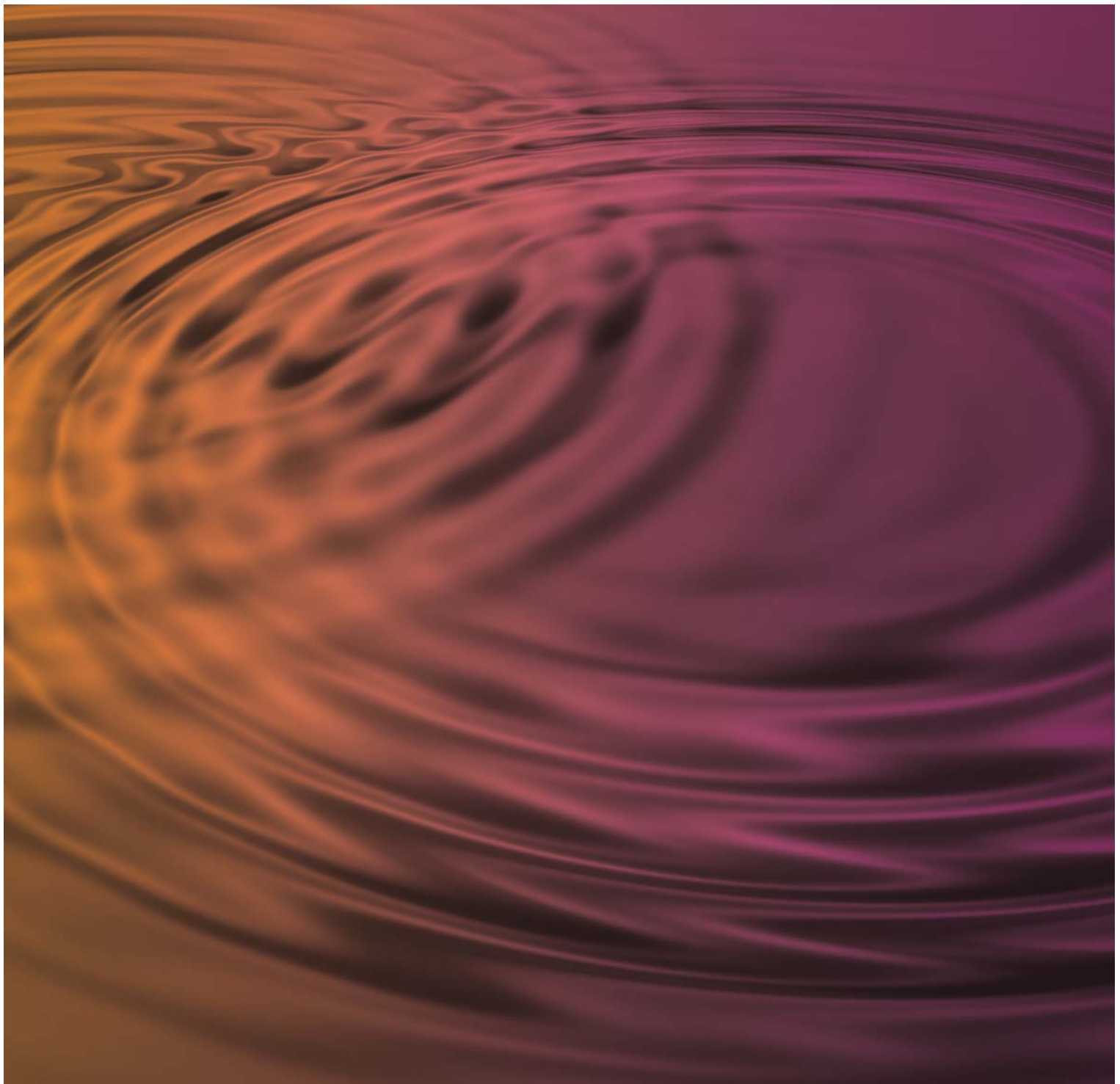


Rainwater Tank Testing - Post Introduction Testing

Australian Super Hornet Flying Operations



Rainwater Tank Testing - Post Introduction Testing

Australian Super Hornet Flying Operations

Client: Department of Defence

ABN: N/A

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Quality Information

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Executive Summary

This report outlines the methodology and outcomes of a comparative water quality study of residential rainwater tanks, undertaken within the vicinity of the RAAF Base Amberley. The purpose was to assess the impacts of the Australia Super Hornet (ASH) operations at the base.

Water quality testing was undertaken pre and post-operation of the ASH at the base.

The first round of pre-operation testing was undertaken on the 9 and 10 December 2009 by Sinclair Knight Merz Pty Limited.

In late 2013, Spotless Facility Services Pty Ltd engaged AECOM Australia Pty Ltd (AECOM) to undertake a second round of testing. This was undertaken between 25 November 2013 and 3 February 2014.

The second round of testing found:

- detectable increases in the concentration of some metals results and formaldehyde.
- The detectable increases found were all below the relevant Australian Drinking Water Guideline, with the exception of lead in two locations. These two incidences of increased lead concentrations were determined to be considered likely from sources localised to those two particular tanks.

The study found there is no detectable relationship between the ASH operations at RAAF Base Amberley and the concentration of contaminants in water samples from rainwater tanks in the vicinity of the base.

The 10 rainwater tanks tested included seven tanks in the vicinity of RAAF Amberley and three control tanks located in Brisbane, approximately 30 km away from the base.

The water quality analysis was performed by ALS Limited and involved the following analytes, which were selected in the ASH Air Quality Monitoring Plan (AQMP):

- Total and dissolved metals (arsenic, beryllium, cadmium, chromium, lead, zinc)
- Polynuclear aromatic hydrocarbons (standard suite of 16 PAHs)
- Total Petrol Hydrocarbons (TPH) (C₁₀-C₃₆) and Total Recoverable Hydrocarbons (TRH) (>C₁₀-C₄₀)
- Aldehydes (formaldehyde, acetaldehyde, propionaldehyde, acrolein, butyraldehyde).

1.0 Introduction, Background and Objectives

The Spotless Facility Services Pty Ltd engaged AECOM Australia Pty Ltd (AECOM) to undertake a repeat round of water testing from 10 rainwater tanks previously sampled in 2009. The repeat round of water testing from rainwater tanks is the second part of a study to quantify any potential impacts to drinking water in residential rainwater tanks due to the operation of the Australia Super Hornet (ASH) at RAAF Base Amberley.

Under emergency situations and following strict procedures the ASH is capable of releasing excess fuel during flight to reduce weight for a safe landing. Release of excess fuel is carried out no lower than 6,000 ft. (approx. 1,820m) above ground level and preferably over sea. At this height jettisoned fuel almost immediately vaporises and is dispersed through the air.

The ASH Public Environment Report (PER) identified an issue raised by public submission that many residents within close proximity to RAAF Base Amberley only have access to water tanks as a source of drinking water. Previous studies at RAAF Base Williamstown have investigated the potential for military aircraft to impact on rainwater tanks. The RAAF Base Williamstown study found no relationship between aircraft overflight and water quality in rainwater tanks. Notwithstanding the study findings from RAAF Base Williamstown Defence committed to undertake water testing pre and post introduction of the ASH at RAAF Base Amberley.

The first round of water quality testing (pre-introduction) was conducted in November 2009, and was documented in the report "*Rainwater Tank Testing, Super Hornet Public Environment Report*" dated 3 February 2010 by Sinclair Knight Merz Pty Limited (SKM, 2010). The first round of water quality testing was undertaken at rain water tanks that were volunteered by the owners and within 2km to 8 km of RAAF Base Amberley and control rainwater tanks greater than 25km from RAAF Base Amberley.

To quantify any potential impacts to drinking water in residential rainwater tanks due to the operation of the ASH at RAAF Base Amberley, a second round of water quality testing was performed. To provide a 'like-for-like' comparison the sampling methodology and rainwater tank selection from round 1 sampling were replicated, where practicable, in the second round. Any deviations from the round 1 sampling methodology are discussed in Section 2. This report details the second (post-introduction) round of testing. Results from the second (post-introduction) round of testing were compared with first round of testing (pre-introduction) testing to assess if there was any detectable relationship between ASH operations and water quality in rainwater tanks.

2.0 Methodology

2.1 Sampling Locations

Seven rainwater tanks in the vicinity of RAAF Amberley were sampled to assess impacts from operations at RAAF Amberley, identified as tanks T1 – T7 in Table 1 below. In addition, three control rainwater tanks away from the immediate vicinity of RAAF Amberley were sampled to provide comparative results, identified as tanks C2 – C5 in Table 1 below. These control tanks were located in suburban Brisbane. The sampling locations are detailed in Table 1 below, and an aerial of sampling locations is presented in Figure 1.

The ten tanks sampled are a subset of the twelve tanks sampled in the pre-introduction sampling round. All test tanks were resampled, and three of the five control tanks were resampled. Two control tanks were not available to be resampled, the remaining three control tanks were considered sufficient to establish a baseline with now potential influence from ASH activities. The identifier of each tank remains identical to the pre-introduction round of sampling, except for T4. Tank T4A is a different tank of similar composition and age, drawing from the same roofing structure, on the same property. The tank sampled as T4 in 2009 has been moved and is drawing rainwater from a roof different in size, construction, elevation and angle to the previous test.

