CALTEX AUSTRALIA PETROLEUM PTY LTD

CALTEX CALWELL SERVICE STATION (SITE ID 22176)

GROUNDWATER MONITORING EVENT JULY 2017 - RESULTS REPORT

JULY 2017

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Caltex Calwell Service Station (Site ID 22176)
Groundwater Monitoring Event July 2017 - Results Report

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ABBREVIATIONS

BTEXN	Benzene, toluene, ethylbenzene, xylene and naphthalene
EPA	Environmental Protection Authority
GIL	Groundwater investigation levels
GME	Groundwater monitoring event
HIL	Health investigation level
HSL	Health screening level
LNAPL	Light non-aqueous phase liquid
LOR	Limit of reporting
mAHD	metres relative to 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
PID	Photoionization detector
PQL	Practical quantitation level
RPD	Relative per cent differences
TRH	Total recoverable hydrocarbon
UPSS	Underground petroleum storage system
UST	Underground storage tank
VOCs	Volatile organic compounds

EXECUTIVE SUMMARY

Caltex Australia Petroleum Pty Ltd (Caltex) engaged WSP Australia Pty Ltd (WSP) to undertake a groundwater monitoring event 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 included:

- gauging and monitoring of seven existing groundwater monitoring wells (MW01, MW02, MW03, MW4, MW5, MW6, and MW7)
- sampling of five existing groundwater monitoring wells (MW01, MW02, MW5, MW6, MW7)
- analysis of groundwater samples for contaminants of concern (total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), ethanol and lead) and interpretation of results

RESULTS

The following are pertinent results of the investigation:

- Groundwater is inferred to flow in a north/north-east direction, though previous assessments have indicated that groundwater flow may be in a south-west direction.
- Elevated dissolved phase hydrocarbon concentrations above the laboratory limit of reporting (LOR) were identified in samples collected from monitoring wells MW01, MW02, MW5, and MW7. Exceedances of nominated assessment criteria for TRH F1, TRH C_{10}-C_{40}, and BTEXN compounds were recorded in samples collected from monitoring wells, MW02, and MW7.

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 to 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 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 of Appendix A.

1.2 BACKGROUND

The property is currently occupied by an operating service station with a retail shop in the southern portion of the site, and a separate mechanical workshop in the northern portion of the site. Of the seven monitoring wells at the site, hydrocarbon contamination was identified in at least one downgradient well (MW02) since its installation in 2011. Data collected during previous environmental assessment since 2011 revealed a peak in contaminant concentration in 2013/2014 and an apparent decreasing trend since then. However, as of the last groundwater monitoring event in 2015, benzene concentrations in monitoring well MW02 were still above the recommended health screening level (HSL) for vapour intrusion on commercial/industrial sites.

1.3 OBJECTIVES

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

1.4 SCOPE OF WORK

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

- gauging and monitoring of seven existing groundwater monitoring wells (MW01, MW02, MW03, MW4, MW5, MW6, MW7)
- sampling of five existing groundwater monitoring wells (MW01, MW02, MW5, MW6, MW7)
- analysis of groundwater samples for contaminants for concern (total recoverable hydrocarbons [TRH], benzene, toluene, ethylbenzene, xylenes and naphthalene [BTEXN], ethanol and lead) and interpretation of results.

2 SITE CHARACTERISTICS

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 and then residential property
- West: Were Street and then 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 volcaniclastic 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 m below ground level (mBGL).

A review of the information in the CSIRO Australia Soil Resource Information Systems (http://www.asris/csiro/au) accessed on 13 July 2017 indicated that soils underlying the site are mapped as having a low probability of occurrence of acid sulfate soils.

2.4 HYDROGEOLOGY

A review of the ACTMapi groundwater database conducted on 13 July 2017 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 4 mBGL and saturated conditions exist between 11-18 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.*
- 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).*
- Australian Capital Territory (ACT) Environment Protection Authority (EPA) 2016, *Environmental Authorisation Letter.*

In 2011 AECOM installed three groundwater monitoring wells to depths of 10.700 mBGL, 13.965 mBGL and 18.00 mBGL for 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. 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. Groundwater was inferred to flow in a north-easterly direction.

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.

3 METHODOLOGY

3.1 SAMPLING METHODOLOGY

The sampling methodology adopted during the GME was low flow purging using a MicroPurge™ pump. 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 an 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.

Groundwater was purged until physicochemical parameters (pH, dissolved oxygen, electrical conductivity, temperature and reduction/oxidation potential (redox)) stabilised to ensure the sample was representative of fresh groundwater. The groundwater extracted was also visually assessed for turbidity.

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. Groundwater samples were submitted to the laboratory for TRH, BTEXN, ethanol and lead. Samples were collected across two separate sampling events due to sample bottles from the initial sampling event being damaged through freezing during transit to the laboratory. During the resampling event, a sample was not collected from monitoring well MW03.

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 lab undertook internal quality assurance and quality control (QA/QC), including the analysis of laboratory control spikes, surrogate recoveries, laboratory duplicates and method blanks. Laboratory documentation, including chain of custodies and certificates of analysis, is provided in Appendix C.

3.3 DATA QUALITY PLANNING

In order to comply with sampling quality assurance regulation, duplicate samples comprising one intra-laboratory duplicate (QC1) and one inter-laboratory duplicate (QC1A) were collected for sample MW01. The intra-laboratory duplicate damaged through freezing during transit to the laboratory. The inter-laboratory duplicate sample was analysed by the secondary analytical laboratory and was analysed for TRH, BTEXN, ethanol and lead.

One equipment rinsate blank was analysed as part of the investigation. The rinsate process involved collection of rinse water from a decontaminated low flow pump, and was analysed for TRH, BTEXN, lead and ethanol.

One trip blank 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 (C_6–C_{10}).

4 ASSESSMENT CRITERIA

4.1 GUIDELINES

The *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPM, as amended 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.*
- National Health and Medical Research Council (NHMRC)/National Resource Management Ministerial Council (NRMMC) 2011, Australian Drinking Water Guidelines 6.
- NHMRC 2008, Guidelines for Managing Risk in Recreational Waters 2008.

The GILs do not provide data for all BTEX compounds and PAHs; however, as the GILs are based on the ANZECC/ARMCANZ (2000) water quality guidelines, low reliability trigger values for fresh and marine waters from for BTEX and PAHs compounds can be considered.

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 environmental authorisation (EA 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 *Environmental Guidelines for Service Station Sites and Hydrocarbon Storage 2014* provides criteria for groundwater pH, petroleum hydrocarbon compounds, dissolved lead and ethanol in water. These criteria have been adopted.

4.2 POTENTIAL RECEPTORS

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 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 mBGL and 5.5 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 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 COMMERCIAL/ INDUSTRIAL 4 TO <8 m (SAND)[1]	FRESHWATER ECOSYSTEM[2]	ACT SERVICE STATION GUIDELINES[3]
	ALL VALUES IN µg/L[4]		
TRH C_6–C_{10} less BTEX (F1)	7,000	-	-
TRH >C_{10}–C_{16} less naphthalene (F2)	NL	-	600
Benzene	5,000	950	950
Toluene	NL	-	300
Ethylbenzene	NL	-	140
o-Xylene	-	350	350
m-, p-Xylene	-	200	200
Total xylene	NL	-	-
Naphthalene	NL	16	-
Lead	-	3.4	3.4
Ethanol	-	1400	1400
pH	-	-	6.5 – 8.5

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

(2) NEPM (2013) Schedule B1, Table 1C 'Groundwater Investigation Levels (GILs)'

(3) ACT EPA Environmental Guidelines for Service Station Sites and Hydrocarbon Storage 2014

(4) pH is not measured in µg/L

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

5 RESULTS AND DISCUSSION

5.1 GROUNDWATER CONDITIONS

The groundwater conditions encountered 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 3.913 m below top of casing (BTOC) and 5.591 mBTOC. MW4 was dry, which was consistent with previous GMEs undertaken at the site.
LNAPL occurrence	No LNAPL was measured during gauging. Broken hydrocarbon sheens were reported in MW02, MW5 and MW6; these are considered likely to be biological rather than fuel related.
Groundwater elevation and flow direction	Groundwater elevation was between 96.0 m relative level (RL) and 9.40 mRL. Figure 3 shows the inferred groundwater flow direction.
Groundwater quality	The field parameters measured during the GME found the following: — Electrical conductivity measurements ranged from 700 µS/cm to 6,460 µS/cm, indicating fresh water. — Redox measurements ranged from 130.8 mV to 317.3 mV, indicating moderately aerobic 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 6.8 to 7.5 indicating circumneutral conditions. — Dissolved oxygen measurements ranged from 2 ppm to 4 ppm, indicating poorly oxygenated groundwater. — Temperature measurements ranged from 12.9°C to 16.1°C.

Groundwater gauging data and field parameters are summarised in Tables B4 and B5 in Appendix B.

5.2 GROUNDWATER ANALYTICAL RESULTS

Dissolved phase hydrocarbon concentrations above the LORs were identified in groundwater samples collected from monitoring wells MW01, MW02, MW5, and MW7. Hydrocarbon impacts were predominantly within the volatile range, with elevated concentrations of TRH C_6-C_{10} (TRH F1) and BTEXN compounds, with lower concentrations reported for TRH C_{10}-C_{16}. A summary of groundwater analytical results is provided below in Table 5.2.

Table 5.2 Summary of groundwater exceedances

ANALYITE	MINIMUM CONCENTRATION (µg/L)	MAXIMUM CONCENTRATION (µg/L)	SAMPLES EXCEEDING NOMINATED CRITERIA
TRH F1	<50	22,000	MW7
TRH F2	<60	821	None
Benzene	<0.5	850	None
Toluene	<0.5	2,900	MW7
Ethylbenzene	<0.5	680	MW7
Xylene (m + p)	<1	4,400	MW02, MW7
Xylene (o)	<0.5	1,400	MW7
Total xylene	<1.5	5,800	NL
Naphthalene	<0.5	64	MW02, MW7
Lead	<1	<1	None
Ethanol	<1,000	<1,000	None

Hydrocarbon concentrations above ACT service station guidelines were identified in groundwater in the central and northern portions of the site. Exceedances of adopted freshwater protection criteria were present in groundwater on the northern boundary of the site. Concentrations of hydrocarbons above adopted vapour intrusion screening criteria were identified in groundwater in the central portion of the northern site boundary. 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 site 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 comprised 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 3.913 mBTOC and 5.591 mBTOC.

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 tanks, pipes, manifolds and pumps.

Hydrocarbon impacts in the groundwater comprise mostly of light fraction hydrocarbons and BTEXN in the central and north-eastern 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 of 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 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 in groundwater can equilibrate with pore spaces and migrate vertically and may cause a vapour intrusion risk to occupants of overlying building(s). Volatile hydrocarbons of concern detected in the groundwater monitoring wells were low and not considered to represent a risk based on the screening levels. The on-site retail building and workshop 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.
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 minor and below assessment criteria. 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		

POTENTIAL RECEPTOR	POTENTIAL EXPOSURE PATHWAY	LIKELIHOOD OF POTENTIAL POLLUTANT LINKAGES
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. However, the bottles for the intra-laboratory sample, QC1, were broken during transit and were unable to be analysed for hydrocarbon analytes. 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 B2 in Appendix B.

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

where Ro is the primary sample and Rd 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. Where concentrations were less than the laboratory practical quantitation limits (PQL) and in instances where results were greater than the PQL for the one sample, but below the PQL for the corresponding primary or duplicate sample, RPDs were calculated using a result equal to the PQL.

RPDs were within the acceptance criteria. However, it should be noted that the majority of the RPDs could not be calculated due to damaged samples and results below the PQLs.

One rinsate blank was collected and analysed for TRH, BTEXN, ethanol and lead. These analytes were not detected in the samples, suggesting the sampling protocol did not result in cross-contamination of the samples.

A trip blank was supplied to the primary laboratory for analysis, no concentrations of volatile hydrocarbons were identified in the tripblank, suggesting that no-volatile loss occurred during transport of samples.

Results for the rinsate and trip blank samples are presented in Table B3 in Appendix B.

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 C.

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 CONCLUSIONS

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 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 to on- and/or off-site receptors, through vapour intrusion.

9 LIMITATIONS

1 This Report has been prepared by WSP Australia Pty Limited ("*WSP*") for the benefit of Caltex Australia Petroleum Pty Ltd ("*Caltex*"), the registered proprietor or tenant of the site requested to be investigated by WSP ("Site") under its agreement with Caltex dated 22 September 2014 ("Agreement").

2 The nature and extent of the environmental consulting and remediation works at the Site detailed in the Report reflects the scope of the Services set out in the Request for Proposal under the Agreement and the Scope of Works set out in section 1.2 of Schedule 1 of the Agreement ("Scope of Works").

3 A potential purchaser (but not including a purchaser's successor in title) of the Site may rely on the findings contained in the Report for the purpose of considering the possible (but not actual) level of contamination of or at that Site at the time of the contamination assessment of the Site was undertaken ("Permitted Purpose").

