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PERCHED GROUNDWATER AND SURFACE WATER ASSESSMENT
THE NEXT GENERATION (TNG), ENERGY FROM WASTE FACILITY,
HONEYCOMB DRIVE, EASTERN CREEK, NEW SOUTH WALES
CES DOCUMENT REFERENCE: CES160707-ECS-AD

Written by: E. Millar

Reviewed by: M. Challoner

Authorised by: D. Lowe

Client: Dial a Dump Industries Pty Ltd
84-88 Burrows Road
Alexandria NSW 2015

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Suite 3, Level 1 • 55-65 Grandview Street • Pymble, NSW 2073 • Australia
Telephone: 02 8569 2200 • Fax: 02 9983 0582 0 • ABN 67 151 524 757

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EXECUTIVE SUMMARY

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Dial A Dump Industries Pty Ltd (DADI) (the Client) to carry out a perched groundwater and surface water assessment for the Energy from Waste Project located at The Next Generation (NSW) (TNG) energy from waste electricity generation facility, Honeycomb Drive, Eastern Creek, New South Wales.

The objective of the assessment is to assess the perched groundwater quality and surface water quality of Ropes Creek and from this assessment determine whether former or current use of the site or off-site has generated mobile contamination.

Fieldwork was carried out 9 October 2017 following the locating and development of the existing groundwater wells undertaken on 29 September 2017. Four of the five groundwater wells were found to be in a suitable condition for the perched groundwater assessment, with groundwater monitoring well MW4 found damaged and thus unsuitable for the inclusion in this assessment.

The four nominated surface water sampling locations along Ropes Creek were found to be dry at the time of sampling, therefore surface water data taken from the 2014 ADE Consulting Phase 2 investigation was considered and included within this assessment.

Groundwater

Hydrocarbon (total recoverable and polycyclic aromatic) results for perched groundwater samples were all below the laboratory limit of reporting and therefore were below the guideline criteria.

Calcium carbonate concentrations in groundwater samples ranged between 510 mg/L and 770 mg/L and indicate extremely hard (as defined in Table 3.4.4 ANZECC 2000) water beneath the site. Dissolved heavy metal concentrations in groundwater samples were below the guideline criteria, with the exception of copper that was marginally elevated at the following locations:

- MW1 (3 µg/L), MW2 (3 µg/L) and MW3 (2 µg/L) and exceed the groundwater investigation level for fresh water of 1.4 µg/L (uncorrected for hardness as requested by the NSW EPA).

Surface Water (Ropes Creek)

Hydrocarbon concentrations of the four surface water samples (locations SS-01 to SS-04 inclusive) were all less than the limit of reporting and therefore less than the guideline criteria. Heavy metal (Ar, Cd, Cr (total), Cu, Pb, Hg, Ni and Zn) concentrations were all below the guideline criteria, with the exception of the marginal exceedance of copper in three sampling locations.

Overall Water Quality

The results of this perched groundwater and surface water assessment indicate that the groundwater beneath the site and the adjacent surface waters of Ropes Creek are not currently impacted by former and current activities at the site or adjoining sites. The copper exceedances noted in the perched groundwater and surface water samples are likely to be due to background concentrations within the geology of the site.

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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
CES	Consulting Earth Scientists Pty Ltd
CLM	Contaminated Land Management
COPC	Contaminants of Potential Concern
DECCW	Department of Environment and Climate Change and Water
DLWC	Department of Land and Water Conservation
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
km	Kilometre
LGA	Local Government Area
LPI	Land and Property Information Division
LEP	Local Environmental Plan
m	Metre
mbgl	metres Below Ground Level
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PSP	Project Safety Plan
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

1 INTRODUCTION

1.1 *BACKGROUND*

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Dial A Dump Industries Pty Ltd (DADI) (the Client) to carry out a perched groundwater and surface water assessment for the Energy from Waste Project located at The Next Generation (NSW) (TNG) energy from waste electricity generation facility, Honeycomb Drive, Eastern Creek, New South Wales (NSW) (the site) (**Figure 1**).

This report has been prepared in accordance with the CES proposal dated 21 September 2017. CES understands previous investigations by consultants have been undertaken at the site to determine the site's suitability for the construction of the Next Generation Energy from Waste Facility.

This investigation addresses the concerns of potential on-site groundwater contamination as stated in comment 11 of Appendix G – NSW EPA - Soil and Water Assessment of the NSW Environment Protection Authority (EPA) letter (reference DOC17/178599, dated 24 March 2017), commenting on the ADE Consulting Group, *Targeted Phase II Detailed Site Investigation, Honeycomb Drive, Eastern Creek, NSW*. Document Reference: 7773-TDSI1, dated 6 August 2014).

Comment 11 states:

> *"The detailed site investigation only investigated levels of the soils, sediments and surface waters. While the groundwater level is generally deep at the site, there are areas with perched groundwater. Generally, groundwater analysis is a good indicator of any site contamination (that can be missed by targeted soil sampling) and mobilisation of such contamination."*

The findings of this report are based on an initial site visit conducted on 29 September 2017 and groundwater sampling and analysis conducted on the 9 October 2017.

1.2 *OBJECTIVES*

The objective of the assessment is to assess the perched groundwater quality the surface water quality of Ropes Creek and from the assessment confirm the site's suitability for use.

1.3 *SCOPE OF WORK*

CES has completed the following scope of works:

1. Reviewed the following previous reports:
    - ADI Services, March 1995, Stage 2 Environmental Assessment of Areas 1 and 3 Wallgrove Quarry;
    - Ian Grey Groundwater Consulting, June 2014, Environmental Impact Assessment, Proposed Energy from Waste Facility, Eastern Creek, Soil and Water;
    - ADE Consulting Group, August 2014, Targeted Phase II Detailed Site Investigation, Honeycomb Drive Eastern Creek NSW; and
    - Edison Environmental & Engineering Pty Ltd, April 2015, Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek;
2. Site visit to locate the existing network of wells on the subject site. The wells were located with reference to Figure 2 of the Targeted Phase II Detailed Site Investigation (DSI) report (ADE, 2014);
3. Development of the located wells to remove stagnant water and check that the hydraulic connection between the formation and the well remained operational;
4. Allowed a period of stabilisation between the development and sampling of the wells for at least 5 days;
5. Purged and sampled the wells in accordance with standard groundwater practices using bladder pumps and concurrent water quality parameter measurement (such as EC, DO and pH);
6. Sampled Ropes Creek at the same four locations (SW01-SW04) as presented in Figure 2 of the Targeted Phase II DSI (ADE, 2014);
7. Implemented a Quality Assurance and Quality Control (QA/QC) program for groundwater to verify that the data collected during fieldwork was robust and could be relied upon for future assessments of the site. The QA/QC program consisted of a combination of duplicate, triplicate and blank samples;
8. Submitted and scheduled the groundwater samples to a NATA Accredited laboratory for the same analytical suite as previously scheduled by third parties (ADE, 2014), that is to say, Total Recoverable Hydrocarbons (TRH), Polycyclic Aromatic Hydrocarbons (PAH), eight heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb and Zn), Electrical conductivity, pH and hardness (Ca CO_3); and
9. Prepared a brief Perched Groundwater and Surface Water Assessment Report comprising methodology, QA/QC sampling, sampling location plan, tabulated analytical results in comparison to the guideline criteria, laboratory certificates, calibration certificates and summary and recommendations.

2 SITE INFORMATION

2.1 *SITE IDENTIFICATION*

The site is located off Honeycomb Drive, Eastern Creek, New South Wales (NSW), within the Local Government Area (LGA) of Blacktown. The investigation site covers an area of approximately 15 hectares, and is legally identified as Lots 2 and 3 in Deposited Plan (DP) 1145808 (**Figure 1**).

2.2 *PREVIOUS ENVIRONMENTAL REPORTS*

CES has been provided reports of investigations previously undertaken. A summary of information pertaining to the site from each of the reports is provided below.

ADI Services, March 1995, Stage 2 Environmental Assessment of Areas 1 and 3 Wallgrove Quarry

The Stage 2 Environmental Assessment (EA) completed by ADI Services was conducted prior to the surrender of a lease held on the land by Pioneer Concrete (NSW) Pty Ltd. The previous site use of the investigation site appears to be rural open space, however it is not confirmed in the report supplied to CES.

The report was compiled to address the potential contamination issues identified in the Stage 1 Assessment, *Stage 1 Environmental Assessment of Pioneer Concrete (NSW) Wallgrove Quarry*, previously undertaken by ADI. The assessment was undertaken to address potential contamination issues identified in the Stage 1 assessment, that may have occurred due to the quarry and asphalt plant operations conducted on adjacent land to the north and east. The Stage 2 assessment involved the collection and analysis of soil/sediment, groundwater and surface water samples.

Heavy metal concentrations were elevated with respect to background concentrations and exceeded guideline values across the soil and sediment sampling locations. It was found that the concentrations were likely attributed to runoff from spoil stockpiles located on the adjacent Area 1 (north of investigation site).

Groundwater was measured between 2.72 metres below ground level (mbgl) to 6.05 mbgl and flowed in a south-westerly direction. Concentrations of manganese and total PAH above guidelines levels were detected in three of the four groundwater sampling locations. It was also found that the geochemistry of the groundwater at sampling location MW2 was saline in nature and typical of waters associated with shale formations, reflecting regional groundwater. This differed from the remaining three locations, MW3, MW4 and MW5, which was determined to be fresh in nature and influenced by rainfall recharge.

Ian Grey Groundwater Consulting, June 2014, Environmental Impact Assessment, Proposed Energy from Waste Facility, Eastern Creek, Soil and Water

Ian Grey Groundwater Consulting (IGGC) undertook an environmental impact assessment (EIA) of conditions on the site relating to soils, contamination, groundwater, salinity, and surface water, and any of the impacts from the development and operation of the facility relating to groundwater and salinity, including suitability of the site and mitigation measures required.

