2021-2022 Groundwater and Surface Water Monitoring Report

Camden Gas Project

Prepared for AGL Upstream Investments Pty Ltd

September 2022

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E220575 RP1

September 2022

Version	Date	Prepared by	Approved by	Comments
1	26 August 2022	Kaitlyn Brodie	Nicola Fry	Draft
2	13 September 2022	Kaitlyn Brodie	Nicola Fry	Final

Approved by

Nicola Fry
Associate Hydrogeologist
13 September 2022

Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

Executive Summary

AGL Upstream Investments Pty Ltd (AGL) owns and operates the Camden Gas Project (CGP) located in the Macarthur region, 65 kilometres (km) southwest of Sydney, NSW. The CGP has been producing natural gas from coal seams for the Sydney region since 2001 and currently consists of 144 gas wells (of which, 61 were operational as of 30 June 2021). The target coal seams are the Bulli and Balgownie Coal Seams within the Illawarra Coal Measures at depths of approximately 550–700 metres below ground level (mbgl).

The 2021-2022 CGP groundwater monitoring network comprises two nested monitoring sites (seven monitoring bores) targeting the alluvium near the Nepean River, the Ashfield Shale, and the Hawkesbury Sandstone overlying the target coal seams: Menangle Park (monitored since June 2013) and Glenlee (monitored since February 2014). Groundwater levels have been recorded at six-hourly intervals and water quality data have been collected on a six-monthly basis during the monitoring year.

Previously, there was an additional nested monitoring site at Denham Court (RMB01, RMB02, RMB03, RMB04, monitored from 2011 to 2016) with four monitoring bores. All bores at the Denham Court site were decommissioned in October 2016 at the landowner's request, with the final water quality monitoring undertaken at this site in April 2016 and groundwater level data available until October 2016. The Denham Court site was located 12 km from the CGP and acted as a control or background monitoring location.

Surface water is monitored at one monitoring location along the Nepean River next to the Menangle Park site for both surface water quality and water level. River levels have been recorded at three-hourly intervals and water quality data have been collected on two occasions during the 2021/22 monitoring year.

This report presents an assessment of water level and water quality data from the groundwater monitoring network and from the Nepean River for the period up to 30 June 2022, with an emphasis on data obtained during the past 12 months.

The groundwater level in the Nepean River alluvium is shallow and shows a direct response to rainfall and flood events (when occurring). Groundwater levels are shallow (approximately 8 mbgl to 15 mbgl) and follow similar trends in each of the screened Hawkesbury Sandstone water bearing zones (defined as upper, middle, and lower). There is no apparent response to individual rainfall events over the monitoring period at the Glenlee site, while a clear response to rainfall events can be observed at the Menangle Park site. The recorded groundwater levels, during the 2021/22 monitoring year, were overall comparable to groundwater levels recorded during previous monitoring years and consistent with the climatic variations at the Menangle Park site. A slight downward trend in groundwater levels can be observed at the Glenlee site; this is interpreted to not necessarily be representative of true groundwater levels and responses and may be influenced by water chemistry changes and carbonate precipitation within the bore. More data is needed to determine the cause of the downward trend.

Groundwater sampled from the alluvium at the Menangle Park site is fresh to marginally brackish, and generally has low dissolved metal concentrations. Groundwater sampled from the Hawkesbury Sandstone is fresh to marginally brackish at the Menangle Park site, while brackish to slightly saline at the Glenlee site. Dissolved metal concentrations in the Hawkesbury Sandstone are generally low and minor detections of hydrocarbons were reported in the lower Hawkesbury Sandstone at the two monitoring sites. Dissolved methane was detected at all monitoring bores, although concentrations at the Menangle Park were comparable to the former control site at Denham Court (sampled in previous monitoring years). Low concentrations of dissolved ethane were reported at the Glenlee site, and toluene was detected at the Menangle Park lower Hawkesbury Sandstone monitoring bore.

Overall, groundwater quality during the 2021/22 monitoring year was generally comparable to that measured during previous monitoring years, except for GLMB03. GLMB03 was remediated in October 2021 to address changes in water quality, including increased pH, precipitation of calcium carbonate and lower sampling yields. The changes were associated with naturally occurring gases and attributed to natural causes.

Based on assessment of the available data, there are no observable impacts to groundwater levels or quality that could be attributable to the CSG operations. There is also no evidence of connectivity between the shallower monitored zones and the coal seams. This corroborates the conceptual model (Parsons Brinckerhoff 2011) indicating the presence of extensive and thick claystone formations (aquitards and aquicludes) between the Hawkesbury Sandstone and coal seams restricts upward depressurisation and impedes the vertical flow of groundwater.

TABLE OF CONTENTS

Appendices

Tables

Figures

1 Introduction

1.1 Background

AGL Upstream Investments Pty Ltd (AGL) owns and operates the Camden Gas Project (CGP) located in the Macarthur region, 65 kilometres (km) southwest of Sydney, NSW. The CGP has been producing natural gas from coal seams for the Sydney region since 2001 and currently consists of 144 gas wells (of which, 44 were operational on 30 June 2022) within the Stage 1 and Stage 2 areas (Figure 1.1). The target coal seams are the Bulli and Balgownie Coal Seams within the Illawarra Coal Measures at depths of approximately 550–700 metres below ground level (mbgl).

EMM Consulting Pty Limited (EMM) was engaged by AGL to compile groundwater and surface water monitoring results collected between 1 July 2021 and 30 June 2022 (the 2021/22 monitoring year) and to analyse with reference to the CGP activities. Installation of a dedicated water monitoring network of 11 monitoring bores occurred between October 2011 and February 2014. The current groundwater monitoring network comprises seven dedicated monitoring bores in the alluvium, the Ashfield Shale, and the Hawkesbury Sandstone. The collection of groundwater level and groundwater quality data commenced in October 2011. Groundwater levels have been recorded at six-hourly intervals and, following one initial sample in November 2011, water quality data were collected on a quarterly basis between May 2013 and April 2015 and on a six-monthly basis from April 2015 onwards. In addition, one surface water monitoring location has been sampled for water quality on two occasions during the 2021/22 monitoring year.

This report contains an evaluation of the data obtained during the 2021/22 monitoring year, with comparison to the data obtained during the previous monitoring years (EMM 2021b, 2020b, 2019b, 2018b 2017b, and 2016; Parsons Brinckerhoff 2012, 2013a, 2014a, 2014b and 2015e).

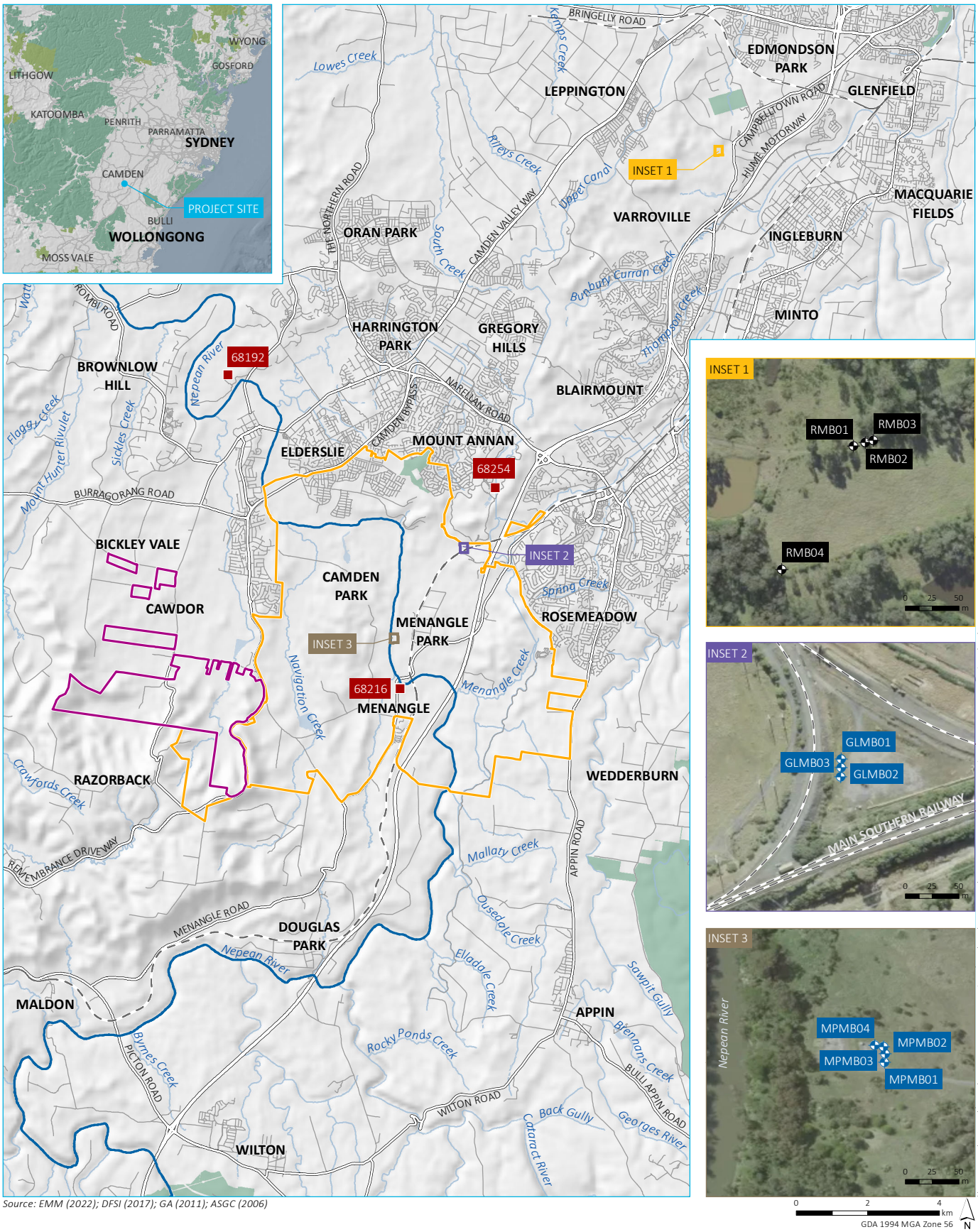
Monitoring was undertaken at two sites within the CGP during the 2021/22 monitoring year: Menangle Park and Glenlee (Figure 1.1). During previous monitoring years there was an additional nested monitoring site at Denham Court (monitored from 2011 to 2016) with four monitoring bores (RMB01, RMB02, RMB03, RMB04). All bores at the Denham Court site were decommissioned in October 2016 at the landowners' request with the final water quality monitoring undertaken at this site in April 2016 and groundwater level data available until October 2016. Denham Court was located 12 km from the CGP and acted as a control and background monitoring location (Figure 1.1).

The objective of the ongoing groundwater monitoring program is to provide water levels and water quality attributes for each of the monitored groundwater systems of the region, in areas within (and previously in areas also distant from) the currently operating CGP.

1.2 Scope of works for the 2021/22 monitoring program

This report presents and interprets groundwater level and groundwater quality data collected since monitoring began at each of the established sites, with emphasis on the data obtained during the 2021/22 monitoring year. The scope of works was to:

- conduct groundwater monitoring, including six-hourly groundwater level measurements and two groundwater quality sampling events (November 2021 and April 2022) testing for field parameters, major cations and anions, dissolved metals, nutrients, dissolved methane and other hydrocarbons;
- conduct surface water quality sampling events (November 2021 and April 2022) at one location (the Nepean River near the Menangle Park site as shown on Figure 1.1);
- analyse and interpret water level and water quality results with reference to the conceptual model, where relevant; and
- establish whether there are any observable impacts from coal seam gas (CSG) activities within the shallow aquifers.



Source: EMM (2022); DFSI (2017); GA (2011); ASGC (2006)

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KEY

- Camden Gas Project Stage 1
- Camden Gas Project Stage 2
- Nepean River
- BOM weather station
- Groundwater monitoring bore
- Decommissioned groundwater monitoring bore
- Rail line
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve

Groundwater monitoring locations

AGL Camden Gas Project
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Figure 1.1

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2 Site characterisation

2.1 Rainfall

The nearest Bureau of Meteorology (BoM) weather station with consistent historical climate measurements is located at Camden airport (BoM site number 68192), approximately 2.5 km northwest of the Stage 2 area (Figure 1.1). Mean temperatures at Camden airport range from 17.4°C in July to 29.7°C in January (based on records from 1971 to 2022). The average annual rainfall is 796.6 millimetres (mm) (based on records from 1972 to 2022). On average, September receives the least rain, with a mean rainfall of 38.1 mm, while March receives the most rain, with a mean rainfall of 105.1 mm (BoM 2022).

The long-term, annual cumulative deviation from mean (CDFM) rainfall for Camden airport is plotted in Figure 2.1 Annual rainfall data for BoM site number 68216 (located approximately 10 km southeast from the Camden airport 68192 station) is presented from 2009 onwards as recent rainfall records at Camden airport are incomplete. The long-term CDFM is generated by subtracting the long-term average annual rainfall for the recorded period from the actual annual rainfall and then accumulating these residuals over the assessment period. Periods of below average rainfall are represented as downward trending slopes while periods of above average rainfall are represented as upward trending slopes.

The cumulative deviation plot (Figure 2.1) shows a relatively wet period between 1972 and 1992, followed by a relatively dry period between 1998 and 2007. From 2007 to 2018, the rainfall was typically below the mean rainfall, showing a relatively dry period. Of these records, 2019 was the driest year, with climatic observations indicative of an unprecedented drought in NSW. Since 2020, rainfall has been above the long-term average, with the cumulative deviation plot indicating a wet period.

As monitoring bore sites are approximately 5 km apart, groundwater level data for each site have been compared with rainfall data from the closest BoM stations (Figure 1.1) as follows:

- Menangle Park: 68216 Menangle Bridge; and
- Glenlee: 68254 Mount Annan Botanic Garden.

The rainfall characteristics are broadly similar between these BoM stations during the monitoring period, as presented in Figure 2.2. Total monthly rainfall for the 2021/22 monitoring year indicates a wet period, with extreme rainfall events in early 2022. March 2022 was the wettest month, with significant floods observed during this month. The remainder of the monitoring year was also above the long-term average.