4 The registered proprietor of the land to which the report relates at the time of writing the report (but not including any proprietor's successor in title) may rely on the findings contained in the Report for the purpose of assessing the possible level of contamination of that Site ("Permitted Purpose") and subject to the limitations set out in the Scope of Works.

5 The findings contained in the Report are subject to the qualifications, assumptions and limitations set out in the Report or otherwise communicated to, or by, Caltex. To the extent of any inconsistency between this Limitation Statement and the qualifications, assumptions and limitations in the Report, this Limitation Statement shall prevail.

6 The Report may contain information provided by others. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of this information. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the Report ("Conclusions") are based in whole or in part on this information, those Conclusions are contingent upon the accuracy and completeness of that information. WSP accepts no responsibility for the reliability, accuracy, completeness or adequacy of information provided by others.

7 WSP has prepared the Report without regard to any special or particular interest of any person (including that of a potential purchaser), other than Caltex when undertaking the Services or setting out its findings in the Report.

8 The Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose and does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in relation to the Site ("Investment Decision").

9 Matters material to a potential purchaser, may have been omitted from the Report, or may not have been investigated because of the scope of the Services. It follows that a potential purchaser should be cognisant of the restrictions inherent in or otherwise set out in the Report and should commission the preparation of a contamination assessment of the Site that caters for its own interests and scope of services, and which will provide findings in relation to the level of contamination of or at the Site at the time the potential purchaser is making an Investment Decision.

10 The Report has not and will not be updated for events occurring after the date of the Report or any other matter which may have a material effect on its contents which come to light after the date of the Report. WSP will not be obliged to inform a potential purchaser of any matter arising or coming to its attention after the date of the Report, which may affect or qualify the Report.

11 WSP is not liable to a potential purchaser in respect of errors or omissions in the Report which a potential purchaser knows of, or ought to be aware of, from:

12 its own actual knowledge and inquiries

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14 matters which a potential purchaser should have been aware of by making reasonable inquiry (including the inquiries recommended at Item 9 above).

15 To the fullest extent permitted at law, WSP, its related bodies corporate, its officers, employees and agents assume no liability and will not be liable to any potential purchaser for, or in relation to, any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of income or profit, revenue or loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, business interruption and pure economic loss) of any kind (and whether arising in contract, tort (including negligence), under statute, in equity or otherwise, suffered or incurred by a potential purchaser (or any other third party) arising out of or in connection with any matter outside the ambit of the Permitted Purpose in relation to the Report or findings expressed in the Report.

BIBLIOGRAPHY

- 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).*
- Australian Capital Territory (ACT) Environment Protection Authority (EPA) 2016, *Environmental Authorisation Letter.*

APPENDIX A

FIGURES

Map: 2270654F_GIS_028_A	Author: Angela.Sun		0 20 40 m 1:2,000
Date: 12/12/2017	Approved by: AM		Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
Data source: Google Earth 2015			

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CALTEX
Caltex Australia

wsp

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

Figure 1
Site location map

TANK ID	CAPACITY (L)	PRODUCT
DEPOT 1	45,200	V95
DEPOT 2	45,200	ULP
DEPOT 3	45,200	ULP
DEPOT 4	45,200	ULP
DEPOT 5	27,400	V98
DEPOT 6	25,000	Diesel
DEPOT 7	7,500	LPG AST

Map: 2270654F_GIS_026_A	Author: Angela.Sun
Date: 13/12/2017	Approved by: AM

Data source: Google Earth 2015

0 5 10 m

1:500

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

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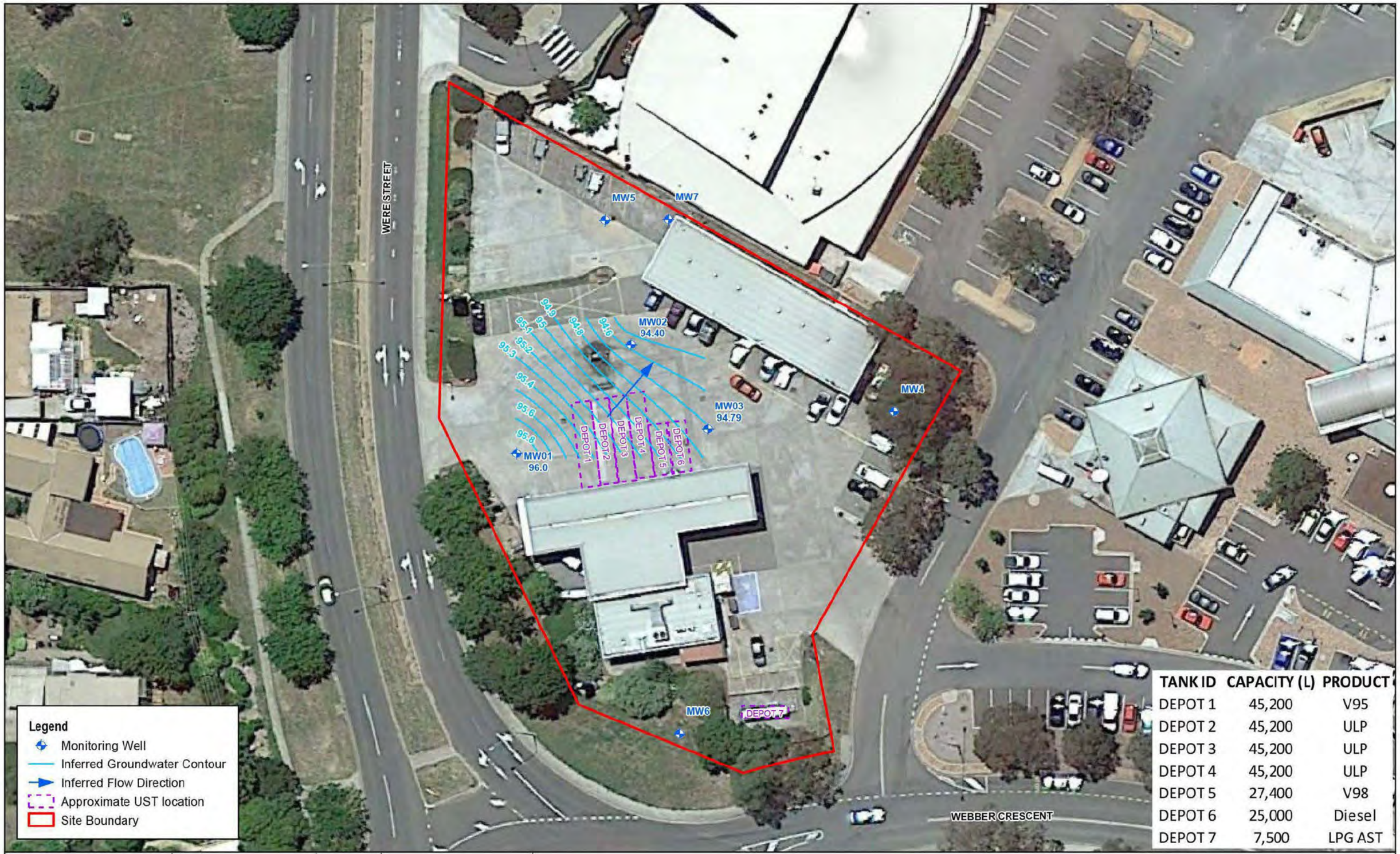
CALTEX
Caltex Australia

wsp

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

Figure 2
Sample location map



TANK ID	CAPACITY (L)	PRODUCT
DEPOT 1	45,200	V95
DEPOT 2	45,200	ULP
DEPOT 3	45,200	ULP
DEPOT 4	45,200	ULP
DEPOT 5	27,400	V98
DEPOT 6	25,000	Diesel
DEPOT 7	7,500	LPG AST

Map: 2270654F_GIS_027_B	Author: Angela.Sun
Date: 14/12/2017	Approved by: AM

Data source: Google Earth 2015

0 5 10 m

1:500

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

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CALTEX
Caltex Australia

wsp

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

Figure 3
Groundwater contour map

MW5 (31/07/2017)	µg/L
F1	1400
F2	96
Benzene	26
Toluene	<5
Ethylbenzene	<5
Xylene	<10
Xylene (m & p)	<5
Xylene (o)	<15
Naphthalene	<5

MW7 (31/07/2017)	µg/L
F1	22000
F2	820
Benzene	380
Toluene	2900
Ethylbenzene	680
Xylene	4400
Xylene (m & p)	1400
Xylene (o)	5800
Naphthalene	64

MW02 (31/07/2017)	µg/L
F1	1400
F2	850
Benzene	800
Toluene	100
Ethylbenzene	89
Xylene	310
Xylene (m & p)	11
Xylene (o)	320
Naphthalene	29

MW01 (31/07/2017)	µg/L
F1	<50
F2	-
Benzene	2.6
Toluene	2.7
Ethylbenzene	<0.5
Xylene	<1
Xylene (m & p)	<0.5
Xylene (o)	<1.5
Naphthalene	<0.5

MW6 (31/07/2017)	µg/L
F1	<50
F2	<60
Benzene	<0.5
Toluene	<0.5
Ethylbenzene	<0.5
Xylene	<1
Xylene (m & p)	<0.5
Xylene (o)	<1.5
Naphthalene	<0.5

MW5 MW7 MW02 MW4 MW03 MW01 MW6

DEPOT 1 DEPOT 2 DEPOT 3 DEPOT 4 DEPOT 5 DEPOT 6 DEPOT 7

WEBBER CRESCENT

Legend

- Monitoring Well
- Approximate UST location
- Abandoned/Former/Historic UST
- Bowser
- Oil/Water Separator
- Site Boundary

Map: 2270654F_GIS_029_B	Author: Angela.Sun
Date: 15/12/2017	Approved by: AM

Data source: Google Earth 2015

1:500

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

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\\apsydfil03\PROJ\C\Caltex_Aus_Petroleum\2270654F_CX_CANBERRA_SURR_ESA_PROG17Q3\10_GIS\Projects\Maps\2270654F_GIS_029_B.mxd

CALTEX Caltex Australia

wsp

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

Figure 4
Groundwater impact plan

APPENDIX B

ANALYTICAL RESULTS

Table B1 - Groundwater Analytical Results
Caltex Calwell (22176)
Were St, Cnr Webber Crescent

								Field_ID	MW01	MW02	MW5	MW6	MW7
								Location_Code	MW01	MW02	MW5	MW6	MW7
								Well	-	-	-	-	-
								Sampled_Date_Time	31/07/2017	31/07/2017	31/07/2017	31/07/2017	31/07/2017
				ACT Service Station Guidelines	NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand			NEPM 2013 Table 1C GILs, Fresh Waters					
Chem_Group	**ChemName**	**output unit**	**EQL**		2-4m	4-8m	>8m						
Alcohols	Ethanol	µg/L	1000	1400				1400	-	<1000	<1000	<1000	<1000
TRH	C6 - C10 Fraction	µg/L	50						<50	2700	1400	<50	32,000
	C6 - C10 Fraction minus BTEX (F1)	µg/L	50		6000	6000	7000		<50	1400	1400	<50	22,000
	C10 - C16 Fraction	µg/L	60						-	850	96	<60	820
	TRH >C10-C16 less Naphthalene (F2)	µg/L	100		NL	NL	NL		-	-	-	-	-
	C16 - C34 Fraction	µg/L	500						-	<500	<500	<500	<500
	C10 - C40 Fraction (Sum)	µg/L	650	600					-	910	<650	<650	1400
	C34 - C40 Fraction	µg/L	500						-	<500	<500	<500	<500
BTEX	Benzene	µg/L	0.5	950	5000	5000	5000	950	2.6	800	26	<0.5	380
	Toluene	µg/L	0.5	300	NL	NL	NL		2.7	100	<5	<0.5	2900
	Ethylbenzene	µg/L	0.5	140	NL	NL	NL		<0.5	89	<5	<0.5	680
	Xylene (m & p)	µg/L	1	200					<1	310	<10	<1	4400
	Xylene (o)	µg/L	0.5	350				350	<0.5	11	<5	<0.5	1400
	Xylene Total	µg/L	1.5		NL	NL	NL		<1.5	320	<15	<1.5	5800
	Total BTEX	µg/L	3						6	1300	31	<3	9800
Metals	Lead (Filtered)	µg/L	1	3.4				3.4	<1	<1	<1	<1	<1
PAH,s	Naphthalene	µg/L	0.5		NL	NL	NL	16	<0.5	29	<5	<0.5	64