The geology underlain the site was identified as strata of the Wianamatta Group comprising claystone, siltstone, and minor sandstone. The site area was also classified as moderate salinity potential with high potential along the tributary of Ropes Creek.

The proposed Energy from Waste Facility (EfWF) is estimated to contribute 63 ML/a to flow in the tributary of Ropes Creek through run-off and minor shallow groundwater discharge. Additionally, highly erodible soils and sediments are present on site and may contribute to run-off water quality and volume entering the Ropes Creek tributary and will require mitigation measures and controls during the construction phase of the development. Storm water run-off risks include discharge of excessively high peak flows potentially increasing erosion and flood risk, changes to flow and water level regime in the watercourse due to insufficient discharge volumes between rain events and inadequate treatment potentially discharging water of unacceptable quality.

Furthermore, there is potential for the development to pose a risk to groundwater quality due to leaching of contaminant from waste and storage/handling areas, combustion systems, flue gas treatment or residue of handling and treatment areas. The development will comprise of relatively impermeable surface areas which will lead to a decrease in rainfall recharge impacting groundwater flow and levels.
Additionally, the proposed development could result in a localised increase in groundwater recharge from the storm water retention basin and increase down gradient salinity due to reduction in shallow groundwater through-flow.

ADE Consulting Group, August 2014, Targeted Phase II Detailed Site Investigation, Honeycomb Drive Eastern Creek NSW

ADE undertook a Targeted Phase II Detailed Site Contamination Investigation (DSI) to assess the current level of contamination of the site prior to TNG taking possession of the site for the 'Energy from Waste' Facility.

Samples from boreholes, stockpiles, creek beds and surface water were collected and analysed. Concentrations of heavy metals, PAH and TRH in surface water samples tested were below the threshold criteria. Concentrations of heavy metals, PAHs, TRHs, OPPs,

OCPs, PCBs, Phenols and BTEX were below the human health threshold criteria for commercial/ industrial land use in soil samples collected. Soil samples tested for TRH, Naphthalene, Arsenic and DDT were below the ecological screening/investigation levels for commercial / industrial land-use. Additionally, no asbestos was detected in samples submitted for analysis.

Concentrations of TRH and PAH in sediment samples were below ecological threshold levels, however, elevated concentrations of arsenic and nickel were found in sediment samples which maybe be attributed to the creek conditions at the time of sampling which may contribute to precipitation of heavy metals in water during periods of low flow. Based on the findings of the DSI, ADE considered that the site was suitable for the commercial/ industrial land use and the proposed development.

Edison Environmental & Engineering Pty Ltd, April 2015, Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek.

Edison completed an assessment of soil and water impacts at the proposed Energy from Waste Facility to contribute to the Environmental Impact Statement of the project and to address the requirements of the Director General of Planning NSW.

The scope of works for the assessment of soil and water impacts included an assessment of potential existing soil contamination including potential presence of acid sulphate soils (ASS), assess potential surface and groundwater impacts associated with the development including impact mitigation, management and monitoring measures, and specific requirements for monitoring of water quality and run-off volumes and recommendations for post-construction rehabilitation of disturbed areas.

The Edison assessment of soil and groundwater concluded no contamination of the site from potential contamination practices undertaken both on and off site has occurred and that the proposed development does not include activities that pose a particular risk to groundwater quality. It was noted that area available for groundwater recharge will be substantially reduced due to the extensive structures and pavements built on the site and little or no impact is expected on the resources value of the local groundwater system.

Edison recommended further investigation of salinity conditions of soils and any present shallow groundwater to ensure suitability of materials used for construction of hardstand, buildings, roadways and the drainage system. Furthermore, Edison concluded that potential soil and water impacts can be adequately managed during the construction and operational phase.

3 SAMPLING AND ANALYTICAL PROGRAMME

The following sampling programme has been carried out based on the CES Fee Proposal (CES Document Reference: CES170303-SD-AC) dated 21 September 2017, knowledge of the outcomes of previous ESA's, potential contamination issues resulting from past activities undertaken at the site and takes into consideration the objectives of the environmental investigation. The sampling and analysis programme is limited to the contamination status of perched groundwater and surface water.

Perched groundwater samples were collected from an existing network of groundwater wells previously identified within the EIA (IGCC, June 2014).

Surface water samples of Ropes Creek were also collected and scheduled for analysis. The location of the boreholes and proposed surface water sampling points is presented in Figure 2, in response to comment number 5 of Appendix G of the *NSW EPA Review of the Soil and Water Assessment* (Reference: DOC17/178599, dated 24 March 2017, requesting provision of diagrammatic locations of the sampling points.

3.1 *DEVELOPMENT OF EXISTING GROUNDWATER WELLS*

Each of the five existing groundwater wells were inspected for suitability for use for the perched groundwater assessment. Those wells that were found to be suitable were developed to remove stagnant water using dedicated LDPE tubing and foot valves and allowed to stabilise for a minimum of five days between development and sampling to ensure hydraulic connection between the groundwater formation and the monitoring well.

3.2 *METHOD OF SAMPLING COLLECTION*

Standing water levels were measured prior to sampling. The groundwater samples were collected using low-flow purge and sampling techniques utilising a bladder pump. Field parameters, including pH, electrical conductivity, dissolved oxygen, redox potential and temperature, and observations of the colour, turbidity and odour of the samples were recorded and monitored until field parameters stabilised within 10%. Samples were collected following stabilisation of field parameters.

3.3 *DECONTAMINATION PROCEDURES*

The bladder pump was decontaminated using Decon90 detergent and rinsed with de-ionised water between each sampling location. New nitrile gloves, in addition to dedicated bladders and tubing, were used at each sample location.

3.3.1 *Sample Containers*

Groundwater samples were collected in laboratory supplied containers. The containers were supplied by the laboratory with the appropriate sample preservatives for the proposed analysis.

3.4 *METHOD OF SAMPLE STORAGE AND HANDLING*

The sample containers were immediately placed in a cool box in which ice had been added in an effort to keep the samples cool. Samples were then transported directly to the laboratory.

3.5 *DOCUMENTATION*

For each sampling location, the CES Environmental Scientist filled out a copy of CES "field data sheet", which documented:

- Time of purging and sample collection;
- Standing water levels at time of purging and sampling;
- Well condition;
- Weather conditions;
- Unique sample identification number;
- Field parameters; and
- Observations of groundwater.

All samples, including QA/QC samples, were transported to the primary and check laboratories under Chain-of Custody (COC) procedures and maintained in an ice-filled cooler. The COC details the following information:

- Site identification;
- The sampler's name;
- Nature of the sample;
- Collection time and date;
- Analyses to be performed;
- Sample preservation method;
- Departure time from site; and
- Dispatch courier(s).

3.6 *ANALYTICAL PROGRAMME*

3.6.1 Groundwater

A total of four (4) environmental groundwater samples were scheduled for analysis. The analytical programme is summarised below:

- Four (4) groundwater samples for TRH, BTEX, PAHs, filtered heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn), EC, pH, and $CaCO_3$; and
- Quality control one blind replicate and one split replicate samples analysed for TRH, BTEX, PAHs, filtered heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn), EC, pH, and $CaCO_3$, and one trip blank sample analysed for TRH and BTEX.

3.7 *LABORATORY*

CES used Envirolab Services Pty Ltd (Envirolab) as the primary lab and Australian Laboratory Services Pty Ltd (ALS) as the secondary or 'check' laboratory for all chemical testing. Both laboratories are NATA registered for the scheduled chemical testing.

4 SITE ASSESSMENT CRITERIA

The selection of the most appropriate investigation levels for use with a site specific environmental setting and land use scenario should consider factors including the protection of ecosystems.

4.1 *INVESTIGATION AND SCREENING LEVELS*

ANZECC (2000) trigger values have been developed to assess toxicants at alternative levels of species protection in aquatic ecosystems. Alternative levels of species protection are dependent on the ecosystem conditions being high conservation/ecological value systems, slightly to moderately disturbed systems, and highly disturbed systems.

To address the data gap of perched groundwater characterisation at the site and to assess the surface water quality of Ropes Creek, CES compared results of samples of groundwater and surface water to the ANZECC (2000) trigger values for Fresh Waters for 95% level of species protection. Due to the calcium carbonate concentration of the submitted groundwater samples indicating 'extremely hard' water, harness-modified trigger values (HMTV) have been calculated using the algorithm displayed in Table 3.4.3 of ANZECC (2000) and has been adopted in addition to the standard ANZECC (2000) trigger values for Fresh Water for a select number of heavy metal analytes (Cd, Pb, Ni and Zn). It should be noted that the HMTV's for copper have not been adopted as per the recommendation in Comment 12 of Attachment G of the NSW EPA Soil and Water Assessment response, in which states:

> *"…the hardness correction of copper is not recommended as it has been clearly shown that hardness corrected values of copper is not protective of all aquatic species and this may be removed in the reviewed ANZECC guidelines..."*

5 QAQC DATA EVALUATION

Field and laboratory QA/QC requirements compliant with National Environmental Protection Council (1999 updated 2013) requirements are outlined below. Laboratory certificates of analysis are attached as **Appendix A**.

5.1 *DATA ACCEPTANCE CRITERIA*

The QA/QC Data was assessed against the Data Acceptance Criteria (DAC) provided in **Table 2**.

5.2 *FIELD QA/QC PROGRAMME*

Groundwater samples were collected byan experienced Environmental Scientist, under established CES protocols. CES personnel have been trained in sample collection and handling techniques.

For the purpose of assessing the quality of data presented in this report, CES collected and analysed Quality Control (QC) samples, while the laboratory completed their own QC. Tabulated QC data

for groundwater are provided in **Table 4**. The current section of this report is focused on the presentation of results of these QC samples and discussion of deviations from the Data Acceptance Criteria (DAC) displayed in **Table 2**.