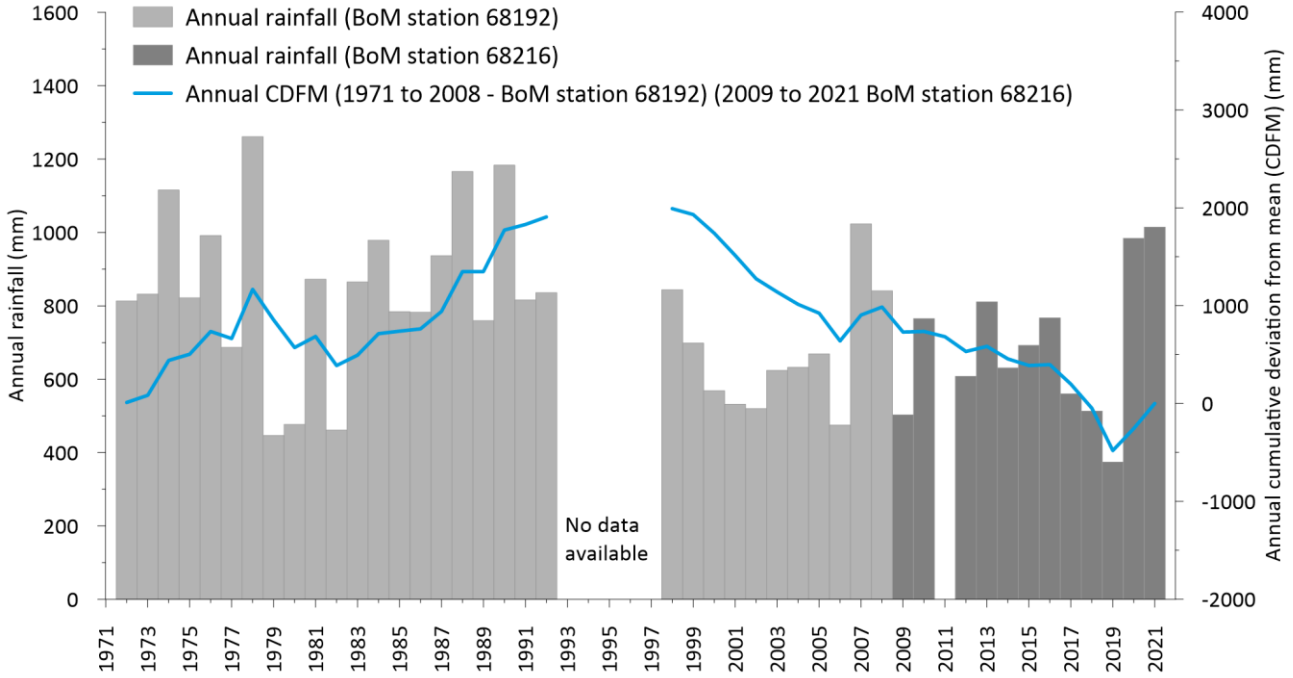


Figure 2.1 **Cumulative deviation from annual mean rainfall**

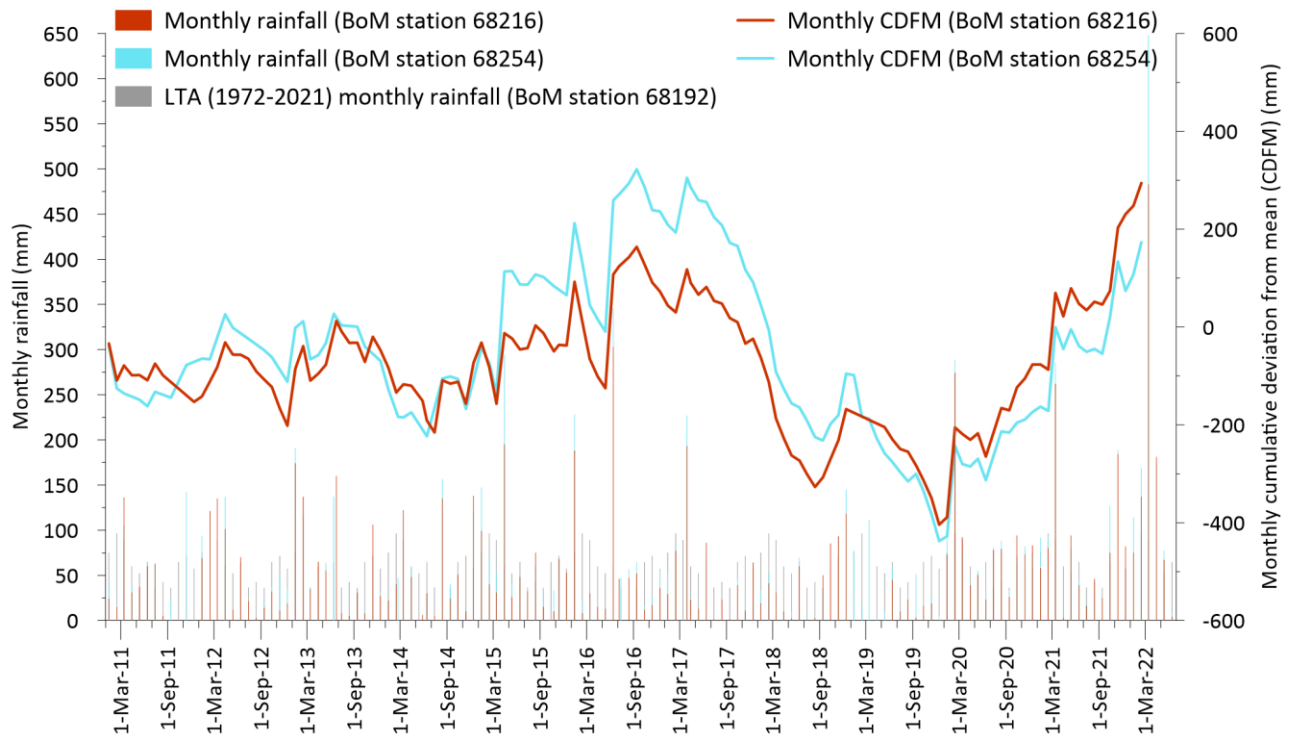


Figure 2.2 **Monthly rainfall for the monitoring period 2011-2022**

2.2 Surface hydrology

The CGP is located within two catchment areas: the Hawkesbury Nepean Catchment and the Sydney Metropolitan Catchment. The major surface hydrology features in the CGP are the Nepean River and its tributaries, which meander in a south to north direction within the project area; and the Georges River, which flows in a northerly direction, in the south-east of the project area.

Small farm dams are common in rural areas and provide water for stock, limited garden and irrigation purposes. Dams are replenished by rainfall and runoff, although some seepage flow through the weathered soil profiles occurs after long wet periods. Dams and seepage flows are not related to the regional groundwater systems. There are no known springs in the CGP area.

2.3 Geological setting

The CGP is part of the Southern Coalfield of the Sydney Geological Basin. The Basin is primarily a Permo-Triassic sedimentary rock sequence (Parkin 2002) and is underlain by undifferentiated sediments of Carboniferous and Devonian age. The stratigraphy of the CGP in the Camden-Campbelltown area is summarised in Table 2.1. The geology and structure of the CGP is shown on Figure 2.3.

The Illawarra Coal Measures is the economic sequence of interest for CSG development in the area, and consists of interbedded sandstone, shale and coal seams, with a thickness of approximately 300 m. The upper sections of the Permian Illawarra Coal Measures (Sydney Subgroup) contain the major coal seams: Bulli Coal Seam, Balgownie Coal Seam, Wongawilli Coal Seam, and Tongarra Coal Seam. The seams targeted for CSG production within the CGP are the Bulli and Balgownie coal seams, both of which are 2 m to 5 m thick within the CGP.

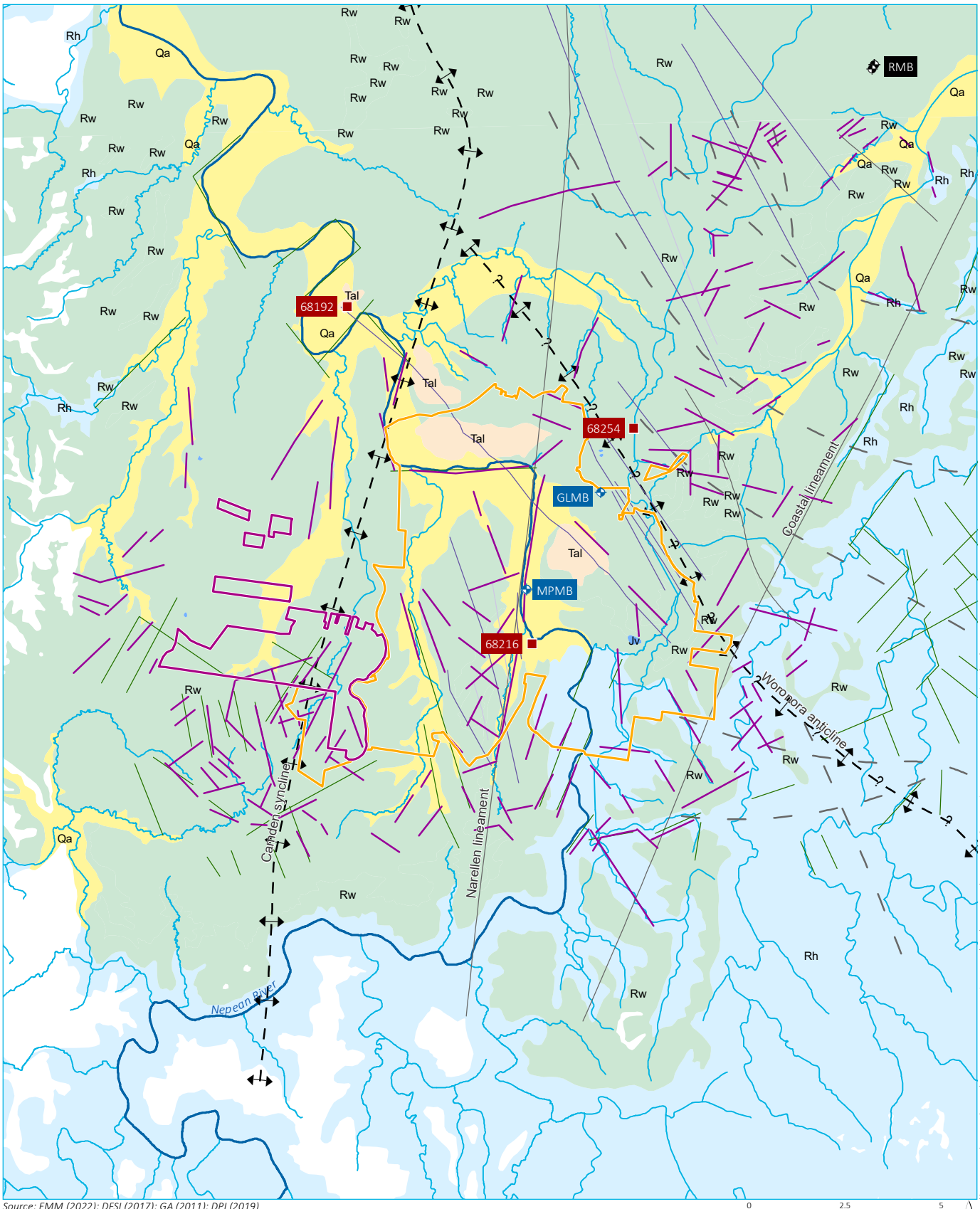
The Illawarra Coal Measures is overlain by Triassic sandstones, siltstones and claystones of the Narrabeen Group and the Hawkesbury Sandstone. Overlying the Hawkesbury Sandstone is the Triassic Wianamatta Group shales which comprise most of the surficial geology (where thin alluvial deposits are not present).

Structurally, the CGP area and surrounds are dominated by the north-northeast plunging Camden Syncline, which is a broad and gentle warp structure (Alder et al. 1991 and Bray et al. 2010). The Camden Syncline is bounded in the west and truncated in the south-west by the north-south trending Nepean Structural Zone, part of the Lapstone Structural Complex.

The CGP is relatively unaffected by major faulting apart from a set of NW-NNW trending faults associated with the Lapstone Monocline Structure (Alder et al. 1991 and Blevin et al. 2007). These faults have been identified from exploration and 2D seismic studies and they have been identified as high-angle, low to moderate displacement normal faults (Blevin et al. 2007). Many of these features intersect coal seams however very few, if any, affect the entire stratigraphic sequence and display no expression at surface.

Period	Group	Sub-group	Formation	Description	Average thickness (m)[1]
Quaternary			Alluvium	Quartz and lithic 'fluvial' sand, silt and clay.	<20
Tertiary			Alluvium	High level alluvium.	
Triassic	Wianamatta Group		Bringelly Shale	Shale, carbonaceous claystone, laminate, lithic sandstone, rare coal.	80 (top eroded)
			Minchinbury Shale	Fine to medium-grained lithic sandstone.	-
			Ashfield Shale[2]	Black to light grey shale and laminate (Bembrick et al. 1987).	-
	Mittagong Formation			Dark grey to grey alternating beds of shale laminate, siltstone and quartzose sandstone (Alder et al. 1991).	11
	Hawkesbury Sandstone			Massive or thickly bedded quartzose sandstone with siltstone, claystone and grey shale lenses up to several metres thick (Bowman 1974; Moffitt 2000).	173
	Narrabeen Group	Gosford Sub-group	Newport Formation	Fine-grained sandstone (less than 3 m thick) interbedded with light to dark grey, fine-grained sandstones, siltstones and minor claystones (Bowman 1974).	35
			Garie Formation	Cream, massive, kaolinite-rich pelletal claystone, which grades upwards to grey, slightly carbonaceous claystone containing plant fossils at the base of the Newport Formation (Moffitt 2000).	8
		Clifton Sub-group	Bald Hill Claystone[2]	Massive chocolate coloured and cream pelletal claystones and mudstones, and occasional fine-grained channel sand units (Moffitt 2000).	34
			Bulgo Sandstone	Thickly bedded sandstone with intercalated siltstone and claystone bands up to 3 m thick (Moffitt 2000).	251
			Stanwell Park Claystone[2]	Red-green-grey shale and quartz sandstone (Moffitt 1999).	36
			Scarborough Sandstone	Quartz-lithic sandstone, pebbly in part (Moffitt 1999).	20
			Wombarra Claystone[2]	Grey shale and minor quartz-lithic sandstone (Moffitt 1999).	32
Permian		Sydney Sub-group	Bulli Coal Seam	Coal interbedded with shale, quartz-lithic sandstone, conglomerate, chert, torbanite seams and occasionally carbonaceous mudstone (Moffitt 2000).	4
			Loddon Sandstone		12
			Balmain Coal Member		24
			Balgownie Coal Seam		2
			(Remaining Sydney Subgroup)		
		Cumberland Sub-group			
	Shoalhaven Group			Sandstone, siltstone, shale, polymictic conglomerate, claystone; rare tuff, carbonate, evaporate.	
Palaeozoic	Lachlan Fold Belt			Intensely folded and faulted slates, phyllites, quartzite sandstones and minor limestones of Ordovician to Silurian age (Moffitt 2000).	

Notes: *1. Average thickness from available well data within CGP (AGL 2013).*
2. Aquitard or aquiclude.



