



## Caley Valley Wetlands

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Ongoing Monitoring Progress Report, November 2019

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## Executive Summary

The Caley Valley is a nationally important wetland and is listed in the Directory of Important Wetlands in Australia. The site contains coastal grass sedge wetland, mangroves, saltmarsh, creeks and channels and a lake. The Caley Valley Wetlands complex is a large, relatively intact wetland system, covering an area of about 5154 hectares. Although the wetland has been modified, it supports a wide range of environmental values such as aquatic ecosystems, recreational use and cultural and spiritual values. Caley Valley Wetlands provide habitat for large numbers of waterbirds, including threatened and migratory birds, with up to 48,000 waterbirds observed on site during high use times (BAAM 2012).

This report outlines three rounds of monitoring of water and sediment quality undertaken in the Caley Valley wetland between October 2018 and March 2019. *In situ* water quality measured in January and March 2019 were slightly above Queensland Water Quality Guidelines (EHP 2009) for some parameters in the control area and sites in the potentially impacted area. These values are within historical ranges and reflective of site specific conditions in the wetland. Although the results were compared to the Queensland Water Quality Guidelines for upper estuaries, the Caley Valley wetland is a modified estuarine system, and only partially tidally influenced.

In terms of toxicants, metals in surface water samples collected in the Caley Valley wetlands were generally measured below guidelines (ANZG 2018). Exceedances of dissolved copper and silver occurred in the control area and further afield in the wetland, however did not occur in the potentially impacted sites. No polycyclic aromatic hydrocarbons (PAH) or BTEX (benzene, toluene, ethylbenzene and xylene) were detected in surface water samples in either January or March 2019.

Overall, this preliminary study found little evidence of contaminants in the surface sediments and waters of the Caley Valley wetland. Elevated values for some water and sediment quality parameters were found, but are not consistent over time and occur in both control and potentially impacted areas.

The results presented in the report do not indicate any issues for management.

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# 1 Introduction

The Caley Valley is a nationally important wetland and is listed in the Directory of Important Wetlands in Australia. The site contains coastal grass sedge wetland, mangroves, saltmarsh, creeks and channels and a lacustrine wetland (a lake). The Caley Valley Wetlands complex is a large, relatively intact wetland system, covering an area of about 5154 hectares. Although the wetland has been modified, it supports a wide range of wetland values such as aquatic ecosystem, recreational use and cultural and spiritual use. Caley Valley Wetlands are a Matter of State Environmental Significance, providing habitat for large numbers of waterbirds, including threatened and migratory birds, with up to 48,000 waterbirds observed on site during high use times (BAAM 2012). The coastal grass-sedge wetlands are particularly important habitat for the endangered Australian painted snipe (*Rostratula australis*) with sightings at several locations in the wetland (BAAM 2012). The wetland is located in the dry tropics and are subject to seasonal variations in the extent of fresh water inundation. The consequential wetting and drying cycle of these wetlands is critical to the environmental values they support.

The Caley Valley wetland is adjacent to, and downstream of, the Abbot Point Bulk Coal Terminal (Abbot Point Terminal) and was subject to an authorised temporary release of stormwater runoff from the coal terminal during Tropical Cyclone Debbie. Satellite imagery collected after Tropical Cyclone Debbie appeared to show dark waters downstream of the release point that extended into the wetland. In April 2017 government staff undertook a rapid assessment of the wetland and found that although there were indications of recent flooding, there was little visual evidence of coal fines across the whole of the wetland, apart from a site immediately downstream of the licensed discharge point. The Queensland Department of Environment and Science (DES) recommended further monitoring be undertaken by Abbot Point Bulkcoal Pty Ltd, as part of an Environmental Evaluation. In September 2018 DES decided to conduct its own long-term monitoring program in the Caley Valley Wetland (see <https://environment.des.qld.gov.au/management/monitoring/locations-of-interest/caley-valley-wetland> for more information).

This report outlines three rounds of monitoring of water and sediment quality undertaken in the Caley Valley wetland between October 2018 and March 2019. Information gathered from this monitoring will be used to design a longer term monitoring program to provide a baseline to assess impacts (if any) from uncontrolled releases from the Abbot Point Terminal in the future.

## 2 Methods

### 2.1 Sampling Sites

Two areas for monitoring were established in two separate arms of the wetland (Figure 1). The eastern arm represented an area likely to be directly impacted by a release from the Abbot Point Terminal. The western arm represented a control area that was less likely to be directly impacted by a release from the Abbot Point Terminal. In each area two transects were established, each originating at a location on the eastern bank and radiating westward and south-westward, respectively, with increasing distance from the origin. In the eastern, potentially impacted area, this origin coincided with the licensed release point for the Abbot Point Terminal. There were a total of seven sites in each area.

## 2.2 Timing

In October 2018 the wetland was completely dry and so only sediment samples were taken. In January 2019, the wetland was partially inundated and water samples were collected. In March 2019 the wetland was completely inundated, and both water and sediment samples were collected. It was not considered safe to sample at all sites in March 2019 due to the deep water and potential for crocodiles to be present. Sampling is summarised in Table 1.

**Table 1: Sample sites in the Caley Valley Wetland, and types of samples collected (S: Sediment samples, CF: Sediment for coal fine analysis, W: Water samples) in October 2018, January and March 2019.**

Location				
Site	October 2018	January 2019	March 2019	Comments
<b>Potential Impact Area</b>				
W1				Release Point
CV-T1-S1	S		S,W	Common start of both transects
CV-T1-S2	S		S	Transect 1, Site 2
CV-T1-S3	S		S	Transect 1, Site 3
CV-T1-S4	S	W	W	Transect 1, Site 4
CV-T2-S2	S		S	Transect 1, Site 2
CV-T2-S3	S		S	Transect 1, Site 3
CV-T2-S4	S			Transect 1, Site 4
<b>Control Area</b>				
CV-CT1-S1	S		W	Common start of both transects
CV-CT1-S2	S		W	Transect 1, Site 2
CV-CT1-S3	S		W	Transect 1, Site 3
CV-CT1-S4	S	W		Transect 1, Site 4
CV-CT2-S2	S			Transect 1, Site 2
CV-CT2-S3	S			Transect 1, Site 3
CV-CT2-S4	S			Transect 1, Site 4
<b>Other areas</b>				
CV-FW			W	Site in wetland
CV-SWC		W	W	Site in Saltwater Creek
CV-BO		W	W	Wetland site at outflow pipe on southern end of the eastern bund
CV-EB			W	Wetland site at northern end of the eastern bund

## 2.3 Water Sampling

At each sampling site where water was present, (Table 1) *in situ* water quality data were collected using a YSI 556 MPS multi-parameter meter. Water samples were taken for the analysis of metals and metalloids, polycyclic aromatic hydrocarbons (PAH) and BTEX (benzene, toluene, ethylbenzene and xylene). Powder free disposable gloves were used when collecting samples, with a fresh pair being used at each site to prevent contamination of samples. Samples were kept chilled on ice after collection and sent to Australian Laboratory Services (ALS), a National Association of Testing Authorities (NATA) Australia accredited laboratory, for analysis.

## 2.4 Sediment Sampling

At each sampling site (Table 1), composite sediment samples were collected. This involved randomly collecting five replicate samples of approximately 10 x 10 cm in area and 1 cm depth at each site and compositing them together before taking a subsample for analysis. This is a standard field sample practice as sediments can be highly heterogeneous (DES 2018). The use of composite samples are a way of adjusting for variation found in sediment samples. Samples were collected using a stainless steel trowel and were mixed in a stainless steel bowl. All equipment was thoroughly cleaned between sites. Disposable gloves were used when collecting samples, with a fresh pair used at each site. From a subset of composite samples, duplicate samples were obtained by splitting the contents of the bowl into two jars. Samples for the analysis of toxicants were kept chilled on ice after collection and sent to ALS for analysis. Additional sediment samples were collected and sent to ALS for coal fines analysis. To test for coal, a density separation method (float/sink testing) was performed on samples before further drying, crushing and microscopic analysis of the two separate density fractions. Samples were then prepared as per normal petrographic methods by mounting the crushed samples in an acrylic resin, and polishing to produce a suitable surface for reflected light microscopy. A point count of each sample was conducted with the material under the crosshairs of the microscope being classified as coal, mineral matter or organic matter. Five hundred points or a single pass of the entire area were counted on the sample at 500x magnification. Results were expressed as the percentage of coal fines and organic matter on a volume basis (for more information, see Appendix C and DSITI 2017).

## 2.5 Quality Control

Quality control (QC) samples were taken as per the Queensland Monitoring and Sampling Manual (DES 2018). Two field blanks were included in the March 2019 sampling round. A small concentration of dissolved boron (8 µg/L) and total nickel (0.6 µg/L) were found in one of the blank samples. However, as none of the samples exceeded guidelines for dissolved boron (370 µg/L) or nickel (dissolved nickel guideline value is 8 µg/L), this low level of contamination were not considered to be of concern. No dissolved boron or total nickel were found in the other blank sample. Therefore, the results of the laboratory analysis were deemed accurate. The results of the blank samples are shown in Appendix A.

## 2.6 Guidelines

The results of *in situ* and laboratory measurements were compared to the following guidelines:

- Total suspended solids and *in situ* results from surface water sampling were compared to Queensland Water Quality Guidelines (QWQG) for upper estuarine waters in the Central Coast Regions, Table 2 (EHP 2009).
- Laboratory results for analytes in surface water samples were compared to guideline values for upper estuarine waters in the Central Coast Regions, Table 2 (EHP 2009) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). Trigger values for cadmium, chromium, lead, nickel and zinc were modified (Table 7) according to the water hardness at each site using the method outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000).
- Results of total metals in sediment samples were compared to the ANZG (2018) sediment quality guidelines.





Figure 1: Sample locations at Caley Valley Wetlands at Abbot Point.

### 3 Results and Discussion

#### 3.1 Coal Fines in Sediment

Estimates of coal in the sediment in October 2018 and March 2019 showed that the highest percentage of coal (0.6 and 1.8 % respectively) were found at site CV-T1-S2 in the potentially impacted area (Table 2). Overall, the concentration of coal fines found in the sediment were low, and no coal was measured at the majority of sites.

**Table 2: Percentage of coal fines in sediment in the Caley Valley wetland in October 2018 and March 2019.**

Site	Percentage of coal fines in sediment (%mass)	
	October 2018	March 2019
<b>Potential Impact Area</b>		
CV-T1-S1	0.3	0.2
CV-T1-S2	0.6	1.8
CV-T1-S3	0.0	0.0
CV-T1-S4	0.0	–
CV-T2-S2	0.0	0.0
CV-T2-S3	0.0	0.0
CV-T2-S4	0.4	–
<b>Control Area</b>		
CV-CT1-S1	0.0	–
CV-CT1-S2	0.2	–
CV-CT1-S3	0.0	–
CV-CT1-S4	0.0	–
CV-CT2-S2	0.0	–
CV-CT2-S3	0.0	–
CV-CT2-S4	0.0	–

<sup>1</sup> Relative densities of 1400 kg·m<sup>-3</sup> for coal and 2600 kg·m<sup>-3</sup> for minerals (O'Brien 2017 and references therein) were used to calculate the mass abundance of coal and mineral in each sample (using mass = volume X density; where volume is equivalent to projected area basis percentage). Sites not sampled are denoted by '–'.

## 3.2 Water Quality Results

### *In situ* measurements

In January 2019 (Table 3):

- pH exceeded the QWQG (2009) at two of the four sites;
- dissolved oxygen concentration was above the guidelines at two sites, and below the guidelines at one site (CV–SWC); and
- electrical conductivity in all wetland sites was high (21.48 - 60.96 mS/cm), and comparatively low at the site in Saltwater Creek (1.90 mS/cm).

In March 2019 (Table 4):

- pH was below the guidelines at site W1, CV–T1–S1 and CV–T1–S2;
- pH was above the guidelines at two out of three sites in the control area and at all other sites in the wetland;
- dissolved oxygen concentration was either above or below the guidelines at all sites; and
- electrical conductivity was relatively low at all sites (1.3 - 2.7 mS/cm in the potentially impacted area, around 4.3 mS/cm in the control area, and 1.1 -2.8 mS/cm in other wetland areas).

Elevated pH levels have been reported in the wetlands previously, with pH exceeding the upper guideline value of pH 8.4 throughout the wetlands depending on the time of the year and site (BMT WBM 2015; DSITI 2017; GHD 2012), and a pH of greater than 9 measured historically throughout the wetland and Lake Caley (BMT WBM 2015).

Historically, dissolved oxygen concentrations have been highly variable in the wetland (BMT WBM 2015; DSITI 2017; GHD 2012), with concentrations of up to 325% saturation being measured in the wetland to the east of the eastern bund (BMT WBM 2015). Large mats of benthic algae and algae covering vegetation were noted at many sites, which likely contribute to the high concentrations of oxygen in the waters.