5.3 *BLIND SAMPLES*

One blind replicate groundwater sample was collected from MW5 (QAQC 1). The replicate sample was preserved, stored, transported, prepared and analysed in an identical manner to the primary sample. As a minimum, the results of analyses on the blind replicate sample pair are assessed by calculating the Relative Percentage Differences (RPDs) between the results. The RPD is calculated as the difference between the results divided by their mean value and expressed as a percentage.

The RPD were all within the DAC listed in **Table 2.**

In summary, it is considered that the blind replicate samples confirm that the primary laboratory (Envirolab) analyses of the soil and groundwater samples are repeatable and accurate.

5.4 *SPLIT SAMPLES*

One split sample was collected from MW5 (QAQC 2), otherwise known as 'inter-laboratory duplicates', which provide a check on the analytical proficiency of the laboratories. Split samples are taken from the same location as the blind replicate, thus becoming a triplicate sample.

The results of the split sample analysis confirm the reliability of the laboratory analysis from Envirolab, since the all the RPD were compliant with the DAC. The results of the RPD analysis indicates the analytical proficiency of the laboratories.

5.5 *TRIP BLANK SAMPLES*

Trip blank sample are prepared and supplied by the laboratory and carried through all stages of sample transport and analysis. Analyte concentrations in blanks should be less than the stated limit of reporting (LOR). One trip blank sample was submitted to the primary laboratory for analysis. The results of the analysis indicated results to be less than the laboratory LOR. As such, it can be stated that no additional contaminants have been added to the samples as a result of transportation of the samples or laboratory handling.

5.6 *LABORATORY QA/QC PROGRAMME*

The reliability of test results from the analytical laboratories was monitored according to the QA/QC procedures used by the NATA accredited laboratory. The QA/QC programme employed by Envirolab Services (Envirolab) (the primary laboratory) specified holding times, extraction dates, method descriptions, Chain of Custody (COC) requirements, analysis, EQLs and acceptance

criteria for the results. Laboratory QA/QC requirements undertaken by Australian Laboratory Services (ALS) are based on NEPM requirements and are outlined below (NEPC, 1999).

5.7 *LABORATORY DUPLICATE SAMPLES*

Laboratory duplicates provide data on analytical precision for each batch of samples. Where required and in order to provide sufficient sample for analysis of laboratory duplicates, two batches of samples are collected at the first site listed on the Chain of Custody form. This is done in order to ensure that sufficient sample is collected.

All laboratory duplicate samples' RPDs conformed to the DAC.

5.8 *LABORATORY CONTROL SAMPLES*

Laboratory control samples consist of a clean matrix (de-ionised water or clean sand) spiked with a known concentration of the analyte being measured. These samples monitor method recovery in clean samples and can also be used to evaluate matrix interference by comparison with matrix spikes. Laboratory control samples may be certified reference materials.

All laboratory control samples conformed the laboratory assessment criteria and therefore the DAC.

5.9 *SURROGATES*

A surrogate is added at the extraction stage in order to verify method effectiveness. The surrogate is then analysed with the batch of samples. Percent recovery is calculated.

All laboratory surrogate samples conformed to the laboratory assessment criteria and therefore the DAC.

5.10 *MATRIX SPIKE*

A matrix spikes consist of samples spiked with a known concentration of the analyte measured, in order to identify properties of the matrix that may hinder method effectiveness. Samples are spiked with concentrations equivalent to 5 to 10 times the LOR. Percent recovery is calculated.

All matrix spikes conformed to the laboratory assessment criteria and therefore to the DAC.

5.11 *METHOD BLANKS*

Method blanks are carried through all stages of sample preparation and analysis. Analyte concentrations in blanks should be less than the stated LOR. Reagent blanks are run if the method blank exceeds the EQL. The purpose of method blanks is to detect laboratory contamination.

All method blanks conformed to the laboratory assessment criteria and therefore to the DAC.

5.12 *QAQC ASSESSMENT SUMMARY*

CES has a high degree of confidence in the quality of the field data (that is to say that the groundwater samples were representative of the water sampled, the samples were collected by an experienced sampler and that the chain of custody documentation was accurate) and the laboratory data (that is to say that Envirolab and ALS are NATA accredited laboratories, and undertake strict internal QA/QC of the results issued, uses appropriate methodology and LOR to analyse soil samples and has completed sample documentation).

In consideration of the QAQC assessment, it is the opinion of CES that the data collected is suitable for the assessment of the site.

6 INVESTIGATION RESULTS

Fieldwork was carried out 9 October 2017 following the locating and development of the existing groundwater wells undertaken on 29 September 2017. Four of the five groundwater wells were found to be in a suitable condition for the perched groundwater assessment, with groundwater monitoring well MW4 found damaged and thus unsuitable for the inclusion in this assessment.

The four nominated surface water sampling locations along Ropes Creek were found to be dry at the time of sampling, therefore surface water data taken from the Phase 2 DSI (ADE, 2014) has been re-assessed and included within this assessment. The surface water results are presented in **Table 5**.

6.1 *PERCHED GROUNDWATER QUALITY FIELD PARAMETERS*

During purging of the groundwater wells, groundwater quality field parameters were measured using a multi-parameter water quality meter which measured; temperature, pH, conductivity (EC), dissolved oxygen (DO) and oxidation-reduction potential (ORP). This equipment was calibrated by the equipment supplier prior to use on-site and did not require adjusting for redox measurements. Groundwater field data sheets and calibration certificates for the water quality meter is presented in **Appendix B**. Groundwater quality field parameters are presented in **Table 6.1.1**.

Table 6.1.1: Stabilised Field Measured Groundwater Parameters

Well ID	Depth to Water (metres below top of casing)	Temperature (Degrees Celsius)	Electrical Conductivity (uS/cm)	pH	Dissolved Oxygen (ppm)	Redox Potential (mV)
MW1	12.22	26.5	1,205	6.88	3.69	93
MW2	2.59	18.3	14,800	6.04	1.41	129
MW3	2.90	18.6	1,189	6.02	2.80	208
MW5	5.58	18.9	1,422	6.52	2.20	226

Depth to groundwater appeared to reduce approaching Ropes Creek, indicating hydraulic continuity with the tributary. At the time of groundwater sampling the perched groundwater was described as generally brown coloured, ranging from slightly turbid to turbid and odourless.

Groundwater field parameters recorded indicate that perched groundwater beneath the site is generally fresh water, with the exception of sampling location MW2 which indicated saline water.

6.2 *PERCHED GROUNDWATER LABORATORY RESULTS*

Groundwater analytical results are presented as **Table 3**. The laboratory Certificates of Analysis are presented in **Appendix A**.

6.2.1 *TRH and BTEX*

TRH and BTEX results for perched groundwater samples were all below laboratory LOR and therefore were below the groundwater investigation level (GIL).

6.2.2 *PAH*

PAH results in perched groundwater samples were below laboratory LOR and therefore below the GIL.

6.2.3 *Heavy Metals*

Dissolved heavy metal concentrations in groundwater samples were below the GIL, with the following exceptions:

- Copper concentrations in monitoring well MW1 (3 µg/L), MW2 (3 µg/L) and MW3 (2 µg/L) exceeded the GIL Fresh Water GIL of 1.4 µg/L.

6.2.4 *pH*

pH concentrations for the samples collected ranged from 6.0 pH to 7.5 pH and indicated neutral pH.

6.2.5 *Electrical Conductivity*

Electrical conductivity concentrations in groundwater samples ranged from 1,200 µS/cm to 1,400 µS/cm indicated fresh water beneath the site, with the exception of sampling location MW2 of which electrical conductivity concentrations are 14,000 µS/cm, thus indicating saline water at that location.

6.2.6 *Calcium Carbonate (CaCO3)*

Calcium carbonate concentrations in groundwater samples ranged between 510 mg/L and 770 mg/L and indicate extremely hard (as defined by Table 3.4.4, ANZECC 2000) water beneath the site.

6.3 *SURFACE WATER LABORATORY RESULTS (ADE, 2014)*

The ADE (2014) Surface Water results have been included for reference in **Table 5.**

TPH and PAH concentrations of the four surface water samples (locations SS-01 to SS-04 inclusive) were all less than LOR and therefore less than the GIL. Unfiltered heavy metal (Ar, Cd, Cr (total), Cu, Pb, Hg, Ni and Zn) concentrations were all below the GIL, with the exception of copper in sample locations SS-02 to SS-04 inclusive which marginally exceeded the ANZECC (2000) Fresh Water GIL of 1.4 µg/L.

7 DISCUSSION

The analytical data collected as part of the CES groundwater sampling and, in the absence of surface water in Ropes Creek at the time of sampling, the Targeted Phase II DSI data (ADE, 2014) has been used to characterise the water quality around the future TNG development site. This data is used to augment the existing soil and sediment data presented already as part of the previous investigations.

Depth to groundwater ranged from 12.22 metres below top of casing (mBTOC) in the north of the investigation site to 2.59 mBTOC in the south of the investigation site. The perched groundwater appears to flow in a southerly direction towards Ropes Creek and suggests hydraulic continuity.

7.1 *GENERAL WATER QUALITY*

Analytical results of the concentration of calcium carbonate in perched groundwater sampling indicate the perched groundwater characterised as 'extremely hard' water

The water quality parameters of the perched groundwater samples indicated water of neutral pH levels and electrical conductivity measurements indicating generally fresh groundwater, with the exception of monitoring location MW2 which indicated saline water. Furthermore, the dissolved oxygen and redox potential measurements of the samples indicated water quality that is unlikely to be adversely impacted by previous and current site use.