Table B2 - RPD's
Caltex Calwell (22176)
Were St, Cnr Webber Crescent

			Sample ID	MW01	QC1A	RPD
			Sample date	31/07/2017	31/07/2017	
Chem Group	**Analyte**	**Unit**	**EQL**			
	Ethanol	µg/L	1000	-	<50	-
PAH/Phenols	Polycylic aromatic hydrocarbons EPA44	ug/L	0.5	-	<0.5	
TRH	C10 - C16 Fraction	µg/L	60	-	<100	-
	C16 - C34 Fraction	µg/L	500	-	<100	-
	C34 - C40 Fraction	µg/L	500	-	<100	-
BTEX	Benzene	µg/L	0.5	2.6	<1	89%
	Toluene	µg/L	0.5	2.7	<2	30%
	Ethylbenzene	µg/L	0.5	<0.5	<2	-
	Xylene (m & p)	µg/L	1	<1	<2	-
	Xylene (o)	µg/L	0.5	<0.5	<2	-
	Xylene Total	µg/L	1.5	<1.5	<2	-
Metals	Lead (Filtered)	µg/L	1	<1	<1	-
	Naphthalene	µg/L	0.5	<0.5	<1	-

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

***High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 100 (1-10 x EQL); 50 (10-30 x EQL); 20 (> 30 x EQL))

****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Table B3 - Rinsate and Tripblank Results
Caltex Calwell (22176)
Were St, Cnr Webber Crescent

			Groundwater monitoring well	R1	TB1
			Sample date	1/08/2017	1/08/2017
Chem Group	**Analyte**	**Unit**	**EQL**		
TRH	C6 - C10 Fraction minus BTEX (F1)	µg/L	50	<50	<50
	C10 - C16 Fraction	µg/L	60	<60	-
	C16 - C34 Fraction	µg/L	500	<500	-
	C34 - C40 Fraction	µg/L	500	<500	-
	C10 - C40 Fraction (Sum)	µg/L	650	<650	-
	TPH C6 - C10 Fraction	µg/L	50	<50	<50
BTEX	Benzene	µg/L	0.5	<0.5	<0.5
	Toluene	µg/L	0.5	<0.5	<0.5
	Ethylbenzene	µg/L	0.5	<0.5	<0.5
	Xylene (m & p)	µg/L	1	<1	<1
	Xylene (o)	µg/L	0.5	<0.5	<0.5
	Xylene Total	µg/L	1.5	<1.5	<1.5
	Sum of BTEX	µg/L	3	<3	<3
PAH	Naphthalene	µg/L	0.5	<0.5	<0.5
Metals	Lead (Filtered)	µg/L	1	<1	-
	Ethanol	µg/L	1000	<1000	-

Table B4 - Groundwater Parametres
Caltex Calwell (22176)
Were St, Cnr Webber Crescent

Groundwater monitoring well	MW01	MW02	MW03	MW5	MW6	MW7
Sample date	18/07/2017	18/07/2017	18/07/2017	18/07/2017	18/07/2017	18/07/2017
pH	6.93	6.39	7.02	6.81	6.98	7.52
Electrical conductivity (µs/cm)	1530	940	2690	700	6460	810
Redox (mV)	261.0	167.8	266.8	156.9	317.3	130.8
Dissolved oxygen (ppm)	4	1	3	2	4	3
Temperature (°C)	14	15.8	14.5	16.1	14.4	12.9

Table B5 - Groundwater Gauging Data
Caltex Calwell (22176)
Were St, Cnr Webber Crescent

Groundwater monitoring well	MW01	MW02	MW03	MW4	MW5	MW6	MW7
Screen Interval (mBGL)	Unknown	Unkown	Unknown	Unknown	Unknown	Unknown	Unknown
Depth to LNAPL (m)	-	-	-	-	-	-	-
Depth to groundwater (m)	3.913	5.591	5.202	Dry	5.14	4.55	5.145
Thickness of LNAPL (mm)	-	-	-	-	-	-	-
Well depth (m)	10.402	13.945	17.831	5.204	5.890	6.855	6.045

*All depths measured from top of casing before sampling
**ND = no detection

APPENDIX C

LABORATORY RESULTS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Alex Moody
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Project	**ENV26740 2270654F - Caltex Calwell**
Order Number	**E66QBU**
Samples	6

LABORATORY DETAILS

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Laboratory	SGS Alexandria Environmental
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SGS Reference	**SE168666 R0**
Date Received	2/8/2017
Date Reported	9/8/2017

COMMENTS

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

SIGNATORIES

Sch 2.2(a)(ii)

Akheeqar Boniameen
Chemist

Sch 2.2(a)(ii)

Dong Liang
Metals/Inorganics Team Leader

Sch 2.2(a)(ii)

Minh Nguyen
Technical Development Mananger

VOCs in Water [AN433] Tested: 4/8/2017

PARAMETER	UOM	LOR	MW01 WATER 31/7/2017 SE168666.001	R1 WATER 31/7/2017 SE168666.005	TB1 WATER 31/7/2017 SE168666.006
Benzene	µg/L	0.5	**2.6**	<0.5	<0.5
Toluene	µg/L	0.5	**2.7**	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	**6**	<3	<3
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 4/8/2017

PARAMETER	UOM	LOR	MW01 WATER 31/7/2017 SE168666.001	R1 WATER 31/7/2017 SE168666.005	TB1 WATER 31/7/2017 SE168666.006
TRH C6-C9	µg/L	40	<40	<40	<40
Benzene (F0)	µg/L	0.5	**2.6**	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 3/8/2017

			R1
			WATER
			31/7/2017
PARAMETER	UOM	LOR	SE168666.005
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
TRH >C10-C16 (F2)	µg/L	60	<60
TRH >C16-C34 (F3)	µg/L	500	<500
TRH >C34-C40 (F4)	µg/L	500	<500
TRH C10-C36	µg/L	450	<450
TRH C10-C40	µg/L	650	<650

Alcohols in Water [AN478] Tested: 3/8/2017

PARAMETER	UOM	LOR	R1 WATER - 31/7/2017 SE168666.005
ethanol*	mg/L	1	<1

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 4/8/2017

PARAMETER	UOM	LOR	MW01 WATER - 31/7/2017 SE168666.001	MW02 WATER - 31/7/2017 SE168666.002	MW2 WATER - 31/7/2017 SE168666.003	QC1 WATER - 31/7/2017 SE168666.004	R1 WATER - 31/7/2017 SE168666.005
Lead, Pb	µg/L	1	<1	<1	<1	<1	<1

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN471	Aqueous samples are filtered into 2mL vials for GC/MS analysis. Soil samples are extracted in water, filtered into 2mL vials ready for GC/MS analysis.

FOOTNOTES

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

Samples 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:

a. 1 Bq is equivalent to 27 pCi
b. 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 criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

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STATEMENT OF QA/QC PERFORMANCE

SE168666 R0

CLIENT DETAILS

Contact	Alex Moody
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Project	**ENV26740 2270654F - Caltex Calwell**
Order Number	**E66QBU**
Samples	6

LABORATORY DETAILS

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Email	au.environmental.sydney@sgs.com
SGS Reference	**SE168666 R0**
Date Received	02 Aug 2017
Date Reported	09 Aug 2017

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 and was supplied by the Client.
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

HOLDING TIME SUMMARY

SE168666 R0

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)-[ENV]AN478

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
R1	SE168666.005	LB129311	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	08 Aug 2017

Trace Metals (Dissolved) in Water by ICPMS — Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW01	SE168666.001	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
MW02	SE168666.002	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
MW2	SE168666.003	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
QC1	SE168666.004	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
R1	SE168666.005	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
R1	SE168666.005	LB129266	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	08 Aug 2017

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW01	SE168666.001	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
R1	SE168666.005	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
TB1	SE168666.006	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW01	SE168666.001	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
R1	SE168666.005	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
TB1	SE168666.006	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017

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 identifer 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]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	MW01	SE168666.001	%	40 - 130%	121
	R1	SE168666.005	%	40 - 130%	114
	TB1	SE168666.006	%	40 - 130%	116
d4-1,2-dichloroethane (Surrogate)	MW01	SE168666.001	%	40 - 130%	101
	R1	SE168666.005	%	40 - 130%	102
	TB1	SE168666.006	%	40 - 130%	104
d8-toluene (Surrogate)	MW01	SE168666.001	%	40 - 130%	86
	R1	SE168666.005	%	40 - 130%	93
	TB1	SE168666.006	%	40 - 130%	94
Dibromofluoromethane (Surrogate)	MW01	SE168666.001	%	40 - 130%	104
	R1	SE168666.005	%	40 - 130%	106
	TB1	SE168666.006	%	40 - 130%	105

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	MW01	SE168666.001	%	40 - 130%	121
	R1	SE168666.005	%	40 - 130%	114
	TB1	SE168666.006	%	40 - 130%	116
d4-1,2-dichloroethane (Surrogate)	MW01	SE168666.001	%	60 - 130%	101
	R1	SE168666.005	%	60 - 130%	102
	TB1	SE168666.006	%	60 - 130%	104
d8-toluene (Surrogate)	MW01	SE168666.001	%	40 - 130%	86
	R1	SE168666.005	%	40 - 130%	93
	TB1	SE168666.006	%	40 - 130%	94
Dibromofluoromethane (Surrogate)	MW01	SE168666.001	%	40 - 130%	104
	R1	SE168666.005	%	40 - 130%	106
	TB1	SE168666.006	%	40 - 130%	105

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.

Alcohols in Water — Method: ME-(AU)-[ENV]AN478

Sample Number	Parameter	Units	LOR	Result
LB129311.001	ethanol*	mg/L	1	<1

Trace Metals (Dissolved) in Water by ICPMS — Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB129314.001	Lead, Pb	µg/L	1	<1

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB129268.001	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)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB129357.001	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	Dibromofluoromethane (Surrogate)	%	-	101
		d4-1,2-dichloroethane (Surrogate)	%	-	104
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	123

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB129357.001		TRH C6-C9	µg/L	40	<40
	Surrogates	Dibromofluoromethane (Surrogate)	%	-	101
		d4-1,2-dichloroethane (Surrogate)	%	-	104
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	123

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / 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 x SDL / 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 identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Alcohols in Water — Method: ME-(AU)-[ENV]AN478

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168639.007	LB129311.011	ethanol*	mg/L	1	<1	0	200	0

Trace Metals (Dissolved) in Water by ICPMS — Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168665.004	LB129314.014	Lead, Pb	µg/L	1	<1	<1	200	0
SE168716.001	LB129314.024	Lead, Pb	µg/L	1	<1	<1	200	0

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168620.001	LB129266.021		TRH C10-C14	µg/L	50	74	106	86	36
			TRH C15-C28	µg/L	200	330	312	92	7
			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	418	139	0
			TRH C10-C40	µg/L	650	<650	418	187	0
		TRH F Bands	TRH >C10-C16 (F2)	µg/L	60	140	171	69	21
			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)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168639.005	LB129357.022	Monocyclic	Benzene	µg/L	0.5	<0.5	0.01	200	0
		Aromatic	Toluene	µg/L	0.5	4.0	4.4	42	10
			Ethylbenzene	µg/L	0.5	<0.5	0.02	200	0
			m/p-xylene	µg/L	1	<1	0.08	200	0
			o-xylene	µg/L	0.5	<0.5	0.02	200	0
		Polycyclic	Naphthalene	µg/L	0.5	<0.5	0.01	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.3	4.49	30	17
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.8	5.4	30	6
			d8-toluene (Surrogate)	µg/L	-	4.9	5.15	30	5
			Bromofluorobenzene (Surrogate)	µg/L	-	5.8	4.59	30	23
SE168665.006	LB129357.023	Monocyclic	Benzene	µg/L	0.5	0.1	0.09	200	0
		Aromatic	Toluene	µg/L	0.5	0	0	200	0
			Ethylbenzene	µg/L	0.5	0.06	0.07	200	0
			m/p-xylene	µg/L	1	0.15	0.15	200	0
			o-xylene	µg/L	0.5	0.06	0.05	200	0
		Polycyclic	Naphthalene	µg/L	0.5	0.05	0.04	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.16	4.71	30	9
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.06	5.75	30	13
			d8-toluene (Surrogate)	µg/L	-	4.65	5.2	30	11
			Bromofluorobenzene (Surrogate)	µg/L	-	5.71	4.94	30	14

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168639.005	LB129357.022		TRH C6-C10	µg/L	50	<50	0	200	0
			TRH C6-C9	µg/L	40	<40	0	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.3	4.49	30	17
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.8	5.4	30	6
			d8-toluene (Surrogate)	µg/L	-	4.9	5.15	30	5
			Bromofluorobenzene (Surrogate)	µg/L	-	5.8	4.59	30	23
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	0.01	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	-4.53	200	0
SE168665.006	LB129357.023		TRH C6-C10	µg/L	50	0	0	200	0
			TRH C6-C9	µg/L	40	0	0	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.16	4.71	30	9
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	5.06	5.75	30	13
			d8-toluene (Surrogate)	µg/L	-	4.65	5.2	30	11
			Bromofluorobenzene (Surrogate)	µg/L	-	5.71	4.94	30	14
		VPH F Bands	Benzene (F0)	µg/L	0.5	0.1	0.09	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / 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 x SDL / 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 identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Water (continued) — Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE168665.006	LB129357.023	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	-0.37	-1.32	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 %
LB129311.002	ethanol*	mg/L	1	25	25	70 - 130	100