High electrical conductivities indicate a high concentration of ions in the water. The wetland has a variety of salinity levels, ranging from fresh to estuarine and hypersaline (BMT WBM 2015), depending on time of year and accumulated rainfall. In January 2019 the wetland sites had electrical conductivities that were brackish in the potential impact and control area (21.48 to 29.5 mS/cm). The site in the southern wetland (CV-BO) had a high electrical conductivity of 60.96 mS/cm. The salinities at the wetland sites were considered typical for the time of year and low rainfall conditions. In January 2019 the site at Saltwater Creek had a low conductivity. Saltwater Creek has been described as being of freshwater to brackish character (BMT WBM 2012, 2015; GHD 2012), and the measured salinities in January 2019 (1.9 mS/cm) lie well within the historical range for this creek (BMT WBM 2015). In March 2019, all sites in the wetland (1.3 to 4.3 mS/cm) and Saltwater Creek (1.1 mS/cm) had electrical conductivities tending towards freshwater, indicating wet season conditions and a large input of freshwater to the system.

**Table 3: *In situ* results from surface water sampling in January 2019 compared to Queensland Water Quality Guidelines (EHP 2009). Shaded cells indicate reported values that exceeded guideline values.**

Site	Date and time	Temperature (°C)	pH range	Dissolved oxygen (% saturation)	Electrical conductivity (mS/cm)
QWQG Upper Estuarine Central Coast Region			7.0-8.4	70-100	N/A
<b>Potential Impact Area</b>					
CV-T1-S4-0119	23/01/2019 13:10	35.82	7.55	106.2	21.48
<b>Control Area</b>					
CV-CT1-S4-0119	23/01/2019 16:15	33.27	9.18	110.0	29.50
<b>Other wetland areas</b>					
CV-BO-0119	23/01/2019 17:00	31.44	8.86	97.3	60.96
CV-SWC-0119	23/01/2019 9:15	25.82	7.49	49.0	1.90

**Table 4: *In situ* results from surface water sampling in March 2019 compared to Queensland Water Quality Guidelines (EHP 2009). Shaded cells indicate reported values that exceeded guideline values.**

Site	Date and time	Temperature (°C)	pH range	Dissolved oxygen (% saturation)	Electrical conductivity (mS/cm)
QWQG Upper Estuarine Central Coast Region			7.0-8.4	70-100	N/A
<b>Potential Impact Area</b>					
W1	6/03/2019 11:00	28.13	6.95	5.9	1.529
CV-T1-S1-0319	5/03/2019 12:05	32.5	6.72	35.7	1.304
CV-T1-S2-0319	5/03/2019 13:45	31.40	6.74	40.2	1.688
CV-T1-S3-0319	5/03/2019 15:00	29.45	7.94	107.6	2.629
CV-T1-S4-0319	6/03/2019 9:35	27.19	7.51	48.2	2.627
CV-T2-S2-0319	6/03/2019 10:20	27.80	7.77	62.9	2.665
<b>Control Area</b>					
CV-CT-C1-0319	6/03/2019	30.31	9.26	135.0	4.320
CV-CT-C2-0319	6/03/2019	30.21	9.26	141.0	4.345
CV-CT-C3-0319	6/03/2019	30.30	10.07	194.0	4.300
<b>Other wetland areas</b>					
CV-FW-0319	6/03/2019 13:50	30.50	8.57	141.4	2.800
CV-SWC-0319	5/03/2019 8:45	26.81	8.53	66.8	1.052
CV-BO-0319	6/03/2019 16:10	29.21	9.63	131.9	2.427
CV-EB-0319	6/03/2019 15:43	29.55	10.14	164.4	2.701

### Laboratory results of surface water samples

In January 2019, surface water samples collected in the Caley Valley wetlands were generally compliant with ANZG (2018) and Queensland Water Quality guidelines (EHP 2009) (Table 5). Exceedances occurred either at both control and impact locations, or only at control locations. Specifically,

- total suspended solids were highest (288 mg/L) at the potentially impacted investigation area, but also exceeded the guideline values of 25 mg/L in the control area and at Saltwater Creek; and
- dissolved (0.45 µm filtered) copper exceeded the guideline value (1.3 µg/L) at the wetland site CV–BO (2 µg/L), but was within the guidelines or not detected at other sites.

Similarly, in March 2019, surface water samples collected in the Caley Valley wetlands were again generally compliant with ANZG (2018) Queensland Water Quality guidelines (EHP 2009) (Table 6). Exceedances only occurred at control locations or other sites in the wetland (Table 6). Specifically,

- total suspended solids were highest (90 and 91 mg/L) and exceeded the guidelines at two sites in the greater wetland area, but were within the guidelines at all other control and impact sites;
- dissolved (0.45 µm filtered) copper was at or exceeded the guideline value of 1.4 µg/L at one control site (CV–CT3) and two sites in the wetland (CV–FW and CV–EB), but was within the guidelines at all other sites, with the exceedances being 0.6 µg/L or less; and
- dissolved (0.45 µm filtered) silver was only detected at, and exceeded the guideline value (0.05 µg/L) at sites CV–FW and one control site CV–CT3 (both 0.2 µg/L), but was not detected at any other site.

No polycyclic aromatic hydrocarbons (PAH) or BTEX (benzene, toluene, ethylbenzene and xylene) were detected in surface water samples.

**Table 5: Laboratory results from surface water sampling in January 2019 compared to Queensland Water Quality Guidelines (EHP 2009) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality, [default toxicant guideline values](#) (ANZG 2018).**

Analyte	Guideline	Potentially Impacted Area	Control Area	Other Wetland Sites	
		CV-T1S4-0119*	CV-CT1S4-0119*	CV-SWC-0119**	CV-BO-0119*
<b>Physico-Chemical</b>					
Total Dissolved Solids (mg/L)		14600	19800	806	41800
Suspended Solids (mg/L)	25 <sup>a</sup>	288	38	40	—
Hardness (mg/L)		3490	3360	185	7600
<b>Major Ions</b>					
Calcium (mg/L)		328	336	28	538
Chloride (mg/L)		7710	10300	298	23400
Fluoride (mg/L)		0.5	0.5	0.2	0.9
Magnesium (mg/L)		649	612	28	1520
Potassium (mg/L)		197	182	10	497
Sodium (mg/L)		5940	5580	167	12900
Sulfate as SO <sub>4</sub> (mg/L)		1150	461	26	3350
Total Anions (meq/L)		242	301	12.3	732
Total Cations (meq/L)		333	314	11.2	726
<b>Dissolved Metals and Metalloids (all µg/L)</b>					
Antimony		—	—	—	—
Arsenic	24 <sup>c</sup>	3.1	2.8	2.2	1.5
Beryllium		—	—	<0.1	—
Boron	370 <sup>c</sup>	1280	1860	137	5180
Cadmium	0.7 <sup>b</sup> , HMTV	—	—	—	—
Chromium III <sup>^</sup>	27.4 <sup>b</sup> , HMTV	—	—	—	—
Chromium VI <sup>^</sup>	4.4 <sup>b</sup>	—	—	—	—
Cobalt	1 <sup>b</sup>	0.6	—	1.0	—
Copper	1.3 <sup>b</sup> ; 1.4 <sup>c</sup>	—	—	0.6	2
Lead	4.4 <sup>b</sup> , HMTV	—	—	—	—
Manganese	1900 <sup>c</sup>	—	—	286	—
Mercury	0.4 <sup>b</sup> ; 0.6 <sup>c</sup>	—	—	—	—
Molybdenum		27.7	38.6	1.6	9.9
Nickel	7 <sup>b</sup> , HMTV	3.5	1.4	1.6	0.5
Selenium	11 <sup>c</sup>	—	2	—	7
Silver	1.4 <sup>b</sup> ; 0.05 <sup>c</sup>	—	—	—	—
Tin		—	—	—	—
Zinc	15 <sup>b</sup> , HMTV	—	—	—	—

a Queensland Water Quality Guidelines (EHP 2009) for Upper Estuarine Central Coast Region

b Australian and New Zealand Guidelines for Fresh and Marine Water Quality, [default toxicant guideline values](#) (ANZG 2018). Trigger values for metals and metalloids in marine water.

c Australian and New Zealand Guidelines for Fresh and Marine Water Quality, [default toxicant guideline values](#) (ANZG 2018). Trigger values for metals and metalloids in freshwater.

HMTV Hardness Modified Trigger Value –see table 7

— Result below Limit of Reporting (LOR)

- \* The sampled water at this site had marine water characteristics and was analysed by the laboratory using a marine water matrix. Trigger values for marine water were used.
- \*\* The sampled water at this site had freshwater characteristics and was analysed by the laboratory using a freshwater matrix. Trigger values for freshwater were used.
- ^ Laboratory results are for unspiciated chromium. Only trigger values for freshwater were used in calculation of HMTVs.

**Table 6: Laboratory results from surface water sampling in March 2019 compared to Queensland Water Quality Guidelines (EHP 2009) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality, [default toxicant guideline values](#) (ANZG 2018).**

Analyte	Guideline	Potentially Impacted Area		Control Area			Other Wetland Sites			
		CV–T1S1–0319*	CV–T1S4–0319*	CV–CT1S1–0319*	CV–CT1S2–0319*	CV–CT1S3–0319*	CV–FW–0319*	CV–SWC–0319*	CV–BO–0319*	CV–EB–0319*
<b>Physico-Chemical</b>										
Total Dissolved Solids (mg/L)		1000	1600	2690	2690	2650	1720	630	1480	1610
Suspended Solids (mg/L)	25 <sup>a</sup>	24	10	5	6	–	90	10	17	91
Hardness (mg/L)		227	280	383	375	375	292	175	209	237
<b>Major Ions</b>										
Calcium (mg/L)		35	33	38	38	38	33	29	21	24
Chloride (mg/L)		323	704	1270	1260	1250	766	258	711	766
Fluoride (mg/L)		0.3	0.3	0.2	0.2	0.2	0.3	0.1	0.2	0.2
Magnesium (mg/L)		34	48	70	68	68	51	25	38	43
Potassium (mg/L)		10	16	24	24	24	17	5	15	17
Sodium (mg/L)		212	395	692	685	686	431	132	376	408
Sulfate as SO <sub>4</sub>		164	131	109	110	107	132	26	66	73
Total Anions		14.5	24.6	39.4	39.1	38.6	26.3	9.88	22.6	24.5
Total Cations		14.0	23.2	38.4	37.9	37.9	25.0	9.37	20.9	22.9
<b>Dissolved Metals and Metalloids (all µg/L)</b>										
Antimony		–	–	–	–	–	–	–	–	–
Arsenic	24 <sup>b</sup>	1.4	1.6	2.4	2.4	2.0	1.8	0.7	2.4	2.3
Beryllium		–	–	–	–	–	–	–	–	–
Boron	370 <sup>b</sup>	116	187	237	251	220	179	58	176	192
Cadmium	HMTV	–	–	–	–	–	–	–	–	–
Chromium <sup>^</sup>	HMTV	–	–	–	–	–	–	–	–	–
Cobalt		1.9	0.6	0.4	0.4	0.3	0.5	0.6	0.4	0.3
Copper	1.4 <sup>b</sup>	–	–	–	0.5	2.1	–	0.5	1.4	1.5
Lead	HMTV	–	–	–	–	–	–	–	–	–
Manganese	1900 <sup>b</sup>	520	119	48.2	38.7	4.6	49.3	54.5	2.7	4.2
Mercury	0.6 <sup>b</sup>	–	–	–	–	–	–	–	–	–
Molybdenum		5.2	5.6	4.1	4.1	4.3	5.2	0.8	3.1	3.6
Nickel	HMTV	4.7	2.6	0.6	0.6	0.6	2.1	1.1	1.0	1.0
Selenium	11 <sup>b</sup>	0.3	0.4	0.6	0.5	0.6	0.4	0.2	0.4	0.4
Silver	0.05 <sup>b</sup>	–	–	–	–	0.2	0.2	–	–	–
Tin		–	–	–	–	–	–	–	–	–
Zinc	HMTV	–	–	–	–	–	–	–	–	–

<sup>a</sup> Queensland Water Quality Guidelines (EHP 2009) for Upper Estuarine Central Coast Region

<sup>b</sup> Australian and New Zealand Guidelines for Fresh and Marine Water Quality, [default toxicant guideline values](#) (ANZG 2018). Trigger values for metals and metalloids in freshwater.

HMTV Hardness Modified Trigger Value – see Table 7

– Result below Limit of Reporting (LOR)

\* The water had freshwater characteristics and was analysed by the laboratory using a freshwater matrix. Trigger values for freshwater were used.