7.2 *PERCHED GROUNDWATER*

In general, the perched water quality underlying the site is good. The marginal exceedance of a conservative (given the location and environmental setting of the site) groundwater investigation levels for copper (alone) is considered to indicate that the previous use of the site (or hydraulically up-gradient sites in the basin) has not generated mobile/leachable contamination that is not significantly adversely impacting the groundwater quality.

It is likely that the copper concentrations detected reflect background concentrations influenced by the geology of the site and as such would be unlikely to pose a risk to aquatic receptors.

7.3 *SURFACE WATER*

The results of the surface water assessment undertaken by ADE in 2014 indicated surface water that marginally exceeded freshwater GILs for copper concentrations. This is not considered to be a significant impact to the aquatic ecosystem and is not considered a result of impact from the site but more likely a result of background concentrations.

8 SUMMARY AND RECOMMENDATION

The results of this perched groundwater and surface water assessment indicate that the groundwater beneath the site and the adjacent surface waters of Ropes Creek are not currently impacted by the site (or adjacent sites). Furthermore, this assessment indicated that the perched

groundwater is extremely hard which, being within hydraulic continuity of the receiving water body of Ropes Creek, suggests that Ropes Creek is likely to also be characterised as extremely hard water. The hardness of the water suggests the probability of heavy metal toxicity to aquatic species is greatly reduced and therefore the marginal exceedance of copper unlikely to adversely impact the receiving water bodies.

9 LIMITATIONS OF THIS REPORT

This report has been prepared for use by the client who commissioned the works in accordance with the project brief and based on information provided by the client. The advice contained in this report relates only to the current project and all results, conclusions and recommendations should be reviewed by a competent person with experience in environmental investigations before being used for any other purpose. CES accepts no liability for use or interpretation by any person or body other than the client. This report must not be reproduced except in full and must not be amended in any way without prior approval by the client and CES.

This report does not provide a complete assessment of the environmental status of the site and is limited to the scope defined therein. Should information become available regarding conditions at the site including previously unknown sources of contamination, CES reserves the right to review the report in the context of the additional information.

10 REFERENCES

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Figures

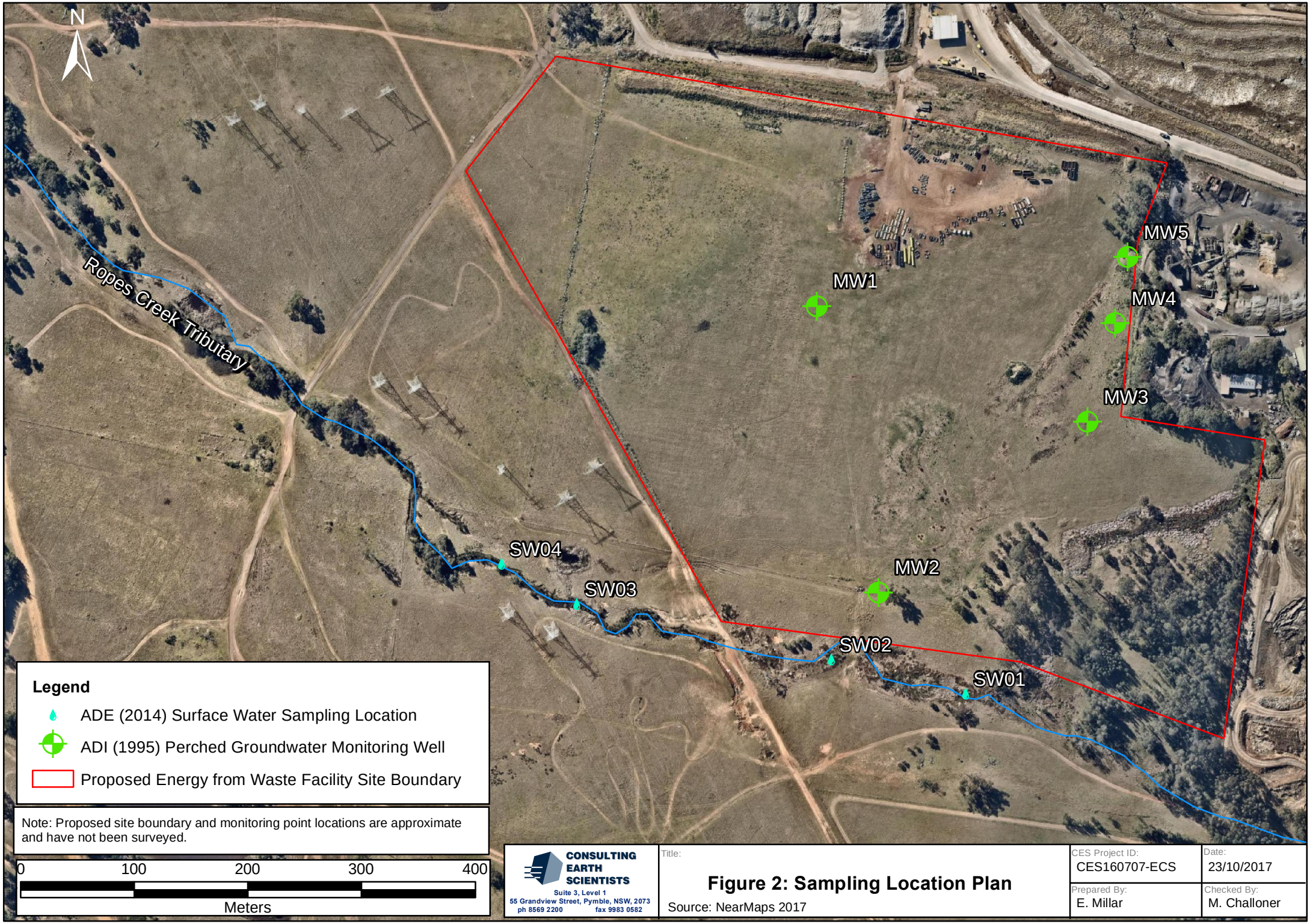
CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble, NSW, 2073
ph 8569 2200 fax 9983 0582

Title:

Figure 1: Site Location Plan

Source: NearMaps 2017

CES Project ID:	Date:
CES160707-ECS	23/10/2017
Prepared By: E. Millar	Checked By: M. Challoner



CONSULTING EARTH SCIENTISTS
Suite 3, Level 1
55 Grandview Street, Pymble, NSW, 2073
ph 8569 2200 fax 9983 0582

Title:

Figure 2: Sampling Location Plan

Source: NearMaps 2017

CES Project ID:	Date:
CES160707-ECS	23/10/2017
Prepared By: E. Millar	Checked By: M. Challoner

Tables

Table 1: Site Assessment Criteria - Groundwater

		ANZECC (2000) - HMTV Fresh Waters [a]	NEPM (2013) GIL - Fresh Waters [1]	NEPM (2013) GIL - Marine Waters [2]
Parameters	**Unit**			
TRH C6 - C9	µg/L	-	-	-
TRH C6 - C10	µg/L	-	-	-
FRACTION 1	µg/L	-	-	-
TRH C10 - C14	µg/L	-	-	-
TRH C15 - C28	µg/L	-	-	-
TRH C29 - C36	µg/L	-	-	-
TRH total C10 - C36	µg/L	-	-	-
TRH >C10-C16	µg/L	-	-	-
FRACTION 2	µg/L	-	-	-
TRH >C16-C34	µg/L	-	-	-
TRH >C34-C40	µg/L	-	-	-
TRH total >C10-C40	µg/L	-	-	-
Benzene	µg/L	-	950	500
Toluene	µg/L	-	-	-
Ethylbenzene	µg/L	-	-	-
m+p-xylene	µg/L	-	-	-
o-Xylene	µg/L	-	350	-
Xylenes	µg/L	-	-	-
Naphthalene	µg/L	-	16	50
Acenaphthylene	µg/L	-	-	-
Acenaphthene	µg/L	-	-	-
Fluorene	µg/L	-	-	-
Phenanthrene	µg/L	-	-	-
Anthracene	µg/L	-	-	-
Fluoranthene	µg/L	-	-	-
Pyrene	µg/L	-	-	-
Benzo(a)anthracene	µg/L	-	-	-
Chrysene	µg/L	-	-	-
Benzo(b+k)fluoranthene	µg/L	-	-	-
Benzo(a)pyrene	µg/L	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	-	-	-
Dibenzo(a,h)anthracene	µg/L	-	-	-
Benzo(g,h,i)perylene	µg/L	-	-	-
Benzo(a)pyrene TEQ	µg/L	-	-	-
Total +ve	µg/L	-	-	-
Arsenic	µg/L	-	13[b]	-
Cadmium	µg/L	2.49[a]	0.2	5.5
Chromium	µg/L	-	1[b]	4.4
Copper	µg/L	15.56[a]	1.4	1.3
Lead	µg/L	124.21[a]	3.4	4.4
Mercury	µg/L	-	0.06	0.4
Nickel	µg/L	122.26[a]	11	70
Zinc	µg/L	88.91[a]	8	15
pH	pH units	-	-	-
Electrical Conductivity	µS/cm	-	-	-
Calcium Carbonate (CaCO3)	mg/L	-	-	-

[1]Groundwater investigation levels for Fresh Waters (Schedule B1, NEPM)

[2]Groundwater investigation levels for Marine Waters (Schedule B1, NEPM)

[a] Hardness-modified trigger values (HMTV) as determined by the algorithm tabulated in Table 3.4.3 (ANZECC, 20000)

[b] The most conservative trigger values of the analyte has been selected due to analyte not being speciated.

