Turnaround Required:

Copies: WHITE: Sign on release. YELLOW: If dispatched to interstate Lab. Lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

#274618

# Appendix C

## Data Validation Report

**Further Assessment of Groundwater Quality - Ash Ponds  
Tallowarra Lands, Yallah Bay Road, Yallah, NSW**

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



SPECIALISTS IN ENVIRONMENTAL,  
SOCIAL AND SAFETY PERFORMANCE

## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### I. SAMPLE HANDLING

1. Were the sample **holding times** met?
2. Were the samples in **proper custody** between the field and reaching the laboratory?
3. Were the samples **properly and adequately** preserved?  
*This includes keeping the samples chilled, where applicable.*
4. Were the samples received by the laboratory in good condition?

Yes	No (Comment below)
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### COMMENTS:

Sample Handling was:

Satisfactory

Unsatisfactory

Partially Satisfactory

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



SPECIALISTS IN ENVIRONMENTAL,  
SOCIAL AND SAFETY PERFORMANCE

## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>

### COMMENTS:

Precision/Accuracy of the Laboratory Report	<input checked="" type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
	<input type="checkbox"/> Partially Satisfactory	

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### III. FIELD QA/QC

- |    |                                    |                       |
|----|------------------------------------|-----------------------|
| 1. | Number of Primary Samples Analysed | Soil: 0<br>Water: 16  |
| 2. | Number of Days of Sampling:        | Soil: N/A<br>Water: 2 |

### 3. Number and Type of QA/QC Samples Collected:

	SOIL	WATER
Field Duplicates (at least 1 in 10 samples)	NA	1 intra lab + 1 inter lab
Trip Blanks (at least 1/day or sampling event)	NA	0
Wash Blanks (at least 1/day/matrix/equipment)	NA	0
Other (Field Blanks, Spiked Trip Blanks, etc.)	NA	0

### 4. FIELD DUPLICATES

- A. Were an Adequate Number of field duplicates analysed for each chemical (min. 10%)?
- B. Were RPDs within Control Limits?
- Organics (< 50 % for soil; < 30% for water)
  - Metals/Inorganics (< 50 % for soil; < 30% for water)

Yes	No (Comment below)
<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>

### COMMENTS:

- RPDs of 47.83% and 35.29%, above the control limit of 30%, were recorded for zinc for the groundwater pair MW1 and DJD001 and MW1 and DJD002. This is not considered significant as the RPD has only marginally exceeded the control limit.
- An RPD of 120.00% above the control limit of 30% was recorded for arsenic for the groundwater pair MW1 and DJD002. This result may indicate some variability for arsenic for the batch may be expected. This is not considered significant as concentrations of arsenic in both groundwater and surface water for other locations across the site have been recorded well above the laboratory limits of reporting (LOR).
- Several inconsistencies were recorded between the groundwater pair MW1 and the inter laboratory duplicate DJD002 for nickel, nitrate and nitrite. The contaminant was either not detected in primary sample but is detected in duplicate sample, or vice versa. This result is not considered significant as concentrations were close to the LOR or were attributed to LOR variations between the two laboratories.
- RPDs calculated for this project have been presented at the end of this report in Table QAQC1.

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### 5. TRIP BLANKS

- A. Were an Adequate Number of trip blanks collected?
- B. Were the Trip Blanks free of contaminants?  
(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A	N/A

### 6. WASH BLANKS

- A. Were an adequate number of Wash Blanks collected?
- B. Were the Wash Blanks free of contaminants?  
(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
<input type="checkbox"/>	<input checked="" type="checkbox"/>
N/A	N/A

### COMMENTS:

- A laboratory prepared trip spike and trip blank sample were not taken into the field and transported with the laboratory samples as the chemicals of concern analysed for this assessment were metals/inorganic analytes and not volatile organic compounds.
- Groundwater samples were collected using a dedicated disposable bailer and disposable nitrile gloves. Surface water samples were collected using an extendable grab sampler and disposable nitrile gloves at each sample location. Decontamination of sampling equipment was carried out in accordance with Coffey Environments standard operating procedures and as such a wash blank was not considered necessary for this monitoring event.

Field QA/QC was:

Satisfactory

Unsatisfactory

Partially Satisfactory

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



SPECIALISTS IN ENVIRONMENTAL,  
SOCIAL AND SAFETY PERFORMANCE

## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

#### 1. Type of QA/QC Samples

	Ammonia	Nitrate	Nitrite	Metals
Laboratory Blanks/Reagent Blanks (at least 1 per batch)	1	1	1	1
Laboratory Duplicates (at least 1 per batch or 1 per 10 samples whichever is the smaller)	3	5	3	1
Matrix Spikes/Matrix Spike Duplicates (1 for each soil type)	1	2	1	1
Laboratory Control Spike	2	1	2	2
Surrogate (where appropriate)*	0	0	0	0

\*Number of surrogates spikes carried out on each sample

2. Were the laboratory blanks/reagents blanks free of contamination?
3. Were the spike recoveries within control limits?
  - a. Organics (60% to 110%)
  - b. Metals/Inorganic (70% to 130%)
4. Were the RPDs of the laboratory duplicates within control limits?
5. Were the surrogate recoveries within control limits?

Yes	No (Comment below)
<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A <input checked="" type="checkbox"/>	N/A <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A	N/A

#### COMMENTS:

- Samples with surrogate or spike recoveries outside the upper control limit but with concentrations below the LOR and/or the GIL have all been disregarded.

5. The laboratory internal QA/QC was:	<input checked="" type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
	<input type="checkbox"/> Partially Satisfactory	

# Coffey Environments Australia Pty Ltd

A.C.N. 140 765 902 A.B.N. 65 140 765 902



## QA/QC DATA VALIDATION REPORT

Job No: ENAUWOLL04009AB Batch: SE80920 and 274618

### V. DATA USABILITY

- |   |                                     |
|---|-------------------------------------|
| 1. Data Directly Usable   | <input checked="" type="checkbox"/> |
| 2. Data Usable with the following corrections/modifications (see comment below) | <input type="checkbox"/>            |
| 3. Data Not Usable.   | <input type="checkbox"/>            |

### COMMENTS:

QA/QC Report Prepared by

Daniel Deen

QA/QC Report Reviewed by:

Manuel Fernandez

(Reviewer)