<sup>^</sup> Laboratory results are for unspicuated Chromium.



**Table 7: Hardness modified Trigger values for cadmium, chromium, lead, nickel and zinc using the method outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, (ANZECC & ARMCANZ 2000). Hardness modification has only been applied to samples with freshwater characteristics.**

Analyte	DGV <sup>a</sup>	Potentially Impacted Area		Control Area				Other Wetland Sites			
		CV-T1S1	CV-T1S4	CV-CT1S1	CV-CT1S2	CV-CT1S3	CV-CT1S4	CV-FW	CV-SWC	CV-BO	CV-EB
<b>January 2019</b>											
Hardness (mg/L)		3490	NA	NA	NA	NA	3360	NA	185	7600	NA
Cadmium	0.2	–	–	–	–	–	–	–	1.01	–	–
Chromium III	3.3	–	–	–	–	–	–	–	14.67	–	–
Lead	3.4	–	–	–	–	–	–	–	34.26	–	–
Nickel	11	–	–	–	–	–	–	–	51.63	–	–
Zinc	8	–	–	–	–	–	–	–	37.55	–	–
<b>March 2019</b>											
Hardness (mg/L)		227	280	383	375	375	NA	292	175	209	237
Cadmium	0.2	1.21	1.46	1.93	1.89	1.89	–	1.52	0.96	1.13	1.26
Chromium III	3.3	17.35	20.6	26.64	26.18	26.18	–	21.23	14.01	16.21	17.97
Lead	3.4	44.43	58.00	86.34	84.05	84.05	–	61.17	31.93	40.01	46.93
Nickel	11	61.44	73.44	95.84	94.14	94.14	–	76.11	49.25	57.27	63.73
Zinc	8	44.68	53.41	69.70	68.46	68.46	–	55.35	35.82	41.65	46.35

a Australian and New Zealand Guidelines for Fresh and Marine Water Quality [default toxicant guideline values](#) (ANZG 2018). Trigger values for metals and metalloids in freshwater.

NA Site not sampled

Shaded cells in blue indicate the sampled water had marine water characteristics and was analysed by the laboratory using a marine water matrix.

Shaded cells in green indicate the sampled water had freshwater characteristics and was analysed by the laboratory using a freshwater matrix. Trigger values for freshwater were used in calculation of HMTVs.

### 3.3 Sediment Quality Results

The analysis of total metals in sediment samples collected in October 2018 (Table 8) and March 2019 (Table 9) showed that all but one analyte (nickel) were lower than [sediment quality guidelines](#) (ANZG 2018). In October 2018, nickel was:

- at the GV-High value (52 mg/kg) at potentially impacted site CV-T1-S1;
- above the DGV of 21 mg/kg at potential impact sites CV-T2-S3; and
- above the DGV of 21 mg/kg at control sites CV-CT1-S2, CV-CT1-S4, CV-CT2-S2 and CV-CT2-S3.

In March 2019 2018, nickel was above the DGV of 21 mg/kg at potential impact sites CV-T1-S1 and CV-T1-S2.

The results would indicate that elevated nickel is naturally occurring in the Caley Valley wetlands as it was found at both the control and potentially impacted sites.

**Table 8: Total metals in soil samples collected in October 2018 compared to the [sediment quality guidelines](#) (ANZG 2018). Highlighted cells indicate the result is above a guideline value. Light orange shading indicates the result is above the default guideline value (DGV), dark orange shading indicates the result is above the GV–High.**

Analyte	Guideline		Potentially Impacted Area							Control Area						
	GV	SQG–High	CV–T1–S1	CV–T1–S2	CV–T1–S3	CV–T1–S4	CV–T2–S2	CV–T2–S3	CV–T2–S4	CV–CT1–S1	CV–CT1–S2	CV–CT1–S3	CV–CT1–S4	CV–CT2–S2	CV–CT2–S3	CV–CT2–S4
Arsenic	20	70	9	11	9	13	10	13	–	12	19	10	15	18	12	9
Barium			90	50	20	30	30	20	20	20	30	20	40	40	40	20
Beryllium			2	–	–	–	–	1	–	–	–	–	1	1	–	–
Boron			50	–	–	70	–	60	–	–	60	–	100	60	70	60
Cadmium	1.5	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chromium	80	370	24	18	24	37	25	37	16	26	46	29	46	46	44	28
Cobalt			52	15	16	16	12	19	8	16	20	14	20	25	23	12
Copper	65	270	27	15	17	21	19	24	12	15	30	15	25	23	23	14
Lead	50	220	9	12	6	7	8	7	5	7	9	7	11	13	11	7
Manganese			332	131	158	324	216	188	98	601	391	462	1280	2160	725	641
Mercury	0.15	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Nickel	21	52	52	18	18	20	16	25	11	14	23	15	22	24	23	14
Selenium			–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vanadium			36	29	35	51	36	51	24	51	93	48	72	79	71	45
Zinc	200	410	158	47	62	53	67	71	28	25	40	24	35	40	35	23

– Result is below Limit of Reporting (LOR)

**Table 9: Total metals in soil samples collected in March 2019 compared to the [sediment quality guidelines](#) (ANZG 2018). Highlighted cells indicate the result is above a guideline value. Highlighted cells indicate the result is above a guideline value. Light orange shading indicates the result is above the default guideline value (DGV).**

Analyte	Guideline		Potentially Impacted Area				
	GV	SQG-High	CV-T1-S1	CV-T1-S2	CV-T1-S3	CV-T1-S4	CV-T2-S2
Arsenic	20	70	6	5	7	7	12
Barium			30	70	10	20	30
Beryllium			–	–	–	–	–
Boron			–	–	–	–	–
Cadmium	1.5	10	–	–	–	–	–
Chromium	80	370	20	18	16	21	26
Cobalt			31	27	9	12	18
Copper	65	270	17	25	13	18	17
Lead	50	220	8	8	5	–	8
Manganese			255	285	62	88	174
Mercury	0.15	1	–	–	–	–	–
Nickel	21	52	30	25	11	16	20
Selenium			–	–	–	–	–
Vanadium			33	34	30	36	46
Zinc	200	410	118	80	47	65	64

– Result is below Limit of Reporting (LOR)

## 4 Conclusions

This preliminary study found little evidence of contaminants in the surface sediments and waters of the Caley Valley wetland. Sediment samples collected in October 2018 and March 2019 showed that most samples contained trace or no coal fines. The highest concentrations (although still very low) of coal fines were found in the vicinity of the bund wall. Nickel exceeded sediment guidelines in October 2018, in both control and potential impact areas, and in March 2019 in the potentially impacted area (note: only the potentially impacted area was sampled in March 2019). As nickel was measured in both the potentially impacted and control areas, it is likely that this element is naturally occurring at elevated levels in the Caley Valley Wetlands.

*In situ* water quality measured in January and March 2019 exceeded Queensland Water Quality Guidelines for some parameters at sites in the potentially impacted area, the control area and other sites in the wetland, as well as Saltwater Creek. These exceedances are within historical ranges, and are likely reflective of site specific conditions in the wetland.

Total suspended solids (TSS) exceeded the guidelines at a number of sites in January and March 2019, with the highest exceedance in the potentially impacted area. However, sites from all over the wetlands had elevated TSS results, not just in the potentially impacted zone.

In terms of toxicants, metals in surface water samples collected in the Caley Valley wetlands were generally measured below guidelines (ANZG 2018). Exceedances of dissolved copper and silver occurred in the control area and further afield in the wetland, but did not occur in the potentially impacted sites. PAHs or BTEX were not detected in the water in either January or March 2019.

Water and sediment quality results to date show that exceedances of several water quality parameters and one sediment quality parameter have occurred, however these exceedances are not consistent over time and occur in both control and potentially impacted areas. Although the results were compared to the *Queensland Water Quality Guidelines* for upper estuaries, the Caley Valley wetland is modified estuarine system, and only partially tidally influenced. Therefore, locally relevant guidelines should be derived for this system.

## References

- ANZECC & ARMCANZ. 2000. "Australian and New Zealand Guidelines for Fresh and Marine Water Quality." *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- ANZG. 2018. "Australian and New Zealand Guidelines for Fresh and Marine Water Quality." *Australian and New Zealand Governments and Australian State and Territory Governments, Canberra ACT, Australia*.
- BAAM. 2012. "Coordinated Migratory Shorebird and Waterbird Surveys Abbot Point." *Report for Saunders Havill Group and E3 Consult on Behalf of NQBP*.
- BMT WBM. 2012. "Kaili (Caley) Valley Wetlands Baseline Report." *Report Prepared for Office of the Coordinator General, Department of Employment, Economic Development and Innovation*.
- BMT WBM. 2015. "Abbot Point Growth Gateway Project." *Technical Report for Wetland Hydrology, Water Quality and Aquatic Ecology Components (MSES). Report Prepared for Advision*.
- DSITI. 2017. "Caley Valley Wetlands - Preliminary Assessment of Impacts to Caley Valley Wetlands from Abbot Point Coal Terminal Post Tropical Cyclone Debbie." (July).DES. 2018. "Monitoring and Sampling Manual: Environmental Protection (Water) Policy. Brisbane: Department of Environment and Science Government."
- EHP. 2009. "Department of Environment and Heritage Protection. Queensland Water Quality Guidelines." 3:184.
- GHD. 2012. "Abbot Point Cumulative Assessment: Water Quality and Hydrology." *Report Prepared for Abbot Point Working Group*.

## Appendix A: Quality Assurance and Quality Control

Table A-1

		Sample Description	BLANK	Blank full suite
		Date	06/03/2019	06/03/2019
		Site	CV-BI-0319	CV-BB-0319
Analyte	Unit	LOR		
<b>Physico-Chemical</b>				
Suspended Solids (SS)	mg/L	5	–	<5
Total Hardness as CaCO <sub>3</sub>	mg/L	1	–	<1
Total Alkalinity as CaCO <sub>3</sub>	mg/L	1	–	4
<b>Major Ions</b>				
Calcium	mg/L	1	–	<1
Chloride	mg/L	1	–	<1
Fluoride	mg/L	0.1	–	<0.1
Magnesium	mg/L	1	–	<1
Potassium	mg/L	1	–	<1
Sodium	mg/L	1	–	<1
Sulfate as SO <sub>4</sub> - Turbidimetric	mg/L	1	–	<1
Total Anions	meq/L	0.01	–	0.08
Total Cations	meq/L	0.01	–	<0.01
Ionic Balance	%	0.01	–	–
<b>Dissolved Metals and Metalloids</b>				
Antimony	µg/L	0.2	<0.2	<0.2
Arsenic	µg/L	0.2	<0.2	<0.2
Beryllium	µg/L	0.1	<0.1	<0.1
Boron	µg/L	5	8	<5
Cadmium	µg/L	0.05	<0.05	<0.05
Chromium	µg/L	0.2	<0.2	<0.2
Cobalt	µg/L	0.1	<0.1	<0.1
Copper	µg/L	0.5	<0.5	<0.5
Lead	µg/L	0.1	<0.1	<0.1
Manganese	µg/L	0.5	<0.5	<0.5
Mercury	mg/L	0.0001	<0.0001	<0.0001
Molybdenum	µg/L	0.1	<0.1	<0.1
Nickel	µg/L	0.5	<0.5	<0.5
Selenium	µg/L	0.2	<0.2	<0.2
Silver	µg/L	0.1	<0.1	<0.1
Tin	µg/L	0.2	<0.2	<0.2
Zinc	µg/L	1	<1	<1
<b>Total Metals and Metalloids</b>				
Antimony	µg/L	0.2	<0.2	<0.2
Selenium	µg/L	0.2	<0.2	<0.2
Arsenic	µg/L	0.2	<0.2	<0.2

		Sample Description	BLANK	Blank full suite
		Date	06/03/2019	06/03/2019
		Site	CV-BI-0319	CV-BB-0319
Beryllium	µg/L	0.1	<0.1	<0.1
Boron	µg/L	5	<5	<5
Cadmium	µg/L	0.05	<0.05	<0.05
Chromium	µg/L	0.2	<0.2	<0.2
Cobalt	µg/L	0.1	<0.1	<0.1
Copper	µg/L	0.5	<0.5	<0.5
Lead	µg/L	0.1	<0.1	<0.1
Manganese	µg/L	0.5	<0.5	<0.5
Mercury	mg/L	0.0001	<0.0001	<0.0001
Molybdenum	µg/L	0.1	<0.1	<0.1
Nickel	µg/L	0.5	0.6	<0.5
Silver	µg/L	0.1	<0.1	<0.1
Tin	µg/L	0.2	<0.2	<0.2
Zinc	µg/L	1	<1	<1