Table 2: QC Sample Data Acceptance Criteria

QC Sample Type	Method of Assessment	Acceptable Range
Field QC		
Blind Replicates and Split Samples	The assessment of split replicate is undertaken by calculating the Relative Percent Difference (RPD) of the replicate concentration compared with the original sample concentration. The RPD is defined as: $RPD = 100 \times \frac{\lvert X_1 - X_2 \rvert}{Average}$ Where: X_1 and X_2 are the concentration of the original and replicate samples.	The acceptable range depends upon the levels detected: ▪ 0 – 100% RPD (When the average concentration is < 5 times the LOR/EQL) ▪ 0 – 75% RPD (When the average concentration is 5 to 10 times the LOR/EQL) ▪ 0 – 50% RPD (When the average concentration is > 10 times the LOR/EQL)
Blanks (Rinsate and Trip Blanks)	Each blank is analysed as per the original samples.	Analytical Result < LOR/EQL
Laboratory-prepared Trip Spike	The trip spike is analysed after returning from the field and the % recovery of the known spike is calculated.	70% - 130%
Laboratory QC		
Laboratory Duplicates	Assessment as per Blind Replicates and Split Samples.	The acceptable range depends upon the levels detected: ▪ 0 – 100% RPD (When the average concentration is < 4 times the LOR/EQL) ▪ 0 – 50% RPD (When the average concentration is 4 to 10 times the LOR/EQL) ▪ 0 – 30% RPD (When the average concentration is > 10 times the LOR/EQL)
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known spike or addition to the sample. $\% \text{ Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; C = Calculated Concentration.	70% - 130% (General Analytes) 50% - 130% (Phenols) 60% - 130% (OP Pesticides) If the result is outside the above ranges, the result must be < 3x Standard Deviation of the Historical Mean (calculated over past 12 months)
Method Blanks	Each blank is analysed as per the original samples.	Analytical Result < LOR/EQL

Note: EQL = Laboratory Estimated Quantitation Limit (EQL) or the minimum detection limit for a particular analyte. LOR = Limit of Reporting or the minimum

Table 3: Groundwater Analytical Results

Sample Location			MW1	MW2		MW3		MW5	ANZECC (2000) - HMTV Fresh Waters [a]	ANZECC (2000) 95% Species Protection - Fresh Waters [1]
Sample ID			TNG-MW1	TNG-MW2		TNG-MW3		TNG-MW5		
Date Sampled			9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17		
Laboratory report			177281	177281	177281	177281	177281	177281		
Sample Type			N	N	REP	N	REP	N		
Parameters	**Unit**	**PQL**								
TRH C6 - C9	µg/L	10	<10	<10	nt	<10	nt	<10	-	-
TRH C6 - C10	µg/L	10	<10	<10	nt	<10	nt	<10	-	-
FRACTION 1	µg/L	10	<10	<10	nt	<10	nt	<10	-	-
TRH C10 - C14	µg/L	50	<50	<50	nt	<50	nt	<50	-	-
TRH C15 - C28	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
TRH C29 - C36	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
TRH total C10 - C36	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
TRH >C10-C16	µg/L	50	<50	<50	nt	<50	nt	<50	-	-
FRACTION 2	µg/L	50	<50	<50	nt	<50	nt	<50	-	-
TRH >C16-C34	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
TRH >C34-C40	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
TRH total >C10-C40	µg/L	100	<100	<100	nt	<100	nt	<100	-	-
Benzene	µg/L	1	<1	<1	nt	<1	nt	<1	-	950
Toluene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Ethylbenzene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
m+p-xylene	µg/L	2	<2	<2	nt	<2	nt	<2	-	-
o-Xylene	µg/L	1	<1	<1	nt	<1	nt	<1	-	350
Xylenes	µg/L	2	<2	<2	nt	<2	nt	<2	-	-
Naphthalene	µg/L	1	<1	<1	nt	<1	nt	<1	-	16
Acenaphthylene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Acenaphthene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Fluorene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Phenanthrene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Anthracene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Fluoranthene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Pyrene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Benzo(a)anthracene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-

Table 10: Groundwater Analytical Results - Continued

Sample Location			MW1	MW2		MW3		MW5	ANZECC (2000) - HMTV Fresh Waters [a]	ANZECC (2000) 95% Species Protection - Fresh Waters [1]
Sample ID			TNG-MW1	TNG-MW2		TNG-MW3		TNG-MW5		
Date Sampled			9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17	9-Oct-17		
Laboratory report			177281	177281	177281	177281	177281	177281		
Sample Type			N	N	REP	N	REP	N		
Chrysene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Benzo(b+k)fluoranthene	µg/L	2	<2	<2	nt	<2	nt	<2	-	-
Benzo(a)pyrene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Dibenzo(a,h)anthracene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Benzo(g,h,i)perylene	µg/L	1	<1	<1	nt	<1	nt	<1	-	-
Benzo(a)pyrene TEQ	µg/L	5	<5	<5	nt	<5	nt	<5	-	-
Total +ve	µg/L	1	NIL (+)VE	NIL (+)VE	nt	NIL (+)VE	nt	NIL (+)VE	-	-
Arsenic	µg/L	1	<1	<1	nt	<1	nt	<1	-	13[b]
Cadmium	µg/L	0.1	<0.1	0.2	nt	<0.1	nt	0.1	2.49[a]	0.2
Chromium	µg/L	1	<1	<1	nt	<1	nt	1	-	1[b]
Copper	µg/L	1	**3**	**3**	nt	**2**	nt	1	-	1.4
Lead	µg/L	1	<1	<1	nt	<1	nt	<1	124.21[a]	3.4
Mercury	µg/L	0.05	<0.05	<0.05	nt	<0.05	nt	<0.05	-	0.06
Nickel	µg/L	1	6	21	nt	7	nt	7	122.26[a]	11
Zinc	µg/L	1	3	26	nt	28	nt	3	88.91[a]	8
pH	pH units	0.01	7.4	6	nt	6.7	nt	7.5	-	-
Electrical Conductivity	µS/cm	1	1200	14000	nt	1200	nt	1400	-	-
Calcium Carbonate (CaCO3)	mg/L	5	630	770	nt	510	nt	620	-	-

Notes:

BOLD - exceedance of trigger value

nt- not tested

* indicates moderate reliability ESL trigger values

[1]Groundwater investigation levels for Fresh Waters (Schedule B1, NEPM)

[2]Groundwater investigation levels for Marine Waters (Schedule B1, NEPM)

[a] Hardness-modified trigger values (HMTV) as determined by the algorithm tabulated in Table 3.4.3 (ANZECC, 20000)

[b] The most conservative trigger values of the analyte has been selected due to analyte not being speciated.

Table 4a: Groundwater RPD tabulated results

					Sample ID	TNG-MW5	QAQC1	QAQC2	Average	Blind RPD	Average	Split RPD
					Sample Type	Original	Blind replicate	Split replicate				
					Laboratory report	ELS 177281	ELS 177281	ALS ES1725319				
Parameters	Unit	Primary PQL	Blind PQL	Split PQL					µg/L	%	µg/L	%
TRH C6 - C9	µg/L	10	10	20	<10	<10	<10	N/A	N/A	N/A	N/A	
TRH C6 - C10	µg/L	10	10	20	<10	<10	<10	N/A	N/A	N/A	N/A	
FRACTION 1	µg/L	10	10	20	<10	<10	<10	N/A	N/A	N/A	N/A	
TRH C10 - C14	µg/L	50	50	50	<50	<50	<50	N/A	N/A	N/A	N/A	
TRH C15 - C28	µg/L	100	100	100	<100	<100	<100	N/A	N/A	N/A	N/A	
TRH C29 - C36	µg/L	100	100	50	<100	<100	<100	N/A	N/A	N/A	N/A	
TRH >C10-C16	µg/L	50	50	50	<50	<50	<50	N/A	N/A	N/A	N/A	
FRACTION 2	µg/L	50	50	100	<50	<50	<50	N/A	N/A	N/A	N/A	
TRH >C16-C34	µg/L	100	100	100	<100	<100	<100	N/A	N/A	N/A	N/A	
TRH >C34-C40	µg/L	100	100	100	<100	<100	<100	N/A	N/A	N/A	N/A	
Benzene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Toluene	µg/L	1	1	2	<1	<1	<2	N/A	N/A	N/A	N/A	
Ethylbenzene	µg/L	1	1	2	<1	<1	<2	N/A	N/A	N/A	N/A	
m+p-xylene	µg/L	2	2	2	<2	<2	<2	N/A	N/A	N/A	N/A	
o-Xylene	µg/L	1	1	2	<1	<1	<2	N/A	N/A	N/A	N/A	
Naphthalene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Acenaphthylene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Acenaphthene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Fluorene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Phenanthrene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Anthracene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Fluoranthene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Pyrene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Benzo(a)anthracene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Chrysene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Benzo(b+k)fluoranthene	µg/L	2	2	1	<2	<2	<1	N/A	N/A	N/A	N/A	
Benzo(a)pyrene	µg/L	1	1	0.5	<1	<1	<0.5	N/A	N/A	N/A	N/A	
Indeno(1,2,3-c,d)pyrene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Dibenzo(a,h)anthracene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Benzo(g,h,i)perylene	µg/L	1	1	1	<1	<1	<1	N/A	N/A	N/A	N/A	
Benzo(a)pyrene TEQ	µg/L	5	5	5	<5	<5	<5	N/A	N/A	N/A	N/A	
Total +ve	µg/L	1	1	0.5	NIL (+)VE	NIL (+)VE	<0.5	N/A	N/A	N/A	N/A	
Arsenic	µg/L	1	1	1	4	4	5	4	0.0%	4.5	22.2%	
Cadmium	µg/L	0.1	0.1	0.1	0.7	0.7	0.7	0.7	0.0%	0.7	0.0%	
Chromium	µg/L	1	1	1	8	8	10	8	0.0%	9.0	22.2%	
Copper	µg/L	1	1	1	12	12	14	12	0.0%	13.0	15.4%	
Lead	µg/L	1	1	1	3	3	4	3	0.0%	3.5	28.6%	
Mercury	µg/L	0.05	0.05	0.1	<0.05	<0.05	<0.1	N/A	N/A	N/A	N/A	
Nickel	µg/L	1	1	1	15	16	18	15.5	6.5%	16.5	18.2%	
Zinc	µg/L	1	1	1	34	34	45	34	0.0%	39.5	27.8%	
pH	pH units	0.01	0.01	0.01	7.5	7.5	7.8	7.5	0.0%	7.7	3.9%	
Electrical Conductivity	uS/cm	1	1	1	1400	1400	1400	1400	0.0%	1400	0.0%	
Calcium Carbonate	mg/L	5	5	1	620	610	391	615	1.6%	505.5	45.3%	