Total Metals (Dissolved) in Water by ICPMS

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

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB129314.002	Lead, Pb	µg/L	1	23	20	80 - 120	116

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB129266.002		TRH C10-C14	µg/L	50	940	1200	60 - 140	79
		TRH C15-C28	µg/L	200	1100	1200	60 - 140	95
		TRH C29-C36	µg/L	200	1300	1200	60 - 140	107
	TRH F Bands	TRH >C10-C16 (F2)	µg/L	60	1100	1200	60 - 140	88
		TRH >C16-C34 (F3)	µg/L	500	1300	1200	60 - 140	106
		TRH >C34-C40 (F4)	µg/L	500	620	600	60 - 140	103

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB129357.002	Monocyclic	Benzene	µg/L	0.5	51	45.45	60 - 140	113
	Aromatic	Toluene	µg/L	0.5	51	45.45	60 - 140	113
		Ethylbenzene	µg/L	0.5	51	45.45	60 - 140	113
		m/p-xylene	µg/L	1	100	90.9	60 - 140	112
		o-xylene	µg/L	0.5	51	45.45	60 - 140	113
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.0	5	60 - 140	100
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	4.9	5	60 - 140	98
		d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 140	102
		Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 140	101

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB129357.002		TRH C6-C10	µg/L	50	930	946.63	60 - 140	98
		TRH C6-C9	µg/L	40	760	818.71	60 - 140	93
	Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	5.0	5	60 - 140	100
		d4-1,2-dichloroethane (Surrogate)	µg/L	-	4.9	5	60 - 140	98
		d8-toluene (Surrogate)	µg/L	-	5.1	5	60 - 140	102
		Bromofluorobenzene (Surrogate)	µg/L	-	5.0	5	60 - 140	101
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	620	639.67	60 - 140	97

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 identifer 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%
SE168665.001	LB129314.004	Lead, Pb	µg/L	1	22	0.046	20	108

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE168620.001	LB129266.020		TRH C10-C14	µg/L	50	1000	74	1200	79
			TRH C15-C28	µg/L	200	1500	330	1200	94
			TRH C29-C36	µg/L	200	1200	<200	1200	103
			TRH C37-C40	µg/L	200	<200	<200	-	-
			TRH C10-C36	µg/L	450	3700	<450	-	-
			TRH C10-C40	µg/L	650	3700	<650	-	-
		TRH F Bands	TRH >C10-C16 (F2)	µg/L	60	1200	140	1200	90
			TRH >C16-C34 (F3)	µg/L	500	1500	<500	1200	121
			TRH >C34-C40 (F4)	µg/L	500	610	<500	600	101

VOCs in Water — Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE168639.001	LB129357.024	Monocyclic	Benzene	µg/L	0.5	<0.5	45.45	113
		Aromatic	Toluene	µg/L	0.5	<0.5	45.45	127
			Ethylbenzene	µg/L	0.5	<0.5	45.45	115
			m/p-xylene	µg/L	1	<1	90.9	119
			o-xylene	µg/L	0.5	<0.5	45.45	116
		Polycyclic	Naphthalene	µg/L	0.5	<0.5	-	-
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	4.7	-	85
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	4.8	-	107
			d8-toluene (Surrogate)	µg/L	-	4.3	-	102
			Bromofluorobenzene (Surrogate)	µg/L	-	6.0	-	97

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE168639.001	LB129357.024		TRH C6-C10	µg/L	50	<50	946.63	87
			TRH C6-C9	µg/L	40	<40	818.71	89
		Surrogates	Dibromofluoromethane (Surrogate)	µg/L	-	4.7	-	85
			d4-1,2-dichloroethane (Surrogate)	µg/L	-	4.8	-	107
			d8-toluene (Surrogate)	µg/L	-	4.3	-	102
			Bromofluorobenzene (Surrogate)	µg/L	-	6.0	-	97
		VPH F	Benzene (F0)	µg/L	0.5	<0.5	-	-
		Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	639.67	78

MATRIX SPIKE DUPLICATES

SE168666 R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

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 x SDL / 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 identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.

①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to Analytical Report comments for further information.

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SAMPLE RECEIPT ADVICE

SE168666

CLIENT DETAILS

Contact	Alex Moody
Client	WSP AUSTRALIA PTY LIMITED
Address	Level 1, 121 Marcus Clarke Street Canberra ACT 2600
Telephone	02 6201 9600
Facsimile	02 9272 5101
Email	[redacted]@pbworld.com
Project	**2270654F - Caltex Calwell**
Order Number	**E66QBU**
Samples	6

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Wed 2/8/2017
Report Due	Wed 9/8/2017
SGS Reference	**SE168666**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Wednesday 2/8/2017. Results are expected to be ready by Wednesday 9/8/2017. Please quote SGS reference SE168666 when making enquiries. Refer below for details relating to sample integrity upon receipt.

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	6 Water
Date documentation received	2/8/17@10:48am	Type of documentation received	COC
Samples received in good order	**No**	Samples received without headspace	Yes
Sample temperature upon receipt	1.0°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.
Some samples received broken.

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SAMPLE RECEIPT ADVICE

SE168666

CLIENT DETAILS

Client: WSP AUSTRALIA PTY LIMITED

Project: 2270654F - Caltex Calwell

SUMMARY OF ANALYSIS

No.	Sample ID	Alcohols in Water	Trace Metals (Dissolved) in Water by ICPMS	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	MW01	-	1	-	12	8
002	MW02	-	1	-	-	-
003	MW2	-	1	-	-	-
004	QC1	-	1	-	-	-
005	R1	1	1	9	12	8
006	TB1	-	-	-	12	8

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.

HOLDING TIME SUMMARY

SE168667 R0

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)-[ENV]AN478

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5	SE168667.001	LB129311	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	08 Aug 2017
MW6	SE168667.002	LB129311	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	08 Aug 2017

Trace Metals (Dissolved) in Water by ICPMS — Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5	SE168667.001	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
MW6	SE168667.002	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017
MW7	SE168667.003	LB129314	31 Jul 2017	02 Aug 2017	27 Jan 2018	04 Aug 2017	27 Jan 2018	07 Aug 2017

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5	SE168667.001	LB129266	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	09 Aug 2017
MW6	SE168667.002	LB129266	31 Jul 2017	02 Aug 2017	07 Aug 2017	03 Aug 2017	12 Sep 2017	09 Aug 2017

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5	SE168667.001	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
MW6	SE168667.002	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
MW5	SE168667.001	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017
MW6	SE168667.002	LB129357	31 Jul 2017	02 Aug 2017	07 Aug 2017	04 Aug 2017	13 Sep 2017	09 Aug 2017

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 identifer 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]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	MW5	SE168667.001	%	40 - 130%	100
	MW6	SE168667.002	%	40 - 130%	122
d4-1,2-dichloroethane (Surrogate)	MW5	SE168667.001	%	40 - 130%	92
	MW6	SE168667.002	%	40 - 130%	105
d8-toluene (Surrogate)	MW5	SE168667.001	%	40 - 130%	102
	MW6	SE168667.002	%	40 - 130%	96
Dibromofluoromethane (Surrogate)	MW5	SE168667.001	%	40 - 130%	97
	MW6	SE168667.002	%	40 - 130%	103

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	MW5	SE168667.001	%	40 - 130%	100
	MW6	SE168667.002	%	40 - 130%	122
d4-1,2-dichloroethane (Surrogate)	MW5	SE168667.001	%	60 - 130%	92
	MW6	SE168667.002	%	60 - 130%	105
d8-toluene (Surrogate)	MW5	SE168667.001	%	40 - 130%	102
	MW6	SE168667.002	%	40 - 130%	96
Dibromofluoromethane (Surrogate)	MW5	SE168667.001	%	40 - 130%	97
	MW6	SE168667.002	%	40 - 130%	103

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Alex Moody
Client	WSP AUSTRALIA PTY LIMITED
Address	Level 1, 121 Marcus Clarke Street Canberra ACT 2600
Telephone	02 6201 9600
Facsimile	02 9272 5101
Email	Sch 2.2(a)(ii)@wsp.com
Project	**ENV26741 2270654F - Caltex Calwell**
Order Number	**E66QBU**
Samples	3

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE168667 R1**
Date Received	2/8/2017
Date Reported	1/12/2017

COMMENTS

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

This report cancels and supersedes the report No.SE168667R0. dated 9/8/17 issued by SGS Environment, Health and Safety due to updated sample ID for #1.

SIGNATORIES

Sch 2.2(a)(ii)

Akheeqar Beniameen
Chemist

Sch 2.2(a)(ii)

Dong Liang
Metals/Inorganics Team Leader

Sch 2.2(a)(ii)

Minh Nguyen
Technical Development Mananger

VOCs in Water [AN433] Tested: 9/8/2017

PARAMETER	UOM	LOR	MW2 WATER 31/7/2017 SE168667.001	MW6 WATER 31/7/2017 SE168667.002
Benzene	µg/L	0.5	800	<0.5
Toluene	µg/L	0.5	100	<0.5
Ethylbenzene	µg/L	0.5	89	<0.5
m/p-xylene	µg/L	1	310	<1
o-xylene	µg/L	0.5	11	<0.5
Total Xylenes	µg/L	1.5	320	<1.5
Total BTEX	µg/L	3	1300	<3
Naphthalene	µg/L	0.5	29	<0.5

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 9/8/2017

PARAMETER	UOM	LOR	MW2 WATER 31/7/2017 SE168667.001	MW6 WATER 31/7/2017 SE168667.002
TRH C6-C9	µg/L	40	2600	<40
Benzene (F0)	µg/L	0.5	800	<0.5
TRH C6-C10	µg/L	50	2700	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	1400	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 4/8/2017

PARAMETER	UOM	LOR	MW2 WATER 31/7/2017 SE168667.001	MW6 WATER 31/7/2017 SE168667.002
TRH C10-C14	µg/L	50	**910**	<50
TRH C15-C28	µg/L	200	<200	<200
TRH C29-C36	µg/L	200	<200	<200
TRH C37-C40	µg/L	200	<200	<200
TRH >C10-C16 (F2)	µg/L	60	**850**	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500
TRH C10-C36	µg/L	450	**910**	<450
TRH C10-C40	µg/L	650	**910**	<650

Alcohols in Water [AN478] Tested: 8/8/2017

PARAMETER	UOM	LOR	MW2 WATER 31/7/2017 SE168667.001	MW6 WATER 31/7/2017 SE168667.002
ethanol*	mg/L	1	<1	<1

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 7/8/2017

PARAMETER	UOM	LOR	MW2 WATER - 31/7/2017 SE168667.001	MW6 WATER - 31/7/2017 SE168667.002	MW7 WATER - 31/7/2017 SE168667.003
Lead, Pb	µg/L	1	<1	<1	<1

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN478	Aqueous samples are filtered into 2mL vials for GC/MS analysis. Soil samples are extracted in water, filtered into 2mL vials ready for GC/MS analysis.

FOOTNOTES

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

Samples 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:

a. 1 Bq is equivalent to 27 pCi
b. 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 criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

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source: M630_SR_20170802160636.pdf page: 1 SGS Ref: SE168667_COC

SGS

CHAIN OF CUSTODY & ANALYSIS REQUEST

SGS Environmental Services
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Telephone No: (02) 85940400
Facsimile No: (02) 85940499
Email: [redacted]

Company Name:	WSP | Parsons Brinckerhoff	Project Name/No:	2270654F Caltex Calwell
Address:	121 Marcus Clarke Street	Purchase Order No:	E66QBU
	Canberra, ACT	Results Required By:	Standard TAT
		Telephone:	Sch 2.2(a)(ii)
Contact Name:	Alex Moody	Facsimile:	
		Email Results:	Sch 2.2(a)(ii)@wsp.com

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	PS3 (TRH, BTEXN, Lead)	Ethanol	
MW5	2/8/17	1	X			6	X	X	
MW6		2	X			6	X	X	
MW7		3	X			6	X	X	METALS

SGS EHS Alexandria Laboratory

SE168667 COC
Received: 02 – Aug – 2017

Relinquished By: Alex Moody	Date/Time: 01/08/2017	Received By: Sch 2.2(a)(ii)	Date/Time 2/8/17 @ 11:15
Relinquished By:	Date/Time:	Received By:	Date/Time
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

Out of scope

Out of scope

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Out of scope

Out of scope

Out of scope

Out of scope

RE: COC's for Samples Despatched from the ACT.

Moody, Alex Sch 2.2(a)(ii) @wsp.com>

Mon 27/11/2017 12:59 PM

To: Adams, Erin (Sydney) <Sch 2.2(a)(ii) @sgs.com>; AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>;

Hi Erin,

That would be great.