Table 1 Sampling Locations

Identifier	Type	Suburb	Relative Location
T1	Test	Amberley	2km SE of RAAF Amberley
T2	Test	Willowbank	4km SW of RAAF Amberley
T3	Test	Karrabin	5km N of RAAF Amberley
T4A	Test	Walloon	6km NW of RAAF Amberley
T5	Test	Ironbark	8km WNW of RAAF Amberley
T6	Test	Ironbark	8km WNW of RAAF Amberley
T7	Test	Ironbark	7km WNW of RAAF Amberley
C2	Control	Keperra	35km NE of RAAF Amberley
C4	Control	Yeronga	33km ENE of RAAF Amberley
C5	Control	Corinda	28km ENE of RAAF Amberley

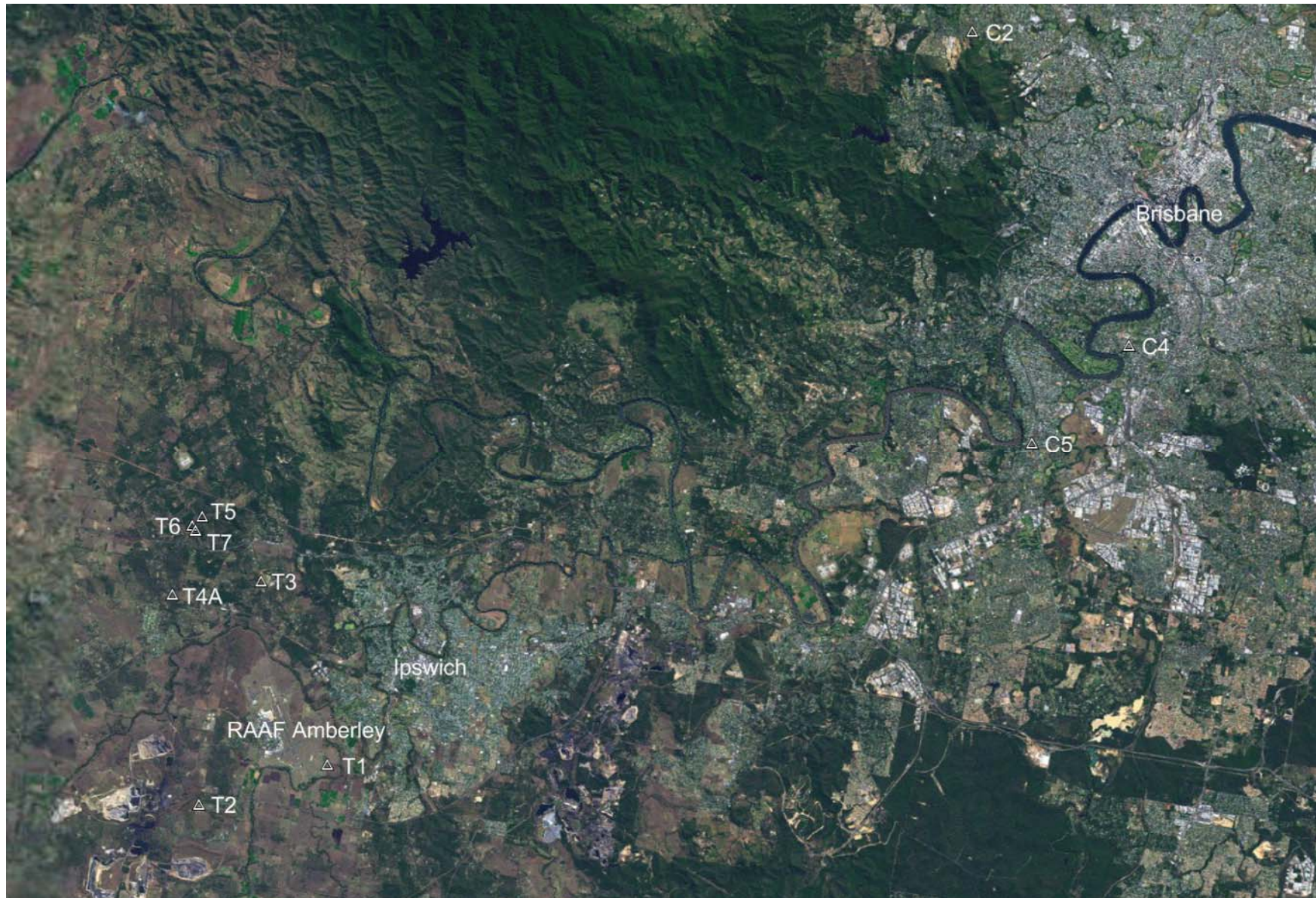


Figure 1 Aerial of testing locations

2.2 Tank Information

Tank information is summarised in Table 2 below. The roof and tank details were sourced from the pre-introduction testing report, and were either visually confirmed by the technician at the time of testing or verbally confirmed to be accurate with the respective residents.

Table 2 Tank sampling information

Identifier	Sampling point	Roof material	Tank material	Approximate tank volume (L)
T1	Hose	Metal	Fibreglass	30,000
T2	Tap	Metal	Metal	22,000
T3	Tap	Metal	Concrete	20,000
T4A	Water inlet	Metal	Metal	10,000
T5	Tap	Concrete Tile	Metal	19,000
T6	Tap	Metal	Concrete	10,000
T7	Tap	Metal	Concrete	10,000
C2	Tap	Metal	Plastic	2,000
C4	Tap	Metal	Metal	2,000
C5	Tap	Metal	Metal	8,000

2.3 Dates of testing

Sampling was conducted on 25, 26 and 29 November 2013. There was 52mm of rain reported by the Bureau of Meteorology for the Amberley weather station on 24 November 2013. There was 10.6mm of rain recorded for the Brisbane weather station on 24 November 2013. There was no rain reported at Amberley between 25 and 29 November 2013. There was 8.8mm of rain recorded in Brisbane on 25 November 2013.

Upon review of sampling results it was discovered that a laboratory holding time non-compliance for aldehydes existed for samples taken on 25 and 26 September 2013. The tanks affected were T1, T2, T3, T4A, T5, T6, C4 and C5. Results for tanks T7 and C2 were not affected by this non-compliance. The holding time limit was 7 days and the non-compliant samples exceeded this by up to 6 days.

Due to the holding time non-compliance, affected tanks were resampled in early 2014. Tanks T1, T2 and T6 were resampled on 13 January 2014 and tanks T3, T4A and T5 were resampled on 14 January 2014. Control tanks C4 and C5 were resampled on 3 February 2014 due to unavailability of the occupants during the post-Christmas/New Year period.

The Bureau of Meteorology reports a total of 1.0mm of rain in the week prior to 13/14 January 2014 at the Amberley weather station. There was 0.4mm of rain recorded at the Amberley weather station during 14 January 2014. The Bureau of Meteorology recorded 1.0mm of rain in the week leading up to 3 February 2014 at the Brisbane weather station, and recorded 1.6mm of rain during 3 February 2014.

Table 3 details sampling dates and laboratory QA evaluations for post-introduction samples referenced in this report.

Table 3 Tank Sampling Information

ID	Pre-Introduction Sampling	Post-Introduction Sampling	2013 Sampling Date	2013 Sample QA Evaluation	2014 Sampling Date	2014 Sample QA Evaluation
T1	Yes	Yes	26/11/2013	Holding time non-compliance	13/01/2014	OK
T2	Yes	Yes	26/11/2013	Holding time non-compliance	13/01/2014	OK
T3	Yes	Yes	26/11/2013	Holding time non-compliance	14/01/2014	OK
T4/T4A	Yes	Yes ¹	25/11/2013	Holding time non-compliance	14/01/2014	OK
T5	Yes	Yes	26/11/2013	Holding time non-compliance	14/01/2014	OK
T6	Yes	Yes	26/11/2013	Holding time non-compliance	13/01/2014	OK
T7	Yes	Yes	29/11/2013	OK	Not resampled	-
C1	Yes	No	-	-	-	-
C2	Yes	No	-	-	-	-
C2	Yes	Yes	29/11/2013	OK	Not resampled	-
C4	Yes	Yes	26/11/2013	Holding time non-compliance	3/02/2014	OK
C5	Yes	Yes	26/11/2013	Holding time non-compliance	3/02/2014	OK

¹ Tank T4A is a different tank drawing from the same roof, as detailed in Section 2.1.

2.4 Sampling Technique

To ensure consistency, sampling was conducted in accordance with the sampling procedure described in Section 3.3 of the report "*Rainwater Tank Testing, Super Hornet Public Environment Report*" dated 3 February 2010 (the pre-introduction report). The procedure, and any deviations from the procedure used in the pre-introduction round of testing, is noted below:

- A clean 10L plastic bucket was filled twice from the sampling point and the water discarded in order to flush the access point of any surface contaminants. During this process, related equipment such as the hand pump was also flushed by completely filling them twice and discarding the water. The exception to this was Tank T4A, at which a bailer was used to extract water from the tank inlet. The outlet system for tank T4A was relatively complex and also drew water from other tanks on the property, which if used was judged to be likely to lead to contamination.
- Following the flushing of the system, the sample containers were filled from the access point (where possible). If the access point was not suitable for sampling the clean and flushed 10L plastic bucket was refilled with a quantity of water suitable for filling the sample containers, taking care to ensure the mouth of the sample container did not come into contact with other sources of contamination (e.g. hands). It is noted that the pre-introduction sampling used triplicate water sample bottles of unstated capacity, whereas the sampling detailed in this test used sample bottles provided by ALS Limited specifically prepared for each sample. It is also noted that the dissolved metals samples were field-filtered using a Waterra 0.45 micron in-line disposable filter and hand pump. It should be noted that the laboratory report notes that the pre-introduction samples were filtered for metals. It is not clear however if the samples were filtered in the field or in the laboratory.