Table 4b: Groundwater QA/QC tabulated results

			Soil Sample	TB
			Sample Type	Trip Blank
			Laboratory report	ELS 177281
Parameters	Unit	Primary PQL		
TRH C6 - C9	µg/L	10	<10	
TRH C6 - C10	µg/L	10	<10	
FRACTION 1	µg/L	10	nt	
TRH C10 - C14	µg/L	50	nt	
TRH C15 - C28	µg/L	100	nt	
TRH C29 - C36	µg/L	100	nt	
TRH >C10-C16	µg/L	50	nt	
FRACTION 2	µg/L	50	nt	
TRH >C16-C34	µg/L	100	nt	
TRH >C34-C40	µg/L	100	nt	
Benzene	µg/L	1	<1	
Toluene	µg/L	1	<2	
Ethylbenzene	µg/L	1	<2	
m+p-xylene	µg/L	2	<2	
o-Xylene	µg/L	1	<2	

Table 5: Surface Water Results (ADE, 2014)

Sample ID	7773-C22	7773-C23	7773-C24	7773-C25	ANZECC 95% Species Protection [1] µg/L	Hardness-adjusted trigger values (ANZECC (2000) 95% Species Protection) µg/L
Sample Location	**SS-01**	**SS-02**	**SS-03**	**SS-04**		
Date of Sampling	**25/6/2014**	**25/6/2014**	**25/6/2014**	**25/6/2014**		
Metals						
Arsenic	<1	<1	<1	<1	**13**[e]	-
Cadmium	0.10	0.10	0.10	0.10	**0.2**	**2.49**[a]
Chromium (total)	<1	<1	<1	<1	**1**[f]	-
Copper	1	**2**	**3**	**3**	**1.4**	-
Lead	<1	<1	<1	<1	**3.4**	**124.21**[a]
Mercury	<0.1	<0.1	<0.1	<0.1	**0.06** [b]	-
Nickel	1	2	1	2	**11**	**122.26**[a]
Zinc	<5	<5	<5	<5	**8**	**88.91**[a]
TRH						
TRH C10-C16	<50	<50	<50	<50	-	-
TRH C16-C34	<100	<100	<100	<100	-	-
TRH C34-C40	<100	<100	<100	<100	-	-
PAH						
Napthalene	<0.1	<0.1	<0.1	<0.1	**16**	-
Anthracene	<0.1	<0.1	<0.1	<0.1	**0.01** [a, b]	-
Phenanthrene	<0.1	<0.1	<0.1	<0.1	**0.6** [a, b]	-
Fluoranthene	<0.1	<0.1	<0.1	<0.1	**1.0** [a, b]	-
Benzo(a)pyrene	<0.1	<0.1	<0.1	<0.1	**0.1** [a, b]	-

Notes:

- No Investigation Level Assigned

Indicates contaminant above ANZECC Guidelines (trigger level)

1 Trigger values adopted (level of protection: 95% of species for slightly-moderately disturbed systems), Australian and New Zealand Guidelines for Marine Water Quality, Australian and New Zealand Environment and Conservation Council, 2000

2 Maximum of 600 µg/l for sum of TRH>C10-C40 (adapted from Netherlands Intervention Values).

3 Adjusted trigger value for 'Extremely Hard' water (>400 mg/L CaCo3)

a.In the absence of a high reliability concentration, the moderate or low reliability guideline concentration has been adopted.

b.Due to the potential for the chemical to bioaccumulate, a 99% percent protection level has been adopted.

c.Figure may not protect key species from chronic toxicity, ANZECC 2000.

d.As total concentration was reported for the analyte, the most stringent valence threshold was adopted.

e.As total Arsenic is provided in analytical results, the most stringent criteria of As III and As V has been adopted.

f.As total chromium is provided in analytical results, the most stringent criteria of Cr III and Cr VI has been adopted.

Appendix A
Laboratory Certificates

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

CERTIFICATE OF ANALYSIS 177281

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Erin Millar
Address	Suite 3, Level 1, 55 Grandview Street, Pymble, NSW, 2073

Sample Details

Your Reference	**CES160707-ECS**
Number of Samples	6 Water
Date samples received	09/10/2017
Date completed instructions received	09/10/2017

Analysis Details

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

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

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

Report Details

Date results requested by	16/10/2017
Date of Issue	16/10/2017

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

Results Approved By
Dragana Tomas, Senior Chemist
Jaimie Loa-Kum-Cheung, Senior Chemist
Priya Samarawickrama, Senior Chemist
Steven Luong, Chemist

Authorised By

David Springer, General Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		177281-1	177281-2	177281-3	177281-4	177281-5
Your Reference	UNITS	TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5	QAQC1
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Date analysed	-	11/10/2017	11/10/2017	11/10/2017	11/10/2017	11/10/2017
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	101	99	101	105	101
Surrogate toluene-d8	%	101	95	100	102	102
Surrogate 4-BFB	%	94	94	93	79	95

vTRH(C6-C10)/BTEXN in Water		
Our Reference		177281-6
Your Reference	UNITS	TB
Date Sampled		04/10/2017
Type of sample		Water
Date extracted	-	10/10/2017
Date analysed	-	11/10/2017
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	99
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	98

svTRH (C10-C40) in Water						
Our Reference		177281-1	177281-2	177281-3	177281-4	177281-5
Your Reference	UNITS	TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5	QAQC1
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Date analysed	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	104	90	98	104	109

PAHs in Water						
Our Reference		177281-1	177281-2	177281-3	177281-4	177281-5
Your Reference	UNITS	TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5	QAQC1
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Date analysed	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Naphthalene	µg/L	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	78	74	77	79	84

HM in water - total						
Our Reference		177281-1	177281-2	177281-3	177281-4	177281-5
Your Reference	UNITS	TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5	QAQC1
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Date analysed	-	10/10/2017	10/10/2017	10/10/2017	10/10/2017	10/10/2017
Arsenic-Total	µg/L	9	9	<1	4	4
Cadmium-Total	µg/L	0.1	0.1	<0.1	0.7	0.7
Chromium-Total	µg/L	41	5	5	8	8
Copper-Total	µg/L	66	19	6	12	12
Lead-Total	µg/L	27	5	2	3	3
Mercury-Total	µg/L	0.30	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	61	27	9	15	16
Zinc-Total	µg/L	130	54	33	34	34

Miscellaneous Inorganics						
Our Reference	UNITS	177281-1	177281-2	177281-3	177281-4	177281-5
Your Reference		TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5	QAQC1
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
Date analysed	-	09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
pH	pH Units	7.4	6.0	6.7	7.5	7.5
Electrical Conductivity	µS/cm	1,200	14,000	1,200	1,400	1,400
Total Alkalinity as $CaCO_3$	mg/L	630	770	510	620	610

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			10/10/2017	5	10/10/2017	10/10/2017		10/10/2017	[NT]
Date analysed	-			11/10/2017	5	11/10/2017	11/10/2017		11/10/2017	[NT]
TRH C_6 - C_9	µg/L	10	Org-016	<10	5	<10	<10	0	116	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-016	<10	5	<10	<10	0	116	[NT]
Benzene	µg/L	1	Org-016	<1	5	<1	<1	0	107	[NT]
Toluene	µg/L	1	Org-016	<1	5	<1	<1	0	120	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	5	<1	<1	0	113	[NT]
m+p-xylene	µg/L	2	Org-016	<2	5	<2	<2	0	119	[NT]
o-xylene	µg/L	1	Org-016	<1	5	<1	<1	0	112	[NT]
Naphthalene	µg/L	1	Org-013	<1	5	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	103	5	101	105	4	100	[NT]
Surrogate toluene-d8	%		Org-016	96	5	102	95	7	112	[NT]
Surrogate 4-BFB	%		Org-016	94	5	95	95	0	109	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			10/10/2017	5	10/10/2017	10/10/2017		10/10/2017	[NT]
Date analysed	-			10/10/2017	5	10/10/2017	10/10/2017		10/10/2017	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50	5	<50	<50	0	94	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100	5	<100	<100	0	95	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100	5	<100	<100	0	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-003	<50	5	<50	<50	0	94	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-003	<100	5	<100	<100	0	95	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-003	<100	5	<100	<100	0	86	[NT]
Surrogate o-Terphenyl	%		Org-003	87	5	109	104	5	77	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			10/10/2017	5	10/10/2017	10/10/2017		10/10/2017	[NT]
Date analysed	-			10/10/2017	5	10/10/2017	10/10/2017		10/10/2017	[NT]
Naphthalene	µg/L	1	Org-012	<1	5	<1	<1	0	70	[NT]
Acenaphthylene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Fluorene	µg/L	1	Org-012	<1	5	<1	<1	0	85	[NT]
Phenanthrene	µg/L	1	Org-012	<1	5	<1	<1	0	86	[NT]
Anthracene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-012	<1	5	<1	<1	0	73	[NT]
Pyrene	µg/L	1	Org-012	<1	5	<1	<1	0	72	[NT]
Benzo(a)anthracene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-012	<1	5	<1	<1	0	82	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-012	<2	5	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1	5	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	73	5	84	72	15	82	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	177281-4
Date prepared	-			10/10/2017	3	10/10/2017	10/10/2017		10/10/2017	10/10/2017
Date analysed	-			10/10/2017	3	10/10/2017	10/10/2017		10/10/2017	10/10/2017
Arsenic-Total	µg/L	1	Metals-022	<1	3	<1	<1	0	100	109
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	3	<0.1	<0.1	0	105	112
Chromium-Total	µg/L	1	Metals-022	<1	3	5	5	0	99	107
Copper-Total	µg/L	1	Metals-022	<1	3	6	6	0	96	98
Lead-Total	µg/L	1	Metals-022	<1	3	2	2	0	100	106
Mercury-Total	µg/L	0.05	Metals-021	<0.05	3	<0.05	[NT]		111	[NT]
Nickel-Total	µg/L	1	Metals-022	<1	3	9	9	0	99	104
Zinc-Total	µg/L	1	Metals-022	<1	3	33	34	3	101	109

