

CALTEX SITES IN ACT					
SITE NAME	CALTEX SITE ID	ENVIRONMENTAL AUTHORISATION NO.	EA GUIDELINES EXCEEDED DURING ANNUAL GME (2017)	AUDITOR APPOINTED	STATUS UPDATE FEBRUARY 2018
Out of scope					
Calwell	22176	EA 0748	MW02 (C ₁₀ -C ₄₀ and m & p xylene) and MW7 (C ₁₀ -C ₄₀ , toluene, ethylbenzene, m & p xylene and o xylene).	Sch 2.2(a)(ii) Douglas Partners (appointed by Landlord)	No LNAPL, six monthly gauging, annual gw sampling conducted as per the EA. The GME in July 2017 reported exceedances of of human health vapour intrusion criteria in groundwater sampled from MW7 (F1) and exceedances of freshwater criteria for MW02 (naphthalene) and MW7 (naphthalene). EPA advised that the report be issued to the Auditor for the site. Caltex issued the report to the landlord advising it to be forwarded to their Auditor. EA monitoring was completed in July 2017. EA monitoring is planned for Qtr4 2018 unless required in July by the EPA on the anniversary of the 2017 event.
Out of scope					

CALTEX SITES IN ACT					
SITE NAME	CALTEX SITE ID	ENVIRONMENTAL AUTHORISATION NO.	EA GUIDELINES EXCEEDED DURING ANNUAL GME (2017)	AUDITOR APPOINTED	STATUS UPDATE FEBRUARY 2018
Out of scope					

Site Identification / Description	
Site ID No.:	22178
Address:	Corner Wore Street and Webber Crescent, Calwell ACT 2905
Suburb:	Calwell

Client:	Caltex Australia Petroleum Pty Ltd
Project:	2013 Round 2: ACT Groundwater Monitoring Event

Sampling date(s):	14-Nov-13
Number of groundwater wells gauged/sampled:	3
Number of groundwater wells not gauged/sampled:	0
Summary of wells not gauged/sampled:	N/A

Description:	Concentrations of TRH were reported in all monitoring wells on-site. BTEX compounds were identified in groundwater at MW02 and MW03. Concentrations of benzene, xylene (m&p) and lead exceeded the site assessment criteria in monitoring well MW02, located north of the tank farm.
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Beneficial use(s):	Fresh water Drinking water*
Closest inferred sensitive land use:	Residential properties are located to the north, south and west of the site. Calwell High School is located approximately 500 m south-east of the site.

Nearest surface water receptor(s): Tuggeranong Creek - 150 m north-east of the site

Groundwater
Current and historical data indicate the greatest impact to groundwater at MW02 with high concentrations of benzene and lead reported

Since the first sampling event in November 2011, concentrations of BTEX and TRH have decreased in monitoring well MW01. BTEX and C₆-C₁₀ has had a significant increase since the first sampling round in MW02. MW03 concentration of C₁₀-C₃₀ increased between the November 2011 and May 2013 sampling rounds but showed a slight decrease in the current sampling round in comparison to the May sampling results.

Parsons Brinckerhoff recommends surveying all groundwater monitoring wells to determine the inferred groundwater flow direction, continued groundwater monitoring to establish trends in contaminant concentrations, and consideration of on-site delineating wells.

Attachment A - Laboratory reports
Attachment B - QA/QC results

Report date:	02-Dec-13	Date Sampled:	14-Nov-13
Data entered:	NR	Data Entered:	02-Dec-13
Data QA:	DL	Data QA:	05-Dec-13

PSH detected Concentrations of BTEX exceeded assessment criteria

NOTE
BOUNDARY SHOWN IS FROM SITE DERIVED MEASUREMENTS, AND IS APPROXIMATE ONLY. THE SITE BOUNDARY AND SETBACKS MUST BE CONFIRMED BY SURVEY.

LEGEND

●	GROUNDWATER MONITORING POINT	Ⓜ	EMERGENCY STOP BUTTON
Ⓜ	MANHOLE	Ⓜ	CO2 FIRE EXTINGUISHER
Ⓜ	SWITCHBOARD	Ⓜ	DRY CHEMICAL FIRE EXTINGUISHER
Ⓜ	FIRE HOSE	Ⓜ	MANHOLE BOX CONTAINING ERP DOCUMENT

SITE PLAN

COMMERCIAL & RETAIL STORES

EXISTING WORKSHOP

U/G WASTE TANK

SEPARATOR

SEPARATOR PUMP & POINTS

WELLS

WELL 1

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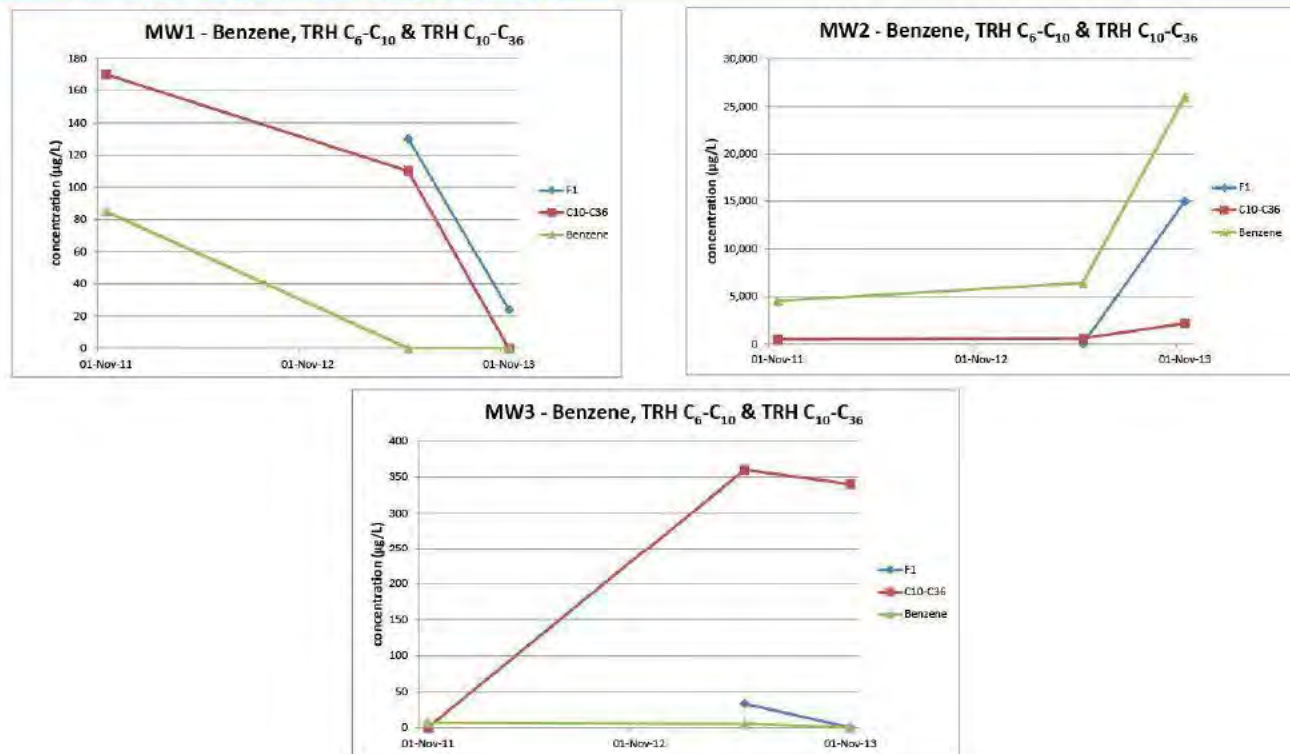
Figure reproduced from Caltex data package supplied as part of contract (Report - AECOM Environmental Management Plan, May 2012. Ref:2012-05-30 22176 Calwell AECOM [2nd DRAFT] EMP (22176).

Analytical table 1 - Groundwater analytical summary for TRH, BTEX and lead (current data)

[illegible]

F1 = TRH C₈-C₁₀ minus BTEX compounds

F2 = TRH > C₁₀-C₁₀ less naphthalene

Groundwater monitoring well trend graphs for benzene, TRH C₁₀-C₁₀ & TRH >C₁₀-C₃₀

Analytical table 2 - Groundwater analytical trends for TRH, BTEX, and lead (current and previous rounds if available).

[illegible]

For ease of interpretation, yellow shading indicates the exceedance of one or more beneficial uses

¹ NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater investigation levels for fresh water

² NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater investigation levels for drinking water

³ NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater HSL D Commercial/Industrial, 2 m to <4 m, sand

³ NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater HSL D Commercial/Industrial, 4 m to <8 m, sand

QA/QC Data validation table 3 - rinsate blanks, trip blanks and trip spike samples

		TRH						BTEx						Lead (dissolved)
		C ₆ -C ₁₀	F1	>C ₁₀ -C ₁₆	F2	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethylbenzene	Xylene (m&p)	Xylene (o)	Total xylene	
Limit of reporting		10	10	50	50	100	100	1	1	1	2	1	-	1
Sample location	Date sampled													
RB_111113	11-Nov-13	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	-	<1
RB_121113	12-Nov-13	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	-	<1
RB_131113	13-Nov-13	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	-	<1
RB_141113	14-Nov-13	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	-	<1
RB_151113	15-Nov-13	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	-	<1
TB_111113	11-Nov-13	<10	<10	-	-	-	-	<1	<1	<1	<2	<1	-	-
TB_121113	12-Nov-13	<10	<10	-	-	-	-	<1	<1	<1	<2	<1	-	-
TB_131113	13-Nov-13	<10	<10	-	-	-	-	<1	<1	<1	<2	<1	-	-
TB_141113	14-Nov-13	<10	<10	-	-	-	-	<1	<1	<1	<2	<1	-	-
TB_151113	15-Nov-13	<10	<10	-	-	-	-	<1	<1	<1	<2	<1	-	-
TS_111113	11-Nov-13	-	-	-	-	-	-	104%	113%	118%	123%	123%	-	-
TS_121113	12-Nov-13	-	-	-	-	-	-	106%	115%	123%	128%	128%	-	-
TS_131113	13-Nov-13	-	-	-	-	-	-	105%	114%	121%	125%	124%	-	-
TS_141113	14-Nov-13	-	-	-	-	-	-	88%	87%	87%	87%	85%	-	-

All results expressed as µg/L, unless stated otherwise

F1 = TRH C₆-C₁₀ minus BTEX compounds

F2 = TRH >C₁₀-C₁₆ less naphthalene

QA/QC Data validation table 4 - intra and inter laboratory duplicate samples

			TRH						BTEX					Lead (dissolved)
			C ₆ -C ₁₀	F1	>C ₁₀ -C ₁₆	F2	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethylbenzene	Xylene (m&p)	Xylene (o)	
Limit of reporting			10	10	50	50	100	100	1	1	1	1	2	1
Sample location	Date sampled	Laboratory												
MW02	12-Nov-13	EnviroLab	650	390	180	170	<100	<100	260	2	2	<2	<1	2
QA01	12-Nov-13	EnviroLab	610	360	200	200	<100	<100	250	2	1	<2	<1	<1
RPD			6%	8%	11%	16%	-	-	4%	0%	67%	-	-	-
MW02	12-Nov-13	EnviroLab	650	390	180	170	100	100	260	2	2	<2	<1	2
QA01a	12-Nov-13	ALS	540	330	100	100	350	180	207	2	2	<2	<2	<1
RPD			18%	17%	57%	52%	111%	57%	23%	0%	0%	0%	0%	0%
MW02	13-Nov-13	EnviroLab	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<1
QA02	13-Nov-13	EnviroLab	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<1
RPD			-	-	-	-	-	-	-	-	-	-	-	-
MW02	13-Nov-13	EnviroLab	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<1
QA02a	13-Nov-13	ALS	<20	<20	<50	<50	<100	<100	<1	<2	<2	<2	<2	<1
RPD			-	-	-	-	-	-	-	-	-	-	-	-

All results expressed as µg/L, unless stated otherwise

F1 = TRH C₆-C₁₀ minus BTEX compounds

F2 = TRH >C₁₀-C₁₆ less naphthalene

Italic - limit of reporting

CERTIFICATE OF ANALYSIS

101008

Client:

Parsons Brinckerhoff Aust. Pty Ltd
GPO Box 5394
Sydney
NSW 2001

Attention: Dan Laver

Sample log in details:

Your Reference:	2193313A, Calwell
No. of samples:	3 Waters
Date samples received / completed instructions received	19/11/2013 / 19/11/2013

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	26/11/13 / 26/11/13
Date of Preliminary Report:	None Issued

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Results Approved By:

Sch 2.2(a)(ii)
Ja
La

vTRH(C6-C10)/BTEXN in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	101008-1 MW01 14/11/2013 Water	101008-2 MW02 14/11/2013 Water	101008-3 MW03 14/11/2013 Water
Date extracted	-	20/11/2013	20/11/2013	20/11/2013
Date analysed	-	20/11/2013	20/11/2013	20/11/2013
TRHC ₆ - C ₉	µg/L	20	42,000	<10
TRHC ₆ - C ₁₀	µg/L	24	45,000	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	24	15,000	<10
Benzene	µg/L	<1	26,000	<1
Toluene	µg/L	<1	940	<1
Ethylbenzene	µg/L	<1	530	<1
m+p-xylene	µg/L	<2	1,800	<2
o-xylene	µg/L	<1	670	<1
Naphthalene	µg/L	<1	240	<1
Surrogate Dibromofluoromethane	%	114	100	120
Surrogate toluene-d8	%	122	102	135
Surrogate 4-BFB	%	84	99	88

svTRH (C10-C40) in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ----- -----	101008-1 MW01 14/11/2013 Water	101008-2 MW02 14/11/2013 Water	101008-3 MW03 14/11/2013 Water
Date extracted	-	20/11/2013	20/11/2013	20/11/2013
Date analysed	-	21/11/2013	21/11/2013	21/11/2013
TRHC ₁₀ - C ₁₄	µg/L	<50	2,000	<50
TRHC ₁₅ - C ₂₈	µg/L	<100	160	340
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	1,000	67
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	760	67
TRH>C ₁₆ - C ₃₄	µg/L	<100	110	360
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	104	99	89

HM in water - dissolved				
Our Reference:	UNITS	101008-1	101008-2	101008-3
Your Reference	-----	MW01	MW02	MW03
Date Sampled	-----	14/11/2013	14/11/2013	14/11/2013
Type of sample		Water	Water	Water
Date prepared	-	20/11/2013	20/11/2013	20/11/2013
Date analysed	-	20/11/2013	20/11/2013	20/11/2013
Lead-Dissolved	µg/L	<1	5	<1

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note Naphthalene is determined from the VOC analysis.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Water						Base II Duplicate II %RPD		
Date extracted	-			20/11/2013	101008-1	20/11/2013 20/11/2013	LCS-W1	20/11/2013
Date analysed	-			20/11/2013	101008-1	20/11/2013 20/11/2013	LCS-W1	20/11/2013
TRHC ₆ - C ₉	µg/L	10	Org-016	<10	101008-1	20 18 RPD: 11	LCS-W1	87%
TRHC ₆ - C ₁₀	µg/L	10	Org-016	<10	101008-1	24 21 RPD: 13	LCS-W1	87%
Benzene	µg/L	1	Org-016	<1	101008-1	<1 <1	LCS-W1	102%
Toluene	µg/L	1	Org-016	<1	101008-1	<1 <1	LCS-W1	124%
Ethylbenzene	µg/L	1	Org-016	<1	101008-1	<1 <1	LCS-W1	101%
m+p-xylene	µg/L	2	Org-016	<2	101008-1	<2 <2	LCS-W1	99%
o-xylene	µg/L	1	Org-016	<1	101008-1	<1 <1	LCS-W1	95%
Naphthalene	µg/L	1	Org-013	<1	101008-1	<1 <1	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	114	101008-1	114 104 RPD: 9	LCS-W1	112%
Surrogate toluene-d8	%		Org-016	99	101008-1	122 137 RPD: 12	LCS-W1	125%
Surrogate 4-BFB	%		Org-016	100	101008-1	84 98 RPD: 15	LCS-W1	89%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH(C10-C40) in Water						Base II Duplicate II %RPD		
Date extracted	-			20/11/2013	[NT]	[NT]	LCS-W1	20/11/2013
Date analysed	-			21/11/2013	[NT]	[NT]	LCS-W1	21/11/2013
TRHC ₁₀ - C ₁₄	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	100%
TRHC ₁₅ - C ₂₈	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	107%
TRHC ₂₉ - C ₃₆	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	111%
TRH>C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	100%
TRH>C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	107%
TRH>C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	111%
Surrogate o-Terphenyl	%		Org-003	104	[NT]	[NT]	LCS-W1	91%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
HM in water - dissolved						Base II Duplicate II %RPD		
Date prepared	-			20/11/2013	101008-1	20/11/2013 20/11/2013	LCS-W1	20/11/2013
Date analysed	-			20/11/2013	101008-1	20/11/2013 20/11/2013	LCS-W1	20/11/2013
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	101008-1	<1 <1	LCS-W1	119%

Report Comments:

Asbestos ID was analysed by Approved Identifier: Not applicable for this job
 Asbestos ID was authorised by Approved Signatory: Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

CERTIFICATE OF ANALYSIS

100815

Client:

Parsons Brinckerhoff Aust. Pty Ltd
GPO Box 5394
Sydney
NSW 2001

Attention: Dan Laver

Sample log in details:

Your Reference:	2193313A, ACT
No. of samples:	9 Waters
Date samples received / completed instructions received	14/11/2013 / 14/11/2013

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/11/13 / 19/11/13
Date of Preliminary Report:	Not issued

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Results Approved By:

John 22(a)(1)
Jacinta
Labo

vTRH(C6-C10)/BTEXN in Water Our Reference: Your Reference Type of sample	UNITS ----- -----	100815-1 RB_111113 Water	100815-2 TB_111113 Water	100815-3 TS_111113 Water	100815-4 RB_121113 Water	100815-5 TB_121113 Water
Date extracted	-	15/11/2013	15/11/2013	15/11/2013	15/11/2013	15/11/2013
Date analysed	-	16/11/2013	16/11/2013	16/11/2013	16/11/2013	16/11/2013
TRHC ₆ - C ₉	µg/L	<10	<10	[NA]	<10	<10
TRHC ₆ - C ₁₀	µg/L	<10	<10	[NA]	<10	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	[NA]	[NA]	<10	[NA]
Benzene	µg/L	<1	<1	104%	<1	<1
Toluene	µg/L	<1	<1	113%	<1	<1
Ethylbenzene	µg/L	<1	<1	118%	<1	<1
m+p-xylene	µg/L	<2	<2	123%	<2	<2
o-xylene	µg/L	<1	<1	123%	<1	<1
Naphthalene	µg/L	<1	[NA]	[NA]	<1	[NA]
Surrogate Dibromofluoromethane	%	130	131	124	128	132
Surrogate toluene-d8	%	86	84	90	86	87
Surrogate 4-BFB	%	84	81	98	84	80

vTRH(C6-C10)/BTEXN in Water Our Reference: Your Reference Type of sample	UNITS ----- -----	100815-6 TS_121113 Water	100815-7 RB_131113 Water	100815-8 TB_131113 Water	100815-9 TS_131113 Water
Date extracted	-	15/11/2013	15/11/2013	15/11/2013	15/11/2013
Date analysed	-	16/11/2013	16/11/2013	16/11/2013	16/11/2013
TRHC ₆ - C ₉	µg/L	[NA]	<10	<10	[NA]
TRHC ₆ - C ₁₀	µg/L	[NA]	<10	<10	[NA]
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	[NA]	<10	[NA]	[NA]
Benzene	µg/L	106%	<1	<1	105%
Toluene	µg/L	115%	<1	<1	114%
Ethylbenzene	µg/L	123%	<1	<1	121%
m+p-xylene	µg/L	128%	<2	<2	125%
o-xylene	µg/L	128%	<1	<1	124%
Naphthalene	µg/L	[NA]	<1	[NA]	[NA]
Surrogate Dibromofluoromethane	%	117	130	129	121
Surrogate toluene-d8	%	89	87	85	90
Surrogate 4-BFB	%	97	84	81	97

svTRH (C10-C40) in Water Our Reference: Your Reference Type of sample	UNITS ----- -----	100815-1 RB_111113 Water	100815-4 RB_121113 Water	100815-7 RB_131113 Water
Date extracted	-	15/11/2013	15/11/2013	15/11/2013
Date analysed	-	18/11/2013	18/11/2013	18/11/2013
TRHC ₁₀ - C ₁₄	µg/L	<50	<50	<50
TRHC ₁₅ - C ₂₈	µg/L	<100	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	<50	<50	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<50
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	97	96	92