Source: EMM (2022); DFSI (2017); GA (2011); DPI (2019)

0 2.5 5 km

GDA 1994 MGA Zone 56

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KEY

- Camden Gas Project Stage 1
- Camden Gas Project Stage 2
- Nepean River
- Watercourse
- Groundwater monitoring bore
- Decommissioned groundwater monitoring bore
- BOM weather station

Structure

- Certain fault *(AGL Energy)*
- Possible fault *(AGL Energy)*
- Fault *(Geology 100k DPI / Mauger et al; Southern Coal Fields map)*
- Interpreted Fault *(Geology 100k DPI / Mauger et al; Southern Coal Fields map)*
- Syncline
- Anticline
- Lineament *(CSIRO 1:80,000 Landsat interpreted fracture analysis)*
- Lineaments (air photo interpreted; CSIRO)

250k Geology

- Jv - Basalt, dolerite & volcanic breccia
- Qa - Quaternary alluvium
- Tal - High level gravels
- Rw - Bringelly Shale, Minchinbury Sandstone & Ashfield Shale
- Rh - Hawkesbury Sandstone

Surface geology

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2021-2022 Groundwater Monitoring Report
Figure 2.3

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2.4 Hydrogeological setting

The Southern Coalfield is located within the area covered by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources. The CGP is located across two porous rock water sources – the Sydney Basin Nepean water source to the south and the Sydney Basin Central water source to the north (NOW 2011). The recognised hydrogeological units within the CGP are shown in Table 2.2.

Table 2.2 Hydrogeological units within the CGP area

Hydrogeological unit	Aquifer type
Alluvium	Unconfined aquifer
Ashfield Shale (Wianamatta Group)	Aquitard or unconfined/perched
Hawkesbury Sandstone	Unconfined/semi-confined aquifer
Bald Hill Claystone (Narrabeen Group)	Aquitard/aquiclude
Bulgo Sandstone (Narrabeen Group)	Confined aquifer
Stanwell Park Claystone (Narrabeen Group)	Aquitard/aquiclude
Scarborough Sandstone (Narrabeen Group)	Confined aquifer
Wombarra Claystone (Narrabeen Group)	Aquitard/aquiclude
Illawarra Coal Measures	Confined water bearing zones

Alluvium occurs along the floodplain of the Nepean River and its tributaries. Alluvial deposits are generally thin, discontinuous (except along the Nepean River) and relatively permeable. The unconfined groundwater systems within the alluvium are responsive to rainfall and stream flow and form a minor beneficial groundwater system. There are also small terrace areas of Tertiary alluvium within the CGP area that contain localised groundwater systems of variable quality (Figure 2.3).

The Ashfield Shale (which outcrops across the majority of the CGP) is generally of low permeability and yield; however small water bearing zones are sometimes present. Water is typically brackish to saline, especially in low relief areas of western Sydney (due to the marine depositional environment of the shales) (Old 1942). Average bore yields are 1.3 litres per second (L/s) (AGL 2013).

The Hawkesbury Sandstone and Narrabeen Group form part of an extensive generally semi-confined regional groundwater system within the Sydney Basin sequence. The Hawkesbury Sandstone is more widely exploited for groundwater than the overlying and underlying formations, being of generally higher yield, better water quality and either outcropping or buried to shallow depths over the basin. Groundwater flow within the Hawkesbury Sandstone and Narrabeen Group groundwater systems at a regional scale has a major horizontal component, due to the alternation of sheet and massive facies, with some vertical leakage. The Hawkesbury Sandstone and Narrabeen Group are characterised by dual porosity. The primary porosity is imparted by connected void space between sand grains and the secondary porosity is due to the interconnected rock defects such as joints, fractures, faults and bedding planes. Superior bore yield in the sandstone groundwater systems of the Hawkesbury Sandstone is often associated with major fractures or a high fracture zone density and yields of up to 40 L/s have been recorded in bores intercepting these zones within deformed areas of the Sydney Basin (McLean and Ross 2009). Typically, within the CGP area bore yields within the Hawkesbury Sandstone rarely exceed 2 L/s (SCA 2007 and Ross 2014). The Narrabeen Group aquifer is generally not used as a water source as it is considered poorer quality and lower permeability compared to the overlying Hawkesbury Sandstone groundwater systems (Madden 2009).

There is a lack of major fracturing and fault systems intersecting the Hawkesbury Sandstone within the CGP. Yields in the Hawkesbury Sandstone are highest and salinities are freshest south of the Nepean River due to the proximity to recharge areas. North of the Nepean River, the groundwater within the Hawkesbury Sandstone is characterised by higher salinity, becoming moderately saline. Groundwater is used for irrigation and domestic purposes to the south and immediately to the north of the Nepean River; however, further north of the river, groundwater quality is typically only suitable for stock (AGL 2013).

The coal seams present in the Illawarra Coal Measures are both regionally and locally minor water bearing zones. Due to the greater depth of burial of the coal measures and fine-grained nature of the sedimentary rocks, the permeability is generally lower than the overlying sandstone aquifers. Recharge to the Permian water bearing zones is likely to occur where formations are outcropping, which occurs at a significant distance to the south of the CGP. Salinity of the water bearing zones is typically brackish to moderately saline.

Within the CGP, there is limited rainfall recharge to the Ashfield Shale with most rainfall generating runoff and overland flow. Some leakage through the Ashfield Shale into the Hawkesbury Sandstone is expected where there is adequate fracture spacing; however, it is anticipated that most recharge to the sandstone aquifers occurs via lateral groundwater through-flow from upgradient and up-dip areas to the south. There is insufficient data within the CGP to define local flow paths and natural discharge zones. Regionally, groundwater flow is predominantly towards the north or northeast, eventually discharging via the Georges, Parramatta or Hawkesbury river systems, and ultimately offshore to the east. Although groundwater-surface water interactions are not well defined in the area, locally, there may be a small base flow or interflow discharge component to local stream headwaters during wet periods (Parsons Brinckerhoff 2010).

3 Monitoring program

3.1 Monitoring network

Construction details for the original 11 monitoring bores within the CGP area are presented in Table 3.1 and Figure 3.1. The current monitoring network consists of only the Menangle Park and Glenlee monitoring bores as the Denham Court monitoring bores (RMB01-04) were decommissioned in October 2016.

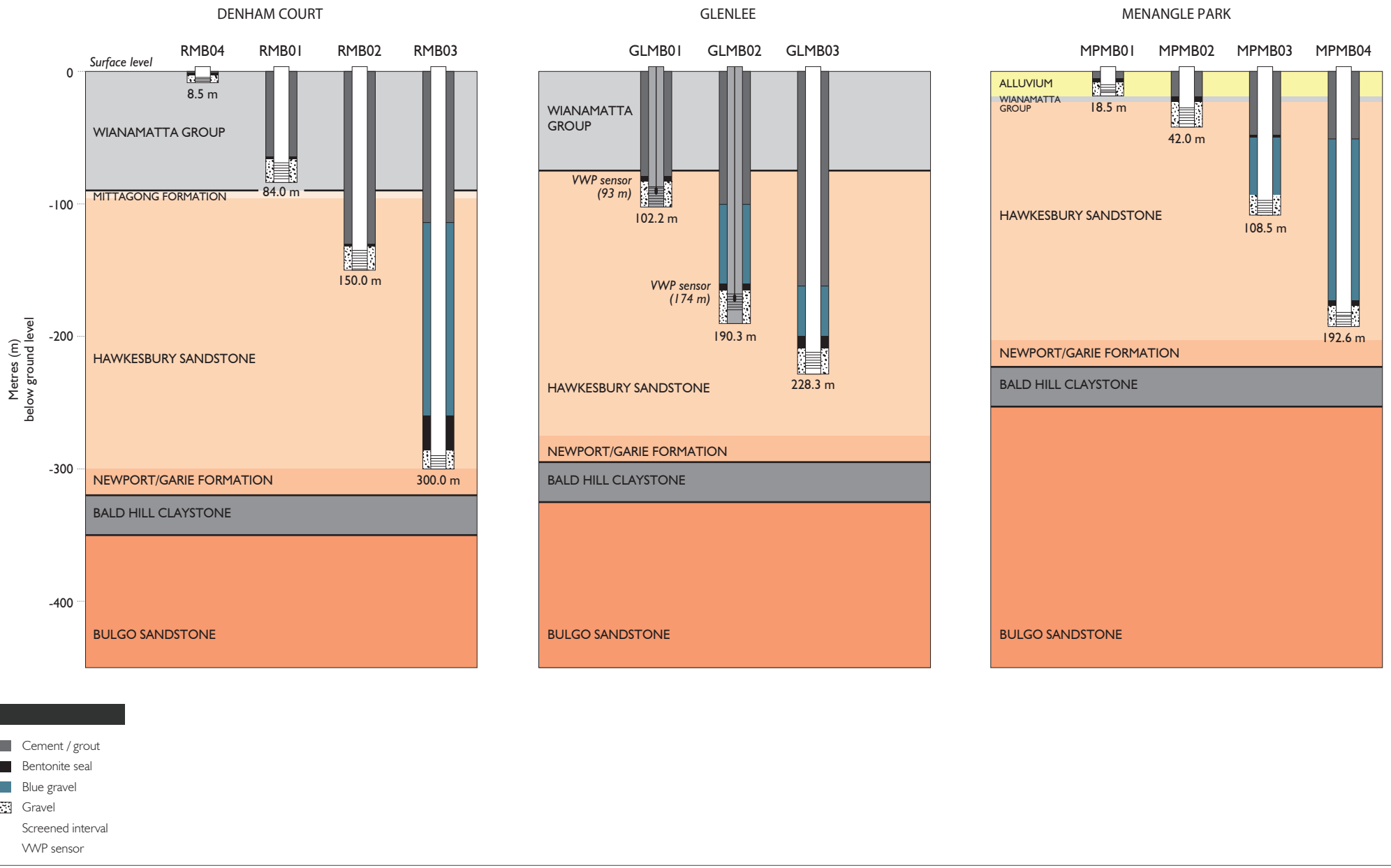
Table 3.1 Groundwater monitoring bore details

Monitoring bore	Location	Total depth (mbgl)	Screened depth (mbgl)	Lithology	Formation
RMB01[2]	Denham Court	84.0	69.0 – 81.0	Siltstone	Ashfield Shale
RMB02[2]	Denham Court	150.0	135.0 – 147.0	Sandstone	Hawkesbury Sandstone (upper)
RMB03[2]	Denham Court	300.0	290.0 – 299.0	Sandstone	Hawkesbury Sandstone (lower)
RMB04[2]	Denham Court	8.5	4.5 – 7.5	Clay/siltstone	Ashfield Shale (weathered)
MPMB01	Menangle Park	18.5	10.0 – 16.0	Clay	Alluvium
MPMB02	Menangle Park	42.0	27.4 – 39.4	Sandstone	Hawkesbury Sandstone (upper)
MPMB03	Menangle Park	108.5	97.0 – 106.0	Sandstone	Hawkesbury Sandstone (middle)
MPMB04	Menangle Park	192.6	182.6 – 191.6	Sandstone	Hawkesbury Sandstone (lower)
GLMB01	Glenlee	102.2	87.0 – 99.0[1]	Sandstone	Hawkesbury Sandstone (upper)
GLMB02	Glenlee	190.3	168.0 – 180.0[1]	Sandstone	Hawkesbury Sandstone (middle)
GLMB03	Glenlee	228.3	212.0 – 224.0	Sandstone	Hawkesbury Sandstone (lower)

Notes: 1. Monitoring bores GLMB01 and GLMB02 were converted to vibrating wire piezometers (VWP) on 12 March 2015 to maintain borehole integrity (Parsons Brinckerhoff 2015b); the VWP sensors are installed at 93 mbgl and 174 mbgl respectively.

2. Monitoring bores RMB01-04 were decommissioned early October 2016 and are no longer monitored.

mbgl – metres below ground level.


DENHAM COURT
GLENLEE
MENANGLE PARK
RMB04
RMB01
RMB02
RMB03
GLMB01
GLMB02
GLMB03
MPMB01
MPMB02
MPMB03
MPMB04
Surface level
0
-100
-200
-300
-400
Metres (m) below ground level
8.5 m
84.0 m
150.0 m
300.0 m
102.2 m
190.3 m
228.3 m
18.5 m
42.0 m
108.5 m
192.6 m
VWP sensor (93 m)
VWP sensor (174 m)
ALLUVIUM
WIANAMATTA GROUP
MITTAGONG FORMATION
HAWKESBURY SANDSTONE
NEWPORT/GARIE FORMATION
BALD HILL CLAYSTONE
BULGO SANDSTONE
KEY
Cement / grout
Bentonite seal
Blue gravel
Gravel
Screened interval
VWP sensor

3.2 Water level monitoring

3.2.1 Groundwater levels

Pressure transducers (Solinst Levelogger (M30) dataloggers) are suspended from a galvanised steel wire in the water column and programmed to record a groundwater level every six hours. To verify the level recorded by the dataloggers, manual measurements are recorded periodically using an electronic dip meter. The monitoring start date of the datalogger data at each monitoring bores is shown in Table 3.2.

A barometric logger installed above the water table at monitoring bore MPMB01 records changes in atmospheric pressure. Data from this logger are used to correct for the effects of changing barometric pressure on water level loggers in the adjacent monitoring bores.

Table 3.2 Summary of water level monitoring locations and data collection periods

Monitoring locations	Monitoring period
Denham Court (RMB01, RMB02, RMB03, RMB04)	November 2011 (June 2013 for RMB04) – October 2016
Menangle Park (MPMB01, MPMB02, MPMB03, MPMB04)	June 2013 – present
Glenlee (GLMB01, GLMB02, GLMB03)	February 2014 – present

The vibrating wire piezometer (VWP) sensors at GLMB01 and GLMB02, which were installed in March 2015, are interpreted to have stabilised at lower piezometric pressure head levels compared with pressures observed from the former standpipe monitoring bores prior to conversion to VWPs. The resulting data is not considered to be representative of formation pressures. It is possible that during the conversion of the monitoring bores to VWPs the grout did not fully penetrate the gravel pack of the former standpipe monitoring bore, creating an unnatural pressure gradient adjacent to the piezometer and bore wall. The gravel pack has a much higher hydraulic conductivity (K) (both horizontal and vertical K) than the grouted VWP sensor and the surrounding formation. In this case the higher vertical gradient in the gravel pack may be responsible for reducing horizontal pressure on the sensor hence the observed pressure difference. Although the absolute pressure values post-VWP installation are not representative of formation pressures, the trends in the data are still useful.

Monitoring paused briefly at GLMB03 in October 2021 due to the detection of elevated levels of naturally occurring hazardous gases present within the bore. Water level data has not been downloaded since November 2021 and is planned to be next downloaded in October 2022.

3.2.2 Surface water levels

Water levels in the Nepean River are monitored by the BoM (gauging station 68216) using automatic dataloggers close to the Menangle Park site (Figure 1.1). These water levels have been included in the hydrograph for the Menangle Park site for comparison (refer to Section 4; Figure 4.1). The river height is derived from automated telemetric real-time data that have been processed to remove erroneous data.