## **Appendix B: Laboratory Certificates of Analysis**



## CERTIFICATE OF ANALYSIS

**Work Order** : **EB1826430**  
**Client** : **QLD DEPT OF ENVIRONMENT & SCIENCE**  
**Contact** : Justin Cagney  
**Address** : GPO BOX 2771  
 BRISBANE QLD, AUSTRALIA 4001  
  
**Telephone** : ----  
**Project** : Caley Valley  
**Order number** :  
**C-O-C number** : ----  
**Sampler** : SUZANNE VARDY  
**Site** : ----  
**Quote number** : EN/222  
**No. of samples received** : 15  
**No. of samples analysed** : 15

**Page** : 1 of 9  
**Laboratory** : Environmental Division Brisbane  
**Contact** : Customer Services EB  
**Address** : 2 Byth Street Stafford QLD Australia 4053  
  
**Telephone** : +61-7-3243 7222  
**Date Samples Received** : 02-Nov-2018 09:15  
**Date Analysis Commenced** : 05-Nov-2018  
**Issue Date** : 16-Nov-2018 14:35



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Gerrad Morgan	Asbestos Identifier	Newcastle - Inorganics, Mayfield West, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



## 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.

- EP075(SIM): High LCS recovery deemed acceptable as all associated analyte results are less than LOR.
- EA153: ALS does not hold NATA accreditation for Laser Particle Sizing.
- EG035T (Total Mercury) Sample EB1826430-002 (CV-T1-S2) shows poor matrix spike recovery due to sample heterogeneity. Confirmed by visual inspection.
- EG005T (Total Metals by ICP-AES): Sample EB1826430 – 010 (CV-CT1-S3) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- 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, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.  
Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1	CV-T1-S2	CV-T1-S3	CV-T1-S4	CV-T2-S2
Client sampling date / time				31-Oct-2018 10:00	31-Oct-2018 10:20	31-Oct-2018 10:50	31-Oct-2018 11:15	31-Oct-2018 12:40	
Compound	CAS Number	LOR	Unit	EB1826430-001	EB1826430-002	EB1826430-003	EB1826430-004	EB1826430-005	
				Result	Result	Result	Result	Result	
<b>EA010: Conductivity (1:5)</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	10500	9840	12600	21300	36600	
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>									
Moisture Content	----	1.0	%	11.4	30.1	43.5	25.6	5.8	
<b>EA153: Laser Particle Size Analysis of Soils and Solids</b>									
ø +1000µm	----	1	%	-	-	-	-	-	
<b>EG005T: Total Metals by ICP-AES</b>									
Arsenic	7440-38-2	5	mg/kg	9	11	9	13	10	
Barium	7440-39-3	10	mg/kg	90	50	20	30	30	
Beryllium	7440-41-7	1	mg/kg	2	<1	<1	<1	<1	
Boron	7440-42-8	50	mg/kg	50	<50	<50	70	<50	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	24	18	24	37	25	
Cobalt	7440-48-4	2	mg/kg	52	15	16	16	12	
Copper	7440-50-8	5	mg/kg	27	15	17	21	19	
Lead	7439-92-1	5	mg/kg	9	12	6	7	8	
Manganese	7439-96-5	5	mg/kg	332	131	158	324	216	
Nickel	7440-02-0	2	mg/kg	52	18	18	20	16	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5	
Vanadium	7440-62-2	5	mg/kg	36	29	35	51	36	
Zinc	7440-66-6	5	mg/kg	158	47	62	53	67	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1	CV-T1-S2	CV-T1-S3	CV-T1-S4	CV-T2-S2
Client sampling date / time					31-Oct-2018 10:00	31-Oct-2018 10:20	31-Oct-2018 10:50	31-Oct-2018 11:15	31-Oct-2018 12:40
Compound	CAS Number	LOR	Unit	EB1826430-001	EB1826430-002	EB1826430-003	EB1826430-004	EB1826430-005	
				Result	Result	Result	Result	Result	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	0.5	%	<b>176</b>	<b>126</b>	<b>132</b>	<b>132</b>	<b>123</b>	
2-Chlorophenol-D4	93951-73-6	0.5	%	<b>155</b>	<b>112</b>	<b>118</b>	<b>116</b>	<b>109</b>	
2.4.6-Tribromophenol	118-79-6	0.5	%	<b>171</b>	<b>112</b>	<b>106</b>	<b>122</b>	<b>113</b>	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.5	%	<b>143</b>	<b>101</b>	<b>108</b>	<b>106</b>	<b>102</b>	
Anthracene-d10	1719-06-8	0.5	%	<b>138</b>	<b>99.1</b>	<b>109</b>	<b>99.8</b>	<b>97.0</b>	
4-Terphenyl-d14	1718-51-0	0.5	%	<b>141</b>	<b>106</b>	<b>111</b>	<b>99.1</b>	<b>98.4</b>	





## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T2-S3	CV-T2-S4	CV-CT1-S1	CV-CT1-S2	CV-CT1-S3
Client sampling date / time					31-Oct-2018 12:30	31-Oct-2018 12:00	31-Oct-2018 13:55	31-Oct-2018 14:10	31-Oct-2018 14:30
Compound	CAS Number	LOR	Unit		EB1826430-006	EB1826430-007	EB1826430-008	EB1826430-009	EB1826430-010
					Result	Result	Result	Result	Result
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	0.5	%		<b>127</b>	<b>130</b>	<b>145</b>	<b>140</b>	<b>133</b>
2-Chlorophenol-D4	93951-73-6	0.5	%		<b>112</b>	<b>114</b>	<b>128</b>	<b>124</b>	<b>117</b>
2.4.6-Tribromophenol	118-79-6	0.5	%		<b>119</b>	<b>116</b>	<b>125</b>	<b>126</b>	<b>109</b>
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.5	%		<b>105</b>	<b>105</b>	<b>119</b>	<b>113</b>	<b>108</b>
Anthracene-d10	1719-06-8	0.5	%		<b>98.4</b>	<b>102</b>	<b>116</b>	<b>108</b>	<b>107</b>
4-Terphenyl-d14	1718-51-0	0.5	%		<b>99.0</b>	<b>103</b>	<b>114</b>	<b>109</b>	<b>104</b>



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-CT1-S4	CV-CT2-S2	CV-CT2-S3	CV-CT2-S4	CV-T3-S1
Client sampling date / time				31-Oct-2018 14:50	31-Oct-2018 15:50	31-Oct-2018 15:30	31-Oct-2018 15:15	31-Oct-2018 17:00	
Compound	CAS Number	LOR	Unit	EB1826430-011	EB1826430-012	EB1826430-013	EB1826430-014	EB1826430-015	
				Result	Result	Result	Result	Result	
<b>EA010: Conductivity (1:5)</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	22000	12700	21700	23600	24400	
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>									
Moisture Content	----	1.0	%	8.8	4.9	4.4	2.3	3.0	
<b>EA153: Laser Particle Size Analysis of Soils and Solids</b>									
ø +1000µm	----	1	%	-	-	-	-	----	
<b>EG005T: Total Metals by ICP-AES</b>									
Arsenic	7440-38-2	5	mg/kg	15	18	12	9	7	
Barium	7440-39-3	10	mg/kg	40	40	40	20	20	
Beryllium	7440-41-7	1	mg/kg	1	1	<1	<1	<1	
Boron	7440-42-8	50	mg/kg	100	60	70	60	<50	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	46	46	44	28	20	
Cobalt	7440-48-4	2	mg/kg	20	25	23	12	10	
Copper	7440-50-8	5	mg/kg	25	23	23	14	11	
Lead	7439-92-1	5	mg/kg	11	13	11	7	6	
Manganese	7439-96-5	5	mg/kg	1280	2160	725	641	481	
Nickel	7440-02-0	2	mg/kg	22	24	23	14	10	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5	
Vanadium	7440-62-2	5	mg/kg	72	79	71	45	34	
Zinc	7440-66-6	5	mg/kg	35	40	35	23	17	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-CT1-S4	CV-CT2-S2	CV-CT2-S3	CV-CT2-S4	CV-T3-S1
Client sampling date / time					31-Oct-2018 14:50	31-Oct-2018 15:50	31-Oct-2018 15:30	31-Oct-2018 15:15	31-Oct-2018 17:00
Compound	CAS Number	LOR	Unit	EB1826430-011	EB1826430-012	EB1826430-013	EB1826430-014	EB1826430-015	
				Result	Result	Result	Result	Result	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>	<b>0.6</b>
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	0.5	%	<b>129</b>	<b>113</b>	<b>106</b>	<b>116</b>	<b>156</b>	
2-Chlorophenol-D4	93951-73-6	0.5	%	<b>111</b>	<b>114</b>	<b>109</b>	<b>120</b>	<b>156</b>	
2.4.6-Tribromophenol	118-79-6	0.5	%	<b>107</b>	<b>82.9</b>	<b>78.6</b>	<b>87.0</b>	<b>111</b>	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.5	%	<b>104</b>	<b>117</b>	<b>112</b>	<b>118</b>	<b>153</b>	
Anthracene-d10	1719-06-8	0.5	%	<b>102</b>	<b>128</b>	<b>120</b>	<b>125</b>	<b>157</b>	
4-Terphenyl-d14	1718-51-0	0.5	%	<b>99.9</b>	<b>129</b>	<b>122</b>	<b>126</b>	<b>166</b>	





## Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	35	155
2-Chlorophenol-D4	93951-73-6	42	153
2,4,6-Tribromophenol	118-79-6	26	157
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	34	157
Anthracene-d10	1719-06-8	37	153
4-Terphenyl-d14	1718-51-0	42	172

## CERTIFICATE OF ANALYSIS

**Work Order** : **EB1901827**  
**Client** : **QLD DEPT OF ENVIRONMENT & SCIENCE**  
**Contact** : Justin Cagney  
**Address** : GPO BOX 2771  
 BRISBANE QLD, AUSTRALIA 4001  
  
**Telephone** : ----  
**Project** : ----  
**Order number** :  
**C-O-C number** : ----  
**Sampler** : SUSI VARDY  
**Site** : ----  
**Quote number** : EN/222  
**No. of samples received** : 4  
**No. of samples analysed** : 4

**Page** : 1 of 8  
**Laboratory** : Environmental Division Brisbane  
**Contact** : Customer Services EB  
**Address** : 2 Byth Street Stafford QLD Australia 4053  
  
**Telephone** : +61-7-3243 7222  
**Date Samples Received** : 25-Jan-2019 09:15  
**Date Analysis Commenced** : 25-Jan-2019  
**Issue Date** : 05-Feb-2019 10:59



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Senior Organic Chemist	Brisbane Organics, Stafford, QLD
Tom Maloney	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