HM in water - dissolved Our Reference: Your Reference Type of sample	UNITS ----- -----	100815-1 RB_111113 Water	100815-4 RB_121113 Water	100815-7 RB_131113 Water
Date prepared	-	15/11/2013	15/11/2013	15/11/2013
Date analysed	-	15/11/2013	15/11/2013	15/11/2013
Lead-Dissolved	µg/L	<1	<1	<1

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Water						Base II Duplicate II %RPD		
Date extracted	-			15/11/2013	[NT]	[NT]	LCS-W1	15/11/2013
Date analysed	-			16/11/2013	[NT]	[NT]	LCS-W1	16/11/2013
TRHC ₆ - C ₉	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	132%
TRHC ₆ - C ₁₀	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	132%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	121%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	125%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	133%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	138%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	137%
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	121	[NT]	[NT]	LCS-W1	122%
Surrogate toluene-d8	%		Org-016	77	[NT]	[NT]	LCS-W1	86%
Surrogate 4-BFB	%		Org-016	70	[NT]	[NT]	LCS-W1	99%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH(C10-C40) in Water						Base II Duplicate II %RPD		
Date extracted	-			15/11/2013	[NT]	[NT]	LCS-W4	15/11/2013
Date analysed	-			18/11/2013	[NT]	[NT]	LCS-W4	18/11/2013
TRHC ₁₀ - C ₁₄	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W4	76%
TRHC ₁₅ - C ₂₈	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	91%
TRHC ₂₉ - C ₃₆	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	99%
TRH>C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W4	76%
TRH>C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	91%
TRH>C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W4	99%
Surrogate o-Terphenyl	%		Org-003	87	[NT]	[NT]	LCS-W4	73%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
HM in water - dissolved						Base II Duplicate II %RPD		
Date prepared	-			15/11/2013	[NT]	[NT]	LCS-W2	15/11/2013
Date analysed	-			15/11/2013	[NT]	[NT]	LCS-W2	15/11/2013
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W2	113%

CERTIFICATE OF ANALYSIS

100816

Client:

Parsons Brinckerhoff Aust. Pty Ltd
GPO Box 5394
Sydney
NSW 2001

Attention: Dan Laver

Sample log in details:

Your Reference:	2193313A, ACT
No. of samples:	2 Waters
Date samples received / completed instructions received	14/11/2013 / 14/11/2013

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
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Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/11/13 / 19/11/13
Date of Preliminary Report:	Not issued

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Results Approved By:



Jacinta
Laboratory

vTRH(C6-C10)/BTEXN in Water Our Reference: Your Reference Type of sample	UNITS ----- -----	100816-1 QA01 Water	100816-2 QA02 Water
Date extracted	-	15/11/2013	15/11/2013
Date analysed	-	16/11/2013	16/11/2013
TRHC ₆ - C ₉	µg/L	530	<10
TRHC ₆ - C ₁₀	µg/L	610	<10
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	360	<10
Benzene	µg/L	250	<1
Toluene	µg/L	2	<1
Ethylbenzene	µg/L	1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	4	<1
Surrogate Dibromofluoromethane	%	106	115
Surrogate toluene-d8	%	92	87
Surrogate 4-BFB	%	101	86

svTRH (C10-C40) in Water Our Reference: Your Reference Type of sample	UNITS ----- -----	100816-1 QA01 Water	100816-2 QA02 Water
Date extracted	-	15/11/2013	15/11/2013
Date analysed	-	18/11/2013	18/11/2013
TRHC ₁₀ - C ₁₄	µg/L	320	<50
TRHC ₁₅ - C ₂₈	µg/L	<100	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	200	<50
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	200	<50
TRH>C ₁₆ - C ₃₄	µg/L	<100	<100
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100
Surrogate o-Terphenyl	%	90	94

HM in water - dissolved			
Our Reference:	UNITS	100816-1	100816-2
Your Reference	-----	QA01	QA02
Type of sample	-----	Water	Water
Date prepared	-	15/11/2013	15/11/2013
Date analysed	-	15/11/2013	15/11/2013
Lead-Dissolved	µg/L	<1	<1

CERTIFICATE OF ANALYSIS

Work Order	: ES1324971	Page	: 1 of 4
Amendment	: 1		
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR DANIEL LAVER	Contact	: Client Services
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	:  @pb.com.au	E-mail	:  @alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9272 5101	Facsimile	: +61-2-8784 8500
Project	: 2193313A CALTEX ACT	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 73761	Date Samples Received	: 15-NOV-2013
Sampler	: ----	Issue Date	: 19-DEC-2013
Site	: ACT		
Quote number	: EN/008/13	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.

Signatories	Position	Accreditation Category
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Edwandy Fadjar	Organic Coordinator	Sydney 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.

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:** This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes- sample QA01A C10-C14 results.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				QA01A	QA02A			
				12-NOV-2013 15:00	13-NOV-2013 15:00			
Compound	CAS Number	LOR	Unit	ES1324971-001	ES1324971-002			
EG020F: Dissolved Metals by ICP-MS								
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	500	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	350	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	180	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	530	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	540	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	330	----	----	----
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	450	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	130	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	580	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	207	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	207	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	81.1	104	----	----	----
Toluene-D8	2037-26-5	0.1	%	98.9	108	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	98.1	105	----	----	----

Page : 4 of 4
Work Order : ES1324971 Amendment 1
Client : PARSONS BRINCKERHOFF AUST P/L
Project : 2193313A CALTEX ACT



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

MANUAL INVOICE / AGREEMENT SPECIFICS



TRANSPACIFIC

TAX INVOICE NUMBER: N 41329

☐ GLENDENNING 6-8 Rayben St Glendenning NSW 2761
☐ NEWCASTLE 19 Egret Street Kooragang Island NSW 2304
☐ ORANGE 28 Leewood Dve Orange NSW 2800
☒ QUEANBEYAN 42B Aurora Ave Queanbeyan NSW 2620
☐ TAMWORTH 31-35 Gunnedah Rd Tamworth NSW 2340
☐ WOLLONGONG 5 Charcoal Close Unanderra NSW 2526

ABN 88 001 576 889

www.transpacific.com.au
ERS Australia 1800 118 800

CUSTOMER NUMBER		Waste Consignor (Activity)		WASTE DATA FORM		WASTE RECEIPT <input checked="" type="checkbox"/>	
NAME		Licenced Activity: <input type="checkbox"/> Non Licenced Activity: <input type="checkbox"/>		Customer Phone		Contact Name	
ADDRESS				Sch 2.2(a)(ii)		DAMIEL LAVER	
SUBURB		STATE POSTCODE		Fax Number		Credit Code ANZSIC Code	
CALWELL		ACT					

Service Date	Time	Representative	Truck Registration	Agreement	Licence No.	Transport No.
21/11/13		DAMIAN	AR77XJ		6090	6239

Load Identification	
---------------------	--

Dangerous Goods		Comments	Qty.	kg	ERS is acting as a: Transporter <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> (Please tick the appropriate box) Consignor <input type="checkbox"/>
Proper Shipping Name					
Waste Description AAA BBB UNCCCC D EEE F GGGG H Y					
DRUM			1	15	
Proper Shipping Name					Interstate Transport Direction of Movement: Into NSW: <input checked="" type="checkbox"/> Out of NSW: <input type="checkbox"/> Destination State: <input type="checkbox"/> (1. Queensland 2. Victoria 3. South Australia)
Waste Description AAA BBB UNCCCC D EEE F GGGG H Y					
Collection			1		
Waste Description AAA BBB UNCCCC D EEE F GGGG H Y					
Proper Shipping Name					Date of despatch is the date of removal and is also the expected date of delivery to destination and the date of receipt. The representative is the driver and the receiving facility (destination) representative.
Waste Description --- UN---- L --- A G110 D R					
DISPOSAL			1		
Waste Description 3 --- UN1263 L III H F100 D R					
Proper Shipping Name					
Waste Description 9 --- UN3082 L III H J120 D R					

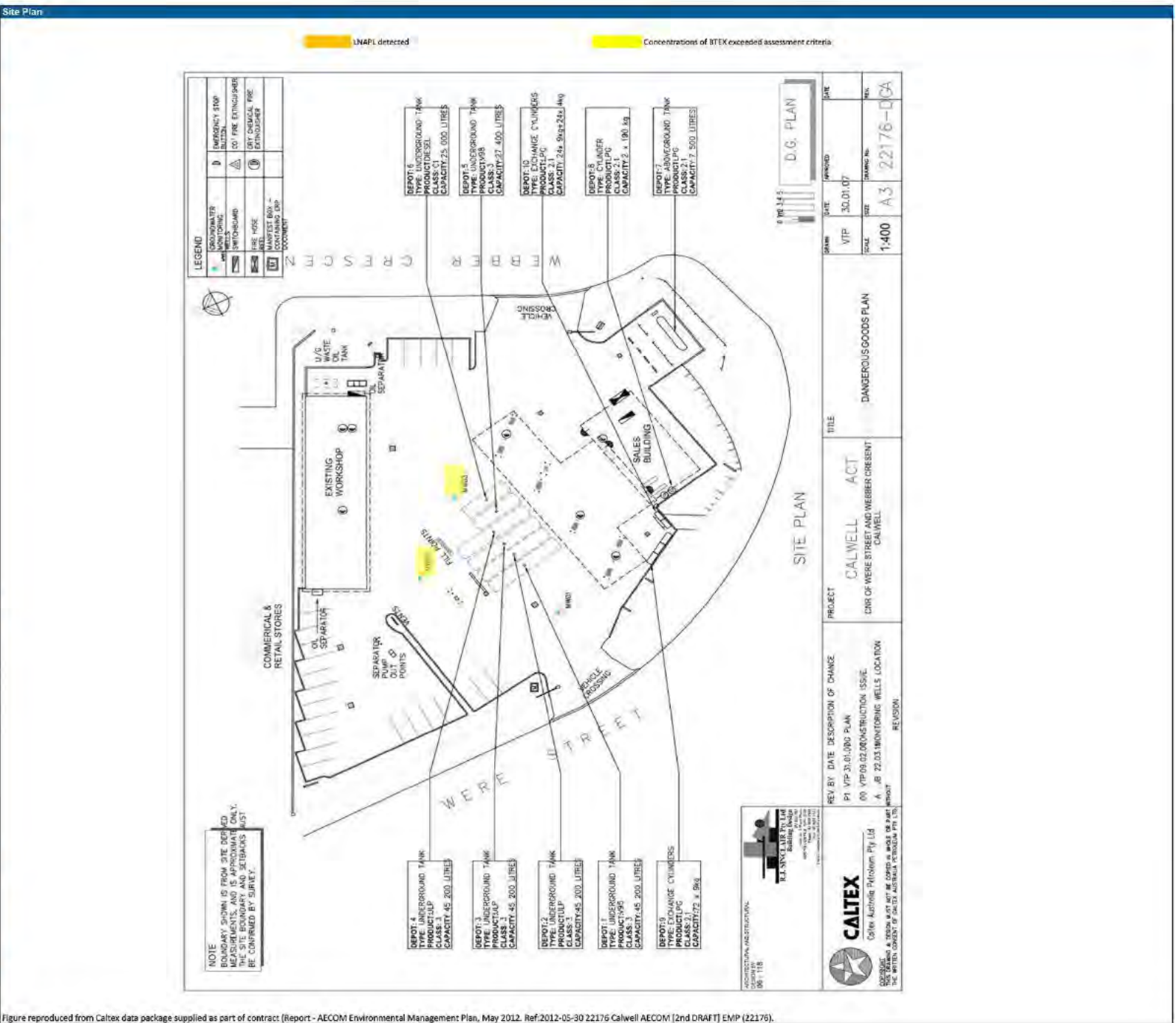
Waste Consignee (Destination) & Transporter		ERS Australia Pty. Ltd.		Date of Waste Movement	
Branch Address:				Representative Name: (Please Print)	
				DAMIAN BECK	
				Signature: Sch 2.2(a)(ii)	
				Customer Name: (Please Print)	
				EMOEL	
				Order No: DANIEL	
				Date: 21/11/13	

WASTE CODE LEGENDS							
Physical Nature Codes = D		NSW Waste Types = F		NSW Waste Types = F		NSW Waste Types = F	
Physical Nature Codes	Description	Waste Type Code	Description	Code	Description	Code	Description
L	Liquid	H	Hazardous	D	Drum	R	Storage
S	Solid	I	Industrial	B	Bulk	T	Treatment
F	Sludge	A	Group A Liquid	O	Other		

WASTE DESCRIPTION: AAABBBUNCCCCCEEEFGGGGHY							
AAA	=	Dangerous Goods	EEE	=	Packing Group Number		
BBB	=	Subsidiary Risk	F	=	NSW Waste Type		
UNCCCC	=	UN Number	GGGG	=	Waste Code		
D	=	Physical Nature Code	H	=	Packaging Type		
			Y	=	Fate of Waste		

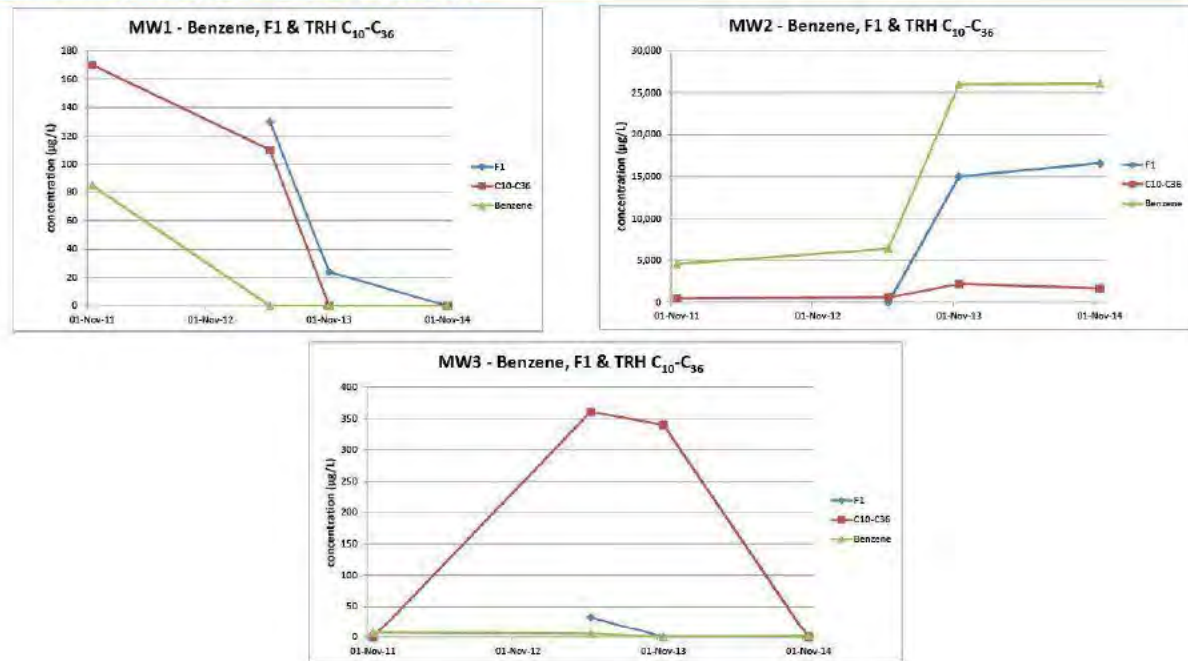
YELLOW COPY: CUSTOMER
GREEN COPY: BRANCH
WHITE COPY: REGIONAL OFFICE

Site Name: Caltex Calwell (Report Status - final)			
Site Identification / Description			
Site ID No.:	22176		
Address:	Corner Were Street and Webber Crescent, Calwell ACT 2905		
Suburb:	Calwell		
Project information			
Client:	Caltex Australia Petroleum Pty Ltd		
Project:	2014 Round 4 - ACT Groundwater Monitoring Event		
Groundwater Sampling Summary			
Sampling date(s):	10-Nov-14		
Number of groundwater wells gauged/sampled:	3		
Number of groundwater wells not gauged/sampled:	0		
Summary of wells not gauged/sampled:	N/A		
Summary of Groundwater Contamination			
Description:	<p>Concentrations of TRH were detected in MW02 only and BTEX compounds were detected in MW02 and MW03. Concentrations of F1, TRH C₁₀-C₄₀, benzene, toluene, ethylbenzene, xylene (m&p) and (o) and lead exceeded the site assessment criteria in monitoring well MW02, located north of the tank farm and benzene exceeded the assessment criteria in MW03, located immediately to the north-east of the tank farm.</p> <p>In accordance with revised ACT regulations, ethanol was analysed for the first time in November 2014. No ethanol was detected above the analytical limit of detection.</p>		
LNAPL present	No		
Apparent LNAPL thickness:	N/A		
Max concentration-F1:	16,600 µg/L (MW02)		
Max concentration-F2:	860 µg/L (MW02)		
Max concentration-benzene:	26,100 µg/L (MW02)		
Max concentration-toluene:	1,620 µg/L (MW02)		
Max concentration-ethylbenzene:	1,090 µg/L (MW02)		
Max concentration-total xylene:	4,210 µg/L (MW02)		
Max concentration-lead:	57 µg/L (MW02)		
Max concentration-ethanol:	<60 µg/L		
Groundwater direction flow:	North-east (Based on AECOM's Groundwater Monitoring Well Report, November 2011. Ref: 2011 #BLR)		
Beneficial use(s):	Fresh water Drinking water*		
	* Drinking water criteria has been considered based on quality parameters, with average total dissolved solids (TDS) of 584 ppm detected prior to sampling. There are currently no registered bores within a 1km radius of the site. The area is serviced with a reticulated town water supply and it is considered unlikely that bores would be installed for drinking water use in the immediate vicinity of the site.		
Closest inferred sensitive land use:	Residential properties are located to the north, south and west of the site. Calwell High School is located approximately 500 m south-east of the site		
Nearest surface water receptor(s):	Tuggeranong Creek - 150 m north-east of the site		
Comments and Recommendations			
Groundwater			
Current and historical data indicate the greatest impact to groundwater at MW02 with elevated concentrations of benzene and lead.			
Since sampling in November 2011, concentrations of BTEX and TRH have decreased in monitoring well MW01. However BTEX and F1 concentrations in MW02 have increased since 2011, with a less significant increase since the previous GME in November 2013.			
MW03 concentration of C ₁₀ -C ₁₂ increased between the November 2011 and May 2013 sampling rounds, but showed a slight decrease in the previous November 2013 sampling round and have decreased again to below the LORs in the current GME.			
Parsons Brinckerhoff recommends surveying all groundwater monitoring wells to determine the inferred groundwater flow direction, continued groundwater monitoring to establish trends in contaminant concentrations, and consideration of on-site delineating wells.			
Attachments			
Attachment A - Laboratory reports			
Attachment B - QA/QC results			
Report Summary			
Report date:	25-Nov-14	Date Sampled:	10-Nov-14
Data entered:	IP	Data Entered:	25-Nov-14
Data QA:	DL	Data QA:	01-Dec-13



Analytical table 1 - Groundwater analytical summary for TRH, BTEX and lead (current data)

All results expressed as $\mu\text{g/L}$, unless stated otherwise
 F1 = TRH $\text{C}_8\text{-C}_{10}$ minus BTEX compounds
 F2 = TRH $>\text{C}_{10}\text{-C}_{18}$ less naphthalene

Groundwater monitoring well trend graphs for benzene, TRH C₅-C₁₀ & TRH >C₁₀-C₃₆

Analytical table 2 - Groundwater analytical trends for TRH, BTEX, and lead (current and previous rounds if available).