3.3 Water quality monitoring

Groundwater sampling has been undertaken on 11 occasions at Denham Court (since November 2011), 20 occasions at Menangle Park (since August 2013) and 18 occasions at Glenlee (since February 2014) with details provided in Table 3.3.

Surface water quality sampling has been undertaken on 11 occasions (since 2013) at the Nepean River site next to the Menangle Park groundwater monitoring site.

Groundwater and surface water sampling was undertaken twice in the 2021/22 monitoring period at Menangle Park, Glenlee and the Nepean River on 15 November 2021 and 13 April 2022.

Sampling of groundwater and surface water was undertaken by Parsons Brinckerhoff from October 2011 through to April 2016. Sampling from October 2016 onwards has been undertaken by EMM.

Table 3.3 Groundwater quality program

Sampling event	Denham Court	Menangle Park	Glenlee	Reference report
November 2011	√[1]	-	-	Parsons Brinckerhoff (2012)
May 2013	√[1]	-	-	Parsons Brinckerhoff (2013a)
August 2013	√[2]	√[3]	-	Parsons Brinckerhoff (2013c)
November 2013	√[4]	√	-	Parsons Brinckerhoff (2014c)
February 2014	√[2]	√	√	Parsons Brinckerhoff (2014d)
May 2014	√[2]	√	√	Parsons Brinckerhoff (2014e)
August 2014	√[2]	√	√	Parsons Brinckerhoff (2014f)
January 2015	√[2]	√	√	Parsons Brinckerhoff (2015a)
April 2015	√[2]	√	√[5]	Parsons Brinckerhoff (2015b)
October 2015	√[4]	√	√[5]	Parsons Brinckerhoff (2015d)
April 2016	√[4]	√	√[5]	Parsons Brinckerhoff (2016a)
October 2016	*	√	√[5]	EMM (2016)
April 2017	*	√	√[5]	EMM (2017a)
October 2017	*	√	√[5]	EMM (2017c)
April 2018	*	√	√[5 6]	EMM (2018a)
October 2018	*	√	√[5]	EMM (2018c)
April 2019	*	√	√[5]	EMM (2019a)
October 2019	*	√	√[5]	EMM (2019c)
April 2020	*	√	√[5]	EMM (2020a)
November 2020	*	√	√[5]	EMM (2020c)
April 2021	*	√	√[5]	EMM (2021a)
November 2021	*	√	√[5]	EMM (2021c)
April 2022	*	√	√[57]	EMM (2022)

Notes:
1. RMB01 not sampled due to insufficient water in monitoring bore.
2. RMB01 and RMB02 not sampled due to insufficient water in monitoring bores.
3. MPMB04 not sampled due to blockage in monitoring bore (Parsons Brinckerhoff 2013b).
4. RMB04 not sampled due to insufficient water in monitoring bore.
5. GLMB01 and GLMB02 not sampled as converted to vibrating wire piezometers (VWP) in March 2015 (Parsons Brinckerhoff 2015b).
6. GLMB03, MPMB03, and MPMB04 were re-sampled on 24 April 2018 to include dissolved methane analysis,
7. GLMB03 was not sampled due to elevated levels of naturally occurring hazardous gases in this bore.

– = monitoring locations not yet installed.

*= Site not sampled due to bore decommissioning in early October 2016.

3.3.1 Sampling techniques

Two methods were used to obtain groundwater quality samples from the monitoring bores. The methods were selected based on the permeability of the screened formation of each bore, which was determined during hydraulic conductivity testing. In summary:

- a submersible 12V pump was used at higher yielding bores MPMB01 and MPMB02; and
- a micro-purge™ low flow sampling pump was used at lower yielding monitoring bores and selected deeper bores: MPMB03, MPMB04 and GLMB03.

Where a submersible pump was used, a minimum of three well volumes was purged from the monitoring bore prior to sampling to allow a representative groundwater sample to be collected. Water quality parameters were measured during and immediately after purging to monitor water quality changes and to indicate representative groundwater suitable for sampling and analysis.

The micro-purge™ system allows groundwater to be drawn into the pump intake directly from the screened portion of the aquifer, eliminating the need to purge relatively large volumes of groundwater from these bores. Water quality parameters were monitored during the micro-purge™ pumping to ensure that a representative groundwater sample was collected.

Physicochemical parameters (pH, electrical conductivity (EC), temperature, total dissolved solids (TDS), dissolved oxygen (DO), and oxidation reduction potential (ORP)) were measured during and following purging using a calibrated hand-held water quality meter.

The surface water samples were taken at the river bank using a telescopic sampler. The sample was collected from just below the water surface and approximately 1 m away from the river bank.

3.3.2 Chemical analysis of water

Groundwater and surface water samples collected in the field were analysed for a broad chemical suite designed specifically to assess the chemical characteristics of the different water bearing zones at the monitoring sites. Table 3.4 details the analytical suite.

Table 3.4 Analytical suite

Category	Parameters		
Physicochemical parameters (measured in the field)	Electrical Conductivity (EC) Temperature	pH Redox Potential (ORP)	Total Dissolved Solids (TDS) Dissolved Oxygen (DO)
General parameters	EC[1]	pH[1, 3]	TDS
Major ions	Calcium Magnesium Sodium Potassium	Chloride Bicarbonate Sulphate	Fluoride Silica Bromine
Metals and minor/trace elements	Aluminium Antimony[1] Arsenic Barium Boron Beryllium Cadmium	Cobalt Copper Cyanide[1] Iron Lead Manganese Molybdenum	Mercury[2] Nickel Selenium Strontium Zinc Uranium Vanadium

Table 3.4 Analytical suite

Category	Parameters		
Nutrients	Ammonia Nitrite	Nitrate Total organic carbon (TOC)	Phosphorus (total) Phosphorus (reactive)
Hydrocarbons	Phenol compounds Polycyclic aromatic hydrocarbons (PAH)	Total petroleum hydrocarbons (TPH)	Benzene, toluene, ethyl benzene and xylenes (BTEX)
Dissolved gases	Methane Ethene Ethane	Propane Propene	Butene Butane

Notes: 1. For samples collected since the May 2013 event.
2. For samples collected since the August 2013 sampling event.
3. Generally analysed outside of recommended holding times.

Samples requiring laboratory analysis were analysed by Australian Laboratory Services (ALS) in Smithfield, a NATA accredited laboratory.

Water samples for laboratory analysis were collected in sample bottles specified by the laboratory, with appropriate preservation where required. Samples undergoing dissolved metal analysis were filtered through 0.45 µm filters in the field prior to collection.

3.3.3 Quality assurance and quality control (QA/QC)

i Field QA/QC

The following field sampling QA/QC procedures were applied to prevent cross-contamination and preserve sample integrity:

- samples were collected in clearly labelled bottles with appropriate preservation solutions;
- samples were delivered to the laboratories within the specified holding times (except for pH); and
- unstable parameters were analysed in the field (physicochemical parameters).

ii Laboratory QA/QC

The laboratories conduct their own internal QA/QC program to assess the repeatability of the analytical procedures and instrument accuracy. These programs include analysis of laboratory sample duplicates, spike samples, certified reference standards, surrogate standards/spikes and laboratory blanks. In addition, a duplicate sample is collected in the field to assess sampling and laboratory analysis accuracy.

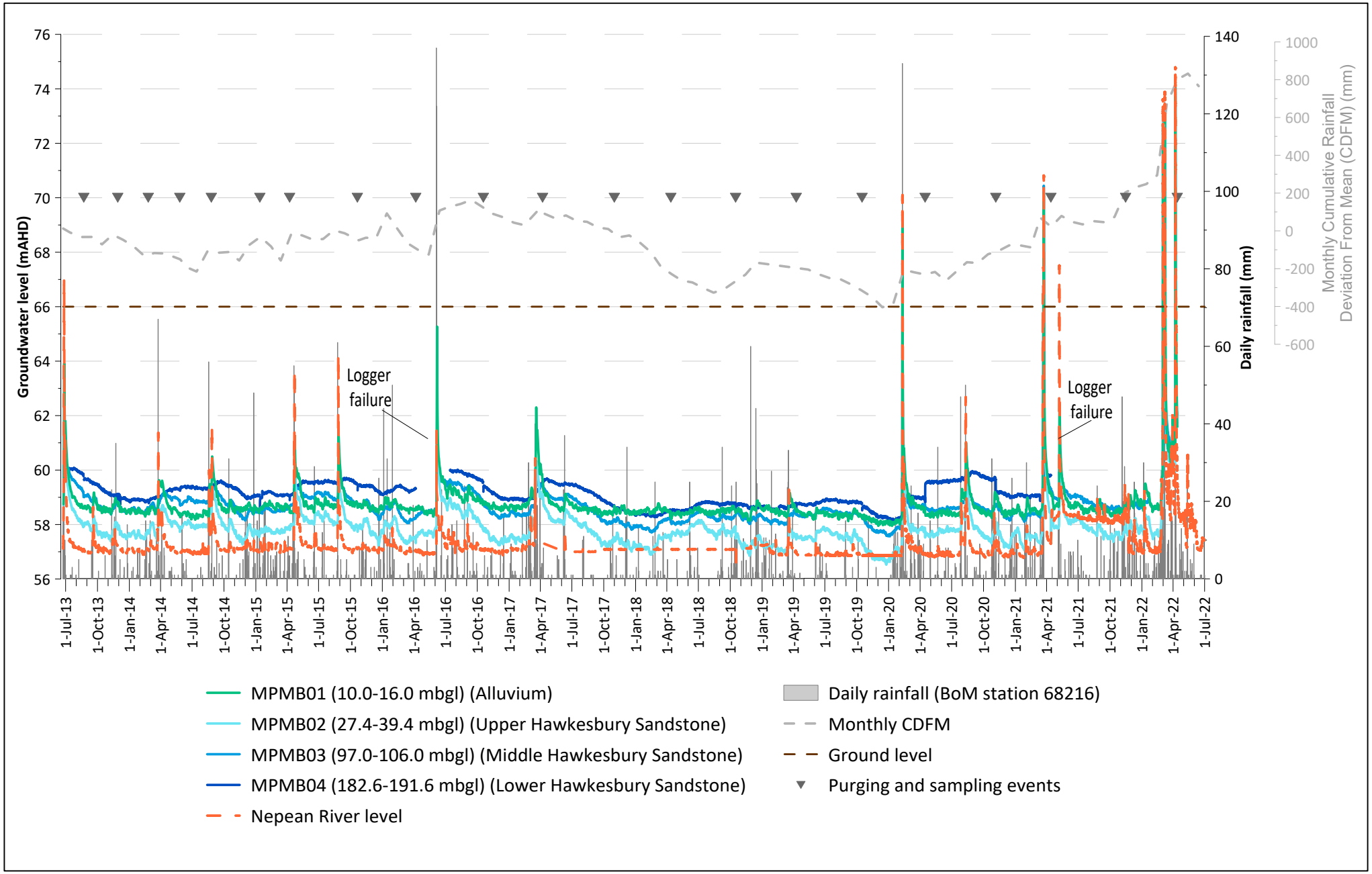
4 Groundwater levels

Hydrographs showing groundwater levels and rainfall from the start of monitoring until April 2022 (the most recent collection of data) are presented for Menangle Park in Figure 4.1 and Glenlee in Figure 4.2. The Menangle Park site is located close to the Nepean River and river levels from BoM gauging station 068216 have also been included in the hydrograph for comparison (Figure 4.1). Individual hydrographs for each monitoring bore are included in Appendix A.

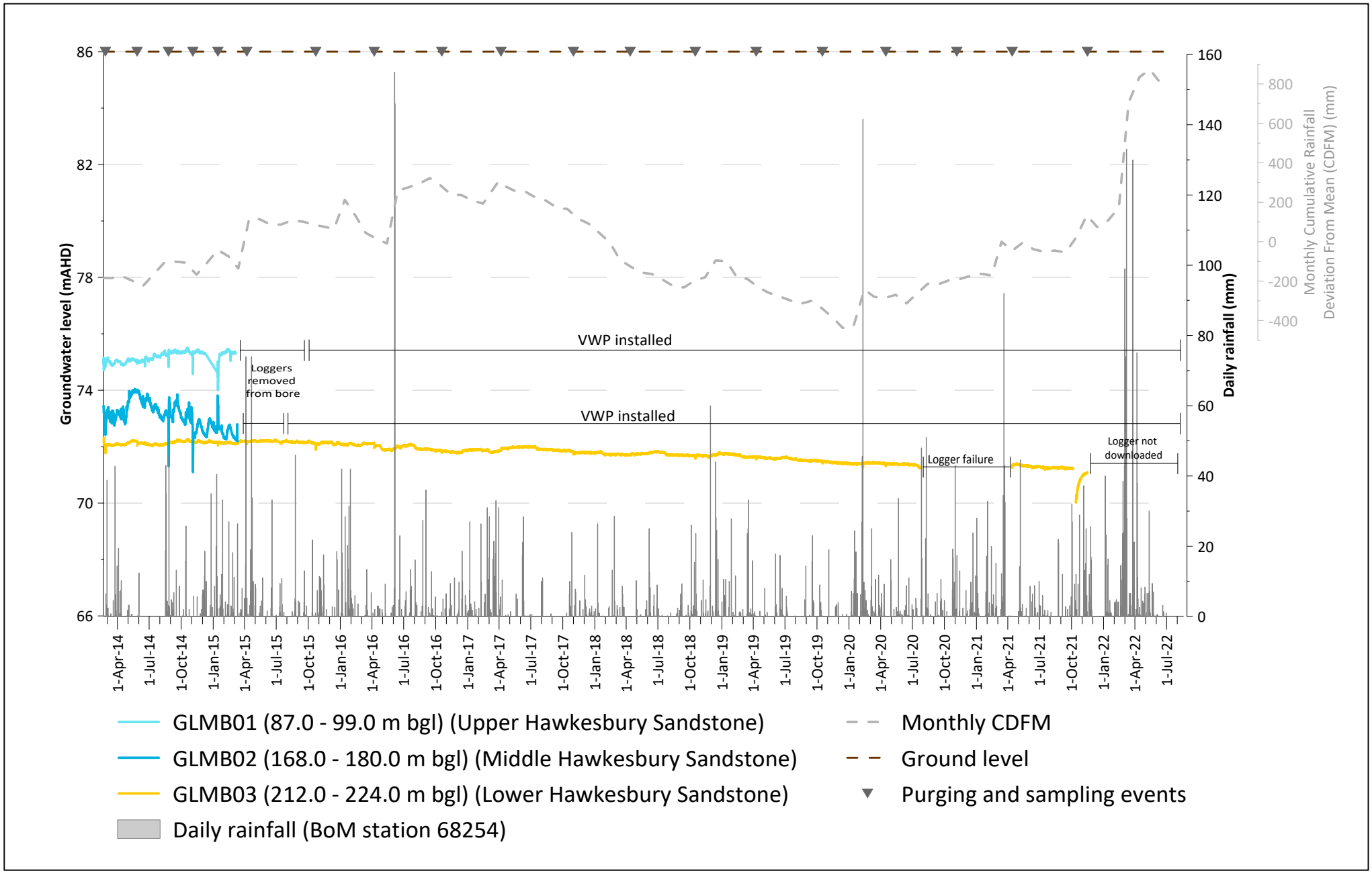
As discussed in Section 3.2.1, VWPs were installed at GLMB01 and GLMB02 in March 2015. It is interpreted that the pressures of the VWP have stabilised at lower piezometric pressure head levels compared with those observed at the former standpipe monitoring bores prior to conversion to VWPs. This discrepancy was likely caused by difficulties of establishing a complete seal and, therefore, effective communication between the grouted VWP and the rock formation due to the presence of the existing bentonite plug in the annular void (ie between the PVC bore casing and the borehole). The absolute pressure values post-VWP installation are not representative of formation pressures. These data are presented on individual hydrographs for each monitoring bore are in Appendix A.