- Samples were chilled in a cooler box and either delivered to ALS Limited in Stafford on the same day, or returned to refrigerated storage overnight to be delivered subsequently for testing in accordance with holding times specified by ALS Limited.

2.5 Analysis of Samples and Data Interpretation

Analysis was performed by ALS Limited for the following analytes, as nominated by the Department of Defence in the ASH Air Quality Monitoring Plan (AQMP):

- Total and dissolved metals (arsenic, beryllium, cadmium, chromium, lead, zinc)
- Polynuclear aromatic hydrocarbons (standard suite of 16 PAHs)
- Total Petrol Hydrocarbons (TPH) (C₁₀-C₃₆) and Total Recoverable Hydrocarbons (TRH) (>C₁₀-C₄₀) and,
- Aldehydes (formaldehyde, acetaldehyde, propionaldehyde, acrolein, butyraldehyde).

ALS Limited is NATA accredited for these methods of analysis. Aldehydes analysis was performed at ALS' Sydney Organics Laboratory, with all other tests being performed at ALS' Brisbane Laboratory in Stafford. Laboratory Certificates of Analysis, Quality Control Reports and Chain-of-custody forms are presented in Appendix A to Appendix C¹.

The NATA accredited methods used to determine concentrations of the various analytes are subject to minimum reporting limits, below which detection or accurate quantification is not possible. The limits of reporting for each analyte (excluding total petroleum hydrocarbons) in this round of testing were selected to match the limits of reporting listed in Table 4-1 in the pre-introduction testing report (SKM, 2010), where possible. The selection of like for like limit of reporting between the rounds of testing allows the study to achieve its aim of determining if there was any relationship between ASH operations and water quality in rainwater tanks.

It is noted that ALS Limited's NATA accredited method of analysis for TPH fractions was higher than the limit of reporting for the method of analysis used in the pre-introduction round of testing. The method of analysis used in the pre-introduction round of testing was not NATA accredited. At the time of AECOM's testing, a NATA accredited method with a limit of reporting as low as the pre-introduction round of testing does not exist for both ALS Limited and QLD Health: Forensic and Scientific Services the laboratory used in pre-introduction round of testing.

In addition to comparing pre-introduction sampling with post-introduction sampling where possible a comparison with Australian Drinking Water Guidelines was performed to provide further context to the results. In 2011 the NHMRC Australian Drinking Water Guidelines were revised - after the pre-introduction testing report (SKM, 2010). As a result of the guideline value revision in 2011 the Benzo(a)pyrene limit of reporting selected to best match the pre-introduction testing is above the new guideline value therefore ruling out the possibility of a direct comparison with the NHMRC Australian Drinking Water Guidelines.

Table 4 details those analytes where the limit of reporting is relevant in comparison to either the guideline value in the NHMRC Australian Drinking Water Guideline Paper 6, 2011, or the pre-introduction round of testing.

¹ Note ALS reporting has an erroneous sample ID of C3 for all samples taken at location C2. No samples for this round of monitoring were taken at location C3. All results in ALS reporting for sample id C3 are for Monitoring location C2.
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Table 4 Comparison of guideline values and limits of reporting

Analyte	Australian Drinking Water Guideline (mg/L)	Pre-introduction (2009) testing limit of reporting (mg/L)	Post-introduction (2014) testing limit of reporting (mg/L)	Comments
Benzo(a)pyrene	0.00001	0.01	0.0005	Limit of reporting for post-introduction analysis exceeds the new (2011) drinking water guideline
TPH $nC_{10}-C_{14}$ fraction	No guideline value	0.005	0.05	No NATA accredited method available at ALS or QLD Health Forensic and Scientific Services (Laboratory used in 2009) with a limit of reporting of 0.005 mg/L
TPH $nC_{15}-C_{28}$ fraction	No guideline value	0.005	0.1	
TPH $nC_{29}-C_{36}$ fraction	No guideline value	0.005	0.05	

3.0 Post-Introduction Testing Results

Results of the post-introduction water testing are presented in

Table 5 and the following sections. The guideline values specified in the NHMRC *Australian Drinking Water Guidelines Paper 6, 2011* (ADWG) are provided to give context to the results. There were no detections above the guideline values for any of the analysed contaminants in any of the test and control tanks metals with the exception of lead in two locations.

Total and Dissolved Metals

Levels of dissolved and total metals were measured in a number of test and control tanks. All samples are below the guideline values for all total and dissolved metals with the exception of lead in locations T2 and T6. Considering the four test tanks that had decreased levels of lead (T3, T4A, T5 and T7) are in close proximity to tanks that had detectable increases (T1, T2 and T6) it is considered likely that any increased concentrations of lead is from sources localised to those particular tanks.

Polynuclear Aromatic Hydrocarbons

Water samples of a number of test and control tanks were analysed for polynuclear aromatic hydrocarbons. There was no detection above the limit of reporting of polynuclear aromatic hydrocarbons in any sample.

It is noted that the method of analysis chosen has a limit of reporting (LOR) for Benzo(a)pyrene is greater than the 2011 NHMRC Australian Drinking Water Guideline, 2011, as discussed in Section 2.5.

Petroleum Hydrocarbons

Water samples of a number of test and control tanks were analysed for petroleum hydrocarbons. There was no detection above the limit of reporting of petroleum hydrocarbons in any sample. There are no guideline values specified in the NHMRC *Australian Drinking Water Guidelines Paper 6, 2011* (ADWG) for petroleum hydrocarbons.

Aldehydes

Water samples of a number of test and control tanks were analysed for petroleum hydrocarbons. Formaldehyde was detected in tanks T2 and C2. Both detections were below the formaldehyde guideline value, with T2 and C2 being approximately 1% and 2% of the guideline value respectively. All other results are below the formaldehyde guideline value.

Table 5 Dissolved metals (mg/L)

Parameter	GV ¹	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	LOR
Total metals (mg/L)												
Arsenic	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Beryllium	0.06	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Cadmium	0.002	0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Chromium	0.05	0.001	0.006	0.001	0.002	0.003	0.006	0.008	<0.001	<0.001	<0.001	0.001
Lead	0.01	0.001	0.011	0.001	0.001	0.002	0.028	<0.001	0.002	0.008	0.002	0.001
Nickel	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002	0.001
Zinc	3.0	1.21	0.479	0.108	0.330	2.22	0.406	0.237	0.052	0.780	0.218	0.005
Dissolved metals (mg/L)												
Arsenic	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Beryllium	0.06	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Cadmium	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Chromium	0.05	<0.001	0.004	<0.001	0.001	0.001	0.004	0.007	<0.001	<0.001	<0.001	0.001
Lead	0.01	<0.001	0.010	<0.001	0.001	<0.001	0.015	<0.001	<0.001	<0.001	<0.001	0.001
Nickel	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Zinc	3.0	0.345	0.436	0.097	0.281	1.900	0.364	0.224	0.053 ²	0.263	0.209	0.005
Polynuclear Aromatic Hydrocarbons (µg/L)												
Naphthalene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Acenaphthylene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Acenaphthene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Fluorene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Phenanthrene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Anthracene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Fluoranthene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0

Parameter	GV ¹	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	LOR
Pyrene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Benz(a)anthracene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Chrysene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Benzo(b)fluoranthene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Benzo(k)fluoranthene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Benzo(a)pyrene	0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Indeno(1.2.3.cd)pyrene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Dibenz(a.h)anthracene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Benzo(g.h.i)perylene	NGV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Total Petroleum Hydrocarbons (µg/L)												
C ₁₀ - C ₁₄ Fraction	NGV	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
C ₁₅ - C ₂₈ Fraction	NGV	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100
C ₂₉ - C ₃₆ Fraction	NGV	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Aldehydes (µg/L)												
Formaldehyde	500	<2.0	5.4	<2.0	<2.0	<2.0	<2.0	<2.0	10.6	<2.0	<2.0	2.0
Acetaldehyde	NGV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Propionaldehyde	NGV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Acrolein (Propenal)	NGV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0
Butyraldehyde	NGV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0

¹ Guideline Value from the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

² It is noted that the C2 dissolved zinc concentration is reportedly higher than the total zinc concentration. ALS Limited reports that this difference is within experimental variation of the methods.

NGV – No Guideline Value in the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

Bold results are exceedances of the Guideline Value from the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

4.0 ASH Pre-introduction and Post-introduction Discussion

Results detailed in this report have been compared to pre-introduction testing conducted by Sinclair Knight Merz Pty Limited in 2009 and detailed in Tables 4-1 and 4-2 of the report "Rainwater Tank Testing, Super Hornet Public Environment Report" dated 3 February 2010. The aim of the comparison is to determine if there was any relationship between ASH operations and water quality in rainwater tanks.

Total and dissolved metals

Total and dissolved metals were detected in similar concentrations to the pre-introduction round of testing, with the exception of chromium, lead and zinc. The concentration of metals in all samples analysed were below drinking water guideline values with the exception of locations T2 and T6 where lead concentrations were found to exceed drinking water guideline values.

Chromium

Tanks T1, T2, T3, T5, and T7 all showed higher total or dissolved chromium than the pre-introduction round of testing, while, T6, C2, C4 and C5 all showed a reduction in chromium levels. Tank T4A also reported lower chromium concentrations compared to tank T4, but it is noted that T4A is a different tank drawing from the same roof as tank T4 (as detailed in Section 2.1). The concentration of chromium in all samples analysed were below drinking water guideline values.