Thanks

Alex

From: Adams, Erin (Sydney) [mailto Sch 2.2(a)(ii) s@sgs.com]
Sent: Monday, 27 November 2017 12:50 PM
To: Moody, Alex Sch 2.2(a)(ii) @wsp.com>; AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>
Subject: RE: COC's for Samples Despatched from the ACT.

Hi Alex,

Thanks for letting us know, unfortunately we will not be able to add the samples to the job SE168667 as this job has already been completed an invoiced. We can perform the analysis as an "A" job if you would like?

Regards,

Erin Adams
Environment, Health & Safety
Customer Service Representative

Phone: +61 (0)2 8594 0400
Direct: +61 (0)2 8594 0465

From: Moody, Alex [mailto: Sch 2.2(a)(ii) @wsp.com]
Sent: Monday, 27 November 2017 11:03 AM
To: AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>
Cc: Adams, Erin (Sydney) Sch 2.2(a)(ii) @sgs.com>
Subject: COC's for Samples Despatched from the ACT.

Hi,

Please see the attached COC's for samples despatched from the ACT today.

Please note, water samples for 2270654F are on 24h TAT. If possible, please add to existing report SE168667 and reissue to myself.

Regards

Alex Moody
Environmental Scientist, Contaminated Land Management

wsp

T: +61 2 6281 9510

RE: COC's for Samples Despatched from the ACT.

AU.Environmental.Sydney (Sydney)

Mon 27/11/2017 12:22 PM

To: AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>;

Cc: Crawford, Huong (Sydney) [redacted]@sgs.com>;

FYA – I've been advised by the Client (Alex Moody) that the 2 ground water samples [redacted] on the COC is highly contaminated and will affect the instruments (Previous history – Results for BTEX ~20,000 ug/L). When samples logged in please place a comment on the job so that the Organics lab are aware of this can do multiple dilutions on running the samples.

Any questions let me know.

Kind Regards

Elsa Miguel Barrin
Environment, Health & Safety
Customer Service Representative

SGS Australia Pty Ltd
Unit 16, 33 Maddox Street
Alexandria, NSW, 2015

Phone: +61 (0)2 8594 0400
Direct: +61 (0)2 8594 0455
Fax: +61 (0)2 8594 0499
E-mail: [redacted]
Web: www.au.sgs.com

From: AU.SampleReceipt.Sydney (Sydney)
Sent: Monday, 27 November 2017 11:29 AM
To: AU.Environmental.Sydney (Sydney) <AU.Environmental.Sydney@sgs.com>
Subject: Fw: COC's for Samples Despatched from the ACT.

Regards,

Sydney Sample Receipt Team
Environment, Health & Safety
Sample Receipt

SGS Australia Pty Ltd
Unit 16, 33 Maddox Street
Alexandria NSW 2015

Phone: +61 (0)2 8594 0400
Fax: +61 (0)2 8594 0499
E-mail: **au.samplereceipt.sydney@sgs.com**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1719194**	Page	: 1 of 5
Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: ALEX MOODY	Contact	: Loren Schiavon
Address	: Level 1, 121 Marcus Clarke street Canberra, ACT Australia 2600	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8503
Project	: 2270654F CALTEX CALWELL	Date Samples Received	: 02-Aug-2017 15:00
Order number	: E66QBU	Date Analysis Commenced	: 03-Aug-2017
C-O-C number	: ----	Issue Date	: 09-Aug-2017 17:36
Sampler	: ----		
Site	: ----		
Quote number	: EN/085/15 V7		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

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

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QC1A	----	----	----	----
				Client sampling date / time	01-Aug-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1719194-001	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QC1A	----	----	----	----
				Client sampling date / time	01-Aug-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1719194-001	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L		<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP117: Alcohols									
Ethanol	64-17-5	50	µg/L		<50	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		27.1	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		59.9	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		52.3	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		79.3	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%		82.4	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		75.3	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		90.7	----	----	----	----
Toluene-D8	2037-26-5	2	%		104	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		91.3	----	----	----	----

Surrogate Control Limits

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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1719194**	Page	: 1 of 4
Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: ALEX MOODY	Telephone	: +61 2 8784 8503
Project	: 2270654F CALTEX CALWELL	Date Samples Received	: 02-Aug-2017
Site	: ----	Issue Date	: 09-Aug-2017
Sampler	: ----	No. of samples received	: 1
Order number	: E66QBU	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing 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 / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
QC1A	01-Aug-2017	----	----	----	07-Aug-2017	28-Jan-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	04-Aug-2017	12-Sep-2017	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	04-Aug-2017	12-Sep-2017	✓
VOC Vial - Unpres. or Sodium Thiosulfate (EP080)							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	03-Aug-2017	08-Aug-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	04-Aug-2017	12-Sep-2017	✓
VOC Vial - Unpres. or Sodium Thiosulfate (EP080)							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	03-Aug-2017	08-Aug-2017	✓
EP080: BTEXN							
VOC Vial - Unpres. or Sodium Thiosulfate (EP080)							
QC1A	01-Aug-2017	03-Aug-2017	08-Aug-2017	✓	03-Aug-2017	08-Aug-2017	✓
EP117: Alcohols							
VOC Vial - Unpres. or Sodium Thiosulfate (EP117)							
QC1A	01-Aug-2017	----	----	----	03-Aug-2017	15-Aug-2017	✓

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(were) 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	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alcohols by HS-GC-MS	EP117	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alcohols by HS-GC-MS	EP117	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Alcohols by HS-GC-MS	EP117	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm 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	In house: Referenced to 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)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to 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	In house: Referenced to 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.

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1719194**

Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: ALEX MOODY	Contact	: Loren Schiavon
Address	: Level 1, 121 Marcus Clarke street Canberra, ACT Australia 2600	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Sch 2.2(a)(ii)@wsp.com	E-mail	: Sch 2.2(a)(ii) @alsglobal.com
Telephone	: ----	Telephone	: +61 2 8784 8503
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 2270654F CALTEX CALWELL	Page	: 1 of 2
Order number	: E66QBU	Quote number	: ES2016PARBRINSW0009 (EN/085/15 V7)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 02-Aug-2017 15:00	Issue Date	: 03-Aug-2017
Client Requested Due Date	: 09-Aug-2017	Scheduled Reporting Date	: **09-Aug-2017**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 12.2'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Alcohols by HS-GC-MS : EP117		
QC1A	- VOC Vial - Unpres. or Sodium Thiosulfate	- Amber VOC Vial - Sulfuric Acid
TRH Volatiles/BTEX : EP080		
QC1A	- VOC Vial - Unpres. or Sodium Thiosulfate	- Amber VOC Vial - Sulfuric Acid

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP117-ETH Ethanol by Static Headspace GC/MS	WATER - W-21 TRH/BTEXN/PAH/Filtered Pb
ES1719194-001	01-Aug-2017 00:00	QC1A	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALEX MOODY

- *AU Certificate of Analysis - NATA (COA)	Email	alex.moody@wsp.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	alex.moody@wsp.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	alex.moody@wsp.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	alex.moody@wsp.com
- A4 - AU Tax Invoice (INV)	Email	alex.moody@wsp.com
- Chain of Custody (CoC) (COC)	Email	alex.moody@wsp.com
- EDI Format - ENMRG (ENMRG)	Email	alex.moody@wsp.com
- EDI Format - ESDAT (ESDAT)	Email	alex.moody@wsp.com

SGS

CHAIN OF CUSTODY & ANALYSIS REQUEST

Page _1__ of __1_

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

Company Name:	WSP | Parsons Brinckerhoff	Project Name/No:	2270654F Caltex Calwell
Address:	121 Marcus Clarke Street	Purchase Order No:	E66QBU
	Canberra, ACT	Results Required By:	Standard TAT
		Telephone:	Sch 2.2(a)(ii)
Contact Name:	Alex Moody	Facsimile:	
		Email Results:	Sch 2.2(a)(ii) @wsp.com

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	PS3 (TRH, BTEXN, Lead)	Ethanol	TRHF1, BTEXN
MW01			X			6	X	X	
MW02			X			6	X	X	
MW02			X			6	X	X	
QC1			X			6	X	X	
QC1A			X			6	X	X	
R1			X				X	X	
TB1			X						X

Environmental Division Sydney
Work Order Reference
ES1719194
Telephone : + 61-2-8784 8555

Please transfer to ALS for analysis.

Relinquished By: Alex Moody	Date/Time: 01/08/2017	Received By: Sch 2.2(a)(ii)	Date/Time 020817
Relinquished By:	Date/Time:	Received By:	Date/Time 1500
Samples Intact: Yes/ No	Temperature: Ambient / Chilled	Sample Cooler Sealed: Yes/ No	Laboratory Quotation No:
	Comments:		

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AMPOL AUSTRALIA PETROLEUM PTY LTD

GROUNDWATER MONITORING EVENT REPORT - NOVEMBER 2020

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

wsp

ISSUED DECEMBER 2020

Question today
Imagine tomorrow
Create for the future

Groundwater Monitoring Event Report - November 2020
Ampol Calwell Service Station (Site ID 22176), corner Were Street and Webber Crescent Calwell ACT

Ampol 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	08/12/2020	Draft
B	18/12/2020	Final

	NAME	DATE	SIGNATURE
Prepared by:	Kate Dean	30/11/2020	Sch 2.2(a)(ii)
Reviewed by:	Amy Valentine	03/12/2020	
Approved by:	Amy Valentine	18/12/2020	

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LIST OF APPENDICES

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

Ampol Australia Petroleum Pty Ltd (Ampol) engaged WSP Australia Pty Ltd (WSP) to undertake a groundwater monitoring event (GME) at the Ampol 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 to MW07);
- field screening of water quality parameters at each monitoring well; and
- 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 MW01, MW03, MW05 and MW07.
- Concentrations of TRH and BTEXN compounds exceeded the nominated assessment criteria in samples collected from monitoring well MW07. These concentrations were lower than previous investigations in 2018 and 2019, likely due to the rising groundwater levels.

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

Ampol Australia Petroleum Pty Ltd (Ampol) engaged WSP Australia Pty Ltd (WSP) to undertake a groundwater monitoring event (GME) at the Ampol Calwell service station (Ampol 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 to MW07);
- 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; and
- interpretation of results and preparation of this report.

DRAFT

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	Ampol Calwell Service Station
Site address	Corner of Were Street and Webber Crescent, Calwell ACT 2905
Ampol 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; and
- 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 volcaniclastic 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 24 November 2020 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 24 November 2020 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 between approximately 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 Australia Pty Ltd (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 Australia Pty Ltd (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 2019a, *Caltex Calwell Service Station (Site ID 22176) Groundwater Monitoring Event Report November 2018 cnr Were St, & Webber Crescent, Calwell ACT*.
- WSP 2019b, *Caltex Calwell Service Station (Site ID 22176) Groundwater Monitoring Event Report December 2019 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 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 undertook a GME of seven on-site monitoring wells (MW01 to MW07). Elevated concentrations of TRH and BTEXN compounds exceeding adopted assessment criteria were identified in samples collected monitoring wells MW02 and MW07.

In November 2018 WSP undertook a GME of wells MW01 to MW07. 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, MW05 and MW07. Exceedances of nominated assessment criteria for TRH and BTEXN compounds

were recorded in samples collected from monitoring wells MW02 and MW07. No concentrations of TRH or BTEXN compounds were detected in wells MW01, MW03 and MW6.

In November 2019 WSP undertook a GME of wells MW01 to MW07. Results were consistent with those of the 2018 investigation, with elevated dissolved phase hydrocarbon concentrations above the LORs identified in samples collected from wells MW02, MW03, MW05, MW06 and MW07. Exceedances of nominated assessment criteria for TRH and BTEXN compounds were recorded in samples collected from monitoring wells MW02 and MW07. No concentrations of TRH or BTEXN compounds were detected in well MW01.

In October 2020, Caltex Australia Petroleum Pty Ltd changed their name to Ampol Australia Petroleum Pty Ltd.

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3 METHODOLOGY

3.1 SAMPLING METHODOLOGY

The sampling methodology adopted during the GME was grab sampling using Hydrasleeve™ no-purge 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 Australian Laboratory Services Pty Ltd (ALS) in Smithfield, and the secondary analytical laboratory was Eurofins Environment Testing Australia Pty Ltd (Eurofins) in Lane Cove 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 (QA01) and one inter-laboratory duplicate (QA01-A) 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 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 accompanied the shipment of samples during the entire journey from the preparing laboratory to the field sampling location and back to the analytical laboratory and was analysed for BTEXN and volatile TRH (C_6–C_{10}).

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 (NRMMC) 2011, *Australian Drinking Water Guidelines 6* (Version 3.3, Updated November 2016)
- NHMRC 2008, *Guidelines for Managing Risk in Recreational Waters*.