The datalogger at Glenlee monitoring bore GLMB03 was not downloaded during the April 2022 monitoring round and water quality sampling from this bore ceased following observations of elevated levels of naturally occurring hazardous gases in this bore (Section 3.2.1). The datalogger continues to monitor groundwater levels.

The datalogger at MPMB04 was malfunctioning, likely because of the recent floods, and groundwater level data could not be retrieved. The datalogger was replaced in April 2022.



Menangle Park site hydrographs
Camden Gas Project
2021 - 2022 Water Monitoring Report
Figure 4.1



Glenlee site hydrographs
Camden Gas Project
2021 - 2022 Water Monitoring Report
Figure 4.2

4.1 Temporal trends

4.1.1 Alluvium

The groundwater level in the alluvium (MPMB01) is shallow (less than 10 mbgl) and shows a direct response to rainfall and flood events (Figure 4.1). During the monitoring year, the groundwater level exhibited a positive trend in response to a period of higher-than-average rainfall. A significant increase in groundwater level was recorded in response to the flood event of March and April 2022, showing that the site was inundated on several occasions.

4.1.2 Ashfield Shale

Monitoring of the Ashfield Shale is no longer completed as the Denham Court bores have been decommissioned.

Previous results have shown that groundwater levels in the Ashfield Shale (RMB01) are typically deep (approximately 80 mbgl) and showed no apparent response to rainfall (EMM 2017b).

4.1.3 Hawkesbury Sandstone

At the Menangle Park site, located next to the Nepean River, groundwater levels are shallow (less than 10 mbgl) (Appendix A). A definite response to rainfall and flood events is observed in the upper and middle Hawkesbury Sandstone (monitoring bores MPMB02 and MPMB03), while a slightly subdued and delayed response is generally observed in the lower Hawkesbury Sandstone (MPMB04) (Figure 4.1). A significant increase in groundwater level was recorded in all the monitoring bores in response to the flood events of March and April 2022.

At the Glenlee site, groundwater levels are shallow (less than 15 mbgl) (Appendix A). Data recorded at GLMB03 until October 2021 indicates a slight downward trend in the groundwater level in the lower Hawkesbury Sandstone from mid-2016 onwards (Figure 4.2). The groundwater level data do not clearly show a response to the recent increased rainfall recharge. Therefore, it is suspected the trend in data may not be representative of the true groundwater levels and responses at this site. It is possible the water level data since 2016 are being influenced by localised changes in chemistry and calcium carbonate precipitation within and proximate to the bore (Section 5.1). The datalogger malfunctioned and data were unable to be collected for a period (October 2020 – April 2021); more data is needed to confirm the cause of the downward trend.

4.2 Spatial trends in the Hawkesbury Sandstone

The conceptual model (AGL 2013) and hydrogeological setting (Section 2.4) suggest that regional groundwater flow within the Hawkesbury Sandstone is from south to north towards the incised river systems of the Sydney Basin.

The groundwater level elevations in the Hawkesbury Sandstone aquifer can be compared between the two monitoring sites. The data collected at the CGP suggests that groundwater flow (in the Hawkesbury Sandstone at least) is more complex than the regional conceptual model. The data suggests that:

- the Nepean River in the vicinity of the Menangle Park site is a probable groundwater discharge area (as there is upward groundwater flow within the Hawkesbury Sandstone and there is no Ashfield Shale to act as a cap rock) - groundwater elevations here are between 57 mAHD and 61 mAHD and the Nepean River height is typically between 57 mAHD and 59 mAHD; and
- the Glenlee site may be close to a groundwater divide as groundwater elevations are between 71 mAHD and 75 mAHD.

4.3 Groundwater-surface water interactions

Hydraulic connection between surface water and groundwater exists where the river is in direct contact with the underlying aquifer (Bouwer and Maddock 1997). A 'gaining' stream exists where the water table or groundwater level in a connected aquifer is higher than the running level in a stream and groundwater will flow or discharge to the stream (Land and Water Australia 2007).

The Nepean River level shows a clear response to rainfall (Figure 4.1). The river level is usually lower than the level in the alluvium and Hawkesbury Sandstone units, indicating the river is a gaining river at the Menangle Park site during most of the monitoring period, except for short periods during extremely high rainfall events, when recharge to the alluvial groundwater system occurs.

4.4 Vertical gradients

Vertical gradients provide an indication of the potential for groundwater to flow vertically upward or downward at a particular location. A downward hydraulic gradient indicates a potential for downward flow from the shallower unit to the deeper unit, while an upward gradient indicates the opposite. It is noted that the actual flow direction and velocity is also governed by permeability, particularly the permeability of the confining units.

Potential vertical gradients between the various hydrogeological units were assessed and vary between sites. The following observations are made:

- There is an apparent upward hydraulic gradient at the Menangle Park site within the monitored zones of the Hawkesbury Sandstone; however, a downward gradient exists between the alluvium and the upper Hawkesbury Sandstone. The similar response to rainfall and flood events between the alluvial monitoring bore and the Hawkesbury Sandstone monitoring bores indicates connectivity between the two formations at this location, which is expected given the lack of a substantial confining layer (for example shale) between the formations.

- There is an apparent downward hydraulic gradient within the Hawkesbury Sandstone at the Glenlee site.

Vertical gradients can be influenced by structural geological features (ie faults, folds, and lineaments) and low permeability strata, as described in sections 2.3 and 2.4 respectively.

5 Water quality

Water quality monitoring has been undertaken between November 2011 and April 2022. Water quality samples for the 2021/22 monitoring year were collected on the 15 November 2021 and the 13 April 2022. These results are summarised in this chapter and are compared to previous monitoring years (EMM 2016,2017b, 2018b, 2019b, 2020b, 2021b, 2022; Parsons Brinckerhoff 2014, 2014b and 2015e).

The 2021/22 monitoring year full water quality results are presented in Appendix B and laboratory results in Appendix C.

GLMB03 was remediated in October 2021 to address changes in water quality, including increased pH, precipitation of calcium carbonate, and sampling difficulties. The changes were attributed to natural causes.

5.1 Groundwater quality

5.1.1 Field parameters

Time series of field EC and pH for the CGP monitoring bores are presented in Figure 5.1 and

Figure 5.2. It is suspected that the field pH probe used during the sampling event on 12 April 2018 was calibrated incorrectly; the measured pH values in all monitoring bores were approximately 1 unit lower than historical and following measurements.

Groundwater sampled from the alluvium at Menangle Park (MPMB01) is classified as fresh to marginally brackish. The pH at MPMB01 is acidic and was measured between 5.2 to 5.4 during the 2021/22 monitoring round. The Menangle Park site is a former sand and gravel quarry that has been subsequently rehabilitated. The observed low pH may be related to these previous land use activities.

Groundwater in the Hawkesbury Sandstone at the Menangle Park site (MPMB02-04) is classified as fresh to marginally brackish. Historically, slightly saline conditions are observed at the Glenlee sites GLMB01-02, while GLMB03 continues to be brackish to slightly saline. The fresh to marginally brackish conditions at the Menangle Park site are likely due to the influence of rainfall recharge and connectivity with the Nepean River.

The salinity recorded during the 2021/22 monitoring year at the Menangle Park site was within the typical range compared to previous monitoring rounds, with the exception of MPMB03, which recorded a lower than average salinity level for this bore in April 2022. This is most likely attributed to the March 2022 flood event where the Menangle Park site was temporarily inundated.

Salinity within the Hawkesbury Sandstone does not show a clear depth related trend at Menangle Park however, salinity decreases with depth at the Glenlee site. This decrease is likely a result of saline groundwater within the Ashfield Shale migrating into the underlying aquifer because of vertical leakage. The pH generally increases with depth within the Hawkesbury Sandstone.

The pH level recorded in the lower Hawkesbury Sandstone at the Glenlee site (GLMB03) across the monitored period has ranged substantially between neutral and highly alkaline. During this monitoring year, the pH level was average to lower than historically observed at this location. This change in water quality is likely due to the bore rehabilitation that was undertaken in October 2021. GLMB03 was airlifted to purge the bore and an acid solution was injected to dissolve the calcium carbonate deposit encrusting the screens, the solution was then airlifted from the bore. Groundwater level and field parameters are now back within the historical range (EMM 2021c). GLMB03 was unable to be sampled in April 2022 due to high levels of naturally occurring hazardous gas, so longer term trends of the remediation have not been able to be observed.

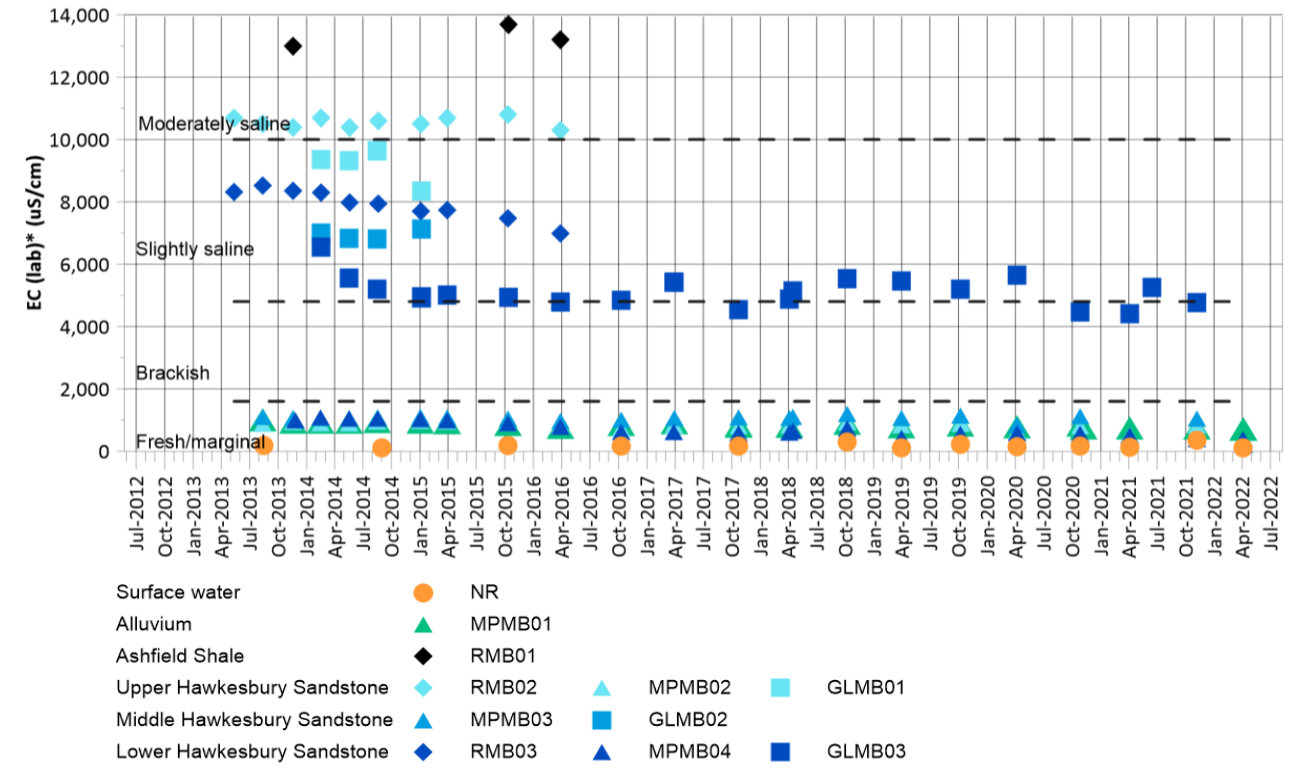


Figure 5.1 EC time series for CGP monitoring bores and Nepean River sample

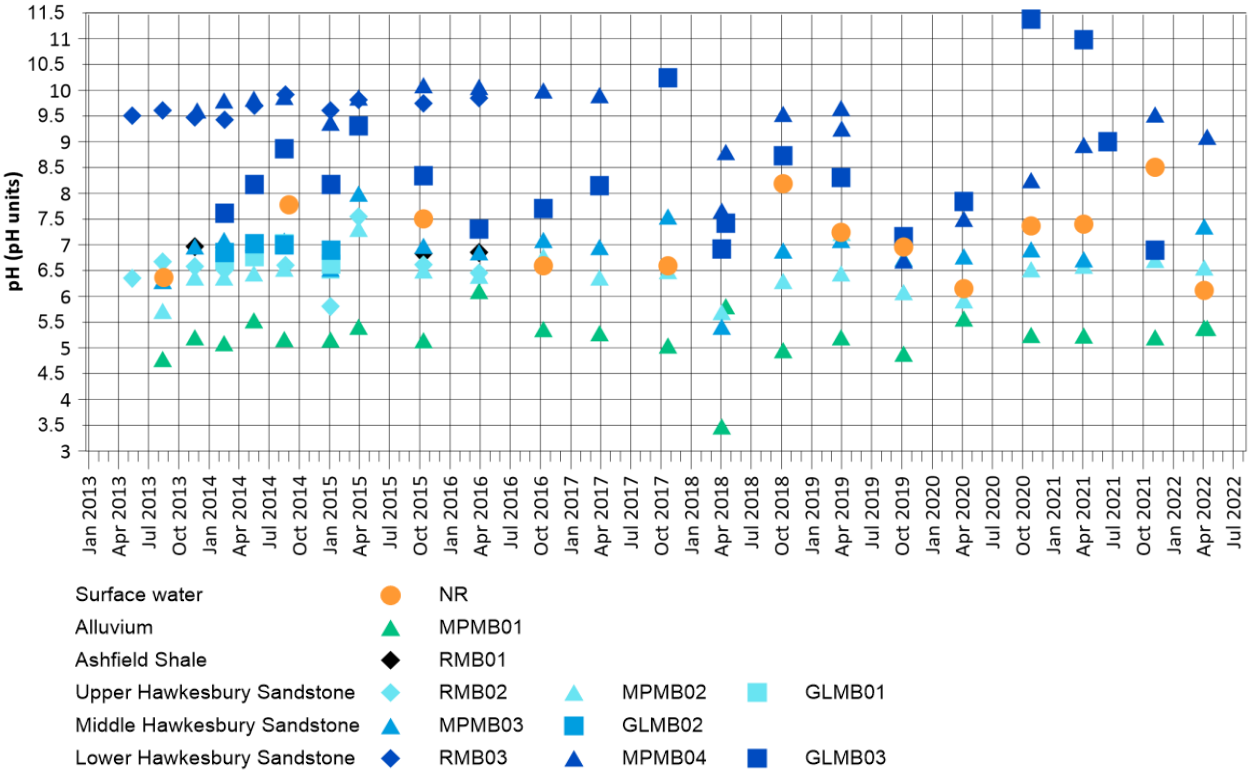


Figure 5.2 pH time series for CGP monitoring bores and Nepean River sample

5.1.2 Major ions

The major ion characteristics of groundwater samples for this monitoring year are shown in a piper diagram and representative bi-variate plots in Figure 5.4. A piper diagram is a graphical representation of the relative concentrations of major ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, HCO_3^{-}, CO_3^{2-} and SO_4^{2-}). The ratios of sodium/chloride and magnesium/chloride versus chloride concentrations are also presented in two bi-variate plots. Chloride is typically assumed to be a conservative (non-reactive) ion in groundwater systems. Evapotranspiration of the initial water with low chloride concentration would therefore be expected to result in a horizontal trend in a major ion/chloride versus chloride plot.