Lead

Tanks T1, T2, T6 C2, C4 and C5 all showed higher total or dissolved lead than the pre-introduction round of testing, while, T3, T4A, T5 and T7 all showed a reduction in lead levels. The concentration of lead in all samples analysed were below drinking water guideline value of 0.01 mg/l with the exception of tanks T2 and T6. The total metals samples from tanks T2 and T6 contained lead concentrations of 0.011 mg/l and 0.028 mg/l respectively. Considering the four test tanks that had decreased levels of lead (T3, T4A, T5 and T7) are in close proximity to tanks that had detectable increases (T1, T2 and T6) it is likely than any increased concentration of lead are from sources localised to those particular tanks.

Zinc

Tanks T1, T2, T3, T5, T6 and T7 all showed higher total or dissolved zinc than the pre-introduction round of testing, while, C2, C4 and C5 all showed a reduction in zinc levels. Tank T4A also reported lower zinc concentrations compared to tank T4, but it is noted that T4A is a different tank drawing from the same roof as tank T4 (as detailed in Section 2.1). The concentration of Zinc in all samples analysed were below drinking water guideline values.

Polynuclear Aromatic Hydrocarbons

Polynuclear Aromatic Hydrocarbons (PAHs) were not detected above the limit of reporting for the test method in either round of testing.

Petroleum Hydrocarbons

Petroleum hydrocarbons in the C₁₅-C₂₈ fraction were detected in T1, T2 and T3 in the pre-introduction round of testing. Additionally, petroleum hydrocarbons in the C₁₀-C₁₄ fraction were detected in T2 in the pre-introduction round of testing. Post-introduction results were below the limit of reporting for the test method in these tanks. It is noted that the concentrations detected in the pre-introduction tests were below the limit of reporting for the method used to analyse samples from the post-introduction round of testing. Therefore no detectable increase in petroleum hydrocarbons is present after the introduction of ASH.

Aldehydes

There was no detection of aldehydes (including formaldehyde) in the 2009 round of testing. Formaldehyde was detected above the limit of reporting in tank T2 and control tank C2 in the post-introduction round of testing. These detections were below the guideline value given in the Australian Drinking Water Guidelines 6 (2011).

It is noted that the concentrations detected in tank T2 during post-introduction testing was below the limit of reporting for the test method used in the pre-introduction round of testing. There is no evidence to show that there was not formaldehyde present at a similar concentration during the pre-introduction sampling. Consequently no detectable increase in aldehydes is present after the introduction of ASH.

A summary of the comparison between pre-introduction and post-introduction analytical results is provided in Table 6. Detectable increases were recorded for some metals results and for formaldehyde, however all were below the relevant drinking water guideline for all sampling locations and analytes with the exception of lead in locations T2 and T6. It is considered likely that any increased concentrations of lead are from sources localised to those particular tanks.

Table 6 Comparison Between ASH Pre-introduction and Post-introduction sampling

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
Total metals (mg/L)												
Arsenic	Pre-introduction	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0002	0.0002	0.0003	0.01
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Beryllium	Pre-introduction	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.06
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Cadmium	Pre-introduction	0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.002
	Post-introduction	0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
	Detectable Increase	No	No	No	No	No	Yes	No	No	No	No	
Chromium	Pre-introduction	0.0004	0.0027	0.0003	0.002	0.001	0.0085	0.0047	0.0003	0.0001	0.0015	0.05
	Post-introduction	0.001	0.006	0.001	0.002	0.003	0.006	0.008	<0.001	<0.001	<0.001	
	Detectable Increase	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	
Lead	Pre-introduction	0.0007	0.0085	0.0019	0.0055	0.0029	0.0042	0.0003	0.001	0.0005	0.0018	0.01
	Post-introduction	0.001	<u>0.011</u>	0.001	0.001	0.002	<u>0.028</u>	<0.001	0.002	0.008	0.002	
	Detectable Increase	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	
Nickel	Pre-introduction	0.0001	0.0004	0.0004	0.001	0.0006	0.0006	0.0001	0.0091	0.0054	0.0017	0.02
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002	
	Detectable Increase	No	No	No	No	No	No	Yes	No	No	Yes	
Zinc	Pre-introduction	0.7777	0.1593	0.081	0.4647	1.423	0.3933	0.0727	0.576	0.8783	0.668	3.0
	Post-introduction	1.21	0.479	0.108	0.33	2.22	0.406	0.237	0.052	0.78	0.218	

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
	Detectable Increase	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	
Dissolved metals (mg/L)												
Arsenic	Pre-introduction	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0003	0.0003	0.0003	0.01
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Beryllium	Pre-introduction	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.06
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Cadmium	Pre-introduction	0.0001	<0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0002	0.0001	0.0001	0.0002	0.002
	Post-introduction	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Chromium	Pre-introduction	0.0003	0.0018	0.0002	0.0018	0.0007	0.0071	0.0036	0.0003	0.0001	0.0013	0.05
	Post-introduction	<0.001	0.004	<0.001	0.001	0.001	0.004	0.007	<0.001	<0.001	<0.001	
	Detectable Increase	No	Yes	No	No	Yes	No	Yes	No	No	No	
Lead	Pre-introduction	0.0011	0.0079	0.0009	0.0068	0.002	0.0032	0.0012	0.0016	0.0005	0.0102	0.01
	Post-introduction	<0.001	0.01	<0.001	0.001	<0.001	0.015	<0.001	<0.001	<0.001	<0.001	
	Detectable Increase	No	Yes	No	No	No	Yes	No	No	No	No	
Nickel	Pre-introduction	0.0004	0.0004	0.0003	0.0015	0.0005	0.0004	0.0002	0.0097	0.0074	0.0046	0.02
	Post-introduction	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Zinc	Pre-introduction	0.7863	0.1573	0.065	0.5543	1.389	0.3717	0.0653	0.5917	0.863	0.6527	3.0
	Post-introduction	0.345	0.436	0.097	0.281	1.9	0.364	0.224	0.0532	0.263	0.209	

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
	Detectable Increase	No	Yes	Yes	No	Yes	No	Yes	No	No	No	
Polynuclear Aromatic Hydrocarbons (µg/L)												
Naphthalene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Acenaphthylene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Acenaphthene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Fluorene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Phenanthrene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Anthracene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
Fluoranthene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Pyrene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Benz(a)anthracene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Chrysene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Benzo(b)fluoranthene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Benzo(a)pyrene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	0.01
	Post-introduction	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Indeno(1.2.3.cd)pyrene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
Dibenz(a.h)anthracene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Benzo(g,h.i)perylene	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Total Petroleum Hydrocarbons (µg/L)												
C ₁₀ - C ₁₄ Fraction	Pre-introduction	<5	0.048	<5	<5	<5	<5	<5	<5	<5	<5	NGV
	Post-introduction	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
C ₁₅ - C ₂₈ Fraction	Pre-introduction	4	78	9	<5	<5	<5	<5	<5	<5	<5	NGV
	Post-introduction	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
C ₂₉ - C ₃₆ Fraction	Pre-introduction	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	NGV
	Post-introduction	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	
Aldehydes (µg/L)												
Formaldehyde	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	500
	Post-introduction	<2.1	5.4	<2.0	<2.0	<2.0	<2.0	<2.0	9.6	<2.0	<2.0	
	Detectable Increase	No	Yes	No	No	No	No	No	Yes	No	No	
Acetaldehyde	Pre-introduction	<10	<10	<10	<10	<10	<10	<10	<0.1	<0.1	<0.1	NGV
	Post-introduction	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	

Parameter	ASH Stage	T1	T2	T3	T4	T5	T6	T7	C2	C4	C5	GV ¹
	Detectable Increase	No	No	No	No	No	No	No	No	No	No	

¹ Guideline Value from the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

NGV – No Guideline Value in the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

Bold and underlined results are exceedances of the Guideline Value from the NHMRC Australian Drinking Water Guidelines Paper 6, 2011

5.0 Conclusions

Rainwater tank monitoring was undertaken to quantify any potential impacts to drinking water in residential rainwater tanks due to the operation of the Australia Super Hornet (ASH) at RAAF Base Amberley. The post-introduction results detailed in this report are compared to the first round of monitoring conducted by SKM prior to the introduction of the Super Hornet aircraft.

The key findings of the second round of testing are:

- a) There was no exceedance in either the pre- or post-introduction round of rainwater tank sampling of the relevant guideline values stated in the NHMRC Australian Drinking Water Guidelines Paper 6, 2011 with the exception of lead in two locations.
- b) Metals detections in tanks were generally similar between the pre-introduction round of testing and the post-introduction testing, with the exception of chromium, lead and zinc where there was a detectable increase in more than one test location. The metals concentrations of all sampled tanks where the total or dissolved metals increased after the introduction of ASH remain below NHMRC Australian Drinking Water Guidelines values with the exception of lead in locations T2 and T6. As described in Section 4.0 it is considered likely that any increased concentration of lead are from sources localised to those particular tanks.
- c) No polynuclear aromatic hydrocarbons (PAHs) were detected in any sample in either round of testing. Therefore there is no detectable relationship between the ASH operations at RAAF Base Amberley and PAHs in rainwater tanks.
- d) There were detections of petroleum hydrocarbons in three tanks during the pre-introduction round of testing. There was no detection of petroleum hydrocarbons in any tank during the post-introduction round of testing. Therefore there is no detectable relationship between the ASH operations at RAAF Base Amberley and petroleum hydrocarbons in rainwater tanks.
- e) Formaldehyde was detected in one tank in the vicinity of RAAF Amberley and one control tank located in suburban Brisbane during the post-introduction round of testing. It is noted that the detection in the tank in the vicinity of RAAF Amberley was at a concentration below the detection limit for the pre-introduction round of testing. Therefore there is no evidence to show that there wasn't formaldehyde around the same concentration during the pre-introduction sampling. Consequently there is no detectable relationship between the ASH operations at RAAF Base Amberley and aldehydes in rainwater tanks.