## 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.

- EG093-F (Dissolved Metals in Saline Water by ORC-ICP-MS): High LCS recovery deemed acceptable as all associated analyte results are less than LOR.
- It is recognised that EG093-T (Total Metals in Saline Water by ORC-ICP-MS) is less than EG093-F (Dissolved Metals in Saline Water by ORC-ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- It is recognised that EG094-T (Total Metals in Fresh Water by ORC-ICP-MS) is less than EG094-F (Dissolved Metals in Fresh Water by ORC-ICP-MS) for sample EB1901827-001(CV-SWC-0119). However, the difference is within experimental variation of the methods.
- Ionic Balance out of acceptable limits for some samples due to analytes not quantified in this report.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- 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.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID			CV-SWC-0119	CV-T1S4-0119	CV-B0-0119	CV-CT1S4-0119	----	
Client sampling date / time		23-Jan-2019 00:00			23-Jan-2019 00:00		23-Jan-2019 00:00		23-Jan-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1901827-001	EB1901827-002	EB1901827-003	EB1901827-004	-----	----	
				Result	Result	Result	Result	----	----	
<b>EA005P: pH by PC Titrator</b>										
pH Value	----	0.01	pH Unit	7.80	8.66	8.91	9.01	----	----	
<b>EA010P: Conductivity by PC Titrator</b>										
Electrical Conductivity @ 25°C	----	1	µS/cm	1240	22400	64300	30500	----	----	
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>										
Total Dissolved Solids (Calc.)	----	1	mg/L	806	14600	41800	19800	----	----	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>										
Suspended Solids (SS)	----	5	mg/L	40	288	<5	38	----	----	
<b>EA065: Total Hardness as CaCO3</b>										
Total Hardness as CaCO3	----	1	mg/L	185	3490	7600	3360	----	----	
<b>ED037P: Alkalinity by PC Titrator</b>										
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	14	73	25	----	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	167	21	36	12	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	167	35	108	37	----	----	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>										
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	26	1150	3350	461	----	----	
<b>ED045G: Chloride by Discrete Analyser</b>										
Chloride	16887-00-6	1	mg/L	298	7710	23400	10300	----	----	
<b>ED093F: Dissolved Major Cations</b>										
Calcium	7440-70-2	1	mg/L	28	328	538	336	----	----	
Magnesium	7439-95-4	1	mg/L	28	649	1520	612	----	----	
Sodium	7440-23-5	1	mg/L	167	5940	12900	5580	----	----	
Potassium	7440-09-7	1	mg/L	10	197	497	182	----	----	
<b>EG035F: Dissolved Mercury by FIMS</b>										
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	----	
<b>EG035T: Total Recoverable Mercury by FIMS</b>										
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	----	
<b>EG093F: Dissolved Metals in Saline Water by ORC-ICPMS</b>										
Antimony	7440-36-0	0.5	µg/L	----	<0.5	<0.5	<0.5	----	----	
Arsenic	7440-38-2	0.5	µg/L	----	3.1	1.5	2.8	----	----	
Beryllium	7440-41-7	0.1	µg/L	----	<0.1	<0.1	<0.1	----	----	
Boron	7440-42-8	100	µg/L	----	1280	5180	1860	----	----	
Cadmium	7440-43-9	0.2	µg/L	----	<0.2	<0.2	<0.2	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-SWC-0119	CV-T1S4-0119	CV-B0-0119	CV-CT1S4-0119	----
Client sampling date / time				23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	----	
Compound	CAS Number	LOR	Unit	EB1901827-001	EB1901827-002	EB1901827-003	EB1901827-004	-----	
				Result	Result	Result	Result	----	
<b>EG093F: Dissolved Metals in Saline Water by ORC-ICPMS - Continued</b>									
Chromium	7440-47-3	0.5	µg/L	----	<0.5	<0.5	<0.5	----	
Cobalt	7440-48-4	0.2	µg/L	----	<b>0.6</b>	<0.2	<0.2	----	
Copper	7440-50-8	1	µg/L	----	<1	<b>2</b>	<1	----	
Lead	7439-92-1	0.2	µg/L	----	<0.2	<0.2	<0.2	----	
Manganese	7439-96-5	0.5	µg/L	----	<0.5	<0.5	<0.5	----	
Molybdenum	7439-98-7	0.1	µg/L	----	<b>27.7</b>	<b>9.9</b>	<b>38.6</b>	----	
Nickel	7440-02-0	0.5	µg/L	----	<b>3.5</b>	<b>0.5</b>	<b>1.4</b>	----	
Selenium	7782-49-2	2	µg/L	----	<2	<b>7</b>	<b>2</b>	----	
Silver	7440-22-4	0.1	µg/L	----	<0.1	<0.1	<0.1	----	
Tin	7440-31-5	5	µg/L	----	<5	<5	<5	----	
Zinc	7440-66-6	5	µg/L	----	<5	<5	<5	----	
<b>EG093T: Total Metals in Saline Water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.5	µg/L	----	<0.5	<0.5	<0.5	----	
Arsenic	7440-38-2	0.5	µg/L	----	<b>5.3</b>	<b>1.6</b>	<b>3.8</b>	----	
Beryllium	7440-41-7	0.1	µg/L	----	<0.1	<0.1	<0.1	----	
Boron	7440-42-8	100	µg/L	----	<b>1250</b>	<b>4780</b>	<b>1800</b>	----	
Cadmium	7440-43-9	0.2	µg/L	----	<0.2	<0.2	<0.2	----	
Chromium	7440-47-3	0.5	µg/L	----	<b>6.6</b>	<b>0.7</b>	<b>3.1</b>	----	
Cobalt	7440-48-4	0.2	µg/L	----	<b>3.4</b>	<b>0.6</b>	<b>1.5</b>	----	
Copper	7440-50-8	1	µg/L	----	<b>2</b>	<b>1</b>	<b>1</b>	----	
Lead	7439-92-1	0.2	µg/L	----	<b>1.0</b>	<0.2	<b>0.5</b>	----	
Manganese	7439-96-5	0.5	µg/L	----	<b>143</b>	<b>44.3</b>	<b>103</b>	----	
Molybdenum	7439-98-7	0.1	µg/L	----	<b>25.9</b>	<b>10.8</b>	<b>36.6</b>	----	
Nickel	7440-02-0	0.5	µg/L	----	<b>5.2</b>	<0.5	<b>2.0</b>	----	
Selenium	7782-49-2	2	µg/L	----	<b>2</b>	<b>7</b>	<b>3</b>	----	
Silver	7440-22-4	0.1	µg/L	----	<0.1	<0.1	<0.1	----	
Tin	7440-31-5	5	µg/L	----	<5	<5	<b>5</b>	----	
Zinc	7440-66-6	5	µg/L	----	<b>68</b>	<5	<5	----	
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	----	----	----	----	
Selenium	7782-49-2	0.2	µg/L	<b>0.5</b>	----	----	----	----	
Arsenic	7440-38-2	0.2	µg/L	<b>2.2</b>	----	----	----	----	
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----	
Boron	7440-42-8	5	µg/L	<b>137</b>	----	----	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-SWC-0119	CV-T1S4-0119	CV-B0-0119	CV-CT1S4-0119	----
Client sampling date / time				23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	----	
Compound	CAS Number	LOR	Unit	EB1901827-001	EB1901827-002	EB1901827-003	EB1901827-004	-----	
				Result	Result	Result	Result	----	
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued</b>									
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----	
Chromium	7440-47-3	0.2	µg/L	<0.2	----	----	----	----	
Cobalt	7440-48-4	0.1	µg/L	1.0	----	----	----	----	
Copper	7440-50-8	0.5	µg/L	0.6	----	----	----	----	
Lead	7439-92-1	0.1	µg/L	<0.1	----	----	----	----	
Manganese	7439-96-5	0.5	µg/L	286	----	----	----	----	
Molybdenum	7439-98-7	0.1	µg/L	1.6	----	----	----	----	
Nickel	7440-02-0	0.5	µg/L	1.6	----	----	----	----	
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----	
Tin	7440-31-5	0.2	µg/L	<0.2	----	----	----	----	
Zinc	7440-66-6	1	µg/L	<1	----	----	----	----	
<b>EG094T: Total metals in Fresh water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	----	----	----	----	
Selenium	7782-49-2	0.2	µg/L	0.4	----	----	----	----	
Arsenic	7440-38-2	0.2	µg/L	2.5	----	----	----	----	
Beryllium	7440-41-7	0.1	µg/L	0.1	----	----	----	----	
Boron	7440-42-8	5	µg/L	150	----	----	----	----	
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----	
Chromium	7440-47-3	0.2	µg/L	5.2	----	----	----	----	
Cobalt	7440-48-4	0.1	µg/L	3.5	----	----	----	----	
Copper	7440-50-8	0.5	µg/L	3.8	----	----	----	----	
Lead	7439-92-1	0.1	µg/L	1.4	----	----	----	----	
Manganese	7439-96-5	0.5	µg/L	702	----	----	----	----	
Molybdenum	7439-98-7	0.1	µg/L	1.8	----	----	----	----	
Nickel	7440-02-0	0.5	µg/L	3.5	----	----	----	----	
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----	
Tin	7440-31-5	0.2	µg/L	<0.2	----	----	----	----	
Zinc	7440-66-6	1	µg/L	8	----	----	----	----	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.5	0.9	0.5	----	
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L	12.3	242	732	301	----	
Total Cations	----	0.01	meq/L	11.2	333	726	314	----	
Ionic Balance	----	0.01	%	4.52	15.8	0.43	2.21	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-SWC-0119	CV-T1S4-0119	CV-B0-0119	CV-CT1S4-0119	----
Client sampling date / time				23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	----	
Compound	CAS Number	LOR	Unit	EB1901827-001	EB1901827-002	EB1901827-003	EB1901827-004	-----	
				Result	Result	Result	Result	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Benzo(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----	
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	29.7	32.0	35.1	26.7	----	
2-Chlorophenol-D4	93951-73-6	1.0	%	69.2	54.5	51.8	36.3	----	
2,4,6-Tribromophenol	118-79-6	1.0	%	63.2	36.6	21.8	19.3	----	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	70.4	73.4	76.1	83.6	----	
Anthracene-d10	1719-06-8	1.0	%	92.6	96.6	112	92.6	----	



**Analytical Results**

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-SWC-0119	CV-T1S4-0119	CV-B0-0119	CV-CT1S4-0119	----
Client sampling date / time				23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	23-Jan-2019 00:00	----	
Compound	CAS Number	LOR	Unit	EB1901827-001	EB1901827-002	EB1901827-003	EB1901827-004	-----	
				Result	Result	Result	Result	----	
<b>EP075(SIM)T: PAH Surrogates - Continued</b>									
4-Terphenyl-d14	1718-51-0	1.0	%	118	120	146	120	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	107	105	104	108	----	
Toluene-D8	2037-26-5	2	%	98.9	98.7	95.1	98.4	----	
4-Bromofluorobenzene	460-00-4	2	%	98.8	100	99.2	97.9	----	





## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	72
2-Chlorophenol-D4	93951-73-6	27	130
2,4,6-Tribromophenol	118-79-6	19	181
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	14	146
Anthracene-d10	1719-06-8	35	137
4-Terphenyl-d14	1718-51-0	36	154
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

## CERTIFICATE OF ANALYSIS

**Work Order** : **EB1905872**  
**Client** : **QLD DEPT OF ENVIRONMENT & SCIENCE**  
**Contact** : MS SUZANNE VARDY  
**Address** : PO BOX 2001  
                   MACKAY QLD, AUSTRALIA 4740  
**Telephone** : +61 07 49360540  
**Project** : ----  
**Order number** :  
**C-O-C number** : ----  
**Sampler** : SUZANNE VARDY  
**Site** : ----  
**Quote number** : EN/222  
**No. of samples received** : 16  
**No. of samples analysed** : 16

**Page** : 1 of 19  
**Laboratory** : Environmental Division Brisbane  
**Contact** : Customer Services EB  
**Address** : 2 Byth Street Stafford QLD Australia 4053  
  
**Telephone** : +61-7-3243 7222  
**Date Samples Received** : 08-Mar-2019 09:15  
**Date Analysis Commenced** : 08-Mar-2019  
**Issue Date** : 15-Mar-2019 08:42



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



## 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.

- EG035T (Total Mercury): Sample EB1905872-013 (CV-T1-S2-0319) shows poor matrix spike recovery due to matrix interference. Confirmed by visual inspection.
- EA153: ALS does not hold NATA accreditation for Laser Particle Sizing.
- **Super Trace PAH analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- It is recognised that EG094-T (Total Metals in Fresh Water by ORC-ICP-MS) is less than EG094-F (Dissolved Metals in Fresh Water by ORC-ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1-0319	CV-T1-S2-0319	CV-T1-S3-0319	CV-T2-S3-0319	CV-T2-S2-0319
Client sampling date / time				05-Mar-2019 12:40	05-Mar-2019 14:10	05-Mar-2019 14:55	06-Mar-2019 10:40	06-Mar-2019 10:00	
Compound	CAS Number	LOR	Unit	EB1905872-012	EB1905872-013	EB1905872-014	EB1905872-015	EB1905872-016	
				Result	Result	Result	Result	Result	
<b>EA010: Conductivity (1:5)</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	362	1100	626	584	496	
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>									
Moisture Content	----	1.0	%	46.9	46.8	38.2	47.3	43.7	
<b>EA153: Laser Particle Size Analysis of Soils and Solids</b>									
ø +1000µm	----	1	%	4	4	5	13	4	
<b>EG005(ED093)T: Total Metals by ICP-AES</b>									
Arsenic	7440-38-2	5	mg/kg	6	5	7	12	7	
Barium	7440-39-3	10	mg/kg	30	70	10	30	20	
Beryllium	7440-41-7	1	mg/kg	1	1	<1	1	<1	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1	
Chromium	7440-47-3	2	mg/kg	20	18	16	26	21	
Cobalt	7440-48-4	2	mg/kg	31	27	9	18	12	
Copper	7440-50-8	5	mg/kg	17	25	13	17	18	
Lead	7439-92-1	5	mg/kg	8	8	5	8	<5	
Manganese	7439-96-5	5	mg/kg	255	285	62	174	88	
Nickel	7440-02-0	2	mg/kg	30	25	11	20	16	
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5	
Vanadium	7440-62-2	5	mg/kg	33	34	30	46	36	
Zinc	7440-66-6	5	mg/kg	118	80	47	64	65	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
<b>EP074A: Monocyclic Aromatic Hydrocarbons</b>									
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,3,5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,2,4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP074B: Oxygenated Compounds</b>									
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	<5	<5	<5	