The alluvium (MPMB01) shares similarities with sea water which is different to the Hawkesbury Sandstone. Groundwater in the alluvium is dominated by sodium and chloride and groundwater in the Hawkesbury Sandstone and Nepean River is dominated by sodium and bicarbonate. Compared to the previous monitoring year, groundwater in GLMB03 in this monitoring year was observed to have higher proportions of calcium and magnesium compared to sodium and potassium. This change is likely related to the remediation of the bore.

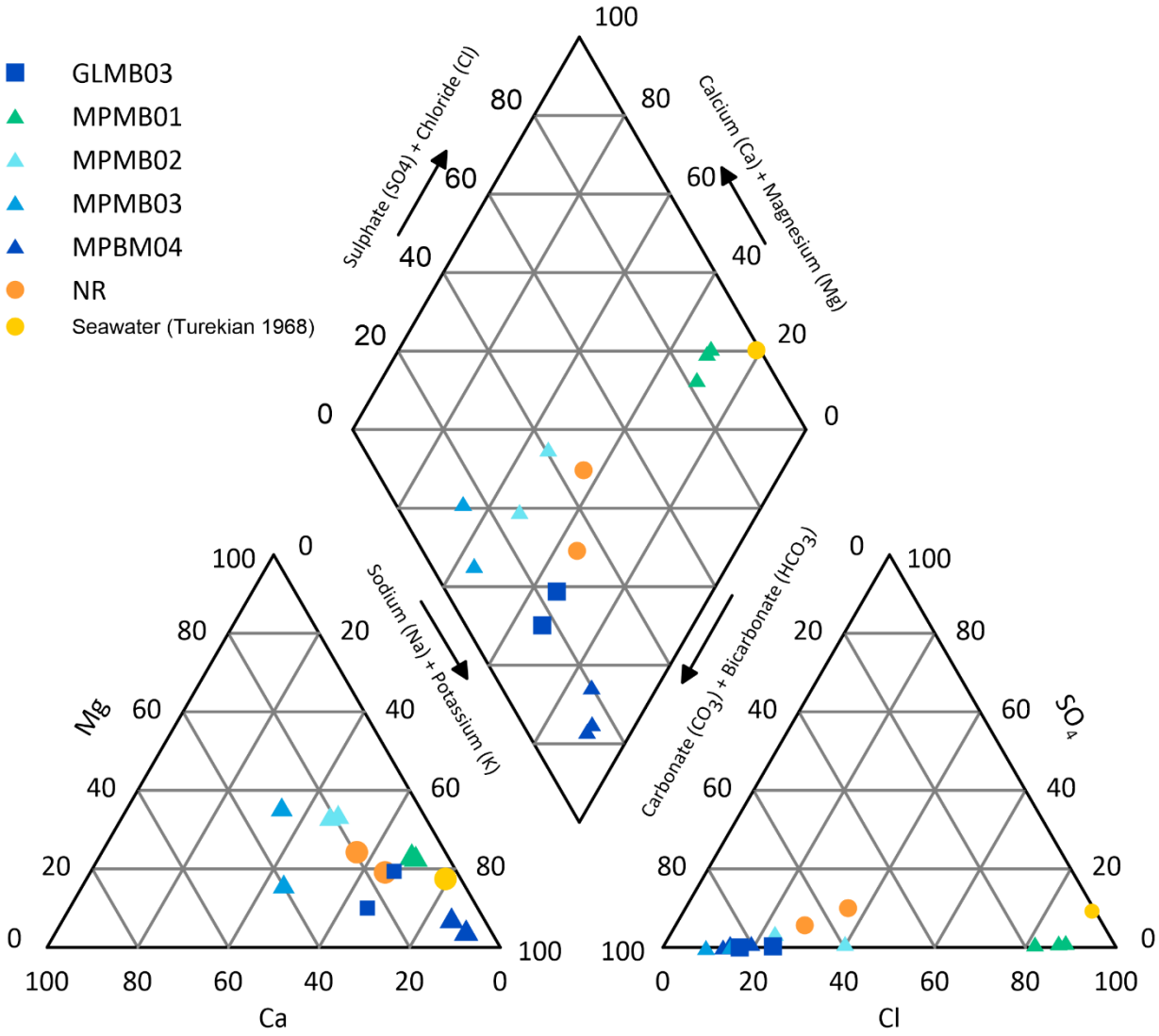


Figure 5.3 Major ion chemistry of groundwater for CGP monitoring bores (2021/22 monitoring year)

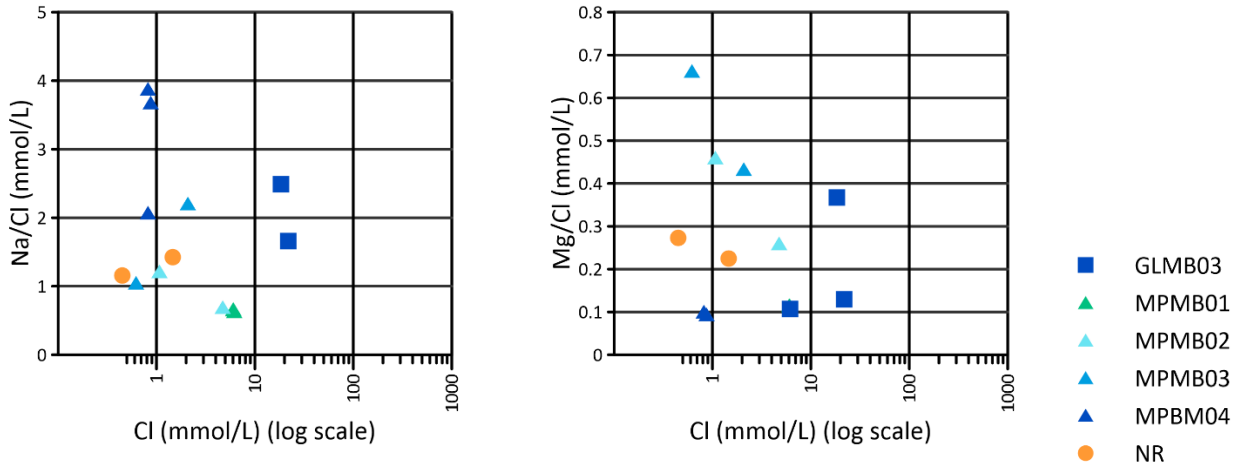


Figure 5.4 Major ion chemistry of groundwater for CGP monitoring bores (2020/21 monitoring year)

5.1.3 Dissolved metals

Concentrations of dissolved metals in groundwater for 2021-22 are presented in Figure 5.5. The major findings for dissolved metals for this monitoring year are as follows:

- Dissolved metal concentrations below the limit of reporting occurred in beryllium, boron, uranium, antimony, cadmium, chromium, mercury, selenium and vanadium, which is historically typical.
- Dissolved metal concentrations are generally similar in the alluvium and the Hawkesbury Sandstone, with exceptions discussed below. Dissolved metal concentrations across all sites were generally comparable to the previous monitoring events (2013 to 2022).
- Consistent with previous years, arsenic is lower in the alluvium and Nepean River than other monitoring locations.
- Consistent with previous years, copper is higher in the alluvium and Nepean River than other monitoring locations.
- Consistent with previous years, molybdenum and zinc is highest in the Lower Hawkesbury Sandstone than other monitoring locations. However, at GLMB03 in November 2021, zinc was two hundred percent higher than average. This is considered erroneous but due to high gas levels, GLMB03 was unable to be re-sampled in April 2022.
- Consistent with previous years, aluminium and cobalt is lower in the Lower Hawkesbury Sandstone than other monitoring locations.
- Consistent with previous years, barium and strontium is highest in GLMB03 and lowest in the Nepean River.
- Consistent with previous years, iron and nickel is lowest in MPMB04.
- Above LOR lead concentrations were reported at GLMB03 during the November 2021 monitoring round, and at MPMB04 in the April 2022 monitoring round. These measurements are not historically typical and will be re-sampled in October 2022.

- Compared to the last monitoring year, GLMB03 had notable differences in dissolved metals, including at least an order of magnitude higher concentrations of iron, zinc, manganese, nickel. It appears the previous monitoring year was anomalous, and this years' dissolved metals data is generally more consistent with earlier monitoring data than last years', with the exception of zinc.

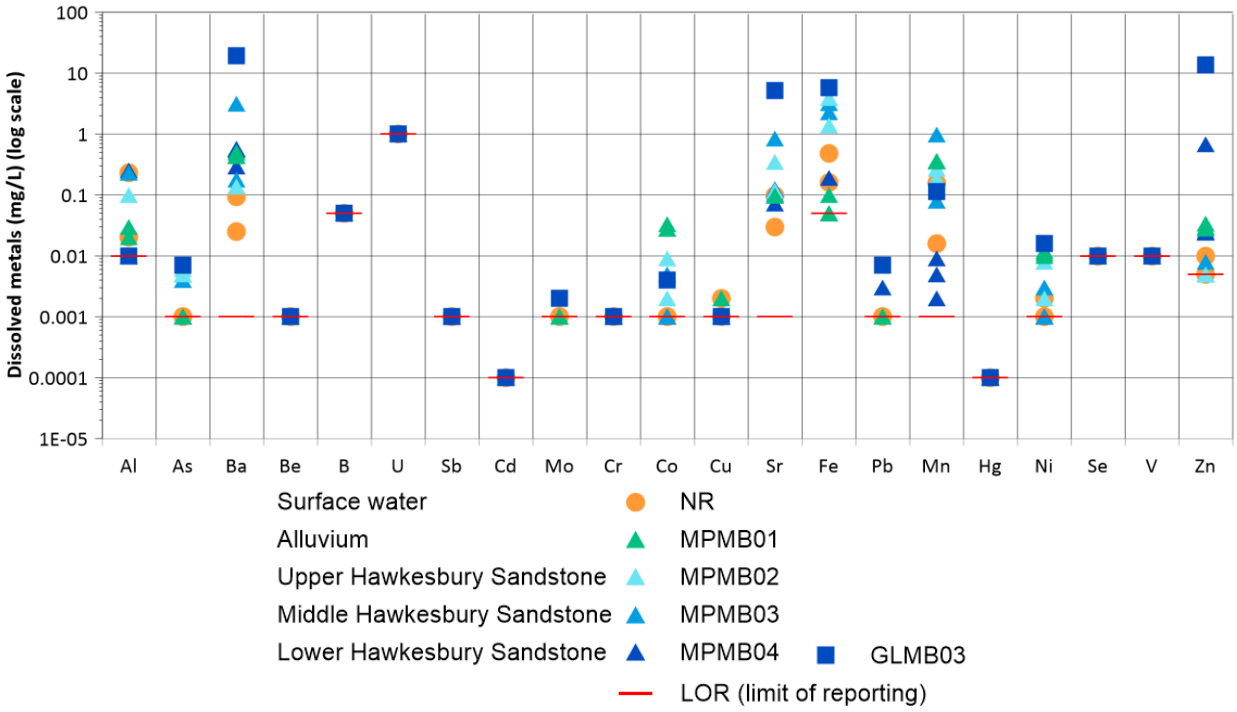


Figure 5.5 Dissolved metal concentrations in groundwater for CGP monitoring bores (2021/22 monitoring year)

5.1.4 Nutrients

A plot showing ammonia versus nitrate in groundwater is presented in Figure 5.6. The major findings for nutrients are as follows:

- Nitrate concentrations in the Hawkesbury Sandstone groundwater remained low (<0.1 mg/L as N). Higher concentrations (up to 0.64 mg/L) continued to be recorded in the alluvial aquifer (MPMB01) and Nepean River (Figure 5.6).
- Ammonia concentrations were the lowest at Menangle Park, which is consistent with previous monitoring years (Figure 5.6).
- Apart from a low nitrite concentration (0.01 mg/L) recorded at MPMB01, nitrite concentrations remained below the laboratory LOR at all monitoring bores and in the Nepean River (Appendix B).
- Low total phosphorus concentrations were detected in all hydrogeological units. Reactive phosphorus concentrations (between 0.01 and 0.09 mg/L) were detected in at all sites except MPMB04.
- Total organic carbon (TOC) concentrations were generally comparable between the lower, middle and upper Hawkesbury Sandstone at both sites and the Nepean River. TOC was not detected in the alluvium.