6.0 References

Costanzo, S, Thompson, A & Carson, D (SKM) 2010, *Rainwater tank testing, Super Hornet public environment report*, Sinclair Knight Merz Pty Ltd, Brisbane.

NHMRC, NRMMC 2011, *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

SADFO Amberley, 2012, *Australian Super Hornet air quality monitoring plan*. Department of Defence, DRMS ID: AB8384848.

Appendix A

Test Results – 29 November 2013: T7 & C2

CERTIFICATE OF ANALYSIS

Work Order	: EB1329490	Page	: 1 of 5
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR PAUL CHANT	Contact	: Rebecca Kleinschmidt
Address	: 17 WARABROOK BOULEVARDE WARABROOK NSW, AUSTRALIA 2304	Address	: 2 Byth Street Stafford QLD Australia 4053
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Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 29-NOV-2013
Sampler	: PAUL CHANT	Issue Date	: 10-DEC-2013
Site	: ----		
Quote number	: BN/773/13	No. of samples received	: 2
		No. of samples analysed	: 2

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Phalak Inthaksone	Laboratory Manager - Organics	Sydney Organics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				T7 (W)	C3 (W)	----	----	----
				29-NOV-2013 08:15	29-NOV-2013 08:15	----	----	----
Compound	CAS Number	LOR	Unit	EB1329490-001	EB1329490-002	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.007	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.224	0.053	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.008	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	0.002	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.237	0.052	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

				T7 (W)	C3 (W)	----	----	----
Client sampling date / time				29-NOV-2013 08:15	29-NOV-2013 08:15	----	----	----
Compound	CAS Number	LOR	Unit	EB1329490-001	EB1329490-002	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
EP121: Aldehydes								
Formaldehyde	50-00-0	2.0	µg/L	<2.0	10.6	----	----	----
Acetaldehyde	75-07-0	2.0	µg/L	<2.0	<2.0	----	----	----
Propionaldehyde	123-38-6	2.0	µg/L	<2.0	<2.0	----	----	----
Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	<2.0	----	----	----
Butyraldehyde	123-72-8	2.0	µg/L	<2.0	<2.0	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	35.2	35.2	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	72.2	73.3	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	94.2	92.9	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	71.6	66.0	----	----	----
Anthracene-d10	1719-06-8	0.1	%	71.0	72.3	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	91.5	93.2	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2

QUALITY CONTROL REPORT

Work Order	: EB1329490	Page	: 1 of 6
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR PAUL CHANT	Contact	: Rebecca Kleinschmidt
Address	: 17 WARABROOK BOULEVARDE WARABROOK NSW, AUSTRALIA 2304	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: paul.chant@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 02 4911 4900	Telephone	: +61 3552 8668
Facsimile	: +61 02 4911 4999	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-NOV-2013
Sampler	: PAUL CHANT	Issue Date	: 10-DEC-2013
Order number	: ----		
Quote number	: BN/773/13	No. of samples received	: 2
		No. of samples analysed	: 2

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

This Quality Control Report contains the following information:

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



NATA Accredited
Laboratory 825

Accredited for
compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Phalak Inthaksone	Laboratory Manager - Organics	Sydney Organics



General Comments

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

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

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

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

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



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3193848)									
EB1329480-022	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.010	0.007	38.6	No Limit
EB1329756-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.013	0.014	0.0	0% - 50%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.007	0.007	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3193637)									
EB1329172-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.0	No Limit
EB1329490-001	T7 (W)	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.008	0.010	19.2	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.237	0.241	1.4	0% - 20%
EP121: Aldehydes (QC Lot: 3190908)									
ES1326137-002	Anonymous	EP121: Formaldehyde	50-00-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Acetaldehyde	75-07-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Propionaldehyde	123-38-6	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Butyraldehyde	123-72-8	2.0	µg/L	<2.0	<2.0	0.0	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3193848)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	98.6	82	116
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	104	79	128
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	96.3	88	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	97.2	87	115
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	99.0	89	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	98.7	86	116
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	98.3	86	118
EG020T: Total Metals by ICP-MS (QCLot: 3193637)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	98.8	85	113
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	99.9	73	129
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	95.7	84	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	100	87	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	98.3	89	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	99.6	87	119
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	98.1	77	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3189472)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	85.6	47	101
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	91.5	46	109
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	93.4	50	104
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	95.4	50	114
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	91.3	49	114
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	90.7	45	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	96.0	46	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	96.2	46	119
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	109	48	125
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	112	43	119
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	89.6	43	135
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	100	42	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	87.9	44	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	67.2	40	137
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	64.8	42	140
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	70.3	37	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3189473)								
EP071-SV: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	66.6	42	111



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP121: Aldehydes (QCLot: 3190908) - continued							
ES1326137-002	Anonymous	EP121: Acetaldehyde	75-07-0	20 µg/L	91.2	70	130
		EP121: Propionaldehyde	123-38-6	20 µg/L	88.7	70	130
		EP121: Acrolein (Propenal)	107-02-8	20 µg/L	91.9	70	130
		EP121: Butyraldehyde	123-72-8	20 µg/L	89.4	70	130

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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
EP121: Aldehydes (QCLot: 3190908)										
ES1326137-002	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	100	----	70	130	----	----
		EP121: Acetaldehyde	75-07-0	20 µg/L	91.2	----	70	130	----	----
		EP121: Propionaldehyde	123-38-6	20 µg/L	88.7	----	70	130	----	----
		EP121: Acrolein (Propenal)	107-02-8	20 µg/L	91.9	----	70	130	----	----
		EP121: Butyraldehyde	123-72-8	20 µg/L	89.4	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3193637)										
EB1329337-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	87.0	----	70	130	----	----
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	83.5	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	83.8	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	87.4	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.000 mg/L	87.0	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	88.2	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	86.5	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 3193848)										
EB1329480-023	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	82.3	----	70	130	----	----
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	82.6	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	85.8	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	84.0	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.100 mg/L	82.9	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	81.2	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	81.0	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: EB1329490	Page	: 1 of 5
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR PAUL CHANT	Contact	: Rebecca Kleinschmidt
Address	: 17 WARABROOK BOULEVARDE WARABROOK NSW, AUSTRALIA 2304	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: paul.chant@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 02 4911 4900	Telephone	: +61 3552 8668
Facsimile	: +61 02 4911 4999	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-NOV-2013
Sampler	: PAUL CHANT	Issue Date	: 10-DEC-2013
Order number	: ----		
Quote number	: BN/773/13	No. of samples received	: 2
		No. of samples analysed	: 2

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

This Interpretive Quality Control Report contains the following information:

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



Analysis Holding Time Compliance

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

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

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

Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)	C3 (W)	29-NOV-2013	---	28-MAY-2014	----	06-DEC-2013	28-MAY-2014	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)	C3 (W)	29-NOV-2013	06-DEC-2013	28-MAY-2014	✓	06-DEC-2013	28-MAY-2014	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071-SV)	C3 (W)	29-NOV-2013	04-DEC-2013	06-DEC-2013	✓	04-DEC-2013	13-JAN-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))	C3 (W)	29-NOV-2013	04-DEC-2013	06-DEC-2013	✓	04-DEC-2013	13-JAN-2014	✓
EP121: Aldehydes								
VOC Vial - unpreserved (EP121)	C3 (W)	29-NOV-2013	----	----	----	03-DEC-2013	04-DEC-2013	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	4	25.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	9.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	11	9.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
TPH - Semivolatile Fractions Only	EP071-SV	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Aldehydes by Derivatization Headspace GCMS	* EP121	WATER	In-house. Aqueous aldehydes are derivatised with o-(2,3,4,5,6-pentafluorobenzyl)-hydroxylamine (PFBOA) in a sealed vial at 70°C. After a programmed heating time with gentle shaking, a reproducible headspace gas is extracted from the vial and injected into GC-MS.
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

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

Outliers : Analysis Holding Time Compliance

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

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

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

- No Quality Control Sample Frequency Outliers exist.



ALS Laboratory:
please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095
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☐ **BRISBANE** 32 Shand Street Stafford QLD 4053
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☐ GLADSTONE 46 Callemondah Drive Clinton QLD 4680
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☐ MACKAY 78 Harbour Road Mackay QLD 4740
 Ph: 07 4944 0177 E: mackay@alsglobal.com

☐ MELBOURNE 2-4 Westall Road Springvale VIC 3171
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☐ **PERTH** 10 Hod Way Malaga WA 6090
 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

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

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

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

CLIENT: AEIOM		TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: BRISSAID		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):			
PROJECT: 60310989		ALS QUOTE NO.: BH/773 113		COC SEQUENCE NUMBER (Circle)	
ORDER NUMBER:				COC: 1 2 3 4 5 6 7	
PROJECT MANAGER: DAVE CLAUGHTON CONTACT PH: 07 3553 3523				OF: 1 2 3 4 5 6 7	
SAMPLER: PAUL CHANT SAMPLER MOBILE: 0409544547		RELINQUISHED BY:		RECEIVED BY:	
COC emailed to ALS? (YES / NO) EDD FORMAT (or default):		DATE/TIME:		DATE/TIME:	
Email Reports to (will default to PM if no other addresses are listed): PAUL.CHANT@AEIOM.COM					
Email Invoice to (will default to PM if no other addresses are listed): PAUL.CHANT@AEIOM.COM					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

[illegible]