[illegible]

For ease of interpretation, yellow shading indicates the exceedance of one or more beneficial uses.

¹ NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater investigation levels for fresh water

² NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater investigation levels for drinking water

³ NEPM National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater HSLD Commercial/Industrial, 2 m to <4 m, sand

¹ NEPM National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC, 2013) - groundwater HSL D Commercial/Industrial, 4 m to <8 m, sand

QA/QC Data validation table 3 - rinsate blanks, trip blanks and trip spike samples

		TRH						BTEX						Lead (dissolved)	Ethanol
		C ₆ -C ₁₀	F1	>C ₁₀ -C ₁₆	F2	>C ₁₆ -C ₃₄	>C ₃₄ -C ₄₀	Benzene	Toluene	Ethylbenzene	Xylene (m&p)	Xylene (o)	Total xylene		
Limit of reporting		20	20	100	100	100	100	1	2	2	2	2	2	1	50
Sample location	Date sampled														
RB_101114	10-Nov-14	<20	<20	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<50
RB_111114	11-Nov-14	<20	<20	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<50
RB_121114	12-Nov-14	<20	<20	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<50
RB_131114	13-Nov-14	<20	<20	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<50
TB_1	11-Nov-13	-	-	-	-	-	-	<1	<2	<2	<2	<2	<2	-	-
TB_2	13-Nov-14	-	-	-	-	-	-	<1	<2	<2	<2	<2	<2	-	-
SB1	10-Nov-14	-	-	-	-	-	-	65%	70%	60%	60%	65%	-	-	-
TS2	13-Nov-14	-	-	-	-	-	-	75%	80%	75%	75%	80%	-	-	-

All results expressed as µg/L, unless stated otherwise
F1 = TRH C₆-C₁₀ minus BTEX compounds
F2 = TRH >C₁₀-C₁₆ less naphthalene

QA/QC Data validation table 4 - intra and inter laboratory duplicate samples

			TRH						BTEX					Lead (dissolved)	Ethanol
			C ₆ -C ₁₀	F1	>C ₁₀ -C ₁₆	F2	>C ₁₆ -C ₃₄	>C ₃₄ -C ₄₀	Benzene	Toluene	Ethylbenzene	Xylene (m&p)	Xylene (o)		
Limit of reporting			20	20	100	100	100	100	1	1	1	1	2	1	1
Sample location	Date sampled	Laboratory													
MW01 (Braddon)	11-Nov-14	ALS	15,000	8,080	940	760	<100	<100	255	1,000	820	3,840	1,010	6	<50
DUP1	11-Nov-14	ALS	17,500	10,000	710	500	<100	<100	280	1,030	749	4,460	933	7	<50
RPD			15%	21%	28%	41%	-	-	9%	3%	9%	15%	8%	15%	-
MW01 (Braddon)	11-Nov-14	ALS	15,000	8,080	940	760	<100	<100	255	1,000	820	3,840	1,010	6	<50
DUP2	11-Nov-14	Envirolab	19,000	9,700	1,100	970	<100	<100	420	1,400	1,000	5,300	1,200	8	<500
RPD			24%	18%	16%	24%	-	-	49%	33%	20%	32%	17%	0%	-
EW2 (Kippax Holt)	13-Nov-14	ALS	40	40	<100	<100	<100	<100	2	<2	3	<2	<2	<1	<50
DUP3	13-Nov-14	ALS	30	30	<100	<100	<100	<100	2	<2	2	<2	<2	<1	<50
RPD			29%	29%	-	-	-	-	0%	-	40%	-	-	-	-
EW2 (Kippax Holt)	13-Nov-14	ALS	40	40	100	100	100	<100	2	<2	3	<2	<2	<1	<50
DUP4	13-Nov-14	Envirolab	35	28	59	58	110	<100	3	<1	4	<2	<1	<1	<500
RPD			13%	35%	52%	53%	10%	-	40%	-	29%	-	-	-	-

All results expressed as µg/L, unless stated otherwise
F1 = TRH C₆-C₁₀ minus BTEX compounds
F2 = TRH >C₁₀-C₁₆ less naphthalene
Italic - limit of reporting

1.1 Field QA/QC data validation

1.1.1 Sampling procedures

Parsons Brinckerhoff standard procedures, which are based on industry accepted standard practice, were followed throughout the investigation to prevent cross contamination, preserve sample integrity and allow for collection of a suitable data set from which to make technically sound and justifiable decisions with data of satisfactory useability.

The work was undertaken by appropriately qualified and experienced personnel. The field methods employed for collection of groundwater samples are outlined in Section 6.

1.1.2 Field duplicate samples

The purpose of duplicate samples are to estimate the variability of a given characteristic or contaminant associated with a population. For the validation assessment blind (intra-laboratory) and split (inter-laboratory) duplicate samples were collected for analysis.

Field duplicate groundwater samples were collected by placing approximately equal portions of the primary sample into separate containers. Duplicate samples were labelled so as to conceal their relationship to the primary sample from the laboratory.

A total of two blind duplicate groundwater samples were submitted for analysis (at an approximate rate of 1:20 primary samples analysed) and two blind triplicate samples during the investigation.

Variation in duplicate results can be observed due to sample heterogeneity or low reported concentrations near the laboratory PQL. The overall precision of field duplicates is generally assessed by their relative percentage difference (RPD), given by:

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

where: *X1 is the first duplicate value*
X2 is the second duplicate value

RPDs for duplicate samples have been calculated and the results are presented in Table 3 and Table 4. The RPDs have been compared to the acceptance limits (<5xPQL - any RPD and >5x PQL – 0-50% RPD). RPDs were all found to be within the acceptable limits.

1.1.3 Rinsate Blanks

Rinsate blanks consist of pre-preserved bottles filled with laboratory-prepared water that is passed over decontaminated field equipment and then collected in containers used for the sampling process. Rinsate blanks are preserved in a similar manner to the original samples. Rinsate blanks are a check on decontamination procedures.

A total of four rinsate samples were analysed; one for each day of sampling and the results are provided in Table 3.

A review of the analytical results indicated all samples recorded concentrations below the acceptable limit (non-detect for contaminants analysed).

It is concluded that the decontamination procedures were adequate and contaminants were unlikely to have been introduced by contact of the sampling equipment with the groundwater sampled.

1.1.4 Trip Blanks

A trip blank assesses the potential for cross contamination between transit from the site to the laboratory. Samples are typically analysed for the same contaminants targeted as part of the assessment. Trip blank samples were prepared by the primary laboratory, carried to the field unopened, subjected to the same preservation methods as the primary field samples.

One trip blank sample was analysed for each sample batch sent to the laboratory (a total of two trip blanks) and the results are provided in Table 3.

A review of the analytical results indicated concentrations of analytes were recorded below the acceptable limit (non-detect for contaminants analysed).

It is concluded that cross contamination did not occur during the course of the fieldwork.

1.1.5 Trip Spikes

Trip spikes are assessed for the potential loss of volatile constituents from groundwater samples whilst in transit from the site to the laboratory. A trip spike sample was prepared by the laboratory, carried to the field unopened, subjected to the same preservation methods as the field samples and analysed for BTEX compounds to determine the loss of volatile compounds incurred prior to laboratory analysis.

Two trip spike samples were analysed, and the analytical results are provided in Table 3. Concentrations of BTEX compounds ranged from 65% - 80%. A review of the analytical results indicates concentrations were within the acceptable limits (70-30% inorganics/metals, 60-140% organics and 10-40% semivolatile organic compounds) indicating a minimal loss of volatile compounds during the fieldwork.



Environmental

CERTIFICATE OF ANALYSIS

Work Order	: ES1425057	Page	: 1 of 4
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR LAVER D	Contact	: Loren Schiavon
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: sch.2.2(a)(ii)@pbworld.com	E-mail	: Sch 2.2(a)(ii)@alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61 2 8784 8503
Facsimile	: +61 02 9272 5101	Facsimile	: +61 2 8784 8500
Project	: ACT11 STRES GME-NOV 2014	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 76057	Date Samples Received	: 14-NOV-2014
C-O-C number	: ---	Issue Date	: 24-NOV-2014
Sampler	: ---	No. of samples received	: 3
Site	: CULWELL	No. of samples analysed	: 3
Quote number	: EN/008/14		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

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Environmental

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RIGHT SOLUTIONS RIGHT PARTNER



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

- Alcohols (CM055) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				22176-MW1	22176-MW2	22176-MW3		
				10-NOV-2014 17:30	10-NOV-2014 18:15	10-NOV-2014 18:35		
Compound	CAS Number	LOR	Unit	ES1425057-001	ES1425057-002	ES1425057-003		
EG020F: Dissolved Metals by ICP-MS								
Lead	7439-92-1	0.001	mg/L	<0.001	0.057	0.001		
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction		20	µg/L	<20	48400	<20		
C10 - C14 Fraction		50	µg/L	<50	1630	<50		
C15 - C28 Fraction		100	µg/L	<100	<100	<100		
C29 - C36 Fraction		50	µg/L	<50	<50	<50		
^ C10 - C36 Fraction (sum)		50	µg/L	<50	1630	<50		
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	49600	<20		
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	16600	<20		
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	1160	<100		
>C16 - C34 Fraction		100	µg/L	<100	<100	<100		
>C34 - C40 Fraction		100	µg/L	<100	<100	<100		
^ >C10 - C40 Fraction (sum)		100	µg/L	<100	1160	<100		
^ >C10 - C16 Fraction minus Naphthalene (F2)		100	µg/L	<100	860	<100		
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	26100	2		
Toluene	108-88-3	2	µg/L	<2	1620	<2		
Ethylbenzene	100-41-4	2	µg/L	<2	1090	<2		
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	3220	<2		
ortho-Xylene	95-47-6	2	µg/L	<2	990	<2		
^ Total Xylenes	1330-20-7	2	µg/L	<2	4210	<2		
^ Sum of BTEX		1	µg/L	<1	33000	2		
Naphthalene	91-20-3	5	µg/L	<5	296	<5		
EP117: Alcohols								
Ethanol	64-17-5	50	µg/L	<50	<50	<50		
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	80.2	88.2	81.0		
Toluene-D8	2037-26-5	0.1	%	94.8	106	109		
4-Bromofluorobenzene	460-00-4	0.1	%	116	112	109		



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: ES1425057	Page	: 1 of 6
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
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Project	: ACT11 STRES GME-NOV 2014	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: CULWELL	Date Samples Received	: 14-NOV-2014
C-O-C number	: ---	Issue Date	: 24-NOV-2014
Sampler	: ---	No. of samples received	: 3
Order number	: 76057	No. of samples analysed	: 3
Quote number	: EN/008/14		

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

Celine Conceicao
Pabi Subba
Shobhna Chandra

Position

Senior Spectroscopist
Senior Organic Chemist
Metals Coordinator

Accreditation Category

Sydney Inorganics
Sydney Organics
Sydney Inorganics



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: 3717418)									
ES1424986-001	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	0.0	No Limit
ES1425060-001	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3721436)									
ES1425057-002	22176-MW2	EG020A-F: Lead	7439-92-1	0.001	mg/L	0.057	0.056	3.2	0% - 20%
ES1425415-003	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3721780)									
ES1425057-001	22176-MW1	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES1425067-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3721780)									
ES1425057-001	22176-MW1	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES1425067-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 3721780)									
ES1425057-001	22176-MW1	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
ES1425067-002	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP117: Alcohols (QC Lot: 3720364)									
ES1425056-001	Anonymous	EP117: Ethanol	64-17-5	50	µg/L	<50	<50	0.0	No Limit
ES1425059-001	Anonymous	EP117: Ethanol	64-17-5	50	µg/L	<50	<50	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 Spike (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
EG020F: Dissolved Metals by ICP-MS (QCLot: 3717418)								
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.9	81	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 3721436)								
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	103	81	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3715613)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	98.0	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	93.7	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	91.0	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3721780)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	81.1	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3715613)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	91.6	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	89.4	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	98.0	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3721780)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	81.4	75	127
EP080: BTEXN (QCLot: 3721780)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	88.3	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	103	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	104	70	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	104	69	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	105	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	92.5	70	124
EP117: Alcohols (QCLot: 3720364)								
EP117: Ethanol	64-17-5	50	µg/L	<50	100 µg/L	97.4	71	125

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 (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High

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

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: 3717418)										
ES1424986-001	Anonymous	EG020A-F: Lead	7439-92-1	0.2 mg/L	97.5	----	70	130	----	----
EP117: Alcohols (QCLot: 3720364)										
ES1425056-001	Anonymous	EP117: Ethanol	64-17-5	100 µg/L	87.9	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 3721436)										
ES1425057-002	22176-MW2	EG020A-F: Lead	7439-92-1	0.2 mg/L	95.5	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3721780)										
ES1425057-001	22176-MW1	EP080: C6 - C9 Fraction	----	325 µg/L	100	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3721780)										
ES1425057-001	22176-MW1	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	99.4	----	70	130	----	----
EP080: BTEXN (QCLot: 3721780)										

Page : 6 of 6
 Work Order : ES1425057
 Client : PARSONS BRINCKERHOFF AUST P/L
 Project : ACT11 STRES GME-NOV 2014



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							
EP080: BTEXN (QCLot: 3721780) - continued										
ES1425057-001	22176-MW1	EP080: Benzene	71-43-2	25 µg/L	79.5	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	118	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	107	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	105	----	70	130	----	----
			106-42-3							
		EP080: ortho-Xylene	95-47-6	25 µg/L	106	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	90.5	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1425057	Page	: 1 of 5
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR LAVER D	Contact	: Loren Schiavon
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Sch 2.2(a)(ii)@pbworld.com	E-mail	: Sch 2.2(a)(ii)@alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61 2 8784 8503
Facsimile	: +61 02 9272 5101	Facsimile	: +61 2 8784 8500
Project	: ACT11 STRES GME-NOV 2014	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: CULWELL	Date Samples Received	: 14-NOV-2014
C-O-C number	: ----	Issue Date	: 24-NOV-2014
Sampler	: ----	No. of samples received	: 3
Order number	: 76057	No. of samples analysed	: 3
Quote number	: EN/008/14		

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) 22176-MW1	10-NOV-2014	---	09-MAY-2015	----	18-NOV-2014	09-MAY-2015	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) 22176-MW2, 22176-MW3	10-NOV-2014	---	09-MAY-2015	----	20-NOV-2014	09-MAY-2015	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) 22176-MW1, 22176-MW3	10-NOV-2014	17-NOV-2014	17-NOV-2014	✓	20-NOV-2014	27-DEC-2014	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) 22176-MW1, 22176-MW3	10-NOV-2014	21-NOV-2014	24-NOV-2014	✓	21-NOV-2014	24-NOV-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080) 22176-MW1, 22176-MW3	10-NOV-2014	21-NOV-2014	24-NOV-2014	✓	21-NOV-2014	24-NOV-2014	✓
EP117: Alcohols							
Amber VOC Vial - Sulfuric Acid (EP117) 22176-MW1, 22176-MW3	10-NOV-2014	----	----	----	19-NOV-2014	24-NOV-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)							
Alcohols by HS-GC-MS	EP117	2	16	12.5	10.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	32	12.5	10.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	10.0	10.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alcohols by HS-GC-MS	EP117	1	16	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	32	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alcohols by HS-GC-MS	EP117	1	16	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	32	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Alcohols by HS-GC-MS	EP117	1	16	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	32	6.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	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.
TRH - Semivolatile Fraction	EP071	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 the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Alcohols by HS-GC-MS	EP117	WATER	In House. A 10 mL aliquot of sample is mixed with 4 g of sodium chloride, equilibrated at 80 degrees C for 10 minutes and the headspace analysed by GCMS in the selected ion monitoring mode.
Preparation Methods	Method	Matrix	Method Descriptions
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.



ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: ES1425063	Page	: 1 of 7
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR LAVER D	Contact	: Loren Schiavon
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: [REDACTED]@pbworld.com	E-mail	: Sch 2.2(a)(ii)@alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61 2 8784 8503
Facsimile	: +61 02 9272 5101	Facsimile	: +61 2 8784 8500
Project	: 2193315A ACT 11 SITES GME - NOV14	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ---	Date Samples Received	: 14-NOV-2014
C-O-C number	: 76062	Issue Date	: 21-NOV-2014
Sampler	: ---	No. of samples received	: 6
Site	: ACT	No. of samples analysed	: 6
Quote number	: EN/008/14		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
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Environmental

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER



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

- EG020: Positive result for sample ES1425063 - #001 has been confirmed by reanalysis.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEX compounds spiked at 20 ug/L.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				RB101114	RB111114	RB121114	TB1	SB1
				10-NOV-2014 15:00	11-NOV-2014 15:00	12-NOV-2014 15:00	10-NOV-2014 15:00	10-NOV-2014 15:00
Compound	CAS Number	LOR	Unit	ES1425063-001	ES1425063-002	ES1425063-003	ES1425063-004	ES1425063-005
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	0.016	<0.005	<0.005	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	13
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	14
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	12
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	12
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	13
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	<2	25
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	64
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	15



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				RB101114	RB111114	RB121114	TB1	SB1
				10-NOV-2014 15:00	11-NOV-2014 15:00	12-NOV-2014 15:00	10-NOV-2014 15:00	10-NOV-2014 15:00
Compound	CAS Number	LOR	Unit	ES1425063-001	ES1425063-002	ES1425063-003	ES1425063-004	ES1425063-005
EP117: Alcohols								
Ethanol	64-17-5	50	µg/L	<50	<50	<50	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	92.1	80.7	90.8	82.2	104
Toluene-D8	2037-26-5	0.1	%	98.1	104	98.6	99.5	100
4-Bromofluorobenzene	460-00-4	0.1	%	100	95.6	92.0	92.0	95.6



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

				DUP1	---	---	---	---
				10-NOV-2014 15:00	---	---	---	---
Compound	CAS Number	LOR	Unit	ES1425063-006	---	---	---	---
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.007	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	<0.001	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.001	---	---	---	---
Nickel	7440-02-0	0.001	mg/L	0.010	---	---	---	---
Lead	7439-92-1	0.001	mg/L	0.007	---	---	---	---
Zinc	7440-66-6	0.005	mg/L	0.043	---	---	---	---
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	---	---	---	---
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	14800	---	---	---	---
C10 - C14 Fraction	----	50	µg/L	1210	---	---	---	---
C15 - C28 Fraction	----	100	µg/L	<100	---	---	---	---
C29 - C36 Fraction	----	50	µg/L	<50	---	---	---	---
^ C10 - C36 Fraction (sum)	----	50	µg/L	1210	---	---	---	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	17500	---	---	---	---
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	10000	---	---	---	---
>C10 - C16 Fraction	>C10_C16	100	µg/L	710	---	---	---	---
>C16 - C34 Fraction	----	100	µg/L	<100	---	---	---	---
>C34 - C40 Fraction	----	100	µg/L	<100	---	---	---	---
^ >C10 - C40 Fraction (sum)	----	100	µg/L	710	---	---	---	---
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	500	---	---	---	---
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	280	---	---	---	---
Toluene	108-88-3	2	µg/L	1030	---	---	---	---
Ethylbenzene	100-41-4	2	µg/L	749	---	---	---	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	4460	---	---	---	---
ortho-Xylene	95-47-6	2	µg/L	933	---	---	---	---
^ Total Xylenes	1330-20-7	2	µg/L	5390	---	---	---	---
^ Sum of BTEX	----	1	µg/L	7450	---	---	---	---
Naphthalene	91-20-3	5	µg/L	210	---	---	---	---



Analytical Results

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

Client sample ID

DUP1

Client sampling date / time

10-NOV-2014 15:00

Compound	CAS Number	LOR	Unit	ES1425063-006	----	----	----	----
EP117: Alcohols								
Ethanol	64-17-5	50	µg/L	<50	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	89.7	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	101	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	92.5	----	----	----	----



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: ES1425063	Page	: 1 of 7
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR LAVER D	Contact	: Loren Schiavon
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	:  @pbworld.com	E-mail	:  @alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61 2 8784 8503
Facsimile	: +61 02 9272 5101	Facsimile	: +61 2 8784 8500
Project	: 2193315A ACT 11 SITES GME - NOV14	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ACT	Date Samples Received	: 14-NOV-2014
C-O-C number	: 76062	Issue Date	: 21-NOV-2014
Sampler	: ---	No. of samples received	: 6
Order number	: ---	No. of samples analysed	: 6
Quote number	: EN/008/14		

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



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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

Celine Conceicao
Pabi Subba

Position

Senior Spectroscopist
Senior Organic Chemist

Accreditation Category

Sydney Inorganics
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: 3717409)									
ES1425062-001	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	0.003	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.004	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.047	0.047	0.0	No Limit
ES1425223-004	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	0.003	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	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	0.019	0.019	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.016	0.016	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3717410)									
ES1425063-002	RB111114	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3719799)									
ES1425407-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	30	40	32.2	No Limit
ES1425063-006	DUP1	EP080: C6 - C9 Fraction	----	20	µg/L	14800	14800	0.08	0% - 50%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3719799)									
ES1425407-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	30	40	0.0	No Limit
ES1425063-006	DUP1	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	17500	17500	0.0	0% - 50%
EP080: BTEXN (QC Lot: 3719799)									
ES1425407-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	3	3	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	3	3	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES1425063-006	DUP1	EP080: Benzene	71-43-2	1	µg/L	280	282	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	1030	1020	1.0	0% - 20%
		EP080: Ethylbenzene	100-41-4	2	µg/L	749	734	1.9	0% - 50%
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	4460	4400	1.4	0% - 20%
			106-42-3						

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 Work Order : ES1425063
 Client : PARSONS BRINCKERHOFF AUST P/L
 Project : 2193315A ACT 11 SITES GME - NOV14



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 (%)
EP080: BTEXN (QC Lot: 3719799) - continued									
ES1425063-006	DUP1	EP080: ortho-Xylene	95-47-6	2	µg/L	933	919	1.5	0% - 50%
		EP080: Naphthalene	91-20-3	5	µg/L	210	208	1.3	No Limit
EP117: Alcohols (QC Lot: 3718728)									
ES1425055-001	Anonymous	EP117: Ethanol	64-17-5	50	µg/L	<50	<50	0.0	No Limit
ES1425141-001	Anonymous	EP117: Ethanol	64-17-5	50	µg/L	<50	<50	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 Spike (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: 3717409)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.4	80	118
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.4	82	112
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.6	81	113
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	90.2	79	113
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.3	81	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.5	81	115
EG020A-F: Zinc	7440-66-8	0.005	mg/L	<0.005	0.1 mg/L	93.1	80	116
EG035F: Dissolved Mercury by FIMS (QCLot: 3717410)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	90.7	78	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3717985)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	94.0	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	95.3	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	95.0	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3719799)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	83.2	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3717985)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	90.0	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	92.0	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	102	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3719799)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	84.1	75	127
EP080: BTEXN (QCLot: 3719799)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	86.1	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	86.5	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	79.1	70	120
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	80.1	69	121
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	83.0	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	88.0	70	124
EP117: Alcohols (QCLot: 3718728)								
EP117: Ethanol	64-17-5	50	µg/L	<50	100 µg/L	100	71	125

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: 3717409)							
ES1425062-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	94.9	70	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	95.3	70	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	87.1	70	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	89.6	70	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	90.7	70	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	85.6	70	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	98.3	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3717410)							
ES1425063-001	RB101114	EG035F: Mercury	7439-97-6	0.0100 mg/L	93.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3719799)							
ES1425407-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	98.6	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3719799)							
ES1425407-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	99.8	70	130
EP080: BTEXN (QCLot: 3719799)							
ES1425407-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.0	70	130
		EP080: Toluene	108-88-3	25 µg/L	87.1	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	85.6	70	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	89.9	70	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	89.0	70	130
	EP080: Naphthalene	91-20-3	25 µg/L	84.7	70	130	
EP117: Alcohols (QCLot: 3718728)							
ES1425055-002	Anonymous	EP117: Ethanol	64-17-5	100 µg/L	86.2	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	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: 3717409)										
ES1425062-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	94.9	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	95.3	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	87.1	----	70	130	----	----



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							
EG020F: Dissolved Metals by ICP-MS (QCLot: 3717409) - continued										
ES1425062-001	Anonymous	EG020A-F: Copper	7440-50-8	0.2 mg/L	89.6	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.2 mg/L	90.7	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	85.6	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	98.3	----	70	130	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 3717410)										
ES1425063-001	RB101114	EG035F: Mercury	7439-97-6	0.0100 mg/L	93.3	----	70	130	----	----
EP117: Alcohols (QCLot: 3718728)										
ES1425055-002	Anonymous	EP117: Ethanol	64-17-5	100 µg/L	86.2	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3719799)										
ES1425407-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	98.6	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3719799)										
ES1425407-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	99.8	----	70	130	----	----
EP080: BTEXN (QCLot: 3719799)										
ES1425407-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.0	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	87.1	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	85.6	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	89.9	----	70	130	----	----
			106-42-3							
		EP080: ortho-Xylene	95-47-6	25 µg/L	89.0	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	84.7	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1425063	Page	: 1 of 6
Client	: PARSONS BRINCKERHOFF AUST P/L	Laboratory	: Environmental Division Sydney
Contact	: MR LAVER D	Contact	: Loren Schiavon
Address	: GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	:  @pbworld.com	E-mail	:  @alsglobal.com
Telephone	: +61 02 9272 5100	Telephone	: +61 2 8784 8503
Facsimile	: +61 02 9272 5101	Facsimile	: +61 2 8784 8500
Project	: 2193315A ACT 11 SITES GME - NOV14	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ACT	Date Samples Received	: 14-NOV-2014
C-O-C number	: 76062	Issue Date	: 21-NOV-2014
Sampler	: ----	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6
Quote number	: EN/008/14		

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) RB101114, DUP1	10-NOV-2014	---	09-MAY-2015	----	18-NOV-2014	09-MAY-2015	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) RB111114	11-NOV-2014	---	10-MAY-2015	----	18-NOV-2014	10-MAY-2015	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) RB121114	12-NOV-2014	---	11-MAY-2015	----	18-NOV-2014	11-MAY-2015	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) RB101114, DUP1	10-NOV-2014	---	08-DEC-2014	----	20-NOV-2014	08-DEC-2014	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) RB111114	11-NOV-2014	---	09-DEC-2014	----	20-NOV-2014	09-DEC-2014	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) RB121114	12-NOV-2014	---	10-DEC-2014	----	20-NOV-2014	10-DEC-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) RB101114, DUP1	10-NOV-2014	17-NOV-2014	17-NOV-2014	✓	20-NOV-2014	28-DEC-2014	✓
Amber Glass Bottle - Unpreserved (EP071) RB111114	11-NOV-2014	18-NOV-2014	18-NOV-2014	✓	20-NOV-2014	28-DEC-2014	✓
Amber Glass Bottle - Unpreserved (EP071) RB121114	12-NOV-2014	18-NOV-2014	19-NOV-2014	✓	20-NOV-2014	28-DEC-2014	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) RB101114, TB1, DUP1 SB1,	10-NOV-2014	19-NOV-2014	24-NOV-2014	✓	19-NOV-2014	24-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080) RB111114	11-NOV-2014	19-NOV-2014	25-NOV-2014	✓	19-NOV-2014	25-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080) RB121114	12-NOV-2014	19-NOV-2014	26-NOV-2014	✓	19-NOV-2014	26-NOV-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
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080) RB101114, DUP1	10-NOV-2014	19-NOV-2014	24-NOV-2014	✓	19-NOV-2014	24-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080) RB111114	11-NOV-2014	19-NOV-2014	25-NOV-2014	✓	19-NOV-2014	25-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080) RB121114	12-NOV-2014	19-NOV-2014	26-NOV-2014	✓	19-NOV-2014	26-NOV-2014	✓
EP117: Alcohols							
Amber VOC Vial - Sulfuric Acid (EP117) RB101114, DUP1	10-NOV-2014	----	----	----	18-NOV-2014	24-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP117) RB111114	11-NOV-2014	----	----	----	18-NOV-2014	25-NOV-2014	✓
Amber VOC Vial - Sulfuric Acid (EP117) RB121114	12-NOV-2014	----	----	----	18-NOV-2014	26-NOV-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)							
Alcohols by HS-GC-MS	EP117	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	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	19	10.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alcohols by HS-GC-MS	EP117	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	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	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Alcohols by HS-GC-MS	EP117	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	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	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Alcohols by HS-GC-MS	EP117	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	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	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	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.
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	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 the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Alcohols by HS-GC-MS	EP117	WATER	In House. A 10 mL aliquot of sample is mixed with 4 g of sodium chloride, equilibrated at 80 degrees C for 10 minutes and the headspace analysed by GCMS in the selected ion monitoring mode.
Preparation Methods	Method	Matrix	Method Descriptions
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.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.



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.

CERTIFICATE OF ANALYSIS

119381

Client:

Parsons Brinckerhoff Aust. Pty Ltd
GPO Box 5394
Sydney
NSW 2001

Attention: Dan Laver

Sample log in details:

Your Reference:	2193313A, QA
No. of samples:	2 Waters
Date samples received / completed instructions received	14/11/2014 / 14/11/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/11/14 / 21/11/14
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

5th 22/9/11
Jac
La

vTRH(C6-C10)/BTEXN in Water	UNITS	119381-1	119381-2
Our Reference:	-----	Dup 2	Dup 4
Your Reference	-----	11/11/2014	13/11/2014
Date Sampled		Water	Water
Type of sample			
Date extracted	-	18/11/2014	18/11/2014
Date analysed	-	19/11/2014	19/11/2014
TRHC ₆ - C ₉	µg/L	14,000	28
TRHC ₆ - C ₁₀	µg/L	19,000	35
TRHC ₆ - C ₁₀ less BTEX (F1)	µg/L	9,700	28
Benzene	µg/L	420	3
Toluene	µg/L	1,400	<1
Ethylbenzene	µg/L	1,000	4
m+p-xylene	µg/L	5,300	<2
o-xylene	µg/L	1,200	<1
Naphthalene	µg/L	150	1
Surrogate Dibromofluoromethane	%	106	105
Surrogate toluene-d8	%	99	100
Surrogate 4-BFB	%	101	100

svTRH (C10-C40) in Water			
Our Reference:	UNITS	119381-1	119381-2
Your Reference	-----	Dup 2	Dup 4
Date Sampled	-----	11/11/2014	13/11/2014
Type of sample		Water	Water
Date extracted	-	17/11/2014	17/11/2014
Date analysed	-	17/11/2014	17/11/2014
TRHC ₁₀ - C ₁₄	µg/L	2,600	57
TRHC ₁₅ - C ₂₈	µg/L	130	<100
TRHC ₂₉ - C ₃₆	µg/L	<100	<100
TRH>C ₁₀ - C ₁₆	µg/L	1,100	59
TRH>C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	970	58
TRH>C ₁₆ - C ₃₄	µg/L	<100	110
TRH>C ₃₄ - C ₄₀	µg/L	<100	<100
Surrogate o-Terphenyl	%	96	96

HM in water - dissolved			
Our Reference:	UNITS	119381-1	119381-2
Your Reference	-----	Dup 2	Dup 4
Date Sampled	-----	11/11/2014	13/11/2014
Type of sample		Water	Water
Date prepared	-	18/11/2014	18/11/2014
Date analysed	-	18/11/2014	18/11/2014
Lead-Dissolved	µg/L	8	<1

Alcohols in Water*	UNITS	119381-1	119381-2
Our Reference:	-----	Dup 2	Dup 4
Your Reference	-----	11/11/2014	13/11/2014
Date Sampled		Water	Water
Type of sample			
Ethanol*	mg/L	<5.0	<5.0

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Ext-061	Analysed by Envirolab Melbourne

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
vTRH(C6-C10)/BTEXN in Water						Base II Duplicate II %RPD		
Date extracted	-			18/11/2014	[NT]	[NT]	LCS-W1	18/11/2014
Date analysed	-			19/11/2014	[NT]	[NT]	LCS-W1	19/11/2014
TRHC ₆ - C ₉	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	94%
TRHC ₆ - C ₁₀	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	84%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	107%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	108%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	95%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	95%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	100%
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	107	[NT]	[NT]	LCS-W1	101%
Surrogate toluene-d8	%		Org-016	98	[NT]	[NT]	LCS-W1	101%
Surrogate 4-BFB	%		Org-016	100	[NT]	[NT]	LCS-W1	100%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
svTRH(C10-C40) in Water						Base II Duplicate II %RPD		
Date extracted	-			17/11/2014	[NT]	[NT]	LCS-W1	17/11/2014
Date analysed	-			17/11/2014	[NT]	[NT]	LCS-W1	17/11/2014
TRHC ₁₀ - C ₁₄	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	120%
TRHC ₁₅ - C ₂₈	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	113%
TRHC ₂₉ - C ₃₆	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	102%
TRH>C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	120%
TRH>C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	113%
TRH>C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	102%
Surrogate o-Terphenyl	%		Org-003	92	[NT]	[NT]	LCS-W1	78%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
HM in water - dissolved						Base II Duplicate II %RPD		
Date prepared	-			18/11/2014	119381-1	18/11/2014 18/11/2014	LCS-W1	18/11/2014
Date analysed	-			18/11/2014	119381-1	18/11/2014 18/11/2014	LCS-W1	18/11/2014
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	119381-1	8 8 RPD: 0	LCS-W1	104%

Client Reference: 2193313A, QA

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Alcohols in Water*						Base Duplicate %RPD		
Ethanol*	mg/L	5	Ext-061	<5.0	119381-1	<5.0 <5.0	LCS-W1	96%
QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#		Duplicate Base + Duplicate + %RPD		Spike Sm#	Spike % Recovery	
Date prepared	-	[NT]		[NT]		119381-2	18/11/2014	
Date analysed	-	[NT]		[NT]		119381-2	18/11/2014	
Lead-Dissolved	µg/L	[NT]		[NT]		119381-2	97%	
QUALITY CONTROL Alcohols in Water*	UNITS	Dup. Sm#		Duplicate Base + Duplicate + %RPD		Spike Sm#	Spike % Recovery	
Ethanol*	mg/L	[NT]		[NT]		119381-2	117%	

Report Comments:

Ethanol analysed by Envirolab Services (VIC). Report No.5133.

Asbestos ID was analysed by Approved Identifier:

Not applicable for this job

Asbestos ID was authorised by Approved Signatory:

Not applicable for this job

INS: Insufficient sample for this test

PQL: Practical Quantitation Limit

NT: Not tested

NA: Test not required

RPD: Relative Percent Difference

NA: Test not required

<: Less than

>: Greater than

LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

MANUAL INVOICE / AGREEMENT SPECIFICS

TAX INVOICE NUMBER: N 43501



TRANSPACIFIC

ABN 88 001 576 889

www.transpacific.com.au
ERS Australia 1800 118 800

- ☐ GLENDENNING 6-8 Rayben St Glendenning NSW 2761
☐ NEWCASTLE 19 Egret Street Kooragang Island NSW 2304
☐ ORANGE 28 Leewood Dve Orange NSW 2800
☒ QUEANBEYAN 42B Aurora Ave Queanbeyan NSW 2620
☐ TAMWORTH 31-35 Gunnedah Rd Tamworth NSW 2340
☐ WOLLONGONG 5 Charcoal Close Uraidira NSW 2526

CUSTOMER NUMBER		Waste Consignor (Activity)		WASTE DATA FORM		WASTE RECEIPT	
NAME		Licenced Activity: <input type="checkbox"/> Non Licenced Activity: <input type="checkbox"/>		Customer Phone		Contact Name	
ADDRESS				Sch 2.2(a)(ii)		DAMIAN	
SUBURB		STATE		Fax Number		Credit Code	
CAULWELL						ANZSIC Code	

Service Date	Time	Representative	Truck Registration	Agreement	Licence No.	Transport No.
20/10/14		DAMIAN			6090	6239

Load Identification	
---------------------	--

Dangerous Goods	Comments	Qty.	kg	ERS is acting as a:
Proper Shipping Name	Drum	1	15	Transporter <input checked="" type="checkbox"/>
Waste Description				Destination: <input checked="" type="checkbox"/> (Please tick the appropriate box)
Proper Shipping Name	waste collection	1		Consignor <input type="checkbox"/>
Waste Description				
Proper Shipping Name	waste disposal	1	15	Interstate Transport
Waste Description				Direction of Movement:
Proper Shipping Name	compliance	1		Into NSW: <input checked="" type="checkbox"/>
Waste Description				Out of NSW: <input type="checkbox"/>
Proper Shipping Name				Destination State: <input type="checkbox"/>
Waste Description	UN 1263	L	111	(1. Queensland 2. Victoria 3. South Australia)
Proper Shipping Name				Date of despatch is the date of removal and is also the expected date of delivery to destination and the date of receipt
Waste Description	UN 3082	L	111	The representative is the driver and the receiving facility (destination) representative

Waste Consignee (Destination) & Transporter	ERS Australia Pty. Ltd.	Date of Waste Movement
Branch Address:		Representative Name: (Please Print)
		DAMIAN BOEL
		Signature: Sch 2.2(a)(ii)
		Customer Name: (Please Print)
		R. JAMES - ANZSIC
		Signature: Sch 2.2(a)(ii)
		Order No: 2193313A
		Date: 20/10/14

WASTE CODE LEGENDS							
Physical Nature Codes = D		NSW Waste Types = F		NSW Waste Types = F		NSW Waste Types = F	
Physical Nature Codes	Description	Waste Type Code	Description	Code	Description	Code	Description
L	Liquid	H	Hazardous	D	Drum	R	Storage
S	Solid	I	Industrial	B	Bulk	T	Treatment
F	Sludge	A	Group A Liquid	O	Other		

WASTE DESCRIPTION: AAABBBUNCCCCEEEFGGGGHY							
AAA	=	Dangerous Goods	EEE	=	Packing Group Number		
BBB	=	Subsidiary Risk	F	=	NSW Waste Type		
UNCCCC	=	UN Number	GGGG	=	Waste Code		
D	=	Physical Nature Code	H	=	Packaging Type		
			Y	=	Fate of Waste		

NSW Environment Protection Authority - Online Waste Tracking System
TRANSPORT CERTIFICATE - No. 2T00578505

Created by: Ken Telfer 27-Oct-2014 1:25 pm

Status: Created

CA no: 2C00086501

CA start date: 01-Jul-2014

CA end date: 30-Jun-2015

PART 1 (this part to be completed by consignor at pickup)

CONSIGNOR

ERS - QUEANBEYAN
42 AURORA AVE
QUEANBEYAN, NSW 2620

Contact: Damien Beck
Phone: (02) 6297 8185
ABN: 88 001 576 889

Role: Agent
Email: Damien.Beck@transpac.com.au
Fax: (02) 6297 0257
Emergency: (02) 6297 8185
ANZSIC code: 0
Licence no.: 6090

Pickup As above

details: **VARIOUS CAHTEX SITE - ACT 2600**

WASTE

Waste code: J120 - Waste oil/hydrocarbons mixtures/emulsions in water

Description: Vehicle washwaters

Form: Liquid

Liquid waste levy applies: Yes

Proposed treatment: Chemical/Physical treatment

Classification: Liquid

Contaminants: N/A

Dangerous goods class: N/A

Subsidiary risk class: N/A

UN no.: N/A

Packaging type: N/A

Packing group no: N/A

No. package: N/A

PICKUP

Waste amount at pickup: **350** (required - Yes)

I declare that to the best of my knowledge and belief the above information is true and correct.