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 3.583 mBGL and 5.227 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 2 m and <4 m and 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 2-4 m (SAND)[1]	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	6,000	-	-
TRH >C_{10}–C_{16} less naphthalene (F2)	NL	NL	-	-
TRH C_{10}-C_{40} (Sum)	-	-	-	600
Benzene	5,000	5,000	950	950
Toluene	NL	NL	180[5]	300
Ethylbenzene	NL	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	NL	-	600
Naphthalene	NL	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 3.583 m below top of casing (BTOC) and 5.227 mBTOC. MW04 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 606.97 m Australian Height Datum (AHD) and 609.42 mAHD. Figure 3, Appendix A, shows the inferred groundwater contours and flow direction to the north/north-east.
Groundwater quality	The field parameters measured during the GME found the following: — Electrical conductivity measurements ranged from 231 µS/cm to 6,637 µS/cm, indicating fresh to brackish water. — Redox measurements ranged from 126 mV to 200 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 6.65 to 7.38, indicating circumneutral conditions. — Dissolved oxygen measurements ranged from 0.67 ppm to 1.66 ppm, indicating poorly oxygenated groundwater. — Temperature measurements ranged from 18.1°C to 20.6°C.

5.2 GROUNDWATER ANALYTICAL RESULTS

Dissolved phase hydrocarbon concentrations above the LORs were identified in groundwater samples collected from monitoring wells MW01, MW03, MW05 and MW07. 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 (µg/L)	MAXIMUM CONCENTRATION (µg/L)	SAMPLES EXCEEDING NOMINATED CRITERIA
TRH F1	<20	7,070	MW07
TRH F2	<100	830	NL
TRH $C_{10} - C_{40}$ (sum)	<100	1,000	MW07
Benzene	<1	551	None
Toluene	<2	83	None
Ethylbenzene	<2	2,090	MW07
Xylene (m + p)	<2	7,110	MW07
Xylene (o)	<2	93	None
Total xylene	<2	7,200	MW07
Naphthalene	<5	172	MW07
Lead	<1	<1	None
Ethanol	<50	<50	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 criteria, and HSL vapour intrusion screening criteria were identified in groundwater at the northern boundary of the site (MW07).

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

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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 3.583 mBTOC and 5.227 mBTOC.

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 northern portion of the site. Concentrations have dropped considerably since the last GME in September 2019. Standing groundwater levels have risen by approximately one metre over this time, which can result in decreases in hydrocarbon concentrations as significant inflow increases can dilute the contaminant plume.

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 of 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	**Incomplete:** Groundwater depth prevents physical access to potentially contaminated groundwater. No extraction of groundwater at the site is occurring.
	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 and so is unlikely to be impacted by potential contamination. Exceedances of relevant human health vapour intrusion screening criteria were recorded in monitoring MW07, 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	**Incomplete**: 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	**Incomplete:** 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.

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

where Ro is the primary sample and Rd 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.

No elevated RPDs were calculated, as all results were below the LORs.

One rinsate blank was collected and analysed for TRH and BTEXN compounds, lead and ethanol. No concentrations of BTEXN or TRH compounds or lead or ethanol were detected in the rinsate blank.

A trip blank was collected and analysed for TRH C_6-C_{10} and BTEXN compounds. No concentrations of TRH C_6-C_{10} or BTEXN compounds were detected in the trip blank.

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.

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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.
- Friebel, 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

Map: PS119811_F001_SiteLocation_r1v1

Author: TWilliamson

Date: 30/11/20

Approved by:

1:2,000

Data source: Google Earth 2015

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

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

Figure 1
Site location map

C:\Users\AUTW500241\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS119811_Caltex_ACT_ESA_20\MXD\02_Calwell\PS119811_F001_SiteLocation_r1v1.mxd

Ampol

www.wsp.com

TANK ID	CAPACITY (L)	PRODUCT
DEPOT 1	50,000	V95
DEPOT 2	50,000	ULP
DEPOT 3	40,000	ULP
DEPOT 4	40,000	V98
DEPOT 5	30,000	VDSL
DEPOT 6	30,000	VDSL
DEPOT 7	7,500	LPG AST

Map: PS119811_F002_SiteLayout_r1v2

Author: TWilliamson

Date: 4/12/2020

Approved by:

Data source: Google Earth 2015

1:500

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

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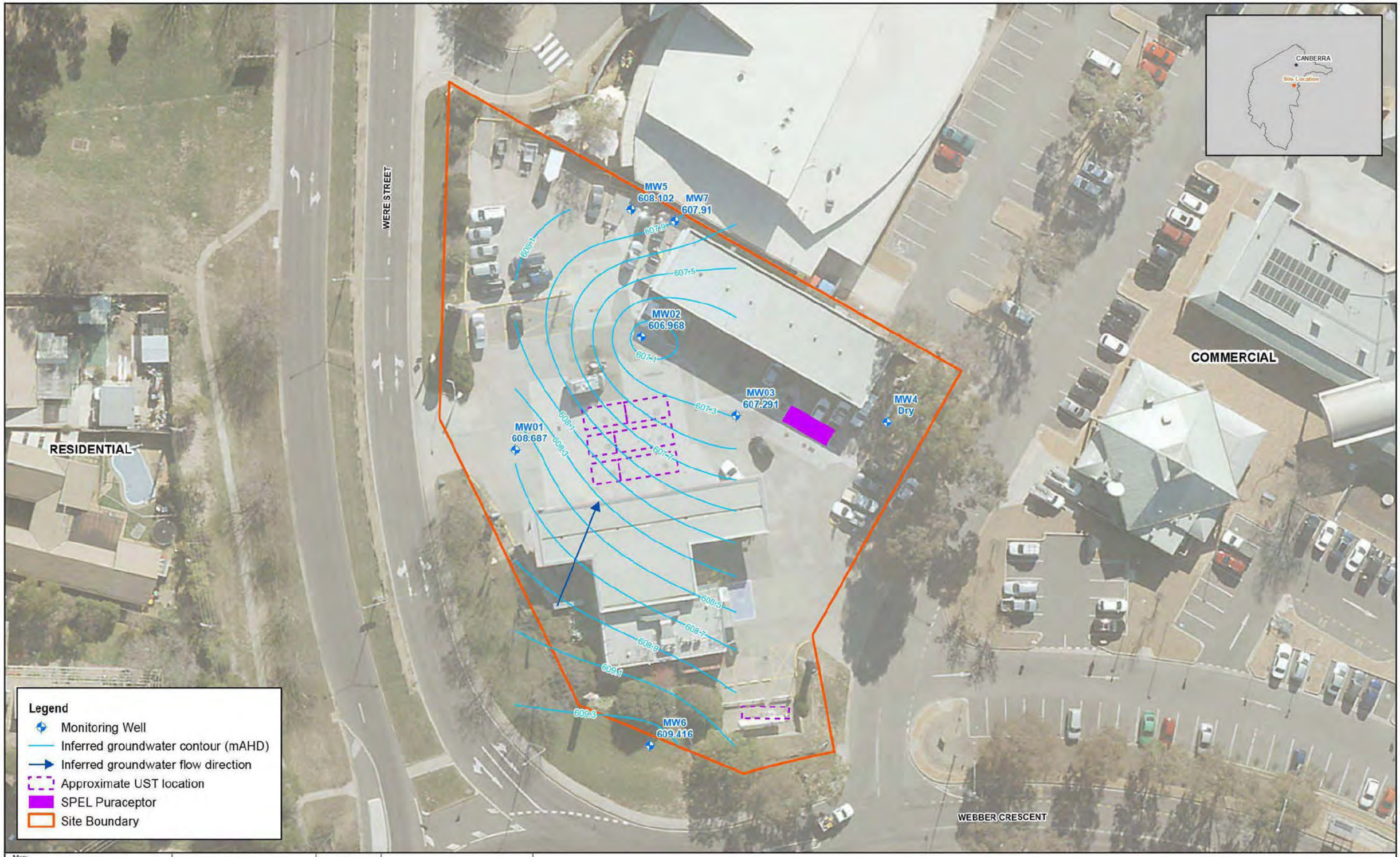
Caltex Calwell Service Station (Site ID: 22176)
1 Webber Crescent, Calwell ACT

Figure 2
Site Layout



Map: PS119811_F003_GroundwaterContours_r1v2	Author: TWilliamson		1:500
Date: 4/12/2020	Approved by:		Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
Data source: Google Earth 2015			

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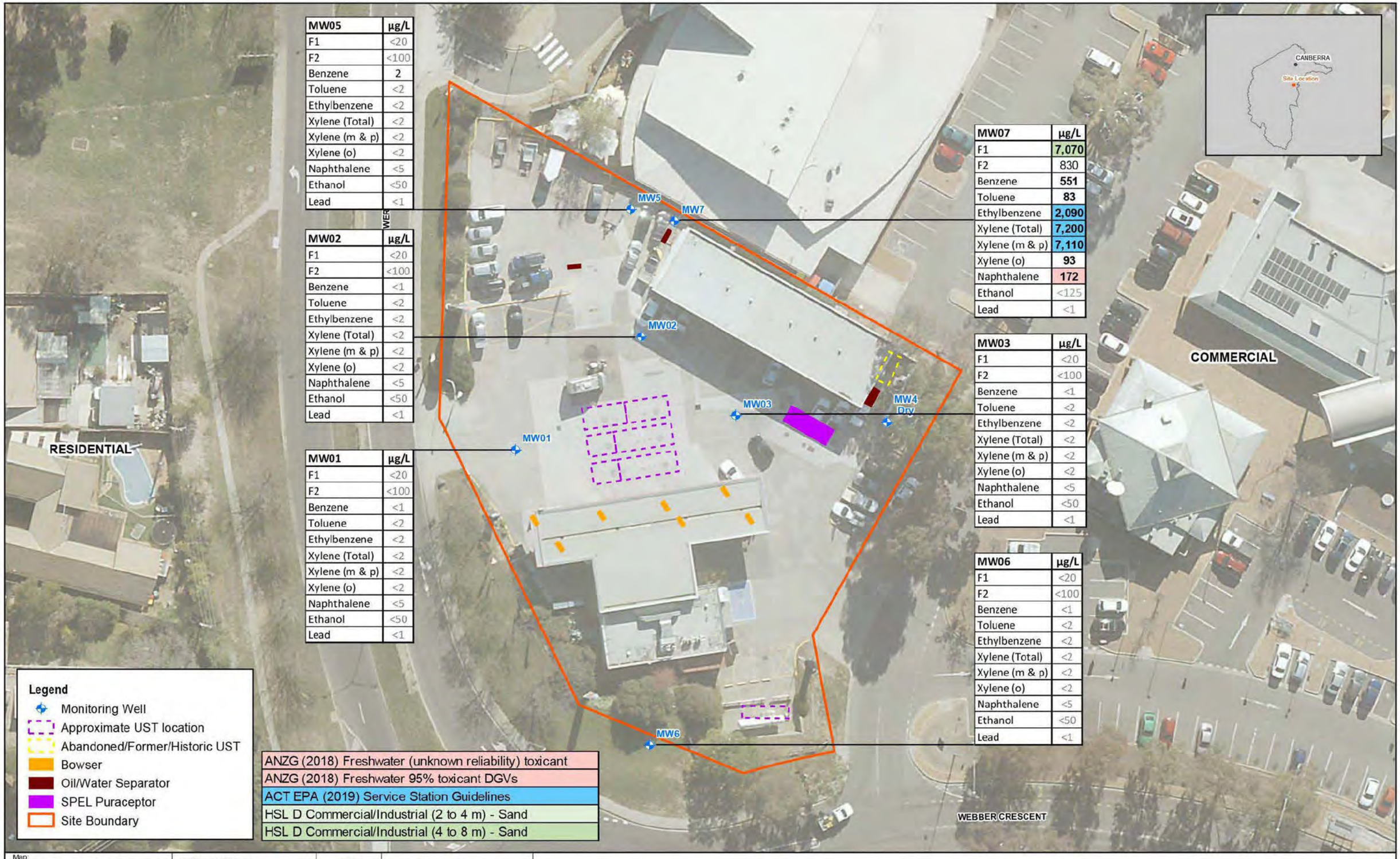
Caltex Calwell Service Station (Site ID: 22176)
1 Webber Crescent, Calwell ACT

Figure 3
Groundwater contour map (May 2020)



MW05	µg/L
F1	<20
F2	<100
Benzene	2
Toluene	<2
Ethylbenzene	<2
Xylene (Total)	<2
Xylene (m & p)	<2
Xylene (o)	<2
Naphthalene	<5
Ethanol	<50
Lead	<1

MW07	µg/L
F1	7,070
F2	830
Benzene	551
Toluene	83
Ethylbenzene	2,090
Xylene (Total)	7,200
Xylene (m & p)	7,110
Xylene (o)	93
Naphthalene	172
Ethanol	<125
Lead	<1

MW02	µg/L
F1	<20
F2	<100
Benzene	<1
Toluene	<2
Ethylbenzene	<2
Xylene (Total)	<2
Xylene (m & p)	<2
Xylene (o)	<2
Naphthalene	<5
Ethanol	<50
Lead	<1