Work Order

EB1329490



Telephone : + 61-7-3243 7222

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

Appendix B

Test Results – 13-14 January 2014: T1, T2, T3, T4A, T5 & T6

CERTIFICATE OF ANALYSIS

Work Order	: EB1400828	Page	: 1 of 7
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVE CLAUGHTON	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307	Address	: 2 Byth Street Stafford QLD Australia 4053
	FORTITUDE VALLEY QLD, AUSTRALIA 4006		
E-mail	: dave.claughton@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 3552 8668
Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 15-JAN-2014
Sampler	: WALTER MANLEY	Issue Date	: 22-JAN-2014
Site	: ----		
Quote number	: BN/773/13	No. of samples received	: 6
		No. of samples analysed	: 6

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Pabi Subba	Senior Organic Chemist	Sydney Organics



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

- **EP071: High failing LCS deemed acceptable as all associated analyte results are less than LOR.**
-



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				T1	T2	T3	T4	T5
				13-JAN-2014 09:00	13-JAN-2014 11:00	14-JAN-2014 08:00	14-JAN-2014 09:00	14-JAN-2014 12:00
Compound	CAS Number	LOR	Unit	EB1400828-001	EB1400828-002	EB1400828-003	EB1400828-004	EB1400828-005
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	0.004	<0.001	0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	0.010	<0.001	0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	0.345	0.436	0.097	0.281	1.90
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0001	<0.0001	0.0001
Chromium	7440-47-3	0.001	mg/L	0.001	0.006	0.001	0.002	0.003
Lead	7439-92-1	0.001	mg/L	0.001	0.011	0.001	0.001	0.002
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	1.21	0.479	0.108	0.330	2.22
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<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	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<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	<1.0
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	<1.0	<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	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<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	<0.5



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				T1	T2	T3	T4	T5
				13-JAN-2014 09:00	13-JAN-2014 11:00	14-JAN-2014 08:00	14-JAN-2014 09:00	14-JAN-2014 12:00
Compound	CAS Number	LOR	Unit	EB1400828-001	EB1400828-002	EB1400828-003	EB1400828-004	EB1400828-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
EP121: Aldehydes								
Formaldehyde	50-00-0	2.0	µg/L	<2.0	5.4	<2.0	<2.0	<2.0
Acetaldehyde	75-07-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Propionaldehyde	123-38-6	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Butyraldehyde	123-72-8	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	29.4	28.4	26.3	29.7	28.1
2-Chlorophenol-D4	93951-73-6	0.1	%	67.2	67.2	62.0	70.6	66.8
2,4,6-Tribromophenol	118-79-6	0.1	%	53.6	55.5	51.3	59.6	63.4
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	87.4	83.8	81.6	89.8	85.3
Anthracene-d10	1719-06-8	0.1	%	92.9	92.2	86.2	97.4	87.0
4-Terphenyl-d14	1718-51-0	0.1	%	126	122	115	129	109



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				T6	----	----	----	----
				13-JAN-2014 10:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1400828-006	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.004	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.015	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.364	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0002	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.006	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.028	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.406	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

				T6	----	----	----	----
Client sampling date / time				13-JAN-2014 10:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1400828-006	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
EP121: Aldehydes								
Formaldehyde	50-00-0	2.0	µg/L	<2.0	----	----	----	----
Acetaldehyde	75-07-0	2.0	µg/L	<2.0	----	----	----	----
Propionaldehyde	123-38-6	2.0	µg/L	<2.0	----	----	----	----
Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	----	----	----	----
Butyraldehyde	123-72-8	2.0	µg/L	<2.0	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	28.6	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	68.1	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	64.9	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	89.7	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	93.4	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	115	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2

QUALITY CONTROL REPORT

Work Order	: EB1400828	Page	: 1 of 8
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVE CLAUGHTON	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: dave.claughton@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
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Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 15-JAN-2014
C-O-C number	: ----	Issue Date	: 22-JAN-2014
Sampler	: WALTER MANLEY	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6
Quote number	: BN/773/13		

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

This Quality Control Report contains the following information:

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



NATA Accredited
Laboratory 825

Accredited for
compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Matt Frost	Senior Organic Chemist	Brisbane Organics
Pabi Subba	Senior Organic Chemist	Sydney Organics



General Comments

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

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

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

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

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



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3251966)									
EB1400818-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0039	0.0036	8.8	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.555	0.566	2.0	0% - 20%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	0.034	0.036	6.1	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.658	0.671	1.9	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.411	0.415	1.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.481	0.455	5.5	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.970	1.12	14.7	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 3251987)									
EB1400595-006	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EB1400680-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.003	0.004	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.006	0.006	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.031	0.032	4.6	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3251989)									
EB1400828-005	T5	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	2.22	2.17	2.4	0% - 20%
EB1400883-006	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.022	0.028	19.9	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.012	0.014	16.8	0% - 50%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.004	0.005	23.9	No Limit

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 Work Order : EB1400828
 Client : AECOM Australia Pty Ltd
 Project : 60310989



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 3251989) - continued									
EB1400883-006	Anonymous	EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.036	0.038	6.2	No Limit
EP121: Aldehydes (QC Lot: 3253889)									
ES1400641-002	Anonymous	EP121: Formaldehyde	50-00-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Acetaldehyde	75-07-0	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Propionaldehyde	123-38-6	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP121: Butyraldehyde	123-72-8	2.0	µg/L	<2.0	<2.0	0.0	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3251966)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	97.7	82	116
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	98.9	79	128
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	93.4	88	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	91.5	87	115
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	93.4	89	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	102	86	116
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	92.0	86	118
EG020T: Total Metals by ICP-MS (QCLot: 3251987)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	99.2	85	113
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	101	73	129
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	97.4	84	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	103	87	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	97.4	89	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	102	87	119
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	100	77	116
EG020T: Total Metals by ICP-MS (QCLot: 3251989)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	102	85	113
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	104	73	129
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	100	84	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	103	87	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	98.5	89	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	102	87	119
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	103	77	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3250909)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	68.0	47	101
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	77.3	46	109
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	69.3	50	104
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	71.0	50	114
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	74.7	49	114
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	78.6	45	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	86.6	46	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	85.3	46	119
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	85.6	48	125
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	85.6	43	119



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3250909) - continued								
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	77.6	43	135
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	86.4	42	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	84.1	44	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	83.6	40	137
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	82.8	42	140
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	83.5	37	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3250910)								
EP071-SV: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	103	42	111
EP071-SV: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	124	54	130
EP071-SV: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3250910)								
EP071-SV: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	1670 µg/L	114	47	120
EP071-SV: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	# 130	51	129
EP071-SV: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
EP121: Aldehydes (QCLot: 3253889)								
EP121: Formaldehyde	50-00-0	2	µg/L	<2.0	20 µg/L	85.5	70	130
EP121: Acetaldehyde	75-07-0	2	µg/L	<2.0	20 µg/L	92.7	70	130
EP121: Propionaldehyde	123-38-6	2	µg/L	<2.0	20 µg/L	99.4	70	130
EP121: Acrolein (Propenal)	107-02-8	2	µg/L	<2.0	20 µg/L	120	70	130
EP121: Butyraldehyde	123-72-8	2	µg/L	<2.0	20 µg/L	98.9	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%) MS	Recovery Limits (%) Low High	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
EG020F: Dissolved Metals by ICP-MS (QCLot: 3251966)							
EB1400820-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	# Not Determined	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	# 0.3	70	130
		EG020A-F: Cadmium	7440-43-9	1 mg/L	130	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	# Not Determined	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	# Not Determined	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	# Not Determined	70	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3251966) - continued							
EB1400820-001	Anonymous	EG020A-F: Zinc	7440-66-6	0.200 mg/L	# Not Determined	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3251987)							
EB1400595-016	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	100	70	130
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	99.6	70	130
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	100	70	130
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	98.6	70	130
		EG020A-T: Lead	7439-92-1	1.000 mg/L	96.4	70	130
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	99.1	70	130
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	102	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3251989)							
EB1400828-006	T6	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	100	70	130
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	102	70	130
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	98.9	70	130
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	99.5	70	130
		EG020A-T: Lead	7439-92-1	1.000 mg/L	102	70	130
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	100	70	130
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	100	70	130
EP121: Aldehydes (QCLot: 3253889)							
ES1400641-002	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	95.7	70	130
		EP121: Acetaldehyde	75-07-0	20 µg/L	97.4	70	130
		EP121: Propionaldehyde	123-38-6	20 µg/L	102	70	130
		EP121: Acrolein (Propenal)	107-02-8	20 µg/L	73.7	70	130
		EP121: Butyraldehyde	123-72-8	20 µg/L	97.4	70	130

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

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value Control Limit
EG020F: Dissolved Metals by ICP-MS (QCLot: 3251966)									
EB1400820-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	# Not Determined	----	70	130	----
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	# 0.3	----	70	130	----
		EG020A-F: Cadmium	7440-43-9	1 mg/L	130	----	70	130	----