Name and Position

Signature

Sch 2.2(a)(ii)

Date

29/11/14

PART 2 - TRANSPORTER (this part to be completed by the transporter at pickup)

ERS - DOONSIDE
PO BOX 46
DOONSIDE, NSW 2767

Contact: Damien Beck
Phone: (02) 6297 8185
Licence no.: 6239

Email: Damien.Beck@transpac.com.au
Fax: (02) 6297 0257
Transit state: N/A
Vehicle reg: TBA
Transport type: Road

I declare that to the best of my knowledge and belief the above information is true and correct.

Name and Position

Signature

Sch 2.2(a)(ii)

Date

29/11/14

PART 3 - RECEIVING FACILITY (this part to be completed by the receiving facility)

ERS - QUEANBEYAN
42 AURORA AVE
QUEANBEYAN, NSW 2620

Contact: Damien Beck
Phone: (02) 6297 8185
Licence no.: 6090

Email: Damien.Beck@transpac.com.au
Fax: (02) 6297 0257
Receiving facility ref no.: N/A

Waste amount at arrival: **350**

Date waste arrived at the facility:

ACCEPT / REJECT THE WASTE

☒ The receiving facility accepted the waste - Date accepted: Date Processed: Treatment:

☐ The receiving facility rejected the waste (complete section below)

Reason for rejection:

Rejected waste sent to - Name:

Address:

I declare that to the best of my knowledge and belief the above information is true and correct - complete if accepted or rejected:

Name and Position

Signature

Sch 2.2(a)(ii)

Date

29/11/14

NOTE

Design for a better *future /*

CALTEX AUSTRALIA PETROLEUM PTY LTD

GROUNDWATER MONITORING EVENT REPORT - SEPTEMBER 2019

CALTEX CALWELL SERVICE STATION (SITE
ID 22176), CORNER WERE STREET AND
WEBBER CRESCENT CALWELL ACT

wsp

ISSUED DECEMBER 2019

Question today *Imagine tomorrow* Create for the future

Groundwater Monitoring Event Report - September 2019

Caltex Calwell Service Station (Site ID 22176), corner Were Street and Webber Crescent
Calwell ACT

Caltex Australia Petroleum Pty Ltd

WSP

Level 1, 121 Marcus Clarke Street

Canberra ACT 2601

PO Box 1551

Canberra ACT 2600

Tel: +61 2 6201 9600

Fax: +61 2 6201 9666

wsp.com

REV	DATE	DETAILS
A	31 October 2019	Draft
B	18 December 2019	Final

	NAME	DATE	SIGNATURE
Prepared by:	Tara Stephens	31 October 2019	Sch 2.2(a)(ii)
Reviewed by:	Amy Valentine	31 October 2019	
Approved by:	Matt Miklos	18 December 2019	

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ABBREVIATIONS

ADI	Acceptable daily limit
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZAST	Australian and New Zealand Governments and States and Territories
BTEXN	Benzene, toluene, ethylbenzene, xylene, and naphthalene
EPA	Environmental Protection Authority
ESA	Environmental site assessment
GIL	Groundwater investigation level
GME	Groundwater monitoring event
HSL	Health screening level
LNAPL	Light non-aqueous phase liquid
LOR	Limit of reporting
mAHD	Metres with respect to the Australian Height Datum
mBGL	Metres below ground level
mBTOC	Metres below top of casing
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NRMMC	National Resource Management Ministerial Council
PULP	Premium unleaded petrol
RPD	Relative percent difference
TPH	Total petroleum hydrocarbon
TRH	Total recoverable hydrocarbon
ULP	Unleaded petrol
UPSS	Underground petroleum storage system
UST	Underground storage tank

EXECUTIVE SUMMARY

INTRODUCTION

Caltex Australia Petroleum Pty Ltd (Caltex) engaged WSP Australia Pty Ltd (WSP) to undertake a groundwater monitoring event (GME) at the Caltex Calwell service station located at the corner of Were Street and Webber Crescent, Calwell ACT 2905 ('the site'). The purpose of the monitoring is to satisfy the groundwater sampling requirements of the site's environmental authorisation (No. 0748).

SCOPE OF WORK

The scope of work was:

- gauging and sampling of seven groundwater monitoring wells (MW01, MW02, MW03, MW4, MW5, MW6 and MW7)
 - field screening of water quality parameters at each monitoring well
 - analysis of groundwater samples for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), ethanol and lead.
-

RESULTS

The following are pertinent results of the investigation:

- Groundwater was inferred to flow in a north/north-east direction, which is consistent with previous investigations.
 - Elevated dissolved phase hydrocarbon concentrations above the laboratory limits of reporting (LORs) were identified in samples collected from monitoring wells MW02, MW03, MW5, MW6 and MW7. Exceedances of nominated assessment criteria for TRH and BTEXN compounds were recorded in samples collected from monitoring wells MW02 and MW7. These results are consistent with previous investigations in 2017 and 2018.
-

CONCLUSION

The following conclusions can be made on review of the results for the site:

- Contamination identified in groundwater adjacent to the northern site boundary has the potential to impact off-site receptors, notably nearby commercial/industrial site users, through vapour intrusion.
- Following review of the conceptual site model and the source-pathway-receptor linkages, the hydrocarbon impact detected in groundwater beneath the site has the potential to pose an unacceptable risk on- and/or off-site receptors, through vapour intrusion.

1 INTRODUCTION

1.1 PURPOSE

Caltex Australia Petroleum Pty Ltd (Caltex) engaged WSP Australia Pty Ltd (WSP) to undertake a groundwater monitoring event (GME) at the Caltex Calwell service station (Caltex site identification 22176) located at the corner of Were Street and Webber Crescent, Calwell ACT 2905 ('the site'). The purpose of the monitoring is to satisfy the groundwater sampling requirements of the site's environmental authorisation (No. 0748). The location of the site is shown in Figure 1, Appendix A.

1.2 OBJECTIVES

The objective of the assessment was to undertake sampling compliant with the site's environmental authorisation and to report on the quality of groundwater at the site.

1.3 SCOPE OF WORK

In order to achieve the above objectives, the following scope of work was completed:

- gauging and sampling of seven existing groundwater monitoring wells (MW01, MW02, MW03, MW4, MW5, MW6 and MW7)
- field screening of water quality parameters (temperature, pH, reduction/oxidation (redox) potential, dissolved oxygen and electrical conductivity)
- analysis of groundwater samples for contaminants for concern; total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN), ethanol and lead
- interpretation of results and preparation of this report.

2 SITE CHARACTERISATION

2.1 LOCATION AND IDENTIFICATION

The site is located within a commercial/industrial precinct of Calwell, ACT. General site details are summarised below in Table 2.1. The site layout is shown in Figure 2.

Table 2.1 Summary of general information

SITE NAME	CALTEX CALWELL SERVICE STATION
Site address	Corner of Were Street and Webber Crescent, Calwell ACT 2905
Caltex site identification	22176
Legal identification	Block 8, Section 787 Calwell
Local government area	ACT Government
Zoning	CZ3: Services zone
Current land use	Service station

2.2 SURROUNDING LAND USE

Surrounding land uses include:

- North: Calwell Club restaurant and bar
- East: Calwell Shopping Centre complex
- South: Webber Crescent followed by residential property
- West: Were Street followed by residential property.

2.3 GEOLOGY

Based on a review of Abell 2007, *Geology of the Australian Capital*, the site is underlain by Quaternary alluvium and Late Silurian shales and volcanoclastic sediments, the latter of which belongs to the Laidlaw Volcanic Suite and the Deakin Volcanics. Previous drilling at the site indicated that the local geology is comprised of sandy clays with pockets of volcanic gravels above a volcanic bedrock approximately 3-4 metres below ground level (mBGL).

A review of the information in the CSIRO Australia Soil Resource Information Systems (<http://www.asris/CSIRO/au>) accessed on 9 October 2019 indicated that soils underlying the site are mapped as having an extremely low probability of occurrence of acid sulfate soils.

2.4 HYDROGEOLOGY

A review of the ACTMapi Cadastre and Imagery water bore layer conducted on 10 October 2019 revealed no registered groundwater monitoring wells within a 1 km radius of the site. Previous drilling at the site indicated that the standing water level is approximately between 4 and 6 mBGL. Based on the surrounding topography, the nearest surface water body and previous environmental assessments, it is considered that groundwater flow is likely to be in a northerly direction.

2.5 SUMMARY OF PREVIOUS INVESTIGATIONS

The following historical reports were available for review in preparation of the sampling design and reporting for this investigation:

- AECOM 2011, *Groundwater Monitoring Well Report, Caltex Calwell (22716), Corner Were Street, and Webber Crescent, Calwell ACT*.
- Parsons Brinckerhoff Australia Pty Ltd (now WSP) 2013a, *Caltex Calwell Groundwater Monitoring Event Round 1*.
- WSP 2013b, *Caltex Calwell Groundwater Monitoring Event Round 2*.
- WSP 2014, *Caltex Calwell Groundwater Monitoring Event*.
- URS (now AECOM) 2015, *Caltex Calwell Service Station (Site ID 22176), 1 Webber Crescent, Calwell ACT 2905*.
- WSP 2016, *Inspection of UPSS replacement works at Caltex Calwell service station (Site ID: 22176)*.
- Australian Capital Territory (ACT) Environment Protection Authority (EPA) 2016, *Environmental Authorisation Letter*.
- WSP 2018, *Caltex Calwell Service Station (Site ID 22176), Groundwater Monitoring Event July 2017 – Results Report cnr Were St, & Webber Crescent, Calwell ACT*.
- WSP 2019, *Caltex Calwell Service Station (Site ID 22176) Groundwater Monitoring Event Report November 2018 cnr Were St, & Webber Crescent, Calwell ACT*.

In 2011, AECOM installed three groundwater monitoring wells to depths of 10.7 mBGL, 14 mBGL and 18 mBGL as monitoring wells MW01, MW02 and MW03, respectively. Monitoring wells were installed immediately to the north, west and east of the on-site underground storage tank (UST) farm. Groundwater was measured at between 3.233 mBGL and 4.417 mBGL and was inferred to flow in a north-easterly direction. Concentrations of TRH and BTEXN above the limits of reporting (LORs) were identified in all monitoring wells. Concentrations of BTEXN exceeding the adopted assessment criteria were identified in monitoring wells MW01 and MW02. Lead concentrations in monitoring well MW02 exceeded the adopted assessment criteria by a factor of 13.

A GME undertaken by WSP in May of 2013 identified elevated concentrations of TRH and BTEXN in groundwater samples collected from MW02. Concentrations of benzene, xylene and lead in monitoring well MW02 exceeded the adopted assessment criteria.

URS undertook a GME at the site in August 2015. Elevated concentrations of TRH and BTEXN compounds were identified in samples collected from monitoring well MW02. Concentrations of benzene exceeded the adopted assessment criteria.

In 2016 fuel infrastructure replacement works were undertaken at the site by the site owner. WSP were commissioned by Caltex to observe excavation and removal of on-site USTs, noting any obvious visual or olfactory indicators of contamination. Visual and olfactory indicators of contamination were observed in soils underneath the on-site remote fill box.

In 2017 WSP were commissioned by Caltex to undertake a GME of seven on-site monitoring wells (MW01, MW02, MW03, MW4, MW5, MW6 and MW7). Elevated concentrations of TRH and BTEXN compounds exceeding adopted assessment criteria were identified in samples collected monitoring wells MW02 and MW7.

In November 2018 WSP undertook a GME of wells MW01-MW7. Results were consistent with those of the 2017 investigation, with elevated dissolved phase hydrocarbon concentrations above the LOR identified in samples collected from wells MW02, MW5 and MW7. Exceedances of nominated assessment criteria for TRH and BTEXN compounds were recorded in samples collected from monitoring wells MW02 and MW7. No concentrations of TRH or BTEXN compounds were detected in wells MW01, MW03 and MW6.

3 METHODOLOGY

3.1 SAMPLING METHODOLOGY

The sampling methodology adopted during the GME was grab sampling using Hydrasleeve™ no-flow grab samplers. Before groundwater sampling, all monitoring wells were gauged to measure standing water level and to identify the presence of light non-aqueous phase liquid (LNAPL) using a calibrated air-oil-water interface probe. Groundwater sampling was carried out in accordance with the Australian standard Australian/New Zealand Standard – Water Quality sampling, Part 11: Guidance on sampling of ground waters, AS/NZS 5667.11, 1998.

Water quality parameters, including pH, dissolved oxygen, reduction/oxidation potential (redox), electrical conductivity and temperature, were measured on a subsample collected from the HydraSleeve™ using a water quality meter calibrated prior to use. The groundwater was visually assessed for turbidity and evidence of contamination, such as odour or visible hydrocarbon sheen.

Equipment calibration certificates are provided in Appendix E.

All samples were collected in laboratory supplied containers with appropriate preservatives, where required. Samples were kept chilled prior to and during delivery to the selected laboratories. To ensure the integrity of the samples from collection to receipt by the analytical laboratory, and to verify transportation and preservation details, samples were accompanied by chain of custody documentation.

3.2 LABORATORY ANALYSES

Two laboratories accredited by the National Association of Testing Authorities (NATA) Australia were used throughout the course of the investigation; the primary analytical laboratory was SGS Australia Pty Ltd (SGS) in Alexandria (NSW), and the secondary analytical laboratory was Australian Laboratory Services Pty Ltd (ALS) in Smithfield (NSW).

Each laboratory undertook internal quality assurance and quality control (QA/QC), including the analysis of laboratory control spikes, surrogate recoveries, laboratory duplicates and method blanks.

Groundwater samples were submitted to the selected laboratories for TRH, BTEXN, ethanol and lead analysis.

Laboratory documentation, including chain of custodies and certificates of analysis, is provided in Appendix D.

3.3 DATA QUALITY PLANNING

To comply with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPM; as amended 2013) sampling quality assurance guidance, one intra-laboratory duplicate (QC1) and one inter-laboratory duplicate (QC1A) were collected for sample MW02. The intra-duplicate was analysed by the primary analytical laboratory, whereas the inter-laboratory duplicate sample was analysed by the secondary analytical laboratory. Duplicate and triplicate samples were analysed for TRH, BTEXN, ethanol and lead.

One equipment rinsate sample was collected during the GME and analysed for TRH, BTEXN, ethanol and lead. The rinsate process involved collection of rinse water from decontaminated sampling equipment.

One trip blank and trip spike accompanied the shipment of samples during the entire journey from the preparing lab to the field sampling location and back to the analytical laboratory, and was analysed for BTEXN and volatile TRH (C₆–C₁₀).

4 ASSESSMENT CRITERIA

4.1 GUIDELINES

The NEPM (2013) has been used to assess groundwater at the site, specifically Schedule B1 Investigation Levels for Groundwater. Schedule B1 provides a framework for the use of investigation and screening levels based on a matrix of human health and ecological risks.

Schedule B1 of the NEPM (2013) defines groundwater investigation levels (GILs) that have been developed for a broad range of metals and organic contaminants in groundwater. GILs are based on the following guidelines:

- Australian and New Zealand Conservation Council (ANZECC)/Agriculture, and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality*. This guideline has been superseded by an online resource prepared by the Australian and New Zealand Governments (ANZG) in 2018
- National Health and Medical Research Council (NHMRC)/National Resource Management Ministerial Council (NRMCC) 2011, *Australian Drinking Water Guidelines 6* (Version 3.3, Updated November 2016)
- NHMRC 2008, *Guidelines for Managing Risk in Recreational Waters*.

The NHMRC (2011) criteria are based on the 10 percent acceptable daily intake (ADI) for specific chemicals for an adult of 70 kg and a daily consumption of 2 L per day. The NHMRC (2008) guideline recommends an assumed consumption of 200 mL per day during recreational activities. As such the NHMRC (2011) criteria were modified by a factor of 10 to assess risks to recreational users assuming a daily intake of 200 mL.

Schedule B1 also provides a framework for assessing the human health risk from petroleum compounds and fractions via the inhalation and direct contact pathways through the development and implementation of health screening levels (HSLs). The adopted carbon fraction ranges for the HSLs are based on TRH analysis after subtraction of BTEX compounds and naphthalene.

The HSLs are divided into four generic land use settings which range from low density residential (HSL A) to commercial/industrial sites (HSL D). The HSL methodology also further specifies subsurface profile, with criteria presented for sand, silt and clay soils at several depth intervals. Where there is reasonable doubt as to the appropriate soil texture to select, either a conservative selection should be made (i.e. sand) or laboratory analysis carried out to determine particle size and hence soil texture sub-class.

In addition to national recommended guidelines, the site's environmental authorisation (No. 0748) includes a set of site specific environmental guidelines, as outlined in Table 4 "Groundwater parameters" for groundwater on the site. These criteria have been adopted from the ACT EPA (2019) *Environmental Guidelines for Petroleum Storage in the ACT*. The document provides criteria for groundwater pH, petroleum hydrocarbon compounds, dissolved lead and ethanol in water.