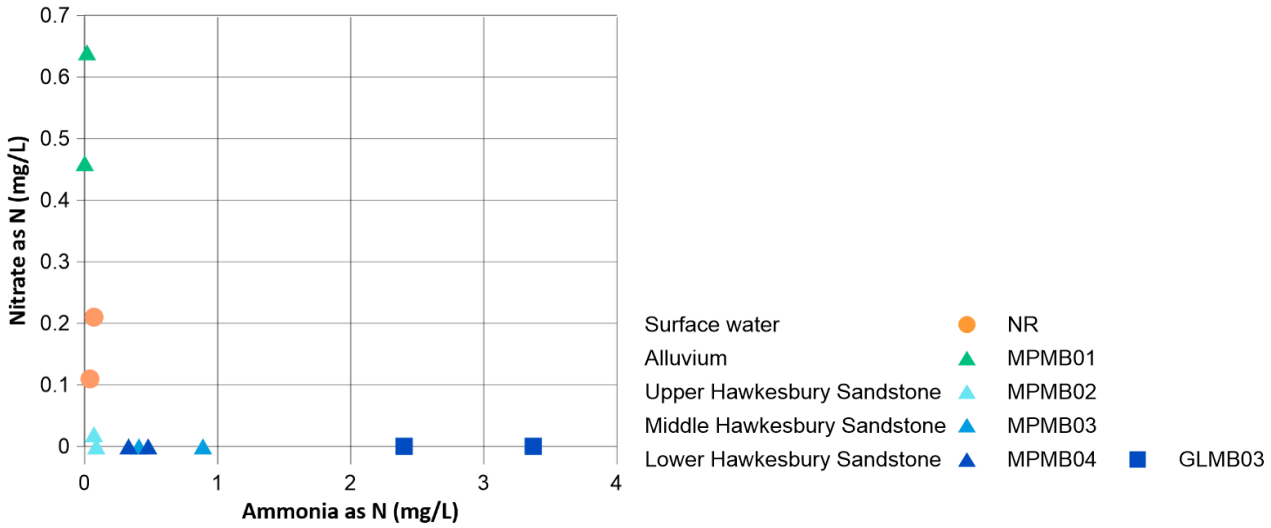


Figure 5.6 **Ammonia versus nitrate concentrations in groundwater for CGP monitoring bores (2021/22 monitoring year)**

5.1.5 Dissolved gasses

A time series plot of dissolved methane concentrations in groundwater is presented in Figure 5.7.

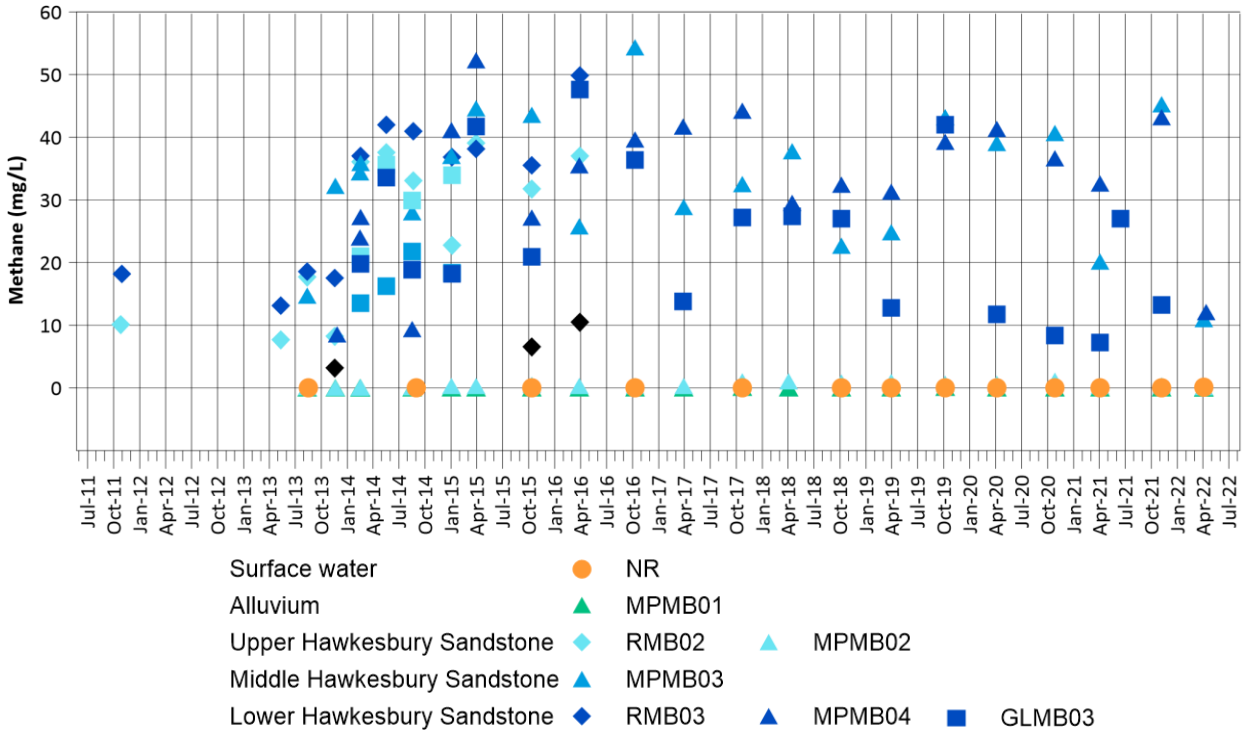


Figure 5.7 **Dissolved methane time series for CGP monitoring bores and Nepean River samples**

The major findings for dissolved gases are as follows:

- Low concentrations of dissolved methane were detected in the alluvium (MPMB01) in November 2021 (0.013 mg/L) but not in April 2022.

- Dissolved methane was detected in the Hawkesbury Sandstone at all monitoring sites. Dissolved methane concentrations were lowest at MPMB02 with concentrations of between 0.08 and 0.35 mg/L while concentrations range between 11.0 and 45.3 mg/L at all other Hawkesbury Sandstone bores (Figure 5.7).
- Propane was detected at low concentrations (less than 0.05 mg/L) in groundwater in the lower Hawkesbury Sandstone at Glenlee site (GLMB03) but was not detected above the laboratory detection limits in any of the other monitoring bores.
- Dissolved ethane was detected at GLMB03 at 0.13 mg/L and 0.06 mg/L during the November 2021 and April 2022 monitoring rounds, respectively.

Dissolved methane is shown to be of mostly thermogenic origin (Parsons Brinckerhoff 2014). The presence of dissolved hydrocarbons observed in the groundwater within the Hawkesbury Sandstone is assessed to be naturally occurring, based on the values present within the groundwater at the former control site (Denham Court, RMB) located at significant distance from the CGP gas production wells (eg EMM 2016).

5.1.6 Dissolved hydrocarbons

The Menangle Park site is a former sand and gravel quarry that has been subsequently rehabilitated. Hydrocarbon detections (PAHs and TRHs) at this site may be related to these previous land use activities. During the 2021/22 monitoring year, hydrocarbon detections were not reported (ie reported below the laboratory LOR), except for TRH (C_6-C_{10} fraction) and TPH (C_6-C_9 fraction) detected at GLMB03, which is consistent with the previous monitoring years.

Toluene continued to be present in the lower Hawkesbury Sandstone (GLMB03 and MPMB04) (Appendix B). It is assessed to be naturally occurring, given that it has been detected in groundwater at all monitoring sites at similar concentrations since monitoring commenced, including the former control site (Denham Court, RMB) located at a significant distance from development activities (eg EMM 2016). No other BTEX compounds (ie benzene, xylenes and ethyl benzene) were detected during this monitoring year.

Dissolved hydrocarbons can occur naturally in groundwater, with concentrations derived from carbonaceous material (CSIRO 2011).

5.2 Surface water quality

Surface water quality results of the Nepean River are overall consistent with previous monitoring years. The results of the 2021/22 monitoring round were compared to ANZECC (2000) guidelines for freshwater ecosystems (95% protection level):

- pH is neutral, 6.8 in both November 2021 and April 2022. The pH of the Nepean River is generally higher than the pH of groundwater in the alluvium (Figure 5.1).
- Salinity is fresh, with electrical conductivities measured at 355 and 113 µS/cm in November 2021 and April 2022, respectively; the April 2022 reading is even lower than the ANZECC guideline range (125–2,200 µS/cm) and lower than groundwater in the alluvium (Figure 5.2).
- Dominant major ions are magnesium, sodium and bicarbonate (Figure 5.3).
- Dissolved metal concentrations are typically lower than those of groundwater in the alluvium and underlying Hawkesbury Sandstone units and below the guideline values. However, a few exceedances were recorded in November 2021 and April 2022 (which in some cases were higher than previous years):
    - aluminium concentration of 0.23 mg/L (April 2022) exceeded the guideline value of 0.055 mg/L;

- copper concentration of 0.002 mg/L (November 2021) exceeded the guideline value of 0.0014 mg/L; and
- zinc concentration of 0.01 mg/L (April 2022) exceeded the guideline value of 0.008 mg/L.

- Nutrient concentrations are generally low with the exception of the November 2021 and April 2022 ammonia concentration which was 0.04 mg/L and 0.07 mg/L respectively, which slightly exceeded the guideline concentration of 0.02 mg/L but was lower than the groundwater concentrations in the Hawkesbury Sandstone, and phosphorus concentration of 0.08 mg/L in November 2021 which slightly exceeded the guideline concentration of 0.05 mg/L.
- Dissolved methane was detected at a concentration similar to that of groundwater in the alluvium.
- No detections of dissolved hydrocarbons.

6 Discussion and conclusions

Monitoring of groundwater levels at the nested monitoring bore sites was undertaken using dataloggers, allowing water level trends to be identified in the alluvium, Ashfield Shale, and Hawkesbury Sandstone. Sampling of water quality at all sites also established useful trends.

The Denham Court nested groundwater monitoring site (monitoring bores RMB01, RMB02, RMB03 and RMB04) was decommissioned by AGL at the landowners' request in October 2016. The final water quality monitoring event from the Denham Court bores was in April 2016 (EMM 2016), water level data continued to be collected until decommissioning.

The main findings for the 2021/22 monitoring year regarding **water levels** are:

- The groundwater level in the alluvium at Menangle Park is less than 10 mbgl and shows a direct response to rainfall and flood events.
- Groundwater levels are shallow (less than 15 mbgl) in the Hawkesbury Sandstone at the Menangle Park and Glenlee sites.
- Groundwater levels appear to follow similar trends in each of the Hawkesbury Sandstone units (upper, middle and lower) at Menangle Park. A clear response to rainfall events can be observed even though this is an apparent groundwater discharge area.
- The datalogger at MPMB04 was malfunctioning likely due to recent floods. Groundwater level data could not be retrieved, the datalogger was replaced in April 2022.
- The datalogger in the lower Hawkesbury Sandstone monitoring bore at the Glenlee site (GLMB03) was not downloaded during the April 2022 monitoring round due to elevated levels of naturally occurring hazardous gases in this bore. Therefore, analysis of recent trends was not possible. Previous records and manual groundwater level measurements suggest a slight downward trend, which is unlikely to represent true groundwater levels and responses.
- The pressures in the VWP installed at GLMB01 and GLMB02 (installed in 2015) have stabilised at lower piezometric pressure head levels compared with pressures observed from the former standpipe monitoring bores, likely caused by inaccurate installation techniques. The measured pressures are not likely to be representative of formation pressures.
- For the regional Hawkesbury Sandstone aquifer, groundwater elevations are higher at the Glenlee site (approximately 71-75 mAHD) than the Menangle Park site (approximately 57-61 mAHD).
- Vertical gradients vary between sites. Upward gradients are evident at Menangle Park and downward gradients are evident the Glenlee site.
- The Nepean River elevation is usually lower than the groundwater elevation in the alluvium and Hawkesbury Sandstone units, indicating the river is a gaining stream around the Menangle Park site, except for short periods during very high rainfall events when recharge to the underlying groundwater systems is observed.
- The groundwater level data collected in the alluvium and Hawkesbury Sandstone are indicative of natural systems in long-term equilibrium with occasional seasonal responses to recharge when there is a connection with surface features, as evident at the Menangle site within the alluvium and Hawkesbury Sandstone.

No long-term groundwater level drawdown trends that can be definitively associated to CSG operations (which involves dewatering of the deep coal seams) have been observed in the groundwater level data at any of the monitored locations.

The main findings for the 2021/22 monitoring year regarding **water quality** are:

- Groundwater quality in the alluvium at the Menangle Park site is characterised as fresh to marginally saline and slightly acidic pH. Dissolved metal concentrations are typically low. Minor dissolved hydrocarbons were detected and may be related to previous land use activities.

- Groundwater quality in the Hawkesbury Sandstone ranges from fresh to marginally brackish at the Menangle Park site and is brackish to moderately saline at the Glenlee site. Salinity decreases with depth at the Glenlee site.

- pH and previously anomalous dissolved metal concentrations have returned to the general historical range in the lower Hawkesbury Sandstone monitoring bore at the Glenlee site during the 2021-22 monitoring year. This change in water quality is attributed to the bore remediation undertaken in October 2021.

- Minor detections of dissolved hydrocarbons were present in the lower Hawkesbury Sandstone. Dissolved methane was detected at all Hawkesbury Sandstone bores and is likely related to degassing of naturally occurring methane after purging during groundwater sampling events. Dissolved ethane and propane were detected at the Glenlee site only. These compounds are assessed to be naturally occurring given that methane has been observed to occur at all sites, including the former control site (Denham Court) which was located at a significant distance from any development activities.

- Toluene was detected at both lower Hawkesbury Sandstone monitoring points. It is assessed to be naturally occurring given that it has been detected at all sites, including the former control site (Denham Court) which was located at a significant distance from the CGP gas production wells. No other BTEX compounds were detected.

- No significant change in water quality was detected during the 2021/22 monitoring year compared to the previous monitoring year (EMM 2021b), except for GLMB03. GLMB03 was remediated in October 2021 to address changes in water quality, including increased pH, precipitation of calcium carbonate and lower sampling yields. The changes were associated with naturally occurring gases and attributed to natural causes.

No adverse water quality impacts that can be attributed to CSG operations were observed at any of the monitored sites. Water quality results are not significantly different between the former control site (Denham Court) and monitoring sites located within the CGP footprint (Menangle Park and Glenlee).

From the available data, there are no observable impacts to groundwater levels or quality or surface water quality that could be attributable to the CSG operations. There is also no evidence of connectivity between the shallower monitored zones and the coal seams which corroborates the conceptual model developed during the Phase 1 studies (Parsons Brinckerhoff 2011). The presence of extensive and thick claystone formations (aquitards and aquicludes) between the Hawkesbury Sandstone and the targeted coal seams restricts depressurisation and impedes the vertical flow of groundwater.

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Glossary

Acidity	Base neutralising capacity.
Alkalinity	Acid neutralising capacity.
Alluvium	Unconsolidated sediments (clays, sands, gravels and other materials) deposited by flowing water. Deposits can be made by streams on river beds, floodplains, and alluvial fans.
Alluvial aquifer	Permeable zones that store and produce groundwater from unconsolidated alluvial sediments. Shallow alluvial aquifers are generally unconfined aquifers.
Ammonia	A compound of nitrogen and hydrogen (NH3) that is a common by-product of animal waste and landfills but is also found naturally in reduced environments. Ammonia readily converts to nitrate in soils and streams.
Anion	An ion with a negative charge – usually non-metal ions when disassociated and dissolved in water.
Aquatic ecosystem	The stream channel, lake or estuary bed, water, and (or) biotic communities and the habitat features that occur therein.
Aquiclude	An impermeable unit that acts as a barrier to the flow of groundwater from one formation to another.
Aquifer	Rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water.
Aquifer properties	The characteristics of an aquifer that determine its hydraulic behaviour and its response to abstraction.
Aquifer, confined	An aquifer that is overlain by low permeability strata. The hydraulic conductivity of the confining bed is significantly lower than that of the aquifer.
Aquifer, semi-confined	An aquifer overlain by a low-permeability layer that permits water to slowly flow through it. During pumping, recharge to the aquifer can occur across the leaky confining layer – also known as a leaky artesian or leaky confined aquifer.
Aquifer, unconfined	Also known as a water table aquifer. An aquifer in which there are no confining beds between the zone of saturation and the surface. The water table is the upper boundary of an unconfined aquifer.
Aquitard	A low permeability unit that can store groundwater and also transmit it slowly from one formation to another. Aquitards retard but do not prevent the movement of water to or from adjacent aquifers.
Australian Height Datum (AHD)	The reference point (very close to mean sea level) for all elevation measurements, and used for correlating depths of aquifers and water levels in bores.
Beneficial aquifer	An aquifer with a water resource of sufficient quality and quantity to provide either ecosystem protection, raw water for drinking water supply, and agricultural or industrial water.
Bore	A structure drilled below the surface to obtain water from an aquifer or series of aquifers.
Boundary	A lateral discontinuity or change in the aquifer resulting in a significant change in hydraulic conductivity, storativity or recharge.
Cation	An ion with a positive charge – usually metal ions when disassociated and dissolved in water.

Claystone	A non-fissile rock of sedimentary origin composed primarily of clay-sized particles (less than 0.004 mm).
Coal	A sedimentary rock derived from the compaction and consolidation of vegetation or swamp deposits to form a fossilised carbonaceous rock.
Coal seam	A layer of coal within a sedimentary rock sequence.
Coal seam gas (CSG)	Coal seam gas is a form of natural gas (predominantly methane) that is extracted from coal seams.
Concentration	The amount or mass of a substance present in a given volume or mass of sample, usually expressed as milligram per litre (water sample) or micrograms per kilogram (sediment sample).
Conceptual model	A simplified and idealised representation (usually graphical) of the physical hydrogeologic setting and the hydrogeological understanding of the essential flow processes of the system. This includes the identification and description of the geologic and hydrologic framework, media type, hydraulic properties, sources and sinks, and important aquifer flow and surface-groundwater interaction processes.
Confining layer	Low permeability strata that may be saturated but will not allow water to move through it under natural hydraulic gradients.
Datalogger	A digital recording instrument that is inserted in monitoring and pumping bores to record pressure measurements and water level variations.
Dual permeability aquifer	An aquifer in which groundwater flow is through both the primary porosity of the rock matrix and the secondary porosity of fractures and fissures.
Electrical conductivity (EC)	A measure of a fluid's ability to conduct an electrical current and is an estimation of the total ions dissolved. It is often used as a measure of water salinity.
Facies	An assemblage or association of mineral, rock, or fossil features reflecting the environment and conditions of origin of the rock. It refers to the appearance and peculiarities that distinguish a rock unit from associated or adjacent units.
Fault	A fracture in rock along which there has been an observable amount of displacement. Faults are rarely single planar units; normally they occur as parallel to sub-parallel sets of planes along which movement has taken place to a greater or lesser extent. Such sets are called fault or fracture zones.
Groundwater	The water contained in interconnected pores or fractures located below the water table in the saturated zone.
Groundwater level	The water level measured in a bore; this may be at or close to the water table in unconfined aquifers, or represent the average piezometric level across the screened interval in confined aquifers.
Groundwater flow	The movement of water through openings in sediment and rock within the zone of saturation.
Groundwater system	A system that is hydrogeologically more similar than different in regard to geological province, hydraulic characteristics and water quality, and may consist of one or more geological formations.
Hydraulic conductivity	The rate at which water of a specified density and kinematic viscosity can move through a permeable medium (notionally equivalent to the permeability of an aquifer to fresh water).
Hydraulic gradient	The change in total hydraulic head with a change in distance in a given direction.

Hydraulic head	A specific measurement of water pressure above a datum. It is usually measured as a water surface elevation, expressed in units of length. In an aquifer, it can be calculated from the depth to water in a monitoring bore. The hydraulic head can be used to determine a hydraulic gradient between two or more points.
Hydrogeology	The study of the interrelationships of geologic materials and processes with water, especially groundwater.
Hydrology	The study of the occurrence, distribution, and chemistry of all surface waters.
Ion	An ion is an atom or molecule where the total number of electrons is not equal to the total number of protons, giving it a net positive or negative electrical charge.
Limit or reporting (LOR)	The concentration below which a particular analytical method cannot determine, with a high degree of certainty, a concentration.
Lithology	The study of rocks and their depositional or formational environment on a large specimen or outcrop scale.
Major ions	Constituents commonly present in concentrations exceeding 10 milligram per litre. Dissolved cations generally are calcium, magnesium, sodium, and potassium; the major anions are sulphate, chloride, fluoride, nitrate, and those contributing to alkalinity, most generally assumed to be bicarbonate and carbonate.
Methane (CH_4)	An odourless, colourless, flammable gas, which is the major constituent of natural gas. It is used as a fuel and is an important source of hydrogen and a wide variety of organic compounds.
MicroSiemens per centimetre (µS/cm)	A measure of water salinity commonly referred to as EC (see also electrical conductivity). Most commonly measured in the field with calibrated field meters.
Monitoring bore	A non-pumping bore, is generally of small diameter that is used to measure the elevation of the water table and/or water quality. Bores generally have a short well screen against a single aquifer through which water can enter.
Monitoring period	Refers to data collected since commencement of monitoring or for a specified time.
Monitoring year	Refers to data collected between July 2021 and June 2022.
Normal faulting	Where the fault plane is vertical or dips towards the downthrow side of a fault.
Oxidising conditions	Conditions in which a species loses electrons and is present in oxidised form.
Permeability	The property or capacity of a porous rock, sediment, clay or soil to transmit a fluid. It is a measure of the relative ease of fluid flow under unequal pressure. The hydraulic conductivity is the permeability of a material for water at the prevailing temperature.
Permeable material	Material that permits water to move through it at perceptible rates under the hydraulic gradients normally present.
Permian	The last period of the Palaeozoic era that finished approximately 252 million years before present.
pH	Potential of Hydrogen; the logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per litre; provides a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution (where 7 is neutral, greater than 7 is alkaline and less than 7 is acidic).
Porosity	The proportion of open space within an aquifer, comprised of intergranular space, pores, vesicles and fractures.

Porosity, primary	The porosity that represents the original pore openings when a rock or sediment formed.
Porosity, secondary	The porosity caused by fractures or weathering in a rock or sediment after it has been formed.
Quaternary	The most recent geological period extending from approximately 2.6 million years ago to the present day.
Quality assurance	Evaluation of quality-control data to allow quantitative determination of the quality of chemical data collected during a study. Techniques used to collect, process, and analyse water samples are evaluated.
Recharge	The process which replenishes groundwater, usually by rainfall infiltrating from the ground surface to the water table and by river water reaching the water table or exposed aquifers. The addition of water to an aquifer.
Recharge area	A geographic area that directly receives infiltrated water from surface and in which there are downward components of hydraulic head in the aquifer. Recharge generally moves downward from the water table into the deeper parts of an aquifer then moves laterally and vertically to recharge other parts of the aquifer or deeper aquifer zones.
Recovery	The difference between the observed water level during the recovery period after cessation of pumping and the water level measured immediately before pumping stopped.
Redox potential (ORP or Eh)	The redox potential is a measure (in volts) of the affinity of a substance for electrons – its electronegativity – compared with hydrogen (which is set at 0). Substances more strongly electronegative than (ie capable of oxidising) hydrogen have positive redox potentials. Substances less electronegative than (ie capable of reducing) hydrogen have negative redox potentials. Also known as oxidation-reduction potential and Eh.
Redox reaction	Redox reactions, or oxidation-reduction reactions, are a family of reactions that are concerned with the transfer of electrons between species, and are mediated by bacterial catalysis. Reduction and oxidation processes exert an important control on the distribution of species like O2, Fe2+, H2S and CH4 etc. in groundwater.
Salinity	The concentration of dissolved salts in water, usually expressed in EC units or milligrams of total dissolved solids per litre (mg/L TDS).
Salinity classification	Fresh water quality – water with a salinity <800 µS/cm. Marginal water quality – water that is more saline than freshwater and generally waters between 800 and 1,600 µS/cm. Brackish quality – water that is more saline than freshwater and generally waters between 1,600 and 4,800 µS/cm. Slightly saline quality – water that is more saline than brackish water and generally waters with a salinity between 4,800 and 10,000 µS/cm. Moderately saline quality – water that is more saline than slightly saline water and generally waters between 10,000 and 20,000 µS/cm. Saline quality – water that is almost as saline as seawater and generally waters with a salinity greater than 20,000 µS/cm. Seawater quality – water that is generally around 55,000 µS/cm. (Australian Water Resources Council 1988)
Sandstone	Sandstone is a sedimentary rock composed mainly of sand-sized minerals or rock grains (predominantly quartz).

Screen	A type of bore lining or casing of special construction, with apertures designed to permit the flow of water into a bore while preventing the entry of aquifer or filter pack material.
Sedimentary rock aquifer	These occur in consolidated sediments such as porous sandstones and conglomerates, in which water is stored in the intergranular pores, and limestone, in which water is stored in solution cavities and joints. These aquifers are generally located in sedimentary basins that are continuous over large areas and may be tens or hundreds of metres thick. In terms of quantity, they contain the largest volumes of groundwater.
Shale	A laminated sedimentary rock in which the constituent particles are predominantly of clay size.
Siltstone	A fine-grained rock of sedimentary origin composed mainly of silt-sized particles (0.004 to 0.06 mm).
Standing water level (SWL)	The height to which groundwater rises in a bore after it is drilled and completed, and after a period of pumping when levels return to natural atmospheric or confined pressure levels.
Stratigraphy	The depositional order of sedimentary rocks in layers.
Surface water-groundwater interaction	This occurs in two ways: (1) streams gain water from groundwater through the streambed when the elevation of the water table adjacent to the streambed is greater than the water level in the stream; and (2) streams lose water to groundwater through streambeds when the elevation of the water table is lower than the water level in the stream.
Tertiary	Geologic time at the beginning of the Cainozoic era, 65 to 2.6 million years ago, after the Cretaceous and before the Quaternary.
Total Dissolved Solids (TDS)	A measure of the salinity of water, usually expressed in milligrams per litre (mg/L). See also EC.
Water quality	Term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.
Water quality data	Chemical, biological, and physical measurements or observations of the characteristics of surface and ground waters, atmospheric deposition, potable water, treated effluents, and waste water and of the immediate environment in which the water exists.
Well	Pertaining to a gas exploration well or gas production well.

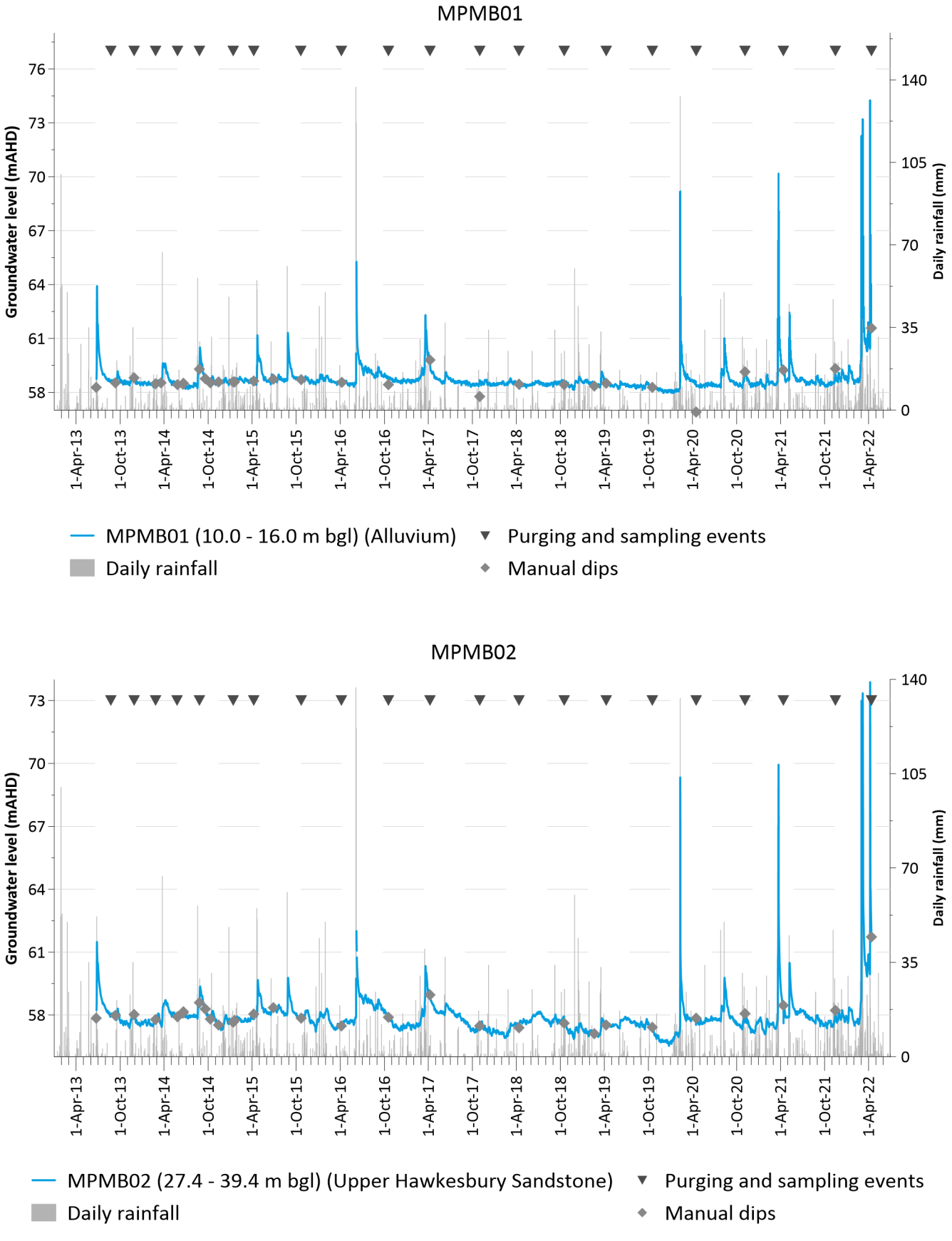
Abbreviations

AGL	AGL Upstream Investments Pty Ltd
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethyl benzene and xylenes
CDFM	Cumulative deviation from mean
CGP	Camden Gas Project
CSG	Coal seam gas
DO	Dissolved oxygen
EC	Electrical conductivity
LOR	Limit of reporting
ORP	Oxidation reduction potential
PAH	Polycyclic aromatic hydrocarbons
SCA	Sydney Catchment Authority
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons
VWP	Vibrating wire piezometer