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	177281-3
Date prepared	-			[NT]	2	10/10/2017	10/10/2017		[NT]	10/10/2017
Date analysed	-			[NT]	2	10/10/2017	10/10/2017		[NT]	10/10/2017
Arsenic-Total	µg/L	1	Metals-022	[NT]	2	9	[NT]		[NT]	[NT]
Cadmium-Total	µg/L	0.1	Metals-022	[NT]	2	0.1	[NT]		[NT]	[NT]
Chromium-Total	µg/L	1	Metals-022	[NT]	2	5	[NT]		[NT]	[NT]
Copper-Total	µg/L	1	Metals-022	[NT]	2	19	[NT]		[NT]	[NT]
Lead-Total	µg/L	1	Metals-022	[NT]	2	5	[NT]		[NT]	[NT]
Mercury-Total	µg/L	0.05	Metals-021	[NT]	2	<0.05	<0.05	0	[NT]	90
Nickel-Total	µg/L	1	Metals-022	[NT]	2	27	[NT]		[NT]	[NT]
Zinc-Total	µg/L	1	Metals-022	[NT]	2	54	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			09/10/2017	[NT]	[NT]	[NT]	[NT]	09/10/2017	[NT]
Date analysed	-			09/10/2017	[NT]	[NT]	[NT]	[NT]	09/10/2017	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	104	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph: 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph: 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph: 03 9763 2500 / melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph: 08 7087 6800 / adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph: 07 3266 9532 / brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
Ph: 08 8967 1201 / darwin@envirolab.com.au

Client: Consulting Earth Scientists	**Client Project Name / Number / Site etc (ie report title):** CES160707-ECS
Contact Person: Erin Millar	
Project Mgr: Erin Millar	**PO No.:**
Sampler: Erin Millar	**Envirolab Quote No. :**
Address: Level 1, Suite 3, 55-65 Grandview Street, Pymble NSW 2073	**Date results required:** Or choose: **standard** / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: **Mob:** 0439 261 637	**Additional report format:** esdat / equis /
Email: erin.millar@consultingearth.com.au, mark.challoner@consultingearth.com.au	**Lab Comments:**

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	EC	pH	CACO3	TRH/BTEX										Provide as much information about the sample as you can
1	TNG-MW1	-	9-Oct	Water	x	x	x	x											Not enough water to fill all sample bottles supplied for sample 'TNG-MW1'. Please contact if not all requested tests can be conducted.
2	TNG-MW2	-	9-Oct	Water	x	x	x	x											
3	TNG-MW3	-	9-Oct	Water	x	x	x	x											
4	TNG-MW5	-	9-Oct	Water	x	x	x	x											
5	QAQC1	-	9-Oct	Water	x	x	x	x											
6 \	QAQC2	-	9-Oct	Water	Please forward to ALS for above analytes (Combo 3, EC, pH &CaCO3)														
6	TB		4/10	Water					x										
	Received at 16:00 9/10. AZ																		

Relinquished by (Company):	CES	**Received by (Company):**	ELS.	***Lab Use Only***	
Print Name:	Erin Millar	**Print Name:**	Andy Zhang.	**Job number:** 177281	**Cooling:** Ice / Ice pack / None
Date & Time:	9/10/2017 at 1:45 pm	**Date & Time:**	9/10. 13.65.	**Temperature:** 8.2.	**Security seal:** Intact / Broken / None
Signature:	Erin Millar	**Signature:**	AZ.	**TAT Req** - SAME day / 1 / 2 / 3 / 4 / STD	

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

CERTIFICATE OF ANALYSIS 177281-A

Client Details

Client	Consulting Earth Scientists Pty Ltd
Attention	Erin Millar
Address	Suite 3, Level 1, 55 Grandview Street, Pymble, NSW, 2073

Sample Details

Your Reference	**CES160707-ECS**
Number of Samples	6 Water
Date samples received	09/10/2017
Date completed instructions received	16/10/2017

Analysis Details

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

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

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

Report Details

Date results requested by	23/10/2017
Date of Issue	17/10/2017

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

Results Approved By
Long Pham, Team Leader, Metals

Authorised By

David Springer, General Manager

HM in water - dissolved					
Our Reference		177281-A-1	177281-A-2	177281-A-3	177281-A-4
Your Reference	UNITS	TNG-MW1	TNG-MW2	TNG-MW3	TNG-MW5
Date Sampled		09/10/2017	09/10/2017	09/10/2017	09/10/2017
Type of sample		Water	Water	Water	Water
Date prepared	-	17/10/2017	17/10/2017	17/10/2017	17/10/2017
Date analysed	-	17/10/2017	17/10/2017	17/10/2017	17/10/2017
Arsenic-Dissolved	µg/L	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	0.2	<0.1	0.1
Chromium-Dissolved	µg/L	<1	<1	<1	1
Copper-Dissolved	µg/L	3	3	2	1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	6	21	7	7
Zinc-Dissolved	µg/L	3	26	28	3

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			17/10/2017	[NT]	[NT]	[NT]	[NT]	17/10/2017	[NT]
Date analysed	-			17/10/2017	[NT]	[NT]	[NT]	[NT]	17/10/2017	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	104	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1725319**	Page	: 1 of 6
Client	: **CONSULTING EARTH SCIENTISTS**	Laboratory	: Environmental Division Sydney
Contact	: ERIN MILLAR	Contact	: Customer Services ES
Address	: Suite 3, Level 1 55-65 Grandview Street PYMBLE NSW, AUSTRALIA 2073	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 8569 2200	Telephone	: +61-2-8784 8555
Project	: CES160707-ECS	Date Samples Received	: 10-Oct-2017 16:50
Order number	: ----	Date Analysis Commenced	: 10-Oct-2017
C-O-C number	: ----	Issue Date	: 17-Oct-2017 14:19
Sampler	: ----		
Site	: ----		
Quote number	: SYBQ/521/16		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
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ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QAQC2	----	----	----	----
				Client sampling date / time	09-Oct-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1725319-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.80**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**1400**	----	----	----	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		**391**	----	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.005**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		**0.0007**	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		**0.010**	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.014**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		**0.004**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.018**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.045**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QAQC2	----	----	----	----
				Client sampling date / time	09-Oct-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1725319-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**25.4**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		**58.7**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		**87.7**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**61.4**	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%		**85.4**	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		**82.7**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**89.5**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**QAQC2**	**----**	**----**	**----**	**----**
				Client sampling date / time	09-Oct-2017 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**ES1725319-001**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
Toluene-D8	2037-26-5	2	%		**91.9**	**----**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**91.6**	**----**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

Appendix B
Field Data Sheets and Equipment Calibration Certificates

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Dial A Dump Industries**	**CES Project Code:**	**CES160707-ECS**
Project:	**TNG - Perched Gorundwater Assessment**	**Location:**	**TNG Energy from Waste Facility**
Sampler (s):	E.MILLAR **Signature(s):** EM	**Project Manager:**	**M. Challoner**
BH ID:	MW1	**Sample ID:**	TNG - MW1
Purging Date:	29/9/17	**Sampling Date:**	9/10/17

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater:	YES/NO
Comments: Brown, turbid, odourless at time of development	YES/NO		

Standing Water Level (SWL):	11.93 (mBTOC)	Weather Conditions			
Well volume:	2 (L)	Temperature:	°C		
Water level after purging:	~~Dry~~ (mBTOC)	Clear	Partly Cloudy	Overcast	
Water level at time of sampling:	12.22 (mBTOC)				
Volume of water purged:	(L)	Calm	Slight breeze	Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy			
Sampling equipment:	Pump / Bailer	Fine	Showers	Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO ($mg.L^{-1}$)	EC ($uS.cm^{-1}$)	pH -	Eh mV	Temp. (°C)	Comments
		3.69	1205	6.88	93%	26.5	Pale brown, turbid, odourless

Groundwater field parameters at the end of purging to be marked "Field Measurements".

* Grab sample due to insufficient volume in well to sample via micro-purging.