For assessing groundwater quality, it is necessary to evaluate the potential uses and receptors of groundwater beneath and downgradient of the site. Based on the information available, groundwater is inferred to flow to the north beneath the site. The nearest surface water body is the concrete-lined Tuggeranong Creek, situated approximately 180 m east-north-east of the site, which drains into Isabella Pond and eventually Lake Tuggeranong. There are no registered bores identified for use within 1 km of the site.

Isabella Pond is assumed to a freshwater system, therefore the GILs for fresh water have been considered. It is understood that the ACT EPA policy is that the trigger values for the protection of 95% of aquatic ecosystems be used except where contaminants are potentially bio-accumulative in which case the trigger values for the protection of 99% of species is relevant.

The site is to continue operating as a service station. Groundwater was measured between approximately 4.8 mBGL and 6.5 mBGL, where a subsurface profile comprising silty clays, sandy clays and clayey sands is expected. Based on this

information, HSL D (commercial/industrial) criteria with a subsurface of sand and groundwater at depths between 4 m and <8 m have been selected.

A summary of the adopted groundwater assessment criteria is included below in Table 4.1.

Table 4.1 Adopted assessment criteria

ANALYTES	HSL D 4 TO <8 m (SAND) ⁽¹⁾	95% PROTECTION OF FRESHWATER ECOSYSTEMS ⁽²⁾	ACT SERVICE STATION GUIDELINES ⁽³⁾
	ALL VALUES IN µg/L ⁽⁴⁾		
TRH C ₆ –C ₁₀ less BTEX (F1)	6,000	-	-
TRH >C ₁₀ –C ₁₆ less naphthalene (F2)	NL	-	-
TRH C ₁₀ –C ₄₀ (Sum)	-	-	600
Benzene	5,000	950	950
Toluene	NL	180 ⁽⁵⁾	300
Ethylbenzene	NL	80 ⁽⁵⁾	140
o-Xylene	-	350	350
m-, p-Xylene	-	75 (as m-xylene) 200 (as p-xylene)	200 (as p-xylene)
Total xylene	NL	-	600
Naphthalene	NL	16	16
Lead	-	3.4	3.4
Ethanol	-	1,400	1,400
pH	-	-	6.5 – 8.5

(1) NEPM (2013) Schedule B1, Table 1A(4) 'Groundwater HSLs for vapour intrusion, commercial/industrial setting in sand'

(2) ANZG (2018), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, toxicant default guideline values 95% species protection, accessed 11 October 2019

(3) ACT EPA (2019) Environmental Guidelines for Petroleum Storage in the ACT

(4) pH is not measured in µg/L

(5) Unknown reliability

NL: Non-limiting, maximum potential vapour concentration in soil vapour do not exceed maximum allowable vapour risk

- No assessment criteria available

5 RESULTS AND DISCUSSION

5.1 GROUNDWATER CONDITIONS

Groundwater conditions encountered at the site are presented in Table B1 and B2, Appendix B. The groundwater conditions at the site are summarised in Table 5.1.

Table 5.1 Summary of groundwater conditions

PARAMETER	RESULTS
Depth to groundwater	Depth to groundwater was measured between 4.849 m below top of casing (BTOC) and 6.510 mBTOC. MW4 was dry, which was consistent with previous GMEs undertaken at the site.
LNAPL occurrence	No LNAPL was measured during gauging.
Groundwater elevation and flow direction	Groundwater elevation was between 605.69 m Australian Height Datum (AHD) and 608.53 mAHD. Figure 3, Appendix A shows the inferred groundwater flow direction to the north/north-east.
Groundwater quality	<p>The field parameters measured during the GME found the following:</p> <ul style="list-style-type: none">— Electrical conductivity measurements ranged from 232.5 $\mu\text{S}/\text{cm}$ to 7,926 $\mu\text{S}/\text{cm}$, indicating fresh to brackish water.— Redox measurements ranged from 114 mV to 268.8 mV, indicating oxidising but anaerobic conditions. Redox potential values collected in the field using a silver chloride electrode have been corrected to standard hydrogen electrode values by adding 199 mV to each reading.— pH readings ranged from 6.97 to 7.86 indicating circumneutral conditions.— Dissolved oxygen measurements ranged from 0.64 ppm to 4.39 ppm, indicating poorly to well oxygenated groundwater.— Temperature measurements ranged from 13.6°C to 16.3°C.

5.2 GROUNDWATER ANALYTICAL RESULTS

Dissolved phase hydrocarbon concentrations above the LORs were identified in groundwater samples collected from monitoring wells MW02, MW03, MW5, MW6 and MW7. No concentrations of lead or ethanol above the LORs were detected in any groundwater sample. A summary of groundwater analytical results is provided in Table 5.2. Groundwater analytical results are presented in Table B3, Appendix B.

Table 5.2 Summary of groundwater exceedances

ANALYTE	MINIMUM CONCENTRATION ($\mu\text{g}/\text{L}$)	MAXIMUM CONCENTRATION ($\mu\text{g}/\text{L}$)	SAMPLES EXCEEDING NOMINATED CRITERIA
TRH F1	<50	20,000	MW7, MW2 (due to raised LOR for TRH F1)
TRH F2	<60	12,000	NL
TRH C ₁₀ – C ₄₀ (sum)	<650	20,000	MW02, MW7

ANALYTE	MINIMUM CONCENTRATION (µg/L)	MAXIMUM CONCENTRATION (µg/L)	SAMPLES EXCEEDING NOMINATED CRITERIA
Benzene	<0.5	21,000	MW02, MW7
Toluene	<0.5	1,100	MW02, MW7
Ethylbenzene	<0.5	1,100	MW7
Xylene (m + p)	<1	9,100	MW02, MW7
Xylene (o)	<0.5	1,900	MW7
Total xylene	<1.5	11,000	MW02, MW7
Naphthalene	<0.5	290	MW02, MW7
Lead	<1	<1	None
Ethanol	<1,000	<1,000	None

NL: Non-limiting, maximum potential vapour concentration in soil vapour do not exceed maximum allowable vapour risk

Exceedances of adopted freshwater protection criteria, ACT service station guidelines, and HSL vapour intrusion screening criteria were identified in groundwater in the central portion (MW02) of the site and the northern boundary (MW7) of the site.

Physical distribution of hydrocarbon impacts in groundwater is summarised in Figure 4, Appendix A.

6 CONCEPTUAL SITE MODEL

6.1 SOURCE AREAS AND PATTERNS OF IMPACTS

The site is occupied by a retail shop and canopy in the southern portion of the site, with a separate mechanical workshop located in the northern portion of the site. The area surrounding the site includes residential properties to the south and south-west and commercial properties to the north and north-east. The subsurface profile at the site is composed of sandy clays, sands, and gravelly clay fill to a depth of up to 1.5 mBGL, and is underlain by volcanic bedrock (AECOM, 2011). Standing water levels measured during the current groundwater monitoring event were between 4.849 mBTC and 6.510 mBTC.

The main potentially contaminating activity is the use of the site for petroleum storage and dispensing. The primary sources of contamination under this land use scenario include leaks and spills from any of the petroleum infrastructure, including tank, pipes, manifolds, and pumps.

Hydrocarbon impacts in the groundwater comprise mostly of light fraction hydrocarbons and BTEXN in the central and northern portions of the site.

6.2 RELEVANT EXPOSURE PATHWAYS AND RECEPTORS

Potential sensitive receptors of groundwater impacts identified included on-site commercial workers, maintenance and underground workers, commercial properties located to the north-west and east, and residents of houses located to the north, south, and south-west.

The site is to continue its current operations as a service station. In this context, a summary a potentially complete exposure pathways and potential receptors is provided below in Table 6.1. Although risks to on-site workers, including maintenance workers in shallow trenches, have been evaluated, these potential pathways are expected to be managed through occupational exposure controls in accordance with health and safety legislation.

Table 6.1 Potentially complete exposure pathways and potential receptors

POTENTIAL RECEPTOR	POTENTIAL EXPOSURE PATHWAY	LIKELIHOOD OF POTENTIAL POLLUTANT LINKAGES
ON-SITE		
Site workers	Ingestion and dermal contact with impacted groundwater	Unlikely: Due to the surface seal across the majority of the site, the risks associated with dermal contact with on-site contaminants are considered negligible.
	Intrusion of vapour to on-site retail building and workshop from contaminated groundwater	Possible: Volatile contaminants can equilibrate with pore spaces and migrate vertically and may cause a vapour intrusion risk to occupants of overlying building(s). The on-site retail building is upgradient of the tank farm so is unlikely to be impacted by potential contamination. Exceedances of relevant human health vapour intrusion screening criteria were recorded in monitoring MW7, located immediately adjacent to the on-site mechanical workshop, and poses a potential risk to workshop users.

POTENTIAL RECEPTOR	POTENTIAL EXPOSURE PATHWAY	LIKELIHOOD OF POTENTIAL POLLUTANT LINKAGES
Intrusive maintenance worker	Ingestion and dermal contact with impacted groundwater	Unlikely: Groundwater depth prevents physical access to potentially contaminated groundwater. Any on-site excavation or maintenance workers will be required to follow WHS guidelines to mitigate potential risks.
	Inhalation of vapour in shallow excavation trenches	Unlikely: Concentrations detected were above HSL vapour intrusion criteria, however, these criteria do not apply to intrusive maintenance workers. Vapour risk is assessed for chronic exposure and thus is unlikely to pose an unacceptable risk to maintenance workers. Any excavation workers or maintenance workers on-site will be required to follow WHS guidelines to mitigate risks.
OFF-SITE		
Commercial workers on downgradient properties (nearest downgradient receptors are commercial properties located immediately to the north of the site)	Ingestion and dermal contact with groundwater	Unlikely: There was no exposure pathway for direct contact with groundwater downgradient of the site given the depth of groundwater and the absence of registered bores.
	Vapour inhalation	Possible: Hydrocarbon concentrations on the downgradient boundary exceeded vapour intrusion screening criteria for commercial/industrial land use.
Commercial workers on downgradient properties (nearest downgradient receptors are commercial properties located immediately to the north of the site)	Ingestion of contaminated groundwater through recreational use and/or inhalation of vapours from extracted groundwater	Unlikely: No registered wells are located within a 1 km radius of the site.
ENVIRONMENTAL		
Surface waters	Lateral migration of contaminants in groundwater	Unlikely: The nearest surface water body is the concrete-lined Tuggeranong Creek, situated approximately 180 m east-north-east of the site, which drains into Isabella Pond and eventually Lake Tuggeranong. Due to the distance to the nearest surface water receptor, it is considered unlikely that hydrocarbons would impact surface water receptors.

7 QUALITY ASSURANCE / QUALITY CONTROL

7.1 FIELD RESULTS

Field sampling procedures conformed to WSP's QA/QC protocols to prevent cross-contamination, preserve sample integrity and allow for collection of a suitable dataset from which to make technically sound decisions.

Two duplicate groundwater samples, one intra-laboratory and one inter-laboratory, were collected and analysed, which is considered adequate to assess the variation in analyte concentration between samples collected from the same sampling point, and the variability of results between laboratories.

Relative per cent differences (RPDs) were calculated for the primary and duplicate samples for assessment of data quality, in particular for assessment of the reproducibility of the analytical data measurements or 'precision' given the adopted field and laboratory methods. The RPDs were calculated using the formula below, and the results are presented in Table C1 in Appendix C.

$$RPD\% = \frac{|R_o - R_d|}{|(R_o + R_d) / 2|} \times 100\%$$

where R_o is the primary sample and R_d is the duplicate.

The RPD values were compared to the 30–50% RPD acceptance criterion adopted from Australian Standard AS 4482.1 (for non- and semi-volatiles). For volatile compounds no published RPD acceptance criteria exists; however, RPDs of <100% are considered acceptable. RPDs for results less than the LOR and in instances where results were greater than the LOR for the one sample, but below the LOR for the corresponding primary or duplicate sample, were not calculated.

Elevated RPDs were reported for the following:

- primary sample MW02 and intra-laboratory duplicate sample QA1_SGS with an RPD of 108% for TRH C₆-C₁₀ fraction
- primary sample MW02 and inter-laboratory duplicate sample QA1A_ALS with RPDs of 180% for TRH C₆-C₁₀ fraction, 87% for TRH C₁₀-C₁₆ fraction, 191% for benzene, 197% for toluene, 190% for x- & p-xylene and 185% for o-xylene.

RPD results indicated significant variation. However, the contaminant concentrations in the primary and intra-laboratory duplicate were indicative of potential LNAPL. The variation is likely attributable to separate phase hydrocarbons not equally distributed between sample containers.

One rinsate blank was collected and analysed for TRH and BTEXN compounds. Low concentrations of BTEXN compounds were detected in the rinsate blank.

A trip blank was collected and analysed for TRH C₆-C₁₀ and BTEXN compounds. Low concentrations of benzene were detected in the trip blank. These results indicate the potential minor volatile cross-contamination from highly contaminated samples within the sample batch during transportation to the laboratory.

Results for primary samples were generally either below reporting limits or significantly higher than the blank detections. Two samples, from wells MW5 and MW6, reported TRH and/or BTEXN concentrations in the range potentially affected by the trip blank result. TRH and BTEXN concentrations reported for all wells during the current investigation are consistent with previous sampling in July 2017 and February and November 2018. Based on the weight of evidence, it is considered that the trip blank result does not affect the outcome of this report.

Historical groundwater analytical results are presented in Table B4, Appendix B. Rinsate blank and trip blank results are provided in Table C2, Appendix C.

7.2 LABORATORY RESULTS

The quality control parameter frequency compliance provided by both laboratories indicated that quality control analysis was undertaken within the required frequency; laboratory reports are provided in Appendix D.

The sampling methods (including sample preservation, transport and decontamination procedures) and laboratory methods followed during the investigation works were consistent with standard protocols. It is therefore considered that the data is sufficiently precise and accurate for the purposes of this project.

8 CONCLUSION

Based on the scope of work undertaken as a part of this project, the following conclusions can be made on review of the results for the site:

- Contamination identified in groundwater adjacent to the northern site boundary has the potential to impact off-site receptors, notably commercial/industrial site users, through vapour intrusion.
- Following review of the conceptual site model and the source pathway receptor linkages, the hydrocarbon impact detected in groundwater beneath the site has the potential to pose an unacceptable risk to on- and/or off-site receptors, through vapour intrusion.

9 REFERENCES

TECHNICAL FRAMEWORK

- ACT EPA 2009, Contaminated Sites Environmental Protection Policy, Environmental Protection Authority.
- ACT EPA 2019, Environmental Guidelines for Petroleum Storage in the ACT
- Australian and New Zealand Governments and Australian state and territory governments (ANZAST) 2018, Australian and New Zealand guidelines (ANZG) for fresh and marine water quality.
- Friebe, E. and Nadebaum, P., 2011. Health screening levels for petroleum hydrocarbons in soil and groundwater., CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation for the Environment, Adelaide, Australia
- National Environment Protection (Assessment of Site Contamination) Measures 1999 (NEPM; as amended 2013)
- Australian Capital Territory (ACT) Environment Protection Authority (EPA) 2019, *Environmental Authorisation Letter*

PREVIOUS ENVIRONMENTAL INVESTIGATIONS (CHRONOLOGICAL ORDER)

- AECOM 2011, *Groundwater Monitoring Well Report, Caltex Calwell (22716), Corner Were Street, and Webber Crescent, Calwell ACT.*
- WSP (formerly Parsons Brinckerhoff Australia, Pty Ltd) 2013a, *Caltex Calwell Groundwater Monitoring Event Round 1.*
- WSP 2013b, *Caltex Calwell Groundwater Monitoring Event Round 2.*
- WSP 2014, *Caltex Calwell Groundwater Monitoring Event.*
- URS 2015, *Caltex Calwell Service Station (Site ID 22176), 1 Webber Crescent, Calwell ACT 2905.*
- WSP 2016, *Inspection of UPSS replacement works at Caltex Calwell service station (Site ID: 22176).*
- WSP 2018, *Caltex Calwell Service Station (Site ID 22176), Groundwater Monitoring Event July 2017 – Results Report*
- WSP 2019, *Caltex Calwell Service Station (Site ID 22176) cnr Were St, & Webber Crescent, Calwell ACT*

APPENDIX A

SITE FIGURES





Legend

- Cadastre
- Site Boundary

Map: PS113523_GIS_001_A1	Author: Angela.Sun		 1:2,000
Date: 14/10/2019	Approved by:		

Data source: Google Earth 2015

Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A3

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Caltex Australia

Caltex Calwell Service Station (Site ID: 22176)
1 Webber Crescent, Calwell ACT

Figure 1
 Site location map

www.wsp.com



Figure 3
Groundwater contour map (September 2019)

APPENDIX B

ANALYTICAL RESULTS

Well ID	Gauging Date	T.O.C Elevation (mAHD)	Easting	Northing	Well Depth (mBTC)	Depth to Water (mBTC)	Depth to LNAPL (mBTC)	Apparent LNAPL Thickness (m)	Corrected Water Elevation (mAHD)
MW01	23/09/2019	612.27	691742.921	6076711.183	10.65	5.229	-	-	607.04
MW02	23/09/2019	612.195	691760.79	6076727.213	14.00	6.510	-	-	605.69
MW03	23/09/2019	612.139	691774.237	6076716.064	17.82	6.090	-	-	606.05
MW4	23/09/2019	612.161	691795.739	6076715.095	2.80	Dry	-	-	-
MW5	23/09/2019	612.15	691759.326	6076745.316	5.93	4.849	-	-	607.30
MW6	23/09/2019	614.591	691761.992	6076669.177	6.86	6.060	-	-	608.53
MW7	23/09/2019	612.16	691765.537	6076743.652	6.05	5.507	-	-	606.65

mAHD = metres Australian Height Datum

mBTC = metres below top of casing

Well ID	Gauging Date	pH	Temperature (°C)	Electrical Conductivity (µs/cm)	Redox Potential (mV) *	Dissolved Oxygen (ppm)	Additional Comments
MW01	23/09/2019	7.02	15.1	232.5	245.5	2.96	Low turbidity, light brown, no hydrocarbon odour
MW02	23/09/2019	7.36	16.3	724	118.1	0.64	Mostly clear, weak hydrocarbon odour
MW03	23/09/2019	7.19	14.4	813	114	2.56	Clear, no hydrocarbon odour
MW4	23/09/2019	-	-	-	-	-	Well not sampled - blocked
MW5	23/09/2019	7.86	13.6	362.9	268.8	1.2	Clear, no hydrocarbon odour
MW6	23/09/2019	6.97	16.2	7926	252.5	4.39	Sampled with bailer
MW7	23/09/2019	-	-	-	-	-	Insufficient water to collect water quality parameters. Moderate hydrocarbon odour

Notes: * Redox potential values collected in the field using a silver chloride electrode have been corrected to standard hydrogen electrode values by adding 199mV to each reading