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1-0319	CV-T1-S2-0319	CV-T1-S3-0319	CV-T2-S3-0319	CV-T2-S2-0319
Client sampling date / time				05-Mar-2019 12:40	05-Mar-2019 14:10	05-Mar-2019 14:55	06-Mar-2019 10:40	06-Mar-2019 10:00	
Compound	CAS Number	LOR	Unit	EB1905872-012	EB1905872-013	EB1905872-014	EB1905872-015	EB1905872-016	
				Result	Result	Result	Result	Result	
<b>EP074B: Oxygenated Compounds - Continued</b>									
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	<5	<5	<5	
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	<5	<5	<5	
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	<5	<5	<5	
<b>EP074C: Sulfonated Compounds</b>									
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP074D: Fumigants</b>									
2,2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
cis-1,3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
trans-1,3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP074E: Halogenated Aliphatic Compounds</b>									
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	<5	<5	<5	
Chloromethane	74-87-3	5	mg/kg	<5	<5	<5	<5	<5	
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	<5	<5	<5	
Bromomethane	74-83-9	5	mg/kg	<5	<5	<5	<5	<5	
Chloroethane	75-00-3	5	mg/kg	<5	<5	<5	<5	<5	
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	<5	<5	<5	
1,1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
trans-1,2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
cis-1,2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,1,1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,1,2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1,1,1,2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
trans-1,4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1-0319	CV-T1-S2-0319	CV-T1-S3-0319	CV-T2-S3-0319	CV-T2-S2-0319
Client sampling date / time				05-Mar-2019 12:40	05-Mar-2019 14:10	05-Mar-2019 14:55	06-Mar-2019 10:40	06-Mar-2019 10:00	
Compound	CAS Number	LOR	Unit	EB1905872-012	EB1905872-013	EB1905872-014	EB1905872-015	EB1905872-016	
				Result	Result	Result	Result	Result	
<b>EP074E: Halogenated Aliphatic Compounds - Continued</b>									
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP074F: Halogenated Aromatic Compounds</b>									
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP074G: Trihalomethanes</b>									
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10	
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	CV-T1-S1-0319	CV-T1-S2-0319	CV-T1-S3-0319	CV-T2-S3-0319	CV-T2-S2-0319
Client sampling date / time				05-Mar-2019 12:40	05-Mar-2019 14:10	05-Mar-2019 14:55	06-Mar-2019 10:40	06-Mar-2019 10:00	
Compound	CAS Number	LOR	Unit	EB1905872-012	EB1905872-013	EB1905872-014	EB1905872-015	EB1905872-016	
				Result	Result	Result	Result	Result	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>									
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	
<b>EP074S: VOC Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	0.5	%	71.3	74.3	110	92.9	89.8	
Toluene-D8	2037-26-5	0.5	%	77.5	75.7	89.9	96.9	90.6	
4-Bromofluorobenzene	460-00-4	0.5	%	87.0	85.8	99.9	108	90.7	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	79.5	83.4	123	108	103	
Toluene-D8	2037-26-5	0.2	%	69.8	68.3	81.0	87.4	81.7	
4-Bromofluorobenzene	460-00-4	0.2	%	85.9	88.7	100	111	84.8	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		CV-C-C0319	CV-T1-S4-0319	CV-FW-0319	CV-CC1-0319	CV-C-C2-0319
Client sampling date / time				06-Mar-2019 14:20	06-Mar-2019 09:40	06-Mar-2019 13:50	06-Mar-2019 13:55	06-Mar-2019 13:40
Compound	CAS Number	LOR	Unit	EB1905872-001	EB1905872-002	EB1905872-003	EB1905872-004	EB1905872-005
				Result	Result	Result	Result	Result
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	9.85	7.69	8.13	8.70	8.93
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	4080	2460	2650	4140	4140
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>								
Total Dissolved Solids (Calc.)	----	1	mg/L	2650	1600	1720	2690	2690
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	<5	10	90	5	6
<b>EA065: Total Hardness as CaCO3</b>								
Total Hardness as CaCO3	----	1	mg/L	375	280	292	383	375
<b>ED037P: Alkalinity by PC Titrator</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	7	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	48	<1	<1	16	28
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	99	97	48	34
Total Alkalinity as CaCO3	----	1	mg/L	54	99	97	64	62
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	107	131	132	109	110
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	1250	704	766	1270	1260
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	38	33	33	38	38
Magnesium	7439-95-4	1	mg/L	68	48	51	70	68
Sodium	7440-23-5	1	mg/L	686	395	431	692	685
Potassium	7440-09-7	1	mg/L	24	16	17	24	24
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EG035T: Total Recoverable Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS</b>								
Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	7782-49-2	0.2	µg/L	0.6	0.4	0.4	0.6	0.5
Arsenic	7440-38-2	0.2	µg/L	2.0	1.6	1.8	2.4	2.4
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	7440-42-8	5	µg/L	220	187	179	237	251





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-C-C0319	CV-T1-S4-0319	CV-FW-0319	CV-CC1-0319	CV-C-C2-0319
Client sampling date / time				06-Mar-2019 14:20	06-Mar-2019 09:40	06-Mar-2019 13:50	06-Mar-2019 13:55	06-Mar-2019 13:40	
Compound	CAS Number	LOR	Unit	EB1905872-001	EB1905872-002	EB1905872-003	EB1905872-004	EB1905872-005	
				Result	Result	Result	Result	Result	
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued</b>									
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Cobalt	7440-48-4	0.1	µg/L	<b>0.3</b>	<b>0.6</b>	<b>0.5</b>	<b>0.4</b>	<b>0.4</b>	
Copper	7440-50-8	0.5	µg/L	<b>2.1</b>	<0.5	<0.5	<0.5	<b>0.5</b>	
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Manganese	7439-96-5	0.5	µg/L	<b>4.6</b>	<b>119</b>	<b>49.3</b>	<b>48.2</b>	<b>38.7</b>	
Molybdenum	7439-98-7	0.1	µg/L	<b>4.3</b>	<b>5.6</b>	<b>5.2</b>	<b>4.1</b>	<b>4.1</b>	
Nickel	7440-02-0	0.5	µg/L	<b>0.6</b>	<b>2.6</b>	<b>2.1</b>	<b>0.6</b>	<b>0.6</b>	
Silver	7440-22-4	0.1	µg/L	<b>0.2</b>	<0.1	<b>0.2</b>	<0.1	<0.1	
Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Zinc	7440-66-6	1	µg/L	<1	<1	<1	<1	<1	
<b>EG094T: Total metals in Fresh water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Selenium	7782-49-2	0.2	µg/L	<b>1.0</b>	<b>0.5</b>	<b>0.6</b>	<b>0.9</b>	<b>1.0</b>	
Arsenic	7440-38-2	0.2	µg/L	<b>2.1</b>	<b>2.0</b>	<b>3.1</b>	<b>2.7</b>	<b>2.6</b>	
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Boron	7440-42-8	5	µg/L	<b>235</b>	<b>174</b>	<b>180</b>	<b>253</b>	<b>254</b>	
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	<b>2.1</b>	<0.2	<0.2	
Cobalt	7440-48-4	0.1	µg/L	<b>0.3</b>	<b>0.9</b>	<b>2.3</b>	<b>0.4</b>	<b>0.6</b>	
Copper	7440-50-8	0.5	µg/L	<0.5	<b>0.6</b>	<b>1.8</b>	<0.5	<0.5	
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	<b>0.5</b>	<0.1	<0.1	
Manganese	7439-96-5	0.5	µg/L	<b>14.9</b>	<b>201</b>	<b>176</b>	<b>62.6</b>	<b>54.8</b>	
Molybdenum	7439-98-7	0.1	µg/L	<b>4.5</b>	<b>5.5</b>	<b>5.4</b>	<b>4.2</b>	<b>4.4</b>	
Nickel	7440-02-0	0.5	µg/L	<0.5	<b>2.5</b>	<b>3.7</b>	<b>0.6</b>	<b>0.6</b>	
Silver	7440-22-4	0.1	µg/L	<b>0.2</b>	<0.1	<0.1	<0.1	<0.1	
Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Zinc	7440-66-6	1	µg/L	<1	<b>1</b>	<b>9</b>	<1	<1	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	<b>0.2</b>	<b>0.2</b>	
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L	<b>38.6</b>	<b>24.6</b>	<b>26.3</b>	<b>39.4</b>	<b>39.1</b>	
Total Cations	----	0.01	meq/L	<b>37.9</b>	<b>23.2</b>	<b>25.0</b>	<b>38.4</b>	<b>37.9</b>	
Ionic Balance	----	0.01	%	<b>0.81</b>	<b>2.88</b>	<b>2.47</b>	<b>1.29</b>	<b>1.52</b>	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-C-C0319	CV-T1-S4-0319	CV-FW-0319	CV-CC1-0319	CV-C-C2-0319
Client sampling date / time				06-Mar-2019 14:20	06-Mar-2019 09:40	06-Mar-2019 13:50	06-Mar-2019 13:55	06-Mar-2019 13:40	
Compound	CAS Number	LOR	Unit	EB1905872-001	EB1905872-002	EB1905872-003	EB1905872-004	EB1905872-005	
				Result	Result	Result	Result	Result	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2	
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5	
<b>EP132B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Acenaphthylene	208-96-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Acenaphthene	83-32-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Fluorene	86-73-7	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Phenanthrene	85-01-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Anthracene	120-12-7	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Fluoranthene	206-44-0	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Pyrene	129-00-0	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Benz(a)anthracene	56-55-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Chrysene	218-01-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Benzo(k)fluoranthene	207-08-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Benzo(a)pyrene	50-32-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	
Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Dibenz(a.h)anthracene	53-70-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Benzo(g.h.i)perylene	191-24-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
^ Total PAH	----	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	
^ Benzo(a)pyrene TEQ (zero)	----	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	104	103	99.7	102	101	
Toluene-D8	2037-26-5	2	%	90.3	96.1	94.9	92.6	96.0	
4-Bromofluorobenzene	460-00-4	2	%	97.0	104	99.0	103	104	
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level)</b>									
2-Fluorobiphenyl	321-60-8	0.02	%	108	105	112	111	112	
Anthracene-d10	1719-06-8	0.02	%	109	112	105	98.1	114	