MW03	µg/L
F1	<20
F2	<100
Benzene	<1
Toluene	<2
Ethylbenzene	<2
Xylene (Total)	<2
Xylene (m & p)	<2
Xylene (o)	<2
Naphthalene	<5
Ethanol	<50
Lead	<1

MW01	µg/L
F1	<20
F2	<100
Benzene	<1
Toluene	<2
Ethylbenzene	<2
Xylene (Total)	<2
Xylene (m & p)	<2
Xylene (o)	<2
Naphthalene	<5
Ethanol	<50
Lead	<1

MW06	µg/L
F1	<20
F2	<100
Benzene	<1
Toluene	<2
Ethylbenzene	<2
Xylene (Total)	<2
Xylene (m & p)	<2
Xylene (o)	<2
Naphthalene	<5
Ethanol	<50
Lead	<1

Legend

- Monitoring Well
- Approximate UST location
- Abandoned/Former/Historic UST
- Bowser
- Oil/Water Separator
- SPEL Puraceptor
- Site Boundary

ANZG (2018) Freshwater (unknown reliability) toxicant
ANZG (2018) Freshwater 95% toxicant DGVs
ACT EPA (2019) Service Station Guidelines
HSL D Commercial/Industrial (2 to 4 m) - Sand
HSL D Commercial/Industrial (4 to 8 m) - Sand

Map: PS119811_F004_GroundwaterImpacts_r1v2	Author: TWilliamson
Date: 4/12/2020	Approved by:

Data source: Google Earth 2015

0 5 10 m

1:500

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

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

Figure 4
Groundwater impact plan (Mayr 2020)

APPENDIX B

ANALYTICAL RESULTS

Table B1 - Groundwater Gauging Data
Ampol Calwell (22176)

Well ID	Gauging Date	T.O.C Elevation (mAHD)	Easting	Northing	Well Depth (mBTOC)	Depth to Water (mBTOC)	Depth to LNAPL (mBTOC)	Apparent LNAPL Thickness (m)	Corrected Water Elevation (mAHD)
MW01	08-05-20	612.27	691742.921	6076711.183	10.67	4.873	-	-	607.40
MW02	08-05-20	612.195	691760.79	6076727.213	14.10	6.200	-	-	606.00
MW03	08-05-20	612.139	691774.237	6076716.064	18.01	5.766	-	-	606.37
MW4	08-05-20	612.161	691795.739	6076715.095	2.74	Dry	-	-	-
MW5	08-05-20	612.15	691759.326	6076745.316	5.90	4.471	-	-	607.68
MW6	08-05-20	614.591	691761.992	6076669.177	6.87	6.072	-	-	608.52
MW7	08-05-20	612.16	691765.537	6076743.652	6.06	4.791	-	-	607.37

mAHD = metres Australian Height Datum
mBTOC = metres below top of casing

Table B1 - Groundwater Gauging Data
Ampol Calwell (22176)

Well ID	Gauging Date	T.O.C Elevation (mAHD)	Easting	Northing	Well Depth (mBTOC)	Depth to Water (mBTOC)	Depth to LNAPL (mBTOC)	Apparent LNAPL Thickness (m)	Corrected Water Elevation (mAHD)
MW01	12-11-20	612.27	691742.921	6076711.183	10.72	3.583	-	-	608.69
MW02	12-11-20	612.195	691760.79	6076727.213	14.16	5.227	-	-	606.97
MW03	12-11-20	612.139	691774.237	6076716.064	18.05	4.848	-	-	607.29
MW04	12-11-20	612.161	691795.739	6076715.095	2.80	Dry	-	-	-
MW05	12-11-20	612.15	691759.326	6076745.316	5.94	4.048	-	-	608.10
MW06	12-11-20	614.591	691761.992	6076669.177	6.88	5.175	-	-	609.42
MW07	12-11-20	612.16	691765.537	6076743.652	6.05	4.250	-	-	607.91

mAHD = metres Australian Height Datum
mBTOC = metres below top of casing

Well ID	Gauging Date	pH	Temperature (°C)	Electrical Conductivity (us/cm)	Redox Potential (mV) *	Dissolved Oxygen (ppm)	Additional Comments
MW01	12-11-20	7.21	20.1	1450	195.1	1.18	Clear, black speckles, low turbifity, no hydrocarbon odour or sheen
MW02	12-11-20	7.38	19	365.1	189	1.56	Clear, low turbidity, weak hydrocarbon odour, no sheen
MW03	12-11-20	6.94	20.6	230.9	191.7	0.94	Clear, black speckles, low turbifity, no hydrocarbon odour or sheen
MW04	12-11-20	-					Well not sampled - blocked
MW05	12-11-20	7.01	19	376.2	152.6	0.67	Clear, low turbidity, no hydrocarbon odour or sheen
MW06	12-11-20	6.89	19.2	6637	200	1.66	Clear, low turbidity, no hydrocarbon odour or sheen
MW07	12-11-20	6.65	18.1	589	125.9	0.91	Clear, low turbidity, 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		20	20	100	100	100	100	100	1	2	2	2	2	2	1	5	1	50
ANZG (2018) Freshwater (unknown reliability) toxicant										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 (2 to 4 m) - Sand			6,000		NL				5,000	NL	NL			NL		NL		
HSL D Commercial/Industrial (4 to 8 m) - Sand			6,000		NL				5,000	NL	NL			NL		NL		
Field ID	**Date**																	
MW01	12-11-20	<20	<20	<100	<100	160	<100	160	<1	<2	<2	<2	<2	<2	<1	<5	<1	<50
MW02	12-11-20	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<1	<50
MW03	12-11-20	<20	<20	<100	<100	140	<100	140	<1	<2	<2	<2	<2	<2	<1	<5	<1	<50
MW05	12-11-20	<20	<20	<100	<100	100	<100	100	2	<2	<2	<2	<2	<2	2	<5	<1	<50
MW06	12-11-20	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<1	<5	<1	<50
MW07	12-11-20	17,000	7,070	1,000	830	<100	<500	1,000	551	83	2,090	7,110	93	7,200	9,930	172	<1	<125

Notes

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

APPENDIX C

QA/QC

	TRH NEPM (2013)				BTEXN						Metals	Alcohols
	C6-C10	C10 - C16	C16 - 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	100	100	100	1	2	2	2	2	5	1	50
Field ID												
MW02	<20	<100	<100	<100	<1	<2	<2	<2	<2	<5	<1	<50
QA01	<20	<100	<100	<100	<1	<2	<2	<2	<2	<5	<1	<50
RPD	-	-	-	-	-	-	-	-	-	-	-	-
MW02	<20	<100	<100	<100	<1	<2	<2	<2	<2	<5	<1	<50
QA01A	<20	<50	<100	<100	<1	<1	<1	<2	<1	<10	<1	<50
RPD	-	-	-	-	-	-	-	-	-	-	-	-

***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.**

Table C2 - Rinsate Blank and Trip Blank Results
Caltex Calwell (22176)

		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
EQL		20	20	100	100	100	100	100	1	2	2	2	2	2	5	1	50
Field ID	**Date**																
RB01	12-11-20	<20	<20	<100	<100	<100	<100	<100	<1	<2	<2	<2	<2	<2	<5	<1	<50
TB01	12-11-20	<20	<20	-	-	-	-	-	<1	<2	<2	<2	<2	<2	<5	-	-

APPENDIX D

LABORATORY DOCUMENTS

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE: 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: amosa@alsglobal.com

BRISBANE: 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE: 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5630 E: gladstone@alsglobal.com

MACKAY: 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE: 24 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE: 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE: 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA: 4/10 Bowy Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH: 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

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

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

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

CLIENT: WSP	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle):** Custody Seal Intact: Yes / No / N/A
OFFICE:		☐ Non Standard or urgent TAT (List due date):	Free ice/gel evidence on ice in proper condition upon receipt: Yes / No / N/A
PROJECT: PS119811 - Ampol Calwell	**ALS QUOTE NO.:** EN/008/20	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	Other comments:
PROJECT MANAGER: Kate Dean	**CONTACT PH:** [redacted]		
SAMPLER: Kate Dean	**SAMPLER MOBILE:** [redacted]	**RELINQUISHED BY:** Kate Dean	**RECEIVED BY:** [redacted]
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):** Esdat and PDF	DATE/TIME:	DATE/TIME: 17/12/20 11:05
Email Reports to: [redacted]@wsp.com		**RELINQUISHED BY:**	**RECEIVED BY:**
Email Invoice to (will default to PM if no other addresses are listed): [redacted]@wsp.com		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Subcon / Forward Lab / Split WO QAQA + QAQA
Lab Received By / Date: Evelyn
Organised By / Date:
Relinquished By / Courier:
Courier / Courier:
WO No:
Attach By PO / Internal:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)						
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	W-4 (TRH C6-C40 & BTEXN)	vTRH & BTEXN	Lead	Ethanol			Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
2	MW02	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
3	MW03	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
4	SNR MW04	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
5	MW05	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
6	MW06	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
7	MW07	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
8	TB01	11/12/2020	W	1 vial	1		X					
9	RB01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
U	QA01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
X	QA01A	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			Please forward to Eurofins for secondary analysis
				TOTAL	61	12	1					

Environmental Division
Sydney
Work Order Reference
ES2040596

Telephone : +61-2-8784 8555

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

Out of scope

UPDATED COC

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 4971 9500 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

ORANGE 10 Warne Place North Orange NSW 2800 Ph: 02 6418 0500 E: orange@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

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

TOWNSVILLE 14-16 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: samples.townsville@alsglobal.com

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

CLIENT: WSP	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: [redacted]		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / N/A
PROJECT: PS119811 - Ampol Calwell	ALS QUOTE NO.: EN/008/20	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Free ice / frozen ice packs present upon receipt? Yes / No
ORDER NUMBER:		OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Kate Dean	CONTACT PH [redacted]		Other comments:
SAMPLER: Kate Dean	SAMPLER MOBILE [redacted]		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat and PDF		
Email Reports to: [redacted]@wsp.com			
Email Invoice to (will default to PM if no other addresses are listed) [redacted]@wsp.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Kate Dean	[redacted]		
DATE/TIME:	DATE/TIME: 9/11/20 1500	DATE/TIME	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY — SAMPLE DETAILS MATRIX: SOLID (S) WATER (W) — CONTAINER INFORMATION

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	W-4 (TRH C6-C40 & BTEXN)	vTRH & BTEXN	Lead	Ethanol				Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
2	MW02	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
3	MW03	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
5	MW05	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
6	MW06	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
7	MW07	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
8	TB01	12/11/2020	W	1 vial	1		X						
9	RB01	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
12	QA01	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				
–	QA01A	12/11/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X				Please forward to Eurofins for secondary analysis
				TOTAL	55	12	1						

Environmental Division Sydney
Work Order Reference
ES2040596

Telephone : +61-2-8784 8555

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

eurofins | Environment Testing

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NATA # 1261
Site # 23736

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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	WSP Australia P/L NSW	**Order No.:**	**Received:** Nov 20, 2020 5:20 PM
Address:	Level 27, Ernst & Young Centre Sydney NSW 2001	**Report #:** 758183 **Phone:** 02 9272 5586 **Fax:** 02 9272 5101	**Due:** Nov 27, 2020 **Priority:** 5 Day **Contact Name:** Kate Dean
Project Name:	AMPOL CALWELL		
Project ID:	PS119811		

Eurofins Analytical Services Manager : Alena Bounkeua

Sample Detail						Ethanol	Lead	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271						X		
Sydney Laboratory - NATA Site # 18217							X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	QA01A	Nov 11, 2020		Water	S20-No35376	X	X	X
Test Counts						1	1	1

WSP Australia P/L NSW
Level 27, Ernst & Young Centre
Sydney
NSW 2001

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Kate Dean**

Report **758183-W**
Project name AMPOL CALWELL
Project ID PS119811
Received Date Nov 20, 2020

Client Sample ID			**QA01A**
Sample Matrix			**Water**
Eurofins Sample No.			**S20-No35376**
Date Sampled			**Nov 11, 2020**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
Alcohols			
Ethanol	0.05	mg/L	< 0.05
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	108
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Heavy Metals			
Lead	0.001	mg/L	< 0.001

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Nov 20, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Nov 20, 2020	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 20, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 20, 2020	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Alcohols	Melbourne	Nov 24, 2020	14 Days
- Method: LTM-ORG-2260 Determination of Alcohols in Water and Soil by Headspace GC-MS			
Heavy Metals	Sydney	Nov 21, 2020	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

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NATA # 1261
Site # 1254 & 14271

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NATA # 1261 Site # 18217

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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: WSP Australia P/L NSW
Address: Level 27, Ernst & Young Centre
Sydney
NSW 2001