		TRH NEPM (2013)						BTEXN							Metals	Alcohols		
		C6-C10	F1: C6 - C10 less BTEX	C10 - C16 Fraction	F2: C10 - C16 less Naphthalene	F3: C16 - C34	F4: C34 - C40	C10 - C40 (Total)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene (Total)	Sum of BTEX	Naphthalene	Lead (filtered)	Ethanol
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		50	50	60	60	500	500	530	0.5	0.5	0.5	1	0.5	1.5	3	0.5	1	1,000
ANZG (2018) Freshwater (unknown reliability) toxicant DGVs										180	80							
ANZG (2018) Freshwater 95% toxicant DGVs									950			75 ⁽²⁾ 200 ⁽¹⁾	350			16	3.4	1,400
ACT EPA (2019) Service Station Guidelines								600	950	300	140	200 ⁽¹⁾	350	600			3.4	1,400
HSL D Commercial/Industrial (4 to 8 m) - Sand			6,000		NL				5,000	NL	NL			NL		NL		
Field ID	Date																	
CALW_MW01	23/09/2019	<50	<50	<60	<60	<500	<500	<530	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1	<1,000
CALW_MW02	23/09/2019	12,000	<10,000	1,300	1,100	<500	<500	1,900	21,000	1,100	<100	2,000	290	2,300	25,000	190	<1	<1,000
CALW_MW03	23/09/2019	<50	<50	89	89	<500	<500	<530	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1	<1,000
CALW_MW5	23/09/2019	180	170	<60	<60	<500	<500	<530	3.7	<0.5	<0.5	<1	<0.5	<1.5	4	0.5	<1	<1,000
CALW_MW6	23/09/2019	<50	<50	<60	<60	<500	<500	<530	2.0	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1	<1,000
CALW_MW7	23/09/2019	35,000	20,000	13,000	12,000	5,400	<500	20,000	1,500	1,000	1,100	9,100	1,900	11,000	15,000	290	<1	<1,000

Notes
(1) as p-xylene
(2) as m-xylene

	TRH NEPM (2013)							BTEXN							Metals	Alcohols	
	C6-C10	F1: C6 - C10 less BTEX	C10 - C16 Fraction	F2: C10 - C16 less Naphthalene	F3: C16 - C34	F4: C34 - C40	C10 - C40 (Total)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene (Total)	Sum of BTEX	Naphthalene	Lead (filtered)	Ethanol
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	50	50	60	60	500	500	530	0.5	0.5	0.5	1	0.5	1.5	3	0.5	1	1,000
ANZG (2018) Freshwater (unknown reliability) toxicant DGVs									180	80							
ANZG (2018) Freshwater 95% toxicant DGVs								950			75 ⁽²⁾ 200 ⁽¹⁾	350			16	3.4	1,400
ACT EPA (2019) Service Station Guidelines							600	950	300	140	200 ⁽¹⁾	350	600			3.4	1,400
HSL D Commercial/Industrial (4 to 8 m) - Sand		6,000		NL				5,000	NL	NL			NL		NL		

Field ID	Date																
MW01	31/07/2017	<50	<50	-	-	-	-	-	2.6	2.7	<0.5	<1	<0.5	<1.5	6	<0.5	<1
	8/11/2018	<50	<50	<60	<60	<500	<500	<650	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	3
	23/09/2019	<50	<50	<60	<60	<500	<500	<530	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
MW02	31/07/2017	2,700	1,400	850	-	<500	<500	910	800	100	89	310	11	320	1,300	29	<1
	23/02/2018	17,100	4,540	510	430	<100	<100	510	7,830	2,220	336	1,420	755	-	12,600	80	-
	8/11/2018	32,000	12,000	640	510	<500	<500	900	15,000	2,600	460	1,800	430	2,300	20,000	130	<1
	23/09/2019	12,000	<10,000	1,300	1,100	<500	<500	1,900	21,000	1,100	<100	2,000	290	2,300	25,000	190	<1
MW03	8/11/2018	<50	<50	<60	<60	<500	<500	<650	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
	23/09/2019	<50	<50	89	89	<500	<500	<530	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
MW5	31/07/2017	1,400	1,400	96	-	<500	<500	<650	26	<5	<5	<10	<5	<15	31	<5	<1
	23/02/2018	880	540	510	510	<100	<100	510	297	<2	40	5	<2	-	342	<5	-
	8/11/2018	1,200	1,100	<60	<60	<500	<500	<650	38	8.1	5.1	9	4.5	13	64	0.6	1
	23/09/2019	180	170	<60	<60	<500	<500	<530	3.7	<0.5	<0.5	<1	<0.5	<1.5	4	0.5	<1
MW6	31/07/2017	<50	<50	<60	-	<500	<500	<650	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
	8/11/2018	<50	<50	<60	<60	<500	<500	<650	<0.5	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
	23/09/2019	<50	<50	<60	<60	<500	<500	<530	2.0	<0.5	<0.5	<1	<0.5	<1.5	<3	<0.5	<1
MW7	31/07/2017	32,000	22,000	820	-	<500	<500	1,400	380	2,900	680	4,400	1,400	5,800	9,800	64	<1
	23/02/2018	33,300	17,000	4,120	3,870	3,930	<100	8,050	945	3,580	1,570	7,480	2,730	-	16,300	250	-
	8/11/2018	42,000	22,000	17,000	16,000	6,400	<500	27,000	2,100	4,100	1,900	9,700	2,700	12,000	21,000	340	<1
	23/09/2019	35,000	20,000	13,000	12,000	5,400	<500	20,000	1,500	1,000	1,100	9,100	1,900	11,000	15,000	290	<1

Notes (1) as p-xylene
(2) as m-xylene

APPENDIX C

QA/QC



	TRH NEPM (2013)				BTEXH						Metals	Alcohols
	CE-ClO	ClO - Cl6	Cl6 - C34	C34 - C40	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Naphthalene	Lead (filtered)	Ethanol
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	20	60	100	100	1	2	2	2	2	5	1	50

Field ID

CALW_MW02	12,000	1,300	<500	<500	21,000	1,100	<100	2,000	290	190	<1	<1,000
CALW_QA1_SGS	40,000	1,400	730	<500	20,000	1,000	<100	2,000	290	180	<1	<1,000
RPD	108	7	-	-	5	10	-	0	0	5	-	-
CALW_MW02	12,000	1,300	<500	<500	21,000	1,100	<100	2,000	290	190	<1	<1,000
CALW_QA1A_ALS	620	510	120	<100	496	7	<2	50	11	<5	<1	<50
RPD	180	87	-	-	191	197	-	190	185	-	-	-

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories.

EQL	TRH NEPM (2013)							BTEXN							Metals	Alcohols
	C6-C10	F1: C6 - C10 less BTEX	C10 - C16 Fraction	F2: C10 - C16 less Naphthalene	F3: C16 - C34	F4: C34 - C40	C10 - C40 (Total)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene (Total)	Naphthalene	Lead (Filtered)	Ethanol
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	50	50	60	60	500	500	530	0.5	0.5	0.5	1	0.5	1.5	0.5	1	1,000

Field ID	Date															
CALW_RB	23/09/2019	<50	<50	<60	<60	<500	<500	<530	20	<0.5	<0.5	2	<0.5	2.5	2.0	<1
CALW_TB	23/09/2019	<50	<50	-	-	-	-	-	3.1	<0.5	<0.5	<1	<0.5	<1.5	<0.5	-

APPENDIX D

LABORATORY DOCUMENTS



CLIENT DETAILS

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 NSW 2000**

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Project **PS113523 Caltex Calwell (22176) - Q3 GME**
 Order Number **PS113523**
 Samples **10**

LABORATORY DETAILS

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SGS Reference **SE198043 R1**
 Date Received **25/9/2019**
 Date Reported **17/10/2019**

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

This report cancels and supersedes the report No.SE198043R0, dated 4/10/19 issued by SGS Environment, Health and Safety due to amended LOR for TRH C10-C40 due to updated method.

Ethanol subcontracted to SGS Special Projects Division-Unit 16, 33 Maddox Street Alexandria NSW 2015.
 VOC/VPH - The Limit of Reporting (LOR) has been raised due to interferences from the sample matrix.

SIGNATORIES

Sch 2.2(a)(ii)

Dong LIANG
 Metals/Inorganics Team Leader

Sch 2.2(a)(ii)

Ly Kim HA
 Organic Section Head

Sch 2.2(a)(ii)

Minh NGUYEN
 Technical Development Manager

VOCs in Water [AN433] Tested: 30/9/2019

PARAMETER	UOM	LOR	CALW_MW01	CALW_MW02	CALW_MW03	CALW_MW5	CALW_MW6
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.001	SE198043.002	SE198043.003	SE198043.004	SE198043.005
Benzene	µg/L	0.5	<0.5	21000	<0.5	3.7	2.0
Toluene	µg/L	0.5	<0.5	1100	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<100†	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	2000	<1	<1	<1
o-xylene	µg/L	0.5	<0.5	290	<0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	2300	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	25000	<3	4	<3
Naphthalene	µg/L	0.5	<0.5	190	<0.5	0.5	<0.5

PARAMETER	UOM	LOR	CALW_MW7	CALW_QA1_SGS	CALW_RB	CALW_TB	CALW_TS
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.006	SE198043.007	SE198043.008	SE198043.009	SE198043.010
Benzene	µg/L	0.5	1500	20000	20	3.1	[103%]
Toluene	µg/L	0.5	1000	1000	<0.5	<0.5	[101%]
Ethylbenzene	µg/L	0.5	1100	<100†	<0.5	<0.5	[104%]
m/p-xylene	µg/L	1	9100	2000	2	<1	[102%]
o-xylene	µg/L	0.5	1900	290	<0.5	<0.5	[100%]
Total Xylenes	µg/L	1.5	11000	2300	2.5	<1.5	-
Total BTEX	µg/L	3	15000	23000	23	4	-
Naphthalene	µg/L	0.5	290	180	2.0	<0.5	-

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 30/9/2019

PARAMETER	UOM	LOR	CALW_MW01	CALW_MW02	CALW_MW03	CALW_MW5	CALW_MW6
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.001	SE198043.002	SE198043.003	SE198043.004	SE198043.005
TRH C8-C9	µg/L	40	<40	10000	<40	170	<40
Benzene (F0)	µg/L	0.5	<0.5	21000	<0.5	3.7	2.0
TRH C8-C10	µg/L	50	<50	12000	<50	180	<50
TRH C8-C10 minus BTEX (F1)	µg/L	50	<50	<10000	<50	170	<50

PARAMETER	UOM	LOR	CALW_MW7	CALW_QA1_SGS	CALW_RB	CALW_TB
			WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.006	SE198043.007	SE198043.008	SE198043.009
TRH C8-C9	µg/L	40	30000	37000	<40	<40
Benzene (F0)	µg/L	0.5	1500	20000	20	3.1
TRH C8-C10	µg/L	50	35000	40000	<50	<50
TRH C8-C10 minus BTEX (F1)	µg/L	50	20000	17000	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 27/9/2019

PARAMETER	UOM	LOR	CALW_MW01	CALW_MW02	CALW_MW03	CALW_MW5	CALW_MW6
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.001	SE198043.002	SE198043.003	SE198043.004	SE198043.005
TRH C10-C14	µg/L	50	<50	1500	70	<50	<50
TRH C15-C28	µg/L	200	<200	360	210	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	1300	89	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500	<500
TRH C10-C36	µg/L	450	<450	1900	<450	<450	<450
TRH C10-C40	µg/L	530	<530	1900	<530	<530	<530
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	1100	89	<60	<60

PARAMETER	UOM	LOR	CALW_MW7	CALW_QA1_SGS	CALW_RB
			WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019
			SE198043.006	SE198043.007	SE198043.008
TRH C10-C14	µg/L	50	13000	1600	<50
TRH C15-C28	µg/L	200	7200	570	<200
TRH C29-C36	µg/L	200	<200	300	<200
TRH C37-C40	µg/L	200	<200	<200	<200
TRH >C10-C16	µg/L	60	13000	1400	<60
TRH >C16-C34 (F3)	µg/L	500	5400	730	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500
TRH C10-C36	µg/L	450	20000	2500	<450
TRH C10-C40	µg/L	530	20000	2500	<530
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	12000	1200	<60



ANALYTICAL RESULTS

SE198043 R1

Alcohols in Water [AN478] Tested: 30/9/2019

			CALW_MW01	CALW_MW02	CALW_MW03	CALW_MW5	CALW_MW6
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
PARAMETER	UOM	LOR	SE198043.001	SE198043.002	SE198043.003	SE198043.004	SE198043.005
ethanol*	mg/L	1	<1	<1	<1	<1	<1

			CALW_MW7	CALW_QA1_SGS	CALW_RB
			WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019
PARAMETER	UOM	LOR	SE198043.006	SE198043.007	SE198043.008
ethanol*	mg/L	1	<1	<1	<1

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 27/9/2019

PARAMETER	UOM	LOR	CALW_MW01	CALW_MW02	CALW_MW03	CALW_MW5	CALW_MW6
			WATER	WATER	WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019	23/9/2019	23/9/2019
			SE198043.001	SE198043.002	SE198043.003	SE198043.004	SE198043.005
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	CALW_MW7	CALW_QA1_SGS	CALW_RB
			WATER	WATER	WATER
			23/9/2019	23/9/2019	23/9/2019
			SE198043.006	SE198043.007	SE198043.008
Lead, Pb	µg/L	1	<1	<1	<1

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- 1 Bq is equivalent to 27 pCi
- 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/pv/sqsvr/en-qb/environment.

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Project PS113523 Caltex Calwell (22176) - Q3 GME
Order Number PS113523
Samples 10

LABORATORY DETAILS

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Samples Received Wed 25/9/2019
Report Due Wed 2/10/2019
SGS Reference SE198043

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Wednesday 25/9/2019. Results are expected to be ready by COB Wednesday 2/10/2019. Please quote SGS reference SE198043 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provided	SGS	Sample cooling method	Ice
Samples received in correct containers	Yes	Sample counts by matrix	10 Water
Date documentation received	25/9/2019	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	2.1°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Ethanol subcontracted to SGS Special Projects Division-Unit 16, 33 Maddox Street Alexandria NSW 2015.

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CLIENT DETAILS

Client WSP AUSTRALIA PTY LIMITED

Project PS113523 Caltex Calwell (22176) - Q3 GME

SUMMARY OF ANALYSIS

No.	Sample ID	Alcohols in Water	Trace Metals (Dissolved) in Water by IC/MS	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	CALW_MW01	1	1	10	11	7
002	CALW_MW02	1	1	10	11	7
003	CALW_MW03	1	1	10	11	7
004	CALW_MW5	1	1	10	11	7
005	CALW_MW6	1	1	10	11	7
006	CALW_MW7	1	1	10	11	7
007	CALW_QA1_SGS	1	1	10	11	7
008	CALW_RB	1	1	10	11	7
009	CALW_TB	-	-	-	11	7
010	CALW_TS	-	-	-	11	-

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.

The numbers shown in the table indicate the number of results requested in each package.

Please indicate as soon as possible should your request differ from these details.

Testing as per this table shall commence immediately unless the client intervenes with a correction.

CLIENT DETAILS

Contact: Matt Miklos
Client: WSP AUSTRALIA PTY LIMITED
Address: Level 27, 680 George St
NSW 2000

Telephone: 02 9272 5689
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Email: **Sch 2.2(a)(ii)**@wsp.com

Project: **PS113523 Caltex Calwell (22176) - Q3 GME**
Order Number: **PS113523**
Samples: 10

LABORATORY DETAILS

Manager: Huong Crawford
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SGS Reference: **SE198043 R1**
Date Received: 25 Sep 2019
Date Reported: 17 Oct 2019

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice
Samples received in correct containers	Yes	Sample counts by matrix	10 Water
Date documentation received	25/9/2019	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	2.1°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Alcohols in Water

Method: ME-(AU)-ENVJAN478

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
CALW_MW01	SE198043.001	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_MW02	SE198043.002	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_MW03	SE198043.003	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_MW5	SE198043.004	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_MW6	SE198043.005	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_MW7	SE198043.006	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_QA1_SGS	SE198043.007	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019
CALW_RB	SE198043.008	LB184214	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	30 Sep 2019

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-ENVJAN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
CALW_MW01	SE198043.001	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_MW02	SE198043.002	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_MW03	SE198043.003	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_MW5	SE198043.004	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_MW6	SE198043.005	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_MW7	SE198043.006	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_QA1_SGS	SE198043.007	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019
CALW_RB	SE198043.008	LB184066	23 Sep 2019	25 Sep 2019	21 Mar 2020	27 Sep 2019	21 Mar 2020	30 Sep 2019

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-ENVJAN333

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
CALW_MW01	SE198043.001	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_MW02	SE198043.002	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_MW03	SE198043.003	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_MW5	SE198043.004	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_MW6	SE198043.005	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_MW7	SE198043.006	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_QA1_SGS	SE198043.007	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019
CALW_RB	SE198043.008	LB184092	23 Sep 2019	25 Sep 2019	30 Sep 2019	27 Sep 2019	06 Nov 2019	02 Oct 2019

VOCs in Water

Method: ME-(AU)-ENVJAN333

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
CALW_MW01	SE198043.001	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW02	SE198043.002	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW03	SE198043.003	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW5	SE198043.004	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW6	SE198043.005	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW7	SE198043.006	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_QA1_SGS	SE198043.007	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_RB	SE198043.008	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_TB	SE198043.009	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_TS	SE198043.010	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019

Volatile Polymers Hydrocarbons in Water

Method: ME-(AU)-ENVJAN333

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
CALW_MW01	SE198043.001	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW02	SE198043.002	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW03	SE198043.003	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW5	SE198043.004	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW6	SE198043.005	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_MW7	SE198043.006	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_QA1_SGS	SE198043.007	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_RB	SE198043.008	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_TB	SE198043.009	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	01 Oct 2019
CALW_TS	SE198043.010	LB184208	23 Sep 2019	25 Sep 2019	30 Sep 2019	30 Sep 2019	09 Nov 2019	02 Oct 2019

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-(ENV)QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOCs in Water

Method: ME-(AU)-(ENV)AH433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	CALW_MW01	SE198043.001	%	40 - 130%	81
	CALW_MW02	SE198043.002	%	40 - 130%	98
	CALW_MW03	SE198043.003	%	40 - 130%	95
	CALW_MW5	SE198043.004	%	40 - 130%	83
	CALW_MW6	SE198043.005	%	40 - 130%	81
	CALW_MW7	SE198043.008	%	40 - 130%	95
	CALW_QA1_SGS	SE198043.007	%	40 - 130%	98
	CALW_RB	SE198043.009	%	40 - 130%	87
	CALW_TB	SE198043.009	%	40 - 130%	81
	CALW_TS	SE198043.010	%	40 - 130%	101
d4-1,2-dichloroethane (Surrogate)	CALW_MW01	SE198043.001	%	40 - 130%	128
	CALW_MW02	SE198043.002	%	40 - 130%	104
	CALW_MW03	SE198043.003	%	40 - 130%	100
	CALW_MW5	SE198043.004	%	40 - 130%	94
	CALW_MW6	SE198043.005	%	40 - 130%	120
	CALW_MW7	SE198043.006	%	40 - 130%	96
	CALW_QA1_SGS	SE198043.007	%	40 - 130%	102
	CALW_RB	SE198043.008	%	40 - 130%	82
	CALW_TB	SE198043.009	%	40 - 130%	93
	CALW_TS	SE198043.010	%	40 - 130%	99
d8-toluene (Surrogate)	CALW_MW01	SE198043.001	%	40 - 130%	102
	CALW_MW02	SE198043.002	%	40 - 130%	101
	CALW_MW03	SE198043.003	%	40 - 130%	99
	CALW_MW5	SE198043.004	%	40 - 130%	124
	CALW_MW6	SE198043.005	%	40 - 130%	101
	CALW_MW7	SE198043.006	%	40 - 130%	95
	CALW_QA1_SGS	SE198043.007	%	40 - 130%	100
	CALW_RB	SE198043.008	%	40 - 130%	99
	CALW_TB	SE198043.009	%	40 - 130%	99
	CALW_TS	SE198043.010	%	40 - 130%	96