**Analytical Results**

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	CV-C-C0319	CV-T1-S4-0319	CV-FW-0319	CV-CC1-0319	CV-C-C2-0319
Client sampling date / time				06-Mar-2019 14:20	06-Mar-2019 09:40	06-Mar-2019 13:50	06-Mar-2019 13:55	06-Mar-2019 13:40	
Compound	CAS Number	LOR	Unit	EB1905872-001	EB1905872-002	EB1905872-003	EB1905872-004	EB1905872-005	
				Result	Result	Result	Result	Result	
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level) - Continued</b>									
<b>4-Terphenyl-d14</b>	1718-51-0	0.02	%	<b>116</b>	<b>120</b>	<b>114</b>	<b>117</b>	<b>116</b>	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-T1-S1-0319	CV-SW-C-0319	CV-BO-0319	CV-BI-0319	CV-EB-0319
Client sampling date / time				05-Mar-2019 12:05	05-Mar-2019 08:45	06-Mar-2019 16:00	06-Mar-2019 10:00	06-Mar-2019 15:45	
Compound	CAS Number	LOR	Unit	EB1905872-006	EB1905872-007	EB1905872-008	EB1905872-009	EB1905872-010	
				Result	Result	Result	Result	Result	
<b>EA005P: pH by PC Titrator</b>									
pH Value	----	0.01	pH Unit	7.17	7.71	9.69	----	9.63	
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	1540	970	2280	----	2480	
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	----	1	mg/L	1000	630	1480	----	1610	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	24	10	17	----	91	
<b>EA065: Total Hardness as CaCO3</b>									
Total Hardness as CaCO3	----	1	mg/L	227	175	209	----	237	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	53	----	61	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	99	103	6	----	9	
Total Alkalinity as CaCO3	----	1	mg/L	99	103	59	----	70	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	164	26	66	----	73	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	323	258	711	----	766	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	35	29	21	----	24	
Magnesium	7439-95-4	1	mg/L	34	25	38	----	43	
Sodium	7440-23-5	1	mg/L	212	132	376	----	408	
Potassium	7440-09-7	1	mg/L	10	5	15	----	17	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Selenium	7782-49-2	0.2	µg/L	0.3	0.2	0.4	<0.2	0.4	
Arsenic	7440-38-2	0.2	µg/L	1.4	0.7	2.4	<0.2	2.3	
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Boron	7440-42-8	5	µg/L	116	58	176	8	192	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-T1-S1-0319	CV-SW-C-0319	CV-BO-0319	CV-BI-0319	CV-EB-0319
Client sampling date / time				05-Mar-2019 12:05	05-Mar-2019 08:45	06-Mar-2019 16:00	06-Mar-2019 10:00	06-Mar-2019 15:45	
Compound	CAS Number	LOR	Unit	EB1905872-006	EB1905872-007	EB1905872-008	EB1905872-009	EB1905872-010	
				Result	Result	Result	Result	Result	
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued</b>									
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Cobalt	7440-48-4	0.1	µg/L	1.9	0.6	0.4	<0.1	0.3	
Copper	7440-50-8	0.5	µg/L	<0.5	0.5	1.4	<0.5	1.5	
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Manganese	7439-96-5	0.5	µg/L	520	54.5	2.7	<0.5	4.2	
Molybdenum	7439-98-7	0.1	µg/L	5.2	0.8	3.1	<0.1	3.6	
Nickel	7440-02-0	0.5	µg/L	4.7	1.1	1.0	<0.5	1.0	
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Zinc	7440-66-6	1	µg/L	<1	<1	<1	<1	<1	
<b>EG094T: Total metals in Fresh water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Selenium	7782-49-2	0.2	µg/L	0.4	0.2	0.5	<0.2	0.5	
Arsenic	7440-38-2	0.2	µg/L	2.2	0.7	2.6	<0.2	2.8	
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Boron	7440-42-8	5	µg/L	129	59	198	<5	213	
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
Chromium	7440-47-3	0.2	µg/L	3.6	<0.2	<0.2	<0.2	1.8	
Cobalt	7440-48-4	0.1	µg/L	5.4	0.7	0.7	<0.1	1.4	
Copper	7440-50-8	0.5	µg/L	2.2	0.6	2.0	<0.5	2.8	
Lead	7439-92-1	0.1	µg/L	0.6	<0.1	0.1	<0.1	0.4	
Manganese	7439-96-5	0.5	µg/L	678	110	37.8	<0.5	85.0	
Molybdenum	7439-98-7	0.1	µg/L	5.9	0.9	3.4	<0.1	3.6	
Nickel	7440-02-0	0.5	µg/L	7.1	1.0	1.3	0.6	2.1	
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
Zinc	7440-66-6	1	µg/L	12	<1	<1	<1	2	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.3	0.1	0.2	----	0.2	
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L	14.5	9.88	22.6	----	24.5	
Total Cations	----	0.01	meq/L	14.0	9.37	20.9	----	22.9	
Ionic Balance	----	0.01	%	1.69	2.61	3.90	----	3.39	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-T1-S1-0319	CV-SW-C-0319	CV-BO-0319	CV-BI-0319	CV-EB-0319
Client sampling date / time				05-Mar-2019 12:05	05-Mar-2019 08:45	06-Mar-2019 16:00	06-Mar-2019 10:00	06-Mar-2019 15:45	
Compound	CAS Number	LOR	Unit	EB1905872-006	EB1905872-007	EB1905872-008	EB1905872-009	EB1905872-010	
				Result	Result	Result	Result	Result	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	<1	
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	<2	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	<2	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	<2	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	----	<2	
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	<1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	<5	
<b>EP132B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Acenaphthylene	208-96-8	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Acenaphthene	83-32-9	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Fluorene	86-73-7	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Phenanthrene	85-01-8	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Anthracene	120-12-7	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Fluoranthene	206-44-0	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Pyrene	129-00-0	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Benzo(a)anthracene	56-55-3	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Chrysene	218-01-9	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Benzo(k)fluoranthene	207-08-9	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Benzo(a)pyrene	50-32-8	0.005	µg/L	<0.005	<0.005	<0.005	----	<0.005	
Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Dibenz(a.h)anthracene	53-70-3	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
Benzo(g.h.i)perylene	191-24-2	0.02	µg/L	<0.02	<0.02	<0.02	----	<0.02	
^ Total PAH	----	0.005	µg/L	<0.005	<0.005	<0.005	----	<0.005	
^ Benzo(a)pyrene TEQ (zero)	----	0.005	µg/L	<0.005	<0.005	<0.005	----	<0.005	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	101	99.4	101	----	100	
Toluene-D8	2037-26-5	2	%	92.8	94.3	94.8	----	96.0	
4-Bromofluorobenzene	460-00-4	2	%	100	102	103	----	101	
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level)</b>									
2-Fluorobiphenyl	321-60-8	0.02	%	119	109	110	----	105	
Anthracene-d10	1719-06-8	0.02	%	114	114	108	----	116	



### Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	CV-T1-S1-0319	CV-SW-C-0319	CV-BO-0319	CV-BI-0319	CV-EB-0319
Client sampling date / time				05-Mar-2019 12:05	05-Mar-2019 08:45	06-Mar-2019 16:00	06-Mar-2019 10:00	06-Mar-2019 15:45	
Compound	CAS Number	LOR	Unit	EB1905872-006	EB1905872-007	EB1905872-008	EB1905872-009	EB1905872-010	
				Result	Result	Result	Result	Result	
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level) - Continued</b>									
<b>4-Terphenyl-d14</b>	1718-51-0	0.02	%	<b>116</b>	<b>119</b>	<b>115</b>	----	<b>112</b>	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID			CV-BB-0319	----	----	----	----
		Client sampling date / time			06-Mar-2019 16:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1905872-011	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EA005P: pH by PC Titrator</b>									
pH Value	----	0.01	pH Unit	8.12	----	----	----	----	----
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	<1	----	----	----	----	----
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	----	1	mg/L	<1	----	----	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----	----
<b>EA065: Total Hardness as CaCO3</b>									
Total Hardness as CaCO3	----	1	mg/L	<1	----	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	----	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	4	----	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	----	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	<1	----	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	<1	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	<1	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	<1	----	----	----	----	----
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	----	----	----	----	----
Selenium	7782-49-2	0.2	µg/L	<0.2	----	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	----	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----	----
Boron	7440-42-8	5	µg/L	<5	----	----	----	----	----





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-BB-0319	----	----	----	----
Client sampling date / time				06-Mar-2019 16:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1905872-011	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued</b>									
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----	----
Chromium	7440-47-3	0.2	µg/L	<0.2	----	----	----	----	----
Cobalt	7440-48-4	0.1	µg/L	<0.1	----	----	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	----	----	----	----	----
Lead	7439-92-1	0.1	µg/L	<0.1	----	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	<0.5	----	----	----	----	----
Molybdenum	7439-98-7	0.1	µg/L	<0.1	----	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	----	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----	----
Tin	7440-31-5	0.2	µg/L	<0.2	----	----	----	----	----
Zinc	7440-66-6	1	µg/L	<1	----	----	----	----	----
<b>EG094T: Total metals in Fresh water by ORC-ICPMS</b>									
Antimony	7440-36-0	0.2	µg/L	<0.2	----	----	----	----	----
Selenium	7782-49-2	0.2	µg/L	<0.2	----	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	----	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----	----
Boron	7440-42-8	5	µg/L	<5	----	----	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----	----
Chromium	7440-47-3	0.2	µg/L	<0.2	----	----	----	----	----
Cobalt	7440-48-4	0.1	µg/L	<0.1	----	----	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	----	----	----	----	----
Lead	7439-92-1	0.1	µg/L	<0.1	----	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	<0.5	----	----	----	----	----
Molybdenum	7439-98-7	0.1	µg/L	<0.1	----	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	----	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----	----
Tin	7440-31-5	0.2	µg/L	<0.2	----	----	----	----	----
Zinc	7440-66-6	1	µg/L	<1	----	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	<0.1	----	----	----	----	----
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L	<b>0.08</b>	----	----	----	----	----
Total Cations	----	0.01	meq/L	<0.01	----	----	----	----	----
<b>EP080: BTEXN</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	CV-BB-0319	----	----	----	----
Client sampling date / time				06-Mar-2019 16:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	EB1905872-011	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP080: BTEXN - Continued</b>									
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	----	----	----	----	
<sup>^</sup> Total Xylenes	----	2	µg/L	<2	----	----	----	----	
<sup>^</sup> Sum of BTEX	----	1	µg/L	<1	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	
<b>EP132B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	0.02	µg/L	<0.02	----	----	----	----	
Acenaphthylene	208-96-8	0.02	µg/L	<0.02	----	----	----	----	
Acenaphthene	83-32-9	0.02	µg/L	<0.02	----	----	----	----	
Fluorene	86-73-7	0.02	µg/L	<0.02	----	----	----	----	
Phenanthrene	85-01-8	0.02	µg/L	<0.02	----	----	----	----	
Anthracene	120-12-7	0.02	µg/L	<0.02	----	----	----	----	
Fluoranthene	206-44-0	0.02	µg/L	<0.02	----	----	----	----	
Pyrene	129-00-0	0.02	µg/L	<0.02	----	----	----	----	
Benz(a)anthracene	56-55-3	0.02	µg/L	<0.02	----	----	----	----	
Chrysene	218-01-9	0.02	µg/L	<0.02	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.02	µg/L	<0.02	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	0.02	µg/L	<0.02	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.005	µg/L	<0.005	----	----	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.02	µg/L	<0.02	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	0.02	µg/L	<0.02	----	----	----	----	
Benzo(g.h.i)perylene	191-24-2	0.02	µg/L	<0.02	----	----	----	----	
<sup>^</sup> Total PAH	----	0.005	µg/L	<0.005	----	----	----	----	
<sup>^</sup> Benzo(a)pyrene TEQ (zero)	----	0.005	µg/L	<0.005	----	----	----	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	105	----	----	----	----	
Toluene-D8	2037-26-5	2	%	97.4	----	----	----	----	
4-Bromofluorobenzene	460-00-4	2	%	103	----	----	----	----	
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level)</b>									
2-Fluorobiphenyl	321-60-8	0.02	%	107	----	----	----	----	
Anthracene-d10	1719-06-8	0.02	%	113	----	----	----	----	



**Analytical Results**

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Client sample ID	<b>CV-BB-0319</b>	---	---	---	---
				Client sampling date / time	06-Mar-2019 16:00	---	---	---	---
Compound	CAS Number	LOR	Unit	<b>EB1905872-011</b>	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level) - Continued</b>									
<b>4-Terphenyl-d14</b>	1718-51-0	0.02	%	<b>119</b>	---	---	---	---	---



## Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP074S: VOC Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	53	134
Toluene-D8	2037-26-5	60	131
4-Bromofluorobenzene	460-00-4	59	127
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	53	134
Toluene-D8	2037-26-5	60	131
4-Bromofluorobenzene	460-00-4	59	127
Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118
<b>EP132T: Base/Neutral Extractable Surrogates (Low-Level)</b>			
2-Fluorobiphenyl	321-60-8	54	136
Anthracene-d10	1719-06-8	66	134
4-Terphenyl-d14	1718-51-0	63	135

## **Appendix C: Coal Fine Analysis**

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# Microscopic Analysis

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GREGORY SHAND/DES SEDIMENT SAMPLES

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December 21, 2018



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## 1. Introduction

ALS Energy – Coal Technology were contacted to conduct an analysis of some sediment samples to determine the amount of coal contained in each sample. Fourteen samples were received. The samples were prepared by float/sink at a density of S1.0/F2.0 (as per AS4156.1) to concentrate the coal portion of the sample. Maceral analysis (AS2856.2) was conducted on the eight samples at the ALS Coal Petrography and Imaging Centre at Richlands.

The eight samples were:

1. CV-T1-S1-1218
2. CV-T1-S2-1218
3. CV-T1-S3-1218
4. CV-T1-S4-1218
5. CV-T2-S2-1218
6. CV-T2-S3-1218
7. CV-T2-S4-1218
8. CV-CT1-S1-1218
9. CV-CT1-S2-1218
10. CV-CT1-S3-1218
11. CV-CT1-S4-1218
12. CV-CT2-S2-1218
13. CV-CT2-S3-1218
14. CV-CT2-S4-1218

## 2. Procedure

After receipt of sample from the Department of Environment and Science, the samples were prepped by removing excess water by filtration (where required), then air drying the samples. Float/sink testing was conducted, with the masses for three density fractions (Float 1.0, Sink 1.0 – Float 2.0 and Sink 2.0) being recorded (see Appendix A) and a petrography sample being prepared from the S1.0 - F2.0 fraction.

Samples were then prepared as per normal petrographic samples by mounting the crushed samples in an acrylic resin, which is polished via a multistage polishing procedure on a Struers Tegra polishing system to produce a suitable surface for reflected light microscopy.

A maceral count of each sample was conducted with the material under the crosshairs of the microscope being classified as per AS2856.2 (see Appendix B for Maceral Reports). 500 points were counted on each sample at 500x magnification.