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG020F: Dissolved Metals by ICP-MS (QCLot: 3251966) - continued										
EB1400820-001	Anonymous	EG020A-F: Chromium	7440-47-3	0.100 mg/L	# Not Determined	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.100 mg/L	# Not Determined	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	# Not Determined	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	# Not Determined	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3251987)										
EB1400595-016	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	100	----	70	130	----	----
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	99.6	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	100	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	98.6	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.000 mg/L	96.4	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	99.1	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	102	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3251989)										
EB1400828-006	T6	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	100	----	70	130	----	----
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	102	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	98.9	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	99.5	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.000 mg/L	102	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	100	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	100	----	70	130	----	----
EP121: Aldehydes (QCLot: 3253889)										
ES1400641-002	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	95.7	----	70	130	----	----
		EP121: Acetaldehyde	75-07-0	20 µg/L	97.4	----	70	130	----	----
		EP121: Propionaldehyde	123-38-6	20 µg/L	102	----	70	130	----	----
		EP121: Acrolein (Propenal)	107-02-8	20 µg/L	73.7	----	70	130	----	----
		EP121: Butyraldehyde	123-72-8	20 µg/L	97.4	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: EB1400828	Page	: 1 of 7
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR DAVE CLAUGHTON	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: dave.claughton@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 3552 8668
Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 15-JAN-2014
C-O-C number	: ----	Issue Date	: 22-JAN-2014
Sampler	: WALTER MANLEY	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6
Quote number	: BN/773/13		

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

This Interpretive Quality Control Report contains the following information:

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



Analysis Holding Time Compliance

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

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

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

Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) T1, T6	T2,	13-JAN-2014	---	12-JUL-2014	----	21-JAN-2014	12-JUL-2014	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) T3, T5	T4,	14-JAN-2014	---	13-JUL-2014	----	21-JAN-2014	13-JUL-2014	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) T1, T6	T2,	13-JAN-2014	17-JAN-2014	12-JUL-2014	✓	17-JAN-2014	12-JUL-2014	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) T3, T5	T4,	14-JAN-2014	17-JAN-2014	13-JUL-2014	✓	17-JAN-2014	13-JUL-2014	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071-SV) T1, T6	T2,	13-JAN-2014	16-JAN-2014	20-JAN-2014	✓	16-JAN-2014	25-FEB-2014	✓
Amber Glass Bottle - Unpreserved (EP071-SV) T3, T5	T4,	14-JAN-2014	16-JAN-2014	21-JAN-2014	✓	16-JAN-2014	25-FEB-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM)) T1, T6	T2,	13-JAN-2014	16-JAN-2014	20-JAN-2014	✓	16-JAN-2014	25-FEB-2014	✓
Amber Glass Bottle - Unpreserved (EP075(SIM)) T3, T5	T4,	14-JAN-2014	16-JAN-2014	21-JAN-2014	✓	16-JAN-2014	25-FEB-2014	✓



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
		EP121: Aldehydes						
VOC Vial - unpreserved (EP121) T1, T6	T2,	13-JAN-2014	----	----	----	17-JAN-2014	18-JAN-2014	✔
VOC Vial - unpreserved (EP121) T3, T5	T4,	14-JAN-2014	----	----	----	17-JAN-2014	19-JAN-2014	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	9	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	16.7	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	4	40	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	9	11.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	12	8.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	9	11.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	12	8.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	9	11.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
TPH - Semivolatile Fractions Only	EP071-SV	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Aldehydes by Derivatization Headspace GCMS	* EP121	WATER	In-house. Aqueous aldehydes are derivatised with o-(2,3,4,5,6-pentafluorobenzyl)-hydroxylamine (PFBOA) in a sealed vial at 70°C. After a programmed heating time with gentle shaking, a reproducible headspace gas is extracted from the vial and injected into GC-MS.
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	3880898-013	----	>C16 - C34 Fraction	----	130 %	51-129%	Recovery greater than upper control limit
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Arsenic	7440-38-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Beryllium	7440-41-7	0.3 %	70-130%	Recovery less than lower data quality objective
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Chromium	7440-47-3	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Lead	7439-92-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Nickel	7440-02-0	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EG020F: Dissolved Metals by ICP-MS	EB1400820-001	Anonymous	Zinc	7440-66-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

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

Regular Sample Surrogates

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

Outliers : Analysis Holding Time Compliance

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

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

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



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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176
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☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Strand St, Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Deema Ct, Rollei QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsenviro.com

☐ Perth: 10 Hod Way, Mnlaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Aecom	TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)		FOR LABORATORY USE ONLY (Circle) Custody Seal intact? Yes No N/A Freezer/Freeze/Dryers/Preservation Temp? Yes No N/A Random Sample Temperature Record? Yes No N/A Other comment:
OFFICE: 18540 WICKHAM ST. FORTITUDE VALLEY 4006	☐ Non Standard or urgent TAT (List due date):		
PROJECT: 60310989	ALS QUOTE NO.: BN/773/13	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	
ORDER NUMBER:			
PROJECT MANAGER: DAVE CLAUGHTON	CONTACT PH: 3553 3004		
SAMPLER: WALTER MANLEY	SAMPLER MOBILE: 0420 804 930	RELINQUISHED BY:	RECEIVED BY: 0700 07
COC emailed to ALS? (YES) / NO	EDD FORMAT (or default):	DATE/TIME:	DATE/TIME: 15/01/14 10:05
Email Reports to (will default to PM if no other addresses are listed): walter.manley@aecom.com			
Email Invoice to (will default to PM if no other addresses are listed): dave.cloughton@aecom.com			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:			

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).					Additional Information
						EG020F	EG020T	EP121	EP071	EP075B SIM	
1	T1	13/1/14 09:00	W		5	✓	✓	✓	✓	✓	
2	T2	13/1/14 11:00	W		5	✓	✓	✓	✓	✓	
3	T3	14/1/14 08:00	W		5	✓	✓	✓	✓	✓	
4	T4	14/1/14 09:00	W		5	✓	✓	✓	✓	✓	
5	T5	14/1/14 12:00	W		5	✓	✓	✓	✓	✓	
6	T6	13/1/14 10:00	W		5	✓	✓	✓	✓	✓	
TOTAL											

Environmental Division
Brisbane
Work Order **EB1400828**



Telephone : +61-7-3243 7222

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



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3189473) - continued								
EP071-SV: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	87.8	54	130
EP071-SV: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3189473)								
EP071-SV: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	1670 µg/L	72.5	47	120
EP071-SV: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	93.1	51	129
EP071-SV: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
EP121: Aldehydes (QCLot: 3190908)								
EP121: Formaldehyde	50-00-0	2	µg/L	<2.0	20 µg/L	113	70	130
EP121: Acetaldehyde	75-07-0	2	µg/L	<2.0	20 µg/L	105	70	130
EP121: Propionaldehyde	123-38-6	2	µg/L	<2.0	20 µg/L	98.4	70	130
EP121: Acrolein (Propenal)	107-02-8	2	µg/L	<2.0	20 µg/L	93.7	70	130
EP121: Butyraldehyde	123-72-8	2	µg/L	<2.0	20 µg/L	91.4	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3193848)							
EB1329480-023	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	82.3	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	82.6	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	85.8	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	84.0	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	82.9	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	81.2	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	81.0	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3193637)							
EB1329337-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	87.0	70	130
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	83.5	70	130
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	83.8	70	130
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	87.4	70	130
		EG020A-T: Lead	7439-92-1	1.000 mg/L	87.0	70	130
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	88.2	70	130
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	86.5	70	130
EP121: Aldehydes (QCLot: 3190908)							
ES1326137-002	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	100	70	130

Appendix C

Test Results - 3 February 2014: C4 & C5

CERTIFICATE OF ANALYSIS

Work Order	: EB1402304	Page	: 1 of 5
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR WALTER MANLEY	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307	Address	: 2 Byth Street Stafford QLD Australia 4053
	FORTITUDE VALLEY QLD, AUSTRALIA 4006		
E-mail	: walter.manley@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 3552 8668
Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 03-FEB-2014
Sampler	: WALTER MANLEY	Issue Date	: 12-FEB-2014
Site	: ----		
Quote number	: BN/773/13	No. of samples received	: 2
		No. of samples analysed	: 2

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Ryan Story	2IC Organic Instrument Chemist	Brisbane Organics



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



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				C4	C5	----	----	----
				03-FEB-2014 10:15	03-FEB-2014 11:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1402304-001	EB1402304-002	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	0.002	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.263	0.209	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	0.008	0.002	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.002	0.002	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.780	0.218	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

				C4	C5	----	----	----
Client sampling date / time				03-FEB-2014 10:15	03-FEB-2014 11:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1402304-001	EB1402304-002	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
EP121: Aldehydes								
Formaldehyde	50-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Acetaldehyde	75-07-0	2.0	µg/L	<2.0	<2.0	----	----	----
Propionaldehyde	123-38-6	2.0	µg/L	<2.0	<2.0	----	----	----
Acrolein (Propenal)	107-02-8	2.0	µg/L	<2.0	<2.0	----	----	----
Butyraldehyde	123-72-8	2.0	µg/L	<2.0	<2.0	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	33.5	34.1	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	86.9	87.3	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	110	106	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	110	104	----	----	----
Anthracene-d10	1719-06-8	0.1	%	116	98.8	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	132	138	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	71.9
2-Chlorophenol-D4	93951-73-6	26.8	130.2
2.4.6-Tribromophenol	118-79-6	19.3	180.8
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	13.9	146.1
Anthracene-d10	1719-06-8	34.6	137.4
4-Terphenyl-d14	1718-51-0	36.2	154.2

QUALITY CONTROL REPORT

Work Order	: EB1402304	Page	: 1 of 6
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR WALTER MANLEY	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: walter.manley@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 3552 8668
Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 03-FEB-2014
Sampler	: WALTER MANLEY	Issue Date	: 12-FEB-2014
Order number	: ----		
Quote number	: BN/773/13	No. of samples received	: 2
		No. of samples analysed	: 2

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

This Quality Control Report contains the following information:

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



NATA Accredited
Laboratory 825

Accredited for
compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Ryan Story	2IC Organic Instrument Chemist	Brisbane Organics