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Dial A Dump Industries**	**CES Project Code:**	**CES160707-ECS**
Project:	**TNG - Perched Groundwater Assessment**	**Location:**	**TNG Energy From Waste Facility**
Sampler (s):	E.MILLAR **Signature(s):** EM	**Project Manager:**	**M. Challoner**
BH ID:	MW2	**Sample ID:**	TNG - MW2
Purging Date:	29/9/17	**Sampling Date:**	9/10/17

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments: Brown, turbid & odourless As time of development. *Auto	YES/NO		

Standing Water Level (SWL):	2.42 (mBTOC)	Weather Conditions			
Well volume:	32 (L)	Temperature:	°C		
Water level after purging:	DRY (mBTOC)	Clear	Partly Cloudy	Overcast	
Water level at time of sampling:	2.89 (mBTOC)				
Volume of water purged:	(L)	Calm	Slight breeze	Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy			
Sampling equipment:	Pump / Bailer	Fine	Showers	Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO ($mg.L^{-1}$)	EC ($uS.cm^{-1}$)	pH -	Eh mV	Temp. (°C)	Comments
10:37	-	4.54	11590	6.44	167	24.6	yellow/ Brown, turbid, odourless
2	1.0	2.76	15660	6.17	143	19.0	"
4	1.5	2.37	15790	6.14	139	18.6	"
6	2	1.87	15440	6.09	133	18.3	"
8	3	1.53	14970	6.05	130	18.3	"
10	4	1.41	14800	6.04	129	18.3	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Dial A Dump Industries**	**CES Project Code:**	**CES160707-ECS**
Project:	**TNG - Perched Groundwater Assessment**	**Location:**	**TNG Energy From Waste Facility**
Sampler (s):	E. MILLAR **Signature(s):** EM	**Project Manager:**	**M. Challoner**
BH ID:	MW3	**Sample ID:**	TNG - MW3
Purging Date:	29/9/17	**Sampling Date:**	9/10/17

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments: Brown, turbid, odourless during development	YES/NO		

Standing Water Level (SWL):	2.60 (mBTOC)	Weather Conditions			
Well volume:	23 (L)	Temperature:	°C		
Water level after purging:	Dry (mBTOC)	Clear	Partly Cloudy	Overcast	
Water level at time of sampling:	2.90 (mBTOC)				
Volume of water purged:	(L)	Calm	Slight breeze	Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy			
Sampling equipment:	Pump / Bailer	Fine	Showers	Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO ($mg.L^{-1}$)	EC ($uS.cm^{-1}$)	pH -	Eh mV	Temp. (°C)	Comments
10:05	-	7.21	1145	6.87	202	22.8	Pale brown, slightly turbid odourless
2	0.5	6.07	1215	6.51	206	19.5	"
4	1.0	5.32	1220	6.28	208	18.9	"
6	1.5	4.32	1205	6.19	209	18.7	"
8	2.0	3.68	1200	6.10	209	18.6	"
10	2.5	3.09	1187	6.07	209	18.6	"
12	3.0	2.80	1189	6.02	208	18.6	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client: Dial A Dump Industries	**CES Project Code:** CES160707-ECS
Project: TNG - Perched Groundwater Assessment	**Location:** TNG Energy From Waste Facility
Sampler (s): E.MILLAR **Signature(s):** EM	**Project Manager:** M. Challoner
BH ID: MW4	**Sample ID:** —
Purging Date: 29/9/17	**Sampling Date:** —

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments: Monument & well damaged. Blocked @ 0.72mbtoc	YES/NO		
Standing Water Level (SWL): —	(mBTOC)	Weather Conditions	
Well volume:	(L)	Temperature:	°C
Water level after purging:	(mBTOC)	Clear / Partly Cloudy / Overcast	
Water level at time of sampling:	(mBTOC)		
Volume of water purged:	(L)	Calm / Slight breeze / Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy	
Sampling equipment:	Pump / Bailer	Fine / Showers / Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO ($mg.L^{-1}$)	EC ($uS.cm^{-1}$)	pH -	Eh mV	Temp. (°C)	Comments

Groundwater field parameters at the end of purging to be marked "Field Measurements".

CONSULTING EARTH SCIENTISTS

GROUNDWATER FIELD DATA SHEET

Client:	**Dial A Dump Industries**	**CES Project Code:**	**CES160707-ECS**
Project:	**TNG - Perched Groundwater Assessment**	**Location:**	**TNG Energy From Waste Facility**
Sampler (s):	E. MILLAR **Signature(s):** EM	**Project Manager:**	**M. Challoner**
BH ID:	MW5	**Sample ID:**	TNG-MW5 / QAQC1 / QAQC2
Purging Date:	29/9/17	**Sampling Date:**	9/10/17

Well Status

Well damaged:	YES/NO	Well locked:	YES/NO
Cement footing damaged:	YES/NO	Cap on PVC casing:	YES/NO
Internal obstructions in casing:	YES/NO	Well ID visible:	YES/NO
Standing water, vegetation around monument:	YES/NO	Monument damaged:	YES/NO
Water between PVC and protective casing:	YES/NO	Odours from groundwater	YES/NO
Comments: Grey, turbid sediments at time of development.	YES/NO		

Standing Water Level (SWL):	5.36 (mBTOC)	Weather Conditions			
Well volume:	12 (L)	Temperature:	°C		
Water level after purging:	Dry (mBTOC)	Clear	Partly Cloudy	Overcast	
Water level at time of sampling:	5.58 (mBTOC)				
Volume of water purged:	1.5 (L)	Calm	Slight breeze	Moderate Breeze	
Purging equipment:	Pump / micro-Purging / Bailer / Foot Valve	Windy			
Sampling equipment:	Pump / Bailer	Fine	Showers	Rain	

Purging Details

Elapsed time (min)	Cumulative volume (L)	DO (mg.L^{-1})	EC (uS.cm^{-1})	pH -	Eh mV	Temp. (°C)	Comments
9:21	-	4.39	1413	6.45	214	20.7	Brown, slightly turbid sediments
2	0.5	3.12	1416	6.45	217	19.1	"
4	1.0	2.49	1422	6.47	222	18.8	"
6	1.5	2.20	1422	6.52	226	18.9	"

Groundwater field parameters at the end of purging to be marked "Field Measurements".

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Equipment Certification Report – TPS 90FLMV Water Quality Meter

This Water Quality Meter has been performance checked and calibrated as follows:

Sensor	Concentration	Span 1	Span 2	Traceability Lot #	Pass?
pH	pH 7.00 / pH 4.00	7.00 pH	4.01 pH	295212/303496	☑
Conductivity	12.88mS/cm	0.0 mS/cm	12.88 mS/cm	306044	☑
TDS	36 ppk	ppk	check only ppk	306264	☑
Dissolved Oxygen	Sodium Sulphite / Air	0.0 ppm in Sodium Sulphite	8.88 ppm Saturation in Air	5253 300125	☑

Check only

Redox (ORP) *	Electrode operability test	240mV +/- 10% 238	236 mV	305342 306359	☑

* This meter uses an Ag/AgCl ORP electrode. To convert readings to SHE (Standard Hydrogen Electrode), add 199mV to the mV reading.

☑ Battery Status 8.3 (min 7.2V)
☐ Electrical Safety Tag attached (AS/NZS 3760)

☑ Temperature 21.0 °C
☐ Electrodes Cleaned and checked

Tag No: 000923

Valid to: 30/11/2017

Date: 06/10/2017

Signed: [signature]

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☑	☐	90FLMV Unit. Ops check/Battery status: 8.3
☑	☐	pH sensor with wetting cap, 5m
☐	☐	Conductivity/TDS/Temperature K=10 sensor, 5m
☑	☐	Dissolved oxygen YSI5739 sensor with wetting cap, 5m
☑	☐	Redox (ORP) sensor with wetting cap, 5m
☑	☐	Power supply 240V to 12V DC 200mA
☑	☐	Instruction Manual
☑	☐	Quick Guide
☑	☐	Syringe with storage solution for pH and ORP sensors
☐	☐	Carry Case
☑	☐	Check to confirm electrical safety (tag must be valid)

Date: 06/10/2017

Signed: [signature]

TFS Reference	CS007618	Return Date:	/ /
Customer Reference		Return Time:	
Equipment ID	90FLMV-2	Condition on return:	
Equipment Serial No.	W4488		

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Equipment Report – Micropurge Kit (MP15)

This system has been performance checked as follows:

Sample Pro Pump		
☑ Components Cleaned / checked	☑ Ops check	
☑ MP15 Controller	☐ Included in kit	☐ Not included in kit
☑ Components Cleaned / checked	☑ Ops check	
☑ Battery check – On/Off	☐ Flow response	

Date: 06/10/2017 Checked by: MILENKO

Signed: JM

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

Sent	Received	Returned	Item
☑	☐	☐	MP15 Control & Power Pack
☑	☐	☐	CO2 cylinder (installed in MP15 backpack)
☑	☐	☐	Gas regulator
☑	☐	☐	Tube cutter
☑	☐	☐	Quick Start Guide
☑	☐	☐	MP15 Users Guide + Pump operating instructions
☑	☐	☐	Sample Pro Stainless Steel Pump ID: QSP6P-6
☑	☐	☐	2 Bladder
☑	☐	☐	Flow cell ID: ~~EFC~~ 500SR
☑	☐	☐	Stainless Steel Hanger Cable, Clamp & Bracket 70 m
☑	☐	☐	Spare CO2 Cylinders, quantity: 1
☑	☐	☐	Gas Cylinder CO2 - Size C ID: 9203215627, 9201274377
☑	☐	☐	Maintenance kit (O rings, fittings, SS check ball, collect & screen if applicable)

Processors Signature/ Initials MS

EE Quote Reference	CS0076818	Condition on return
Customer Ref		
Equipment ID	QMP15SG	
Equipment serial no.		
Return Date	/ /	
Return Time		

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Equipment Report – Solinst Model 122 Interface Meter

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

Cleaned/Tested **Pass?** ☑**Yes** ☐**No**

☑Probe

☑Tape/Reel

☑ Performance Test & Battery Voltage Check (8.3V v) 8.0v minimum

Date: 06/10/2017 Checked by: Jerry

Signed: JS

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

Sent	Received	Returned	Item
☑	☐	☐	Operations check OK
☑	☐	☐	Plastic Box / Bag
☑	☐	☐	Spare 9V Battery Qty 1
☑	☐	☐	Probe Cleaning Brush
☐	☐	☐	Decon
☑	☐	☐	Instruction leaflet
☑	☐	☐	Tape Guide
☐	☐	☐	

Processors Signature/ Initials MS

Quote Reference	CS007618	Condition on return
Customer Ref		
Equipment ID	SOL122-11	
Equipment serial no.	236572	
Return Date	/ /	
Return Time		