### 3. Results

The results of the point count are outlined in the following table:

Sample	S1.0-F2.0 Mass (g)	Coal (% vol) in S1.0-F2.0	Coal (g)	Coal (% mass)
CV-T1-S1-1218	23.3	5.4	0.8	0.3
CV-T1-S2-1218	22.3	6.1	0.9	0.6
CV-T1-S3-1218	3.7	3.8	0.1	0.0
CV-T1-S4-1218	2	3	0.0	0.0
CV-T2-S2-1218	1.3	2	0.0	0.0
CV-T2-S3-1218	10.1	0.8	0.1	0.0
CV-T2-S4-1218	67.4	6.1	2.4	0.4
CV-CT1-S1-1218	1.1	6.7	0.1	0.0
CV-CT1-S2-1218	17.9	2.6	0.3	0.2
CV-CT1-S3-1218	0.1	1.8	0.0	0.0
CV-CT1-S4-1218	0	0	0.0	0.0
CV-CT2-S2-1218	0	0	0.0	0.0
CV-CT2-S3-1218	0	0	0.0	0.0
CV-CT2-S4-1218	5.9	1.4	0.0	0.0

The samples were predominantly made up of a mixture of mineral matter and non-coal organic material. To calculate the mass of coal in each fraction, the coal is assumed to have a relative density of 1.4 whilst the mineral matter is assumed to have a relative density of 2.6.



## 4. Appendix A

### 4.1 Float Sink Results (AS4156.1)

Sample	Fraction	Mass (g)
CV-T1-S1	F1	4.3
	S1 F2	23.3
	S2	232.8
CV-T1-S2	F1	12.8
	S1 F2	22.3
	S2	121.2
CV-T1-S3	F1	14.5
	S1 F2	3.7
	S2	524.8
CV-T1-S4	F1	2.9
	S1 F2	2
	S2	360.2
CV-T2-S2	F1	12.5
	S1 F2	1.3
	S2	90.1
CV-T2-S3	F1	3
	S1 F2	10.1
	S2	314.9



CV-T2-S4	F1	9.6
	S1 F2	67.4
	S2	513.5
CV-CT1-S1	F1	0.1
	S1 F2	1.1
	S2	382.7
CV-CT1-S2	F1	7.3
	S1 F2	17.9
	S2	136.4
CV-CT1-S3	F1	0
	S1 F2	0.1
	S2	396.2
CV-CT1-S4	F1	0
	S1 F2	0
	S2	373.5
CV-CT2-S2	F1	0
	S1 F2	0
	S2	662.2
CV-CT2-S3	F1	0
	S1 F2	0
	S2	736.7



CV-CT2-S4	F1	0
	S1 F2	5.9
	S2	623.2



## 5. Appendix B

Report Number: 45012946  
 Petrography Number: 3013N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-CT1-S2 S1 F2 DES Nov Enviro TQ18011488V040

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)				
VITRINITE	1.4	7.0	Telovitrinite	Textinite	0.0	0.0				
				Texto-ulminite	0.0	0.0				
				Eu-ulminite	0.0	0.0				
				Telocollinite	1.2	6.0				
			Detrovitrinite			Attrinite	0.0	0.0		
						Densinite	0.0	0.0		
						Desmocollinite	0.2	1.0		
			Gelovitrinite			Corpogellinite	0.0	0.0		
						Porigellinite	0.0	0.0		
						Eugellinite	0.0	0.0		
LIPTINITE	0.6	3.0		Sporinite	0.4	2.0				
				Cutinite	0.0	0.0				
				Resinite	0.0	0.0				
				Liptodetrinite	0.0	0.0				
				Alginite	0.0	0.0				
				Suberinite	0.2	1.0				
				Fluorinite	0.0	0.0				
				Exsudatinite	0.0	0.0				
				Bituminite	0.0	0.0				
				INERTINITE	0.6	3.0	Telo-inertinite	Fusinite	0.0	0.0
								Semifusinite	0.6	3.0
Funginite	0.0	0.0								
Detro-inertinite			Inertodetrinite				0.0	0.0		
			Micrinite				0.0	0.0		
Gelo-inertinite			Macrinite				0.0	0.0		
ORGANIC MATTER	17.3	87.0								

#### MINERAL 80.1

Prepared and measured in accordance with Australian Standards AS 2836.1; AS 2836.2.  
 Date: 19/12/2018 Observations: 303  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.



  
 Reporting Signatory: Gregory Shand, Petrographer  
 Erin Cafferky, Petrographer  
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Report Number: 45012946  
 Petrography Number: 3012N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-CT1-S1 S1 F2 DES Nov Enviro TQ18011488V037

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	5.5	11.7	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite	5.1	10.9	Telocollinite	5.1	10.9
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.4	0.8
			Gelovitrinite	0.0	0.0	Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.4	0.8		Sporinite	0.2	0.4		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.2	0.4		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.8	1.7	Telo-inertinite	Fusinite
Semifusinite	0.6	1.3						
Detro-inertinite	Funginite	0.0	0.0					
	Inertodetrinite	0.2	0.4					
Gelo-inertinite	Micrinite	0.0	0.0					
	Macrinite	0.0	0.0					
ORGANIC MATTER	40.5	85.8						

**MINERAL 52.8**  
 Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 20/12/2018 Observations: 506  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.

**NATA** Reporting Signatory: Gregory Shand, Petrographer  
 Signature: Lauren Stanton, Petrographer  
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 Petrography Number: 3014N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-CT1-S3 S1 F2 DES Nov Enviro TQ18011488V043

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	1.0	7.9	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	0.8	6.3
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.2	1.6
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.0	0.0		Sporinite	0.0	0.0		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginite	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.8	6.3	Telo-inertinite	Fusinite
Semifusinite	0.8	6.3						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				0.0	0.0
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
ORGANIC MATTER	10.8	85.7						

#### MINERAL 87.5

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 20/12/2018 Observations: 502  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.

   
 Reporting Signatory  
 Gregory Shand, Petrographer

  
 Lauren Stanton, Petrographer

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### MACERAL ANALYSIS

Sample Details: 45012946 CV-CT2-S4 S1 F2 DES Nov Enviro TQ18011488V055

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	1.2	8.4	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	0.8	5.6
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.4	2.8
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.0	0.0		Sporinite	0.0	0.0		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginite	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.2	1.4	Telo-inertinite	Fusinite
Semifusinite	0.2	1.4						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				0.0	0.0
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
NATURAL COKE	12.6	90.3						

MINERAL 86.0

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 19/12/2018 Observations: 315  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.

**NATA**  
 Accreditation #15794  
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 Petrography Number: 3005N  
 Client: ACIRL CASH SALE




### MACERAL ANALYSIS

Sample Details: 45012946 CV-T1-S1 S1 F2 DES Nov Enviro TQ18011488V016

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	3.8	11.8	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	3.0	9.3
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.8	2.5
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.2	0.6		Sporinite	0.2	0.6		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	1.4	4.4	Telo-inertinite	Fusinite
Semifusinite	0.8	2.5						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				0.6	1.9
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
ORGANIC MATTER	26.9	83.3						

#### MINERAL 67.7

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 18/12/2018 Observations: 502  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.

 **NATA**  
 Accreditation #15794  
 Sinc # 857  
 Reporting Signatory  
 Gregory Shand, Petrographer

*Claudia P. Lunnon*  
 Claudia Lunnon, Petrographer  
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Report Number: 45012946  
 Petrography Number: 3006N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-T1-S2 S1 F2 DES Nov Enviro TQ18011488V019

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	4.5	16.7	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite	3.9	14.5	Telocollinite	0.0	0.0
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.6	2.2
			Gelovitrinite	0.0	0.0	Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.2	0.7		Sporinite	0.2	0.7		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	1.4	5.0	Telo-inertinite	Fusinite
Semifusinite	1.0	3.6						
Funginite	0.0	0.0						
Detro-inertinite	Inertodetrinite	0.2	0.7					
	Micrinite	0.0	0.0					
Gelo-inertinite	Macrinite	0.0	0.0					
ORGANIC MATTER	21.0	77.5						

MINERAL 72.9

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 18/12/2018 Observations: 310  
 Analysis performed on As Received sample  
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 Reporting Signatory  
 Gregory Shand, Petrographer

  
 Claudia Lunnon, Petrographer

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Report Number: 45012946  
 Petrography Number: 3007N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-T1-S3 S1 F2 DES Nov Enviro TQ18011488V022

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	1.8	11.8	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	1.6	10.5
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.2	1.3
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.2	1.3		Sporinite	0.2	1.3		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	1.8	11.8	Telo-inertinite	Fusinite
Semifusinite	1.0	6.6						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				0.2	1.3
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
ORGANIC MATTER	11.3	75.0						

MINERAL 85.0

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 19/12/2018 Observations: 305  
 Analysis performed on As Received sample  
 This data has not been artificially rounded to avoid misleading presentation of results.

   
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Report Number: 45012946  
 Petrography Number: 3008N  
 Client: ACIRL CASH SALE




### MACERAL ANALYSIS

Sample Details: 45012946 CV-T1-S4 S1 F2 DES Nov Enviro TQ18011488V025

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	2.8	24.6	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite	2.8	24.6	Telocollinite	2.8	24.6
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.0	0.0
			Gelovitrinite	0.0	0.0	Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.0	0.0		Sporinite	0.0	0.0		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.2	1.8	Telo-inertinite	Fusinite
Semifusinite	0.0	0.0						
Detro-inertinite	Funginite	0.0	0.0					
	Inertodetrinite	0.0	0.0					
Gelo-inertinite	Micrinite	0.0	0.0					
	Macrinite	0.0	0.0					
ORGANIC MATTER	8.3	73.7						

**MINERAL 88.8**

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 19/12/2018 Observations: 308  
 Analysis performed on As Received sample  
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 Claudia P. Lunnon, Petrographer

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Report Number: 45012946  
 Petrography Number: 3009N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-T2-S2 S1 F2 DES Nov Enviro TQ18011488V028

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	1.2	6.0	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	1.0	5.0
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.2	1.0
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.0	0.0		Sporinite	0.0	0.0		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.8	4.0	Telo-inertinite	Fusinite
Semifusinite	0.4	2.0						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				0.4	2.0
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
ORGANIC MATTER	17.8	90.0						

**MINERAL 80.2**

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 20/12/2018 Observations: 506  
 Analysis performed on As Received sample  
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 Lauren Stanton, Petrographer

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Report Number: 45012946  
 Petrography Number: 3010N  
 Client: ACIRL CASH SALE



### MACERAL ANALYSIS

Sample Details: 45012946 CV-T2-S3 S1 F2 DES Nov Enviro TQ18011488V031

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	0.4	1.8	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite	0.4	1.8	Telocollinite	0.0	0.0
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.0	0.0
			Gelovitrinite	0.0	0.0	Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.4	1.8		Sporinite	0.4	1.8		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	0.0	0.0	Telo-inertinite	Fusinite
Semifusinite	0.0	0.0						
Funginite	0.0	0.0						
Detro-inertinite	Inertodetrinite	0.0	0.0					
	Micrinite	0.0	0.0					
Gelo-inertinite	Macrinite	0.0	0.0					
ORGANIC MATTER	20.7	96.4						

MINERAL 78.6

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 19/12/2018 Observations: 313  
 Analysis performed on As Received sample  
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 Claudia Lunnon, Petrographer

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Report Number: 45012946  
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### MACERAL ANALYSIS

Sample Details: 45012946 CV-T2-S4 S1 F2 DES Nov Enviro TQ18011488V034

GROUP	VOLUME (%)	VOLUME (% mineral free)	SUBGROUP	MACERAL	VOLUME (%)	VOLUME (% mineral free)		
VITRINITE	3.1	21.0	Telovitrinite	Textinite	0.0	0.0		
				Texto-ulminite	0.0	0.0		
				Eu-ulminite	0.0	0.0		
			Detrovitrinite			Telocollinite	2.9	19.7
						Attrinite	0.0	0.0
						Densinite	0.0	0.0
						Desmocollinite	0.2	1.3
			Gelovitrinite			Corpogellinite	0.0	0.0
						Porigelinite	0.0	0.0
						Eugelinite	0.0	0.0
LIPTINITE	0.4	2.6		Sporinite	0.4	2.6		
				Cutinite	0.0	0.0		
				Resinite	0.0	0.0		
				Liptodetrinite	0.0	0.0		
				Alginate	0.0	0.0		
				Suberinite	0.0	0.0		
				Fluorinite	0.0	0.0		
				Exsudatinite	0.0	0.0		
				Bituminite	0.0	0.0		
				INERTINITE	2.6	17.1	Telo-inertinite	Fusinite
Semifusinite	1.2	7.9						
Funginite	0.0	0.0						
Detro-inertinite			Inertodetrinite				1.4	9.2
			Micrinite				0.0	0.0
Gelo-inertinite			Macrinite				0.0	0.0
ORGANIC MATTER	8.8	59.2						

#### MINERAL 85.1

Prepared and measured in accordance with Australian Standards AS 2856.1; AS 2856.2.  
 Date: 19/12/2018 Observations: 311  
 Analysis performed on As Received sample  
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 Erin Cafferky, Petrographer

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