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-(ENV)AH433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	CALW_MW01	SE198043.001	%	40 - 130%	81
	CALW_MW02	SE198043.002	%	40 - 130%	98
	CALW_MW03	SE198043.003	%	40 - 130%	95
	CALW_MW5	SE198043.004	%	40 - 130%	83
	CALW_MW6	SE198043.005	%	40 - 130%	81
	CALW_MW7	SE198043.006	%	40 - 130%	95
	CALW_QA1_SGS	SE198043.007	%	40 - 130%	98
	CALW_RB	SE198043.008	%	40 - 130%	87
	CALW_TB	SE198043.009	%	40 - 130%	81
	CALW_TS	SE198043.010	%	40 - 130%	101
d4-1,2-dichloroethane (Surrogate)	CALW_MW01	SE198043.001	%	60 - 130%	128
	CALW_MW02	SE198043.002	%	60 - 130%	104
	CALW_MW03	SE198043.003	%	60 - 130%	100
	CALW_MW5	SE198043.004	%	60 - 130%	94
	CALW_MW6	SE198043.005	%	60 - 130%	120
	CALW_MW7	SE198043.006	%	60 - 130%	96
	CALW_QA1_SGS	SE198043.007	%	60 - 130%	102
	CALW_RB	SE198043.008	%	60 - 130%	82
	CALW_TB	SE198043.009	%	60 - 130%	93
	CALW_TS	SE198043.010	%	60 - 130%	99
d8-toluene (Surrogate)	CALW_MW01	SE198043.001	%	40 - 130%	102
	CALW_MW02	SE198043.002	%	40 - 130%	101
	CALW_MW03	SE198043.003	%	40 - 130%	99
	CALW_MW5	SE198043.004	%	40 - 130%	124
	CALW_MW6	SE198043.005	%	40 - 130%	101
	CALW_MW7	SE198043.006	%	40 - 130%	95
	CALW_QA1_SGS	SE198043.007	%	40 - 130%	100
	CALW_RB	SE198043.008	%	40 - 130%	99
	CALW_TB	SE198043.009	%	40 - 130%	99
	CALW_TS	SE198043.010	%	40 - 130%	96

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-ENVJAN318

Sample Number	Parameter	Units	LOR	Result
LB184086.001	Lead, Pb	µg/L	1	<1

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-ENVJAN403

Sample Number	Parameter	Units	LOR	Result
LB184082.001	TRH C10-C14	µg/L	50	<50
	TRH C15-C28	µg/L	200	<200
	TRH C29-C36	µg/L	200	<200
	TRH C37-C40	µg/L	200	<200

VOCs in Water

Method: ME-(AU)-ENVJAN433

Sample Number		Parameter	Units	LOR	Result
LB184208.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		o-xylene	µg/L	0.5	<0.5
	Polycyclic VOCs	Naphthalene	µg/L	0.5	<0.5
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	98
		d8-toluene (Surrogate)	%	-	99
		Bromofluorobenzene (Surrogate)	%	-	96

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-ENVJAN433

Sample Number	Parameter	Units	LOR	Result
LB184208.001	TRH C6-C9	µg/L	40	<40
	d4-1,2-dichloroethane (Surrogate)	%	-	98
	d8-toluene (Surrogate)	%	-	99
	Bromofluorobenzene (Surrogate)	%	-	96

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / \text{Mean}$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-ENVJAN316

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE198044.002	LB184066.014	Lead, Pb	µg/L	1	<1	<1	200	0

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-ENVJAN405

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE198015.011	LB184092.023	TRH C10-C14	µg/L	50	<50	0	200	0
		TRH C15-C28	µg/L	200	<200	0	200	0
		TRH C29-C36	µg/L	200	<200	0	200	0
		TRH C37-C40	µg/L	200	<200	0	200	0
		TRH C10-C36	µg/L	450	<450	0	200	0
		TRH C10-C40	µg/L	530	<530	0	200	0
		TRH F Bands	µg/L	60	<60	0	200	0
		TRH >C10-C16	µg/L	60	<60	0	200	0
		TRH >C10-C16 - Naphthalene (F2)	µg/L	500	<500	0	200	0
		TRH >C16-C34 (F3)	µg/L	500	<500	0	200	0
		TRH >C34-C40 (F4)	µg/L	500	<500	0	200	0

VOCs in Water

Method: ME-(AU)-ENVJAN435

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE198021.001	LB184208.025	Monocyclic	Benzene	µg/L	0.5	<0.5	<0.5	200	0
		Aromatic	Toluene	µg/L	0.5	<0.5	<0.5	200	0
			Ethylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			m/p-xylene	µg/L	1	<1	<1	200	0
			o-xylene	µg/L	0.5	<0.5	<0.5	200	0
		Polycyclic	Naphthalene	µg/L	0.5	<0.5	<0.5	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	9.6	30	15
			d8-toluene (Surrogate)	µg/L	-	9.8	9.5	30	3
			Bromofluorobenzene (Surrogate)	µg/L	-	7.7	9.4	30	19

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-ENVJAN435

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE198091.001	LB184208.025	TRH C6-C10	µg/L	50	<50	<50	200	0
		TRH C6-C9	µg/L	40	<40	<40	200	0
		Surrogates						
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	9.6	30	15
		d8-toluene (Surrogate)	µg/L	-	9.8	9.5	30	3
		Bromofluorobenzene (Surrogate)	µg/L	-	7.7	9.4	30	19
		VPH F Bands						
		Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	0
		TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Alcohols in Water

Method: ME-(AU)-[ENV]AN478

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB184214.002	ethanol*	mg/L	1	26	25	70 - 130	104

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB184086.002	Lead, Pb	µg/L	1	22	20	80 - 120	110

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB184092.002	TRH C10-C14	µg/L	50	940	1200	60 - 140	79
	TRH C15-C28	µg/L	200	1100	1200	60 - 140	90
	TRH C29-C36	µg/L	200	1000	1200	60 - 140	87
	TRH >C10-C16	µg/L	60	1000	1200	60 - 140	83
	TRH >C16-C34 (F3)	µg/L	500	1200	1200	60 - 140	98
	TRH >C34-C40 (F4)	µg/L	500	<500	600	60 - 140	79

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB184208.002	Monocyclic	Benzene	µg/L	0.5	58	45.45	60 - 140	127
		Aromatic	Toluene	µg/L	0.5	57	45.45	60 - 140
		Ethylbenzene	µg/L	0.5	60	45.45	60 - 140	131
		m/p-xylene	µg/L	1	120	90.9	60 - 140	131
		o-xylene	µg/L	0.5	59	45.45	60 - 140	131
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11.9	10	60 - 140	119
		d8-toluene (Surrogate)	µg/L	-	11.1	10	60 - 140	111
		Bromofluorobenzene (Surrogate)	µg/L	-	10.3	10	60 - 140	103

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN435

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB184208.002	TRH C6-C10	µg/L	50	920	946.63	60 - 140	97	
	TRH C6-C9	µg/L	40	800	818.71	60 - 140	98	
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10.8	10	60 - 140	108
		d8-toluene (Surrogate)	µg/L	-	11.0	10	60 - 140	110
		Bromofluorobenzene (Surrogate)	µg/L	-	11.0	10	60 - 140	110
		TRH C6-C10 minus BTEX (F1)	µg/L	50	570	639.67	60 - 140	89
	VPH F Bands							

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-(ENV)QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-(ENV)AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE198043.001	LB184088.004	Lead, Pb	µg/L	1	22	<1	20	104

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-(ENV)AN409

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE198042.006	LB184092.024	TRH C10-C14	µg/L	50	910	<50	1200	76
		TRH C15-C28	µg/L	200	1100	<200	1200	81
		TRH C29-C38	µg/L	200	1300	<200	1200	106
		TRH C37-C40	µg/L	200	<200	<200	-	-
		TRH C10-C36	µg/L	450	3300	<450	-	-
		TRH C10-C40	µg/L	530	3300	<530	-	-
		TRH F Bands						
		TRH >C10-C16	µg/L	60	1000	<60	1200	83
		TRH >C10-C16 - Naphthalene (F2)	µg/L	60	-	<60	-	-
		TRH >C16-C34 (F3)	µg/L	500	1300	<500	1200	106
		TRH >C34-C40 (F4)	µg/L	500	620	<500	600	103

VOCs in Water

Method: ME-(AU)-(ENV)AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE198164.025	LB184208.023	Monocyclic						
		Aromatic						
		Benzene	µg/L	0.5	54	<0.5	45.45	119
		Toluene	µg/L	0.5	52	<0.5	45.45	115
		Ethylbenzene	µg/L	0.5	55	<0.5	45.45	120
		m/p-xylene	µg/L	1	110	<1	90.9	120
		o-xylene	µg/L	0.5	54	<0.5	45.45	119
		Polycyclic						
		Naphthalene	µg/L	0.5	54	<0.5	-	-
		Surrogates						
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	10.1	-	105
		d8-toluene (Surrogate)	µg/L	-	11	10.0	-	107
		Bromofluorobenzene (Surrogate)	µg/L	-	11	9.6	-	112

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-(ENV)AN438

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE198164.025	LB184208.023	TRH C6-C10	µg/L	50	880	<50	946.63	93
		TRH C8-C9	µg/L	40	770	<40	818.71	94
		Surrogates						
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	10.1	-	105
		d8-toluene (Surrogate)	µg/L	-	11	10.0	-	107
		Bromofluorobenzene (Surrogate)	µg/L	-	11	9.6	-	112
		VPH F						
		Benzene (F0)	µg/L	0.5	54	<0.5	-	-
		Bands						
		TRH C6-C10 minus BTEX (F1)	µg/L	50	560	<50	638.67	87



SGS Environmental Services Sydney
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: au.samplerreceipt@sgs.com

SGS EHS Alexandria Laboratory



SE198043 COC

Received: 25-Sep-2019

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 1 of 1

Company Name:	WSP Australia Pty Ltd	Project Name/No:	Caltex Calwell (22176) - Q3 GME
Address:	L27, 680 George Street	Purchase Order No:	PS113523
	Sydney 2001 NSW	Results Required Date:	TAT required: Standard
		Telephone:	Sch 2.2(a)(ii) Email: Sch 2.2(a)(ii)@wsp.com
Contact Name:	Tara Stephens	Email Results to:	Sch 2.2(a)(ii)@wsp.com
Quotation No:	WSP_KLW0RW_2018 - Petroleum		cc: Matthew Miklos Sch 2.2(a)(ii)@wsp.com

Matrix (Tick as appropriate)			NO. OF CONTAINERS	ANALYSIS REQUESTED										Additional Report Formats	
Soil Sample	Water Sample	Other		PS2 (TRH, BTEXN, Lead)	VTRH, BTEXN	Secondary lab testing at ALS on standard TAT for TRH, BTEXN, Lead, Ethanol	Ethanol							NEPM CSV ESDAT DQO GO, Guidelines ----- Others -----	Notes/Guidelines/LOR/ Special instructions
1	X		5	X			X								All metals samples field filtered.
2	X		5	X			X								
3	X		5	X			X								
4	X		6	X			X								
4	X		5	X			X								
5	X		5	X			X								
6	X		5	X			X								
7	X		5	X			X								
8	X		5	X			X								
9	X		1		X										
10	X		1		X										
	X		5			X									Please forward to ALS

Relinquished By: J. Stephens	Date/Time: 23/9/19.	Received By: Sch 2.2(a)(ii)	Date/Time: 25/9/19 @ 10.20
Samples Intact: Yes / No	Temperature: 21 °C	Sample Security Sealed: Yes / No	Hazards: e.g. may contain Asbestos

Comments / Subcontracting details: Please forward sample 'CALW_QA1A_ALS' to ALS for secondary lab testing for TRH, BTEXN, Lead and Ethanol on standard turnaround

APPENDIX E

CALIBRATION CERTIFICATES



Multi Parameter Water Meter



airmet

 Air-Met Scientific Pty Ltd
 1300 137 067

 Instrument **YSI Quatro Pro Plus**
 Serial No. **18J104319**

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		324189	pH 9.54
2. pH 7.00		pH 7.00		330737	pH 6.77
3. pH 4.00		pH 4.00		330734	pH 4.03
4. mV		231.8mV		325420/325421	229.2mV
5. EC		2.76mS		329027	2.74mS
6. D.O		0.00ppm		329994	0.01pm
7. Temp		21.2°C		MultiTherm	20.8°C

Calibrated by:

Sch 2.2(a)(ii)

Sarah Lian

Calibration date:

17/09/2019

Next calibration due:

17/10/2019

Oil / Water Interface Meter

Instrument **Interface Meter (30M)**
 Serial No. **312509**



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by:

Sen Philip

Sch 2.2(a)(ii)

Calibration date:

18/09/2019

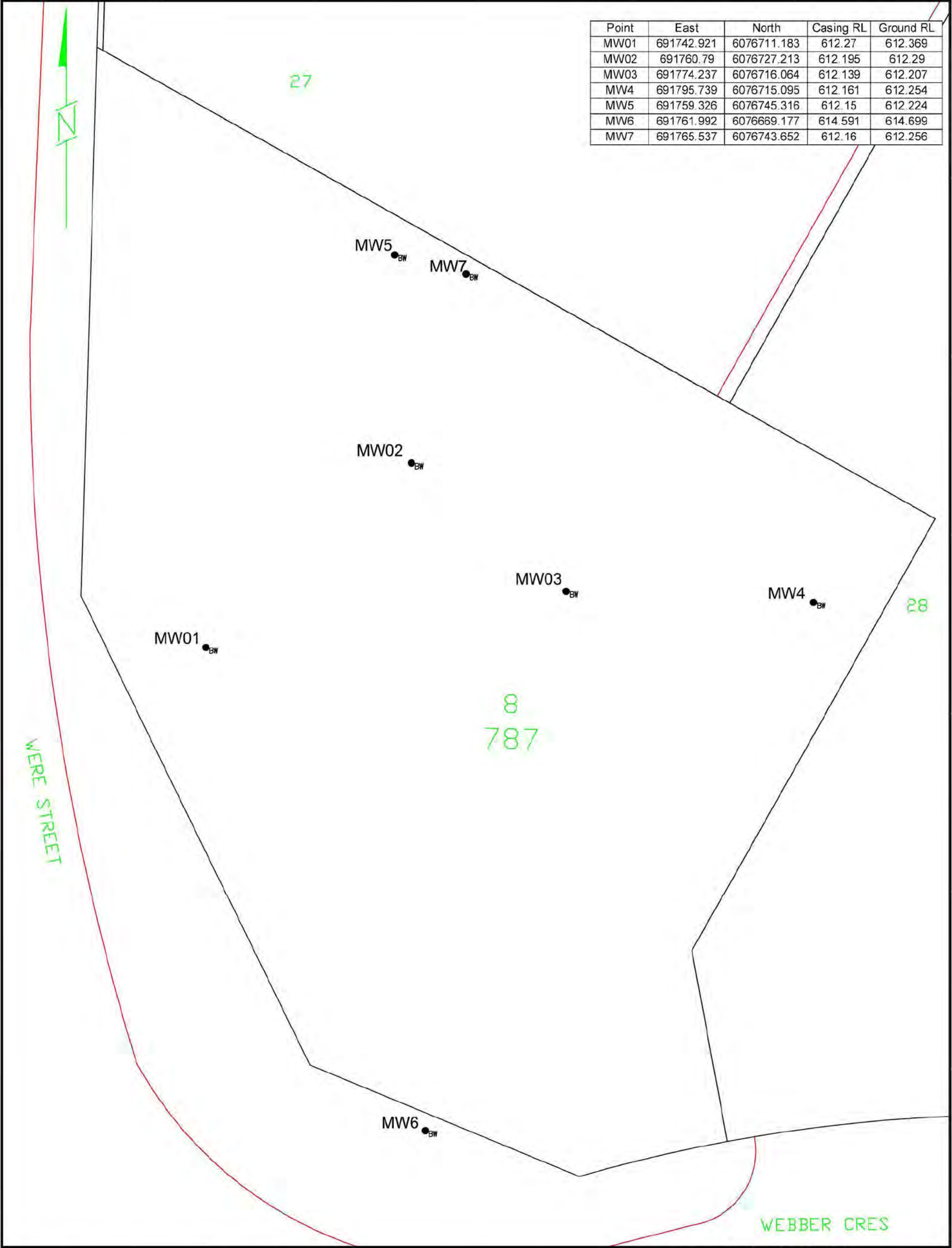
Next calibration due:

17/11/2019

APPENDIX F

SURVEY DATA





Point	East	North	Casing RL	Ground RL
MW01	691742.921	6076711.183	612.27	612.369
MW02	691760.79	6076727.213	612.195	612.29
MW03	691774.237	6076716.064	612.139	612.207
MW4	691795.739	6076715.095	612.161	612.254
MW5	691759.326	6076745.316	612.15	612.224
MW6	691761.992	6076669.177	614.591	614.699
MW7	691765.537	6076743.652	612.16	612.256

Contour Interval	BM	CRM 11242
Datum A.H.D	RL	610.215
Scale		
Surveyed	R JALLAND	23/09/19
Drawn	R JALLAND	28/09/19
Checked	R JALLAND	28/09/19
Approved Surveyor, Registered under the Surveyors Act 2007.	



CANBERRA
11-13 Lawry Place,
Macquarie, ACT, 2614
Phone 02 6202 7600

CALTEX CALWELL

MONITORING WELLS
BLOCK 8 SECTION 787
CALWELL
ACT

Proj No. 219155

Rev

Sheet No. 1 of 1
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219155_DT
A3

APPENDIX G

LIMITATIONS





Limitation Statement: Environmental Site Assessment (intrusive)

This Report has been prepared by WSP Australia Pty Limited (*WSP*) for the benefit of Caltex Australia Petroleum Pty Ltd (*Client*), the registered proprietor or tenant of the site requested to be investigated by WSP ("Site") under its agreement with Caltex dated 31 March 2018 (*Agreement*).

PERMITTED PURPOSE

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

QUALIFICATIONS AND ASSUMPTIONS

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information*), those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

The Conclusions are reflective of the current Site conditions and cannot be regarded as absolute without further extensive intrusive investigations, outside the scope of the services set out in the Agreement and are indicative of the environmental condition of the Site at the time of preparing the Report. As a general principle, vertical and horizontal soil or groundwater conditions are not uniform. No monitoring, common or intrusive testing or sampling technique can eliminate the possibility that monitoring or testing results or samples taken, are not totally representative of soil and / or groundwater conditions encountered at the Site. It should also be recognised that Site conditions, including subsurface conditions can change with time due to the presence and concentration of contaminants, changing natural forces and man-made influences.

Within the limitations imposed by the scope of the services undertaken by WSP, the monitoring, testing (intrusive or otherwise), sampling for the preparation of this Report has been undertaken and performed in a professional manner in accordance with generally accepted practices, using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

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Limitation Statement: Environmental Site Assessment (intrusive)

This Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose. The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) the Conclusions and implement any recommendations in an appropriate, suitable and timely manner.

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