General Comments

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

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

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

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

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



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3279860)									
EB1401971-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.009	0.009	0.0	No Limit
EB1402182-012	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.284	0.284	0.0	0% - 20%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.010	0.009	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.022	0.023	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.006	0.005	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.017	0.017	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3279870)									
EB1401971-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0016	0.0017	0.0	0% - 50%
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.054	0.056	5.0	0% - 20%
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.043	0.044	0.0	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.080	0.086	6.1	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.075	0.080	7.0	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.606	0.639	5.2	0% - 20%
EB1402295-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.138	0.136	1.3	0% - 20%
EP121: Aldehydes (QC Lot: 3284553)									
ES1402035-001	Anonymous	EP121: Formaldehyde	50-00-0	2.0	µg/L	5140	4910	4.5	0% - 20%
		EP121: Acetaldehyde	75-07-0	2.0	µg/L	11100	11100	0.4	0% - 20%
		EP121: Propionaldehyde	123-38-6	2.0	µg/L	<200	<200	0.0	No Limit
		EP121: Acrolein (Propenal)	107-02-8	2.0	µg/L	<200	<200	0.0	No Limit
		EP121: Butyraldehyde	123-72-8	2.0	µg/L	<200	<200	0.0	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3279860)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	102	82	116
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	99.1	79	128
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	99.6	88	109
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	101	87	115
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	97.9	89	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	101	86	116
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	99.0	86	118
EG020T: Total Metals by ICP-MS (QCLot: 3279870)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	101	85	113
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	99.0	73	129
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	97.3	84	111
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	103	87	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	100	89	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	103	87	119
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	100	77	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3277461)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	62.3	47	101
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	69.7	46	109
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	68.0	50	104
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	70.4	50	114
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	70.6	49	114
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	10 µg/L	67.8	45	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	72.8	46	120
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	70.8	46	119
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	69.8	48	125
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	70.2	43	119
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	10 µg/L	63.5	43	135
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	83.7	42	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	74.1	44	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	74.4	40	137
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	72.5	42	140
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	73.6	37	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3277462)								
EP071-SV: C10 - C14 Fraction	----	50	µg/L	<50	1275 µg/L	72.2	42	111



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3277462) - continued								
EP071-SV: C15 - C28 Fraction	----	100	µg/L	<100	1850 µg/L	84.5	54	130
EP071-SV: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3277462)								
EP071-SV: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	1670 µg/L	76.1	47	120
EP071-SV: >C16 - C34 Fraction	----	100	µg/L	<100	1285 µg/L	91.0	51	129
EP071-SV: >C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
EP121: Aldehydes (QCLot: 3284553)								
EP121: Formaldehyde	50-00-0	2	µg/L	<2.0	20 µg/L	105	70	130
EP121: Acetaldehyde	75-07-0	2	µg/L	<2.0	20 µg/L	100	70	130
EP121: Propionaldehyde	123-38-6	2	µg/L	<2.0	20 µg/L	92.6	70	130
EP121: Acrolein (Propenal)	107-02-8	2	µg/L	<2.0	20 µg/L	114	70	130
EP121: Butyraldehyde	123-72-8	2	µg/L	<2.0	20 µg/L	87.8	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3279860)							
EB1401971-004	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	101	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	108	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	97.8	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	92.3	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	95.3	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	91.7	70	130
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	94.3	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3279870)							
EB1401971-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	112	70	130
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	103	70	130
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	108	70	130
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	104	70	130
		EG020A-T: Lead	7439-92-1	1.000 mg/L	108	70	130
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	101	70	130
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	104	70	130
EP121: Aldehydes (QCLot: 3284553)							
ES1402035-001	Anonymous						



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report		
				Spike	Spike Recovery(%)	Recovery Limits (%)
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low High
EP121: Aldehydes (QCLot: 3284553) - continued						
ES1402035-001	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	# Not Determined	70 130
		EP121: Acetaldehyde	75-07-0	20 µg/L	# Not Determined	70 130
		EP121: Propionaldehyde	123-38-6	2000 µg/L	80.2	70 130
		EP121: Acrolein (Propenal)	107-02-8	2000 µg/L	82.3	70 130
		EP121: Butyraldehyde	123-72-8	2000 µg/L	76.8	70 130

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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Lim
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	EG020F: Dissolved Metals by ICP-MS (QCLot: 3279860)						
EB1401971-004	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	101	----	70	130	----	----
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	108	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	97.8	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	92.3	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.100 mg/L	95.3	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	91.7	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.200 mg/L	94.3	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3279870)										
EB1401971-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1.000 mg/L	112	----	70	130	----	----
		EG020A-T: Beryllium	7440-41-7	0.100 mg/L	103	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.500 mg/L	108	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1.000 mg/L	104	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1.000 mg/L	108	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1.000 mg/L	101	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1.000 mg/L	104	----	70	130	----	----
EP121: Aldehydes (QCLot: 3284553)										
ES1402035-001	Anonymous	EP121: Formaldehyde	50-00-0	20 µg/L	# Not Determined	----	70	130	----	----
		EP121: Acetaldehyde	75-07-0	20 µg/L	# Not Determined	----	70	130	----	----
		EP121: Propionaldehyde	123-38-6	2000 µg/L	80.2	----	70	130	----	----
		EP121: Acrolein (Propenal)	107-02-8	2000 µg/L	82.3	----	70	130	----	----
		EP121: Butyraldehyde	123-72-8	2000 µg/L	76.8	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: EB1402304	Page	: 1 of 5
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Brisbane
Contact	: MR WALTER MANLEY	Contact	: Rebecca Kleinschmidt
Address	: P O BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: walter.manley@aecom.com	E-mail	: rebecca.kleinschmidt@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 3552 8668
Facsimile	: +61 07 3553 2050	Facsimile	: +61 7 3352 3662
Project	: 60310989	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 03-FEB-2014
C-O-C number	: ----	Issue Date	: 12-FEB-2014
Sampler	: WALTER MANLEY	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2
Quote number	: BN/773/13		

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

This Interpretive Quality Control Report contains the following information:

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



Analysis Holding Time Compliance

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

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

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

Matrix: **WATER**

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

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) C4, C5	03-FEB-2014	---	02-AUG-2014	----	07-FEB-2014	02-AUG-2014	✓	
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) C4, C5	03-FEB-2014	06-FEB-2014	02-AUG-2014	✓	06-FEB-2014	02-AUG-2014	✓	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
Amber Glass Bottle - Unpreserved (EP071-SV) C4, C5	03-FEB-2014	06-FEB-2014	10-FEB-2014	✓	07-FEB-2014	18-MAR-2014	✓	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM)) C4, C5	03-FEB-2014	06-FEB-2014	10-FEB-2014	✓	07-FEB-2014	18-MAR-2014	✓	
EP121: Aldehydes								
VOC Vial - unpreserved (EP121) C4, C5	03-FEB-2014	----	----	----	07-FEB-2014	08-FEB-2014	✓	



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	6	16.7	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fractions Only	EP071-SV	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Aldehydes by Derivatization Headspace GCMS	EP121	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
TPH - Semivolatile Fractions Only	EP071-SV	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Aldehydes by Derivatization Headspace GCMS	* EP121	WATER	In-house. Aqueous aldehydes are derivatised with o-(2,3,4,5,6-pentafluorobenzyl)-hydroxylamine (PFBOA) in a sealed vial at 70°C. After a programmed heating time with gentle shaking, a reproducible headspace gas is extracted from the vial and injected into GC-MS.
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP121: Aldehydes	ES1402035-001	Anonymous	Formaldehyde	50-00-0	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP121: Aldehydes	ES1402035-001	Anonymous	Acetaldehyde	75-07-0	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

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

Regular Sample Surrogates

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

Outliers : Analysis Holding Time Compliance

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

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

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

- No Quality Control Sample Frequency Outliers exist.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
 Ph: 02 8764 8686 E:samples.sydney@aisenviro.com
☐ **Newcastle:** 5 Rosegem Rd, Warabrook NSW 2304
 Ph: 02 4968 9433 E:samples.newcastle@aisenviro.com

☐ Brisbane: 32 Shand St, Stafford QLD 4063
 Ph: 07 3243 7222 E: samples.brisbane@aleenviro.com
☐ Townsville: 14-16 Desira Ct, Eonla QLD 4818
 Ph: 07 4796 0600 E: townsville.environmental@aleenviro.com

☐ Melbourne: 2-4 Westall Rd. Springvale VIC 3171
 Ph: 03 8549 9600 E. samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burne Rd. Pooraka SA 5005
 Ph: 08 8369 0990 E. adelaide@alsenviro.com

☐ Perth: 10 Rod Way, Malaga WA 6090
 Ph: 08 9206 7656 E: samples.perth@aisenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250
 Ph: 03 6331 2159 E: launceston@aisenviro.com

CLIENT: AECOM		TURNAROUND REQUIREMENTS : ☐ Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: W6 510 WICKHAM		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):		Custody Seal intact? Yes No N/A	
PROJECT: 00310989		ALS QUOTE NO.:		Freezer / frozen ice bricks present upon receipt? Yes No N/A	
ORDER NUMBER:				Random Sample Temperature on Receipt: °C	
PROJECT MANAGER: WALTER MANLEY		CONTACT PH: 0420 804 930		Other comment:	
SAMPLER: WALTER MANLEY		SAMPLER MOBILE: AS ABOVE		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		RECEIVED BY:	
Email Reports to (will default to PM if no other addresses are listed): walter.manley@aecom.com		DATE/TIME:		DATE/TIME:	
Email Invoice to (will default to PM if no other addresses are listed): as above				DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

[illegible]

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

Environmental Division
Brisbane

Work Order

EB1402304



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