Project Name: AMPOL CALWELL
Project ID: PS119811

Order No.:
Report #: 758183
Phone: 02 9272 5586
Fax: 02 9272 5101

Received: Nov 20, 2020 5:20 PM
Due: Nov 27, 2020
Priority: 5 Day
Contact Name: Kate Dean

Eurofins Analytical Services Manager : Alena Bounkeua

Sample Detail						Ethanol	Lead	Eurofins Suite B1
Melbourne Laboratory - NATA Site # 1254 & 14271						X		
Sydney Laboratory - NATA Site # 18217							X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	QA01A	Nov 11, 2020		Water	S20-No35376	X	X	X
Test Counts						1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
Alcohols							
Ethanol	mg/L	< 0.05			0.05	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Lead	mg/L	< 0.001			0.001	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	104			70-130	Pass	
TRH C10-C14	%	75			70-130	Pass	
LCS - % Recovery							
Alcohols							
Ethanol	%	102			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	81			70-130	Pass	
Toluene	%	81			70-130	Pass	
Ethylbenzene	%	84			70-130	Pass	
m&p-Xylenes	%	86			70-130	Pass	
o-Xylene	%	85			70-130	Pass	
Xylenes - Total*	%	86			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	93			70-130	Pass	
TRH C6-C10	%	109			70-130	Pass	
TRH >C10-C16	%	71			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Lead	%	102			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S20-No22239	NCP	%	103			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S20-No22239	NCP	%	103			70-130	Pass	
Toluene	S20-No22239	NCP	%	107			70-130	Pass	
Ethylbenzene	S20-No22239	NCP	%	105			70-130	Pass	
m&p-Xylenes	S20-No22239	NCP	%	104			70-130	Pass	
o-Xylene	S20-No22239	NCP	%	106			70-130	Pass	
Xylenes - Total*	S20-No22239	NCP	%	105			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S20-No22239	NCP	%	97			70-130	Pass	
TRH C6-C10	S20-No22239	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	S20-No37430	NCP	%	81			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S20-No22238	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S20-No37378	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S20-No37378	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S20-No37378	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S20-No22238	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S20-No22238	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S20-No22238	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S20-No22238	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S20-No22238	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S20-No22238	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S20-No22238	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S20-No22238	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	S20-No37378	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S20-No37378	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S20-No37378	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S20-No35376	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	N/A
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Asim Khan	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)
Vivian Wang	Senior Analyst-Volatile (VIC)

Sch 2.2(a)(ii)

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

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

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

CLIENT: WSP	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☒ Standard TAT (List due date):
OFFICE:		☐ Non Standard or urgent TAT (List due date):
PROJECT: PS119811 - Ampol Caltex	ALS QUOTE NO.: EN/008/20	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:		OF: 1 2 3 4 5 6 7
PROJECT MANAGER: Kate Dean	CONTACT PH: Sch 2.2(a)(ii)	
SAMPLER: Kate Dean	SAMPLER MOBILE: Sch 2.2(a)(ii)	
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat and PDF	
Email Reports to: Sch 2.2(a)(ii)@wsp.com		
Email Invoice to (will default to PM if no other addresses are listed) Sch 2.2(a)(ii)@wsp.com		

FOR LABORATORY USE ONLY (Circle)			
Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Kate Dean	Sch 2.2(a)(ii)		
DATE/TIME:	DATE/TIME: 11/12/20 11:08	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Sydney / Forward Lab / Split WO QA01A + ~~QA01A~~ → Eurofins

Organised By / Date:

Relinquished By / Date:

Courier / Courier:

WO No:

Attach by PO / Internal

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	W-4 (TRH C6-C40 & BTEXN)	vTRH & BTEXN	Lead	Ethanol			
1	MW01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
2	MW02	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
3	MW03	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
4	MW04	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
5	MW05	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
6	MW06	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
7	MW07	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
8	TB01	11/12/2020	W	1 vial	1		X					
9	RB01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
10	QA01	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
X	QA01A	11/12/2020	W	4 vials, 1 amber, 1 plastic	6	X		X	X			
				TOTAL	61	12	1					

Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

Environmental Division Sydney

Work Order Reference

Sch 2.2(a)(ii)

Telephone : + 61-2-8784 8555

Please forward to Eurofins for secondary analysis

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

Rcvd 14/12/2020 10.50c 758183

Out of scope

eurofins | Environment Testing

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IANZ # 1290

Sample Receipt Advice

Company name:	WSP Australia P/L NSW
Contact name:	Kate Dean
Project name:	AMPOL CALWELL
Project ID:	PS119811
Turnaround time:	5 Day
Date/Time received	Nov 20, 2020 5:20 PM
Eurofins reference	758183

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	Sample Temperature of a random sample selected from the batch as recorded by Eurofins Sample Receipt : 10.5 degrees Celsius.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
X	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Alena Bounkeua on phone : or by email: AlenaBounkeua@eurofins.com

Results will be delivered electronically via email to Kate Dean - kate.dean@wsp.com.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2040596**	Page	: 1 of 5
Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: KATE DEAN	Contact	: Grace White
Address	: Level 1, 121 Marcus Clarke street Canberra, ACT Australia 2600	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: PS119811 - Ampol Calwell	Date Samples Received	: 17-Nov-2020 11:05
Order number	: ----	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: ----	Issue Date	: 24-Nov-2020 14:28
Sampler	: KATE DEAN		
Site	: ----		
Quote number	: EN/008/20		
No. of samples received	: 13		
No. of samples analysed	: 9		

ilac-MRA NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP117: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW01	MW02	MW03	MW05	MW06
				Sampling date / time	12-Nov-2020 00:00	12-Nov-2020 00:00	12-Nov-2020 00:00	12-Nov-2020 00:00	12-Nov-2020 00:00
Compound	CAS Number	LOR	Unit		ES2040596-001	ES2040596-002	ES2040596-003	ES2040596-005	ES2040596-006
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS									
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		100	<50	60	60	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		100	<50	60	60	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		160	<100	140	100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		160	<100	140	100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	2	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	2	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP117: Alcohols									
Ethanol	64-17-5	50	µg/L		<50	<50	<50	<50	<50
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		99.9	99.0	95.2	111	100
Toluene-D8	2037-26-5	2	%		100.0	97.7	99.4	108	101
4-Bromofluorobenzene	460-00-4	2	%		99.9	102	104	104	106

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW07	TB01	RB01	QA01	----
				Sampling date / time	12-Nov-2020 00:00	12-Nov-2020 00:00	12-Nov-2020 00:00	12-Nov-2020 00:00	----
Compound	CAS Number	LOR	Unit		ES2040596-007	ES2040596-008	ES2040596-009	ES2040596-010	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS									
Lead	7439-92-1	0.001	mg/L		<0.001	----	<0.001	<0.001	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		15600	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		2560	----	<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		2560	----	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		17000	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		7070	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		1000	----	<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		1000	----	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		830	----	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		551	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		83	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		2090	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		7110	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		93	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		7200	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		9930	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		172	<5	<5	<5	----
EP117: Alcohols									
Ethanol	64-17-5	50	µg/L		<125	----	<50	<50	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		107	109	110	89.9	----
Toluene-D8	2037-26-5	2	%		107	107	107	98.4	----
4-Bromofluorobenzene	460-00-4	2	%		104	103	103	98.1	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) 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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2040596**	Page	: 1 of 5
Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: KATE DEAN	Contact	: Grace White
Address	: Level 1, 121 Marcus Clarke street Canberra, ACT Australia 2600	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: PS119811 - Ampol Calwell	Date Samples Received	: 17-Nov-2020
Order number	: ----	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: ----	Issue Date	: 24-Nov-2020
Sampler	: KATE DEAN		
Site	: ----		
Quote number	: EN/008/20		
No. of samples received	: 13		
No. of samples analysed	: 9		

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

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

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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

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**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3376531)									
ES2040596-001	MW01	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
ES2040684-001	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3374932)									
ES2040576-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2040596-009	RB01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3374932)									
ES2040576-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2040596-009	RB01	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3374932)									
ES2040576-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES2040596-009	RB01	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EP117: Alcohols (QC Lot: 3373210)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP117: Alcohols (QC Lot: 3373210) - continued									
EB2030209-005	Anonymous	EP117: Ethanol	64-17-5	50	µg/L	726	773	6.28	0% - 50%
ES2040596-009	RB01	EP117: Ethanol	64-17-5	50	µg/L	<50	<50	0.00	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**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3376531)								
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.5	83.0	111
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3372211)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	72.5	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	102	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	109	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3374932)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	91.1	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3372211)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	76.2	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	98.6	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	106	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3374932)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	94.7	75.0	127
EP080: BTEXN (QCLot: 3374932)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	91.5	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	93.8	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	102	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	93.0	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	100	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	90.3	70.0	120
EP117: Alcohols (QCLot: 3373210)								
EP117: Ethanol	64-17-5	50	µg/L	<50	100 µg/L	101	77.0	117

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	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3376531)							
ES2040596-002	MW02	EG020A-F: Lead	7439-92-1	1 mg/L	89.5	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3374932)							
ES2040576-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	123	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3374932)							
ES2040576-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	123	70.0	130
EP080: BTEXN (QCLot: 3374932)							
ES2040576-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.5	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	97.1	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	103	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.0	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	101	70.0	130
EP117: Alcohols (QCLot: 3373210)							
EB2030209-006	Anonymous	EP117: Ethanol	64-17-5	100 µg/L	79.0	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2040596**	Page	: 1 of 5
Client	: **WSP Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: KATE DEAN	Telephone	: +61 2 8784 8555
Project	: PS119811 - Ampol Calwell	Date Samples Received	: 17-Nov-2020
Site	: ----	Issue Date	: 24-Nov-2020
Sampler	: KATE DEAN	No. of samples received	: 13
Order number	: ----	No. of samples analysed	: 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing 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 / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
MW01, MW02, MW03, MW05, MW06, MW07, RB01, QA01	**12-Nov-2020**	----	----	----	**23-Nov-2020**	11-May-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
MW01, MW02, MW03, MW05, MW06, MW07, RB01, QA01	**12-Nov-2020**	**19-Nov-2020**	19-Nov-2020	✓	**21-Nov-2020**	29-Dec-2020	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MW01, MW02, MW03, MW05, MW06, MW07, TB01, RB01, QA01	**12-Nov-2020**	**21-Nov-2020**	26-Nov-2020	✓	**21-Nov-2020**	26-Nov-2020	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
MW01,	MW02,	**12-Nov-2020**	**19-Nov-2020**	19-Nov-2020	✓	**21-Nov-2020**	29-Dec-2020	✓
MW03,	MW05,							
MW06,	MW07,							
RB01,	QA01							
Amber VOC Vial - Sulfuric Acid (EP080)								
MW01,	MW02,	**12-Nov-2020**	**21-Nov-2020**	26-Nov-2020	✓	**21-Nov-2020**	26-Nov-2020	✓
MW03,	MW05,							
MW06,	MW07,							
TB01,	RB01,							
QA01								
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)								
MW01,	MW02,	**12-Nov-2020**	**21-Nov-2020**	26-Nov-2020	✓	**21-Nov-2020**	26-Nov-2020	✓
MW03,	MW05,							
MW06,	MW07,							
TB01,	RB01,							
QA01								
EP117: Alcohols								
Amber VOC Vial - Sulfuric Acid (EP117)								
MW01,	MW02,	**12-Nov-2020**	----	----	----	**19-Nov-2020**	26-Nov-2020	✓
MW03,	MW05,							
MW06,	MW07,							
RB01,	QA01							

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(were) 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	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alcohols by HS-GC-MS	EP117	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alcohols by HS-GC-MS	EP117	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Alcohols by HS-GC-MS	EP117	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm 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	In house: Referenced to USEPA SW 846 - 8015 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 Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 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 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	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM 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 purging.

APPENDIX E

CALIBRATION CERTIFICATES

Gas Calibration Certificate

Instrument MX6
Serial No. 18081MX-007
Sensors LEL, O2

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
			Low	**High**	**TWA**	**STEL**
Sensor	LEL	✓	5.0%	10.0%		
	O2	✓	19.5%	23.5%		
Alarms	Beeper	✓				
	Settings	✓				
Software	Version					
Datalogger	Operation					
Download	Operation					
Other tests:						

Certificate of Calibration

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

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
LEL		50% LEL Methane	NATA	SY327	47%
O2		20.90%		Fresh Air	20.90%
O2					

Calibrated by: **Darcy Keogh**

Calibration date: **05-Nov-20**

Next calibration due: **04-May-21**

Oil / Water Interface Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument Geotech Interface Meter (30M)
Serial No. 3969

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	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: Darcy Keogh

Calibration date: 5/11/2020

Next calibration due: 4/01/2021

APPENDIX F

LIMITATIONS STATEMENT

LIMITATIONS

This Report is provided by WSP Australia Pt Limited (*WSP*) for Ampol Australia Petroleum Pty Ltd (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 31 March 2018 and agreement with the Client 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*).

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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 conditions 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 service 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 warrant, expressed or implied, is made.

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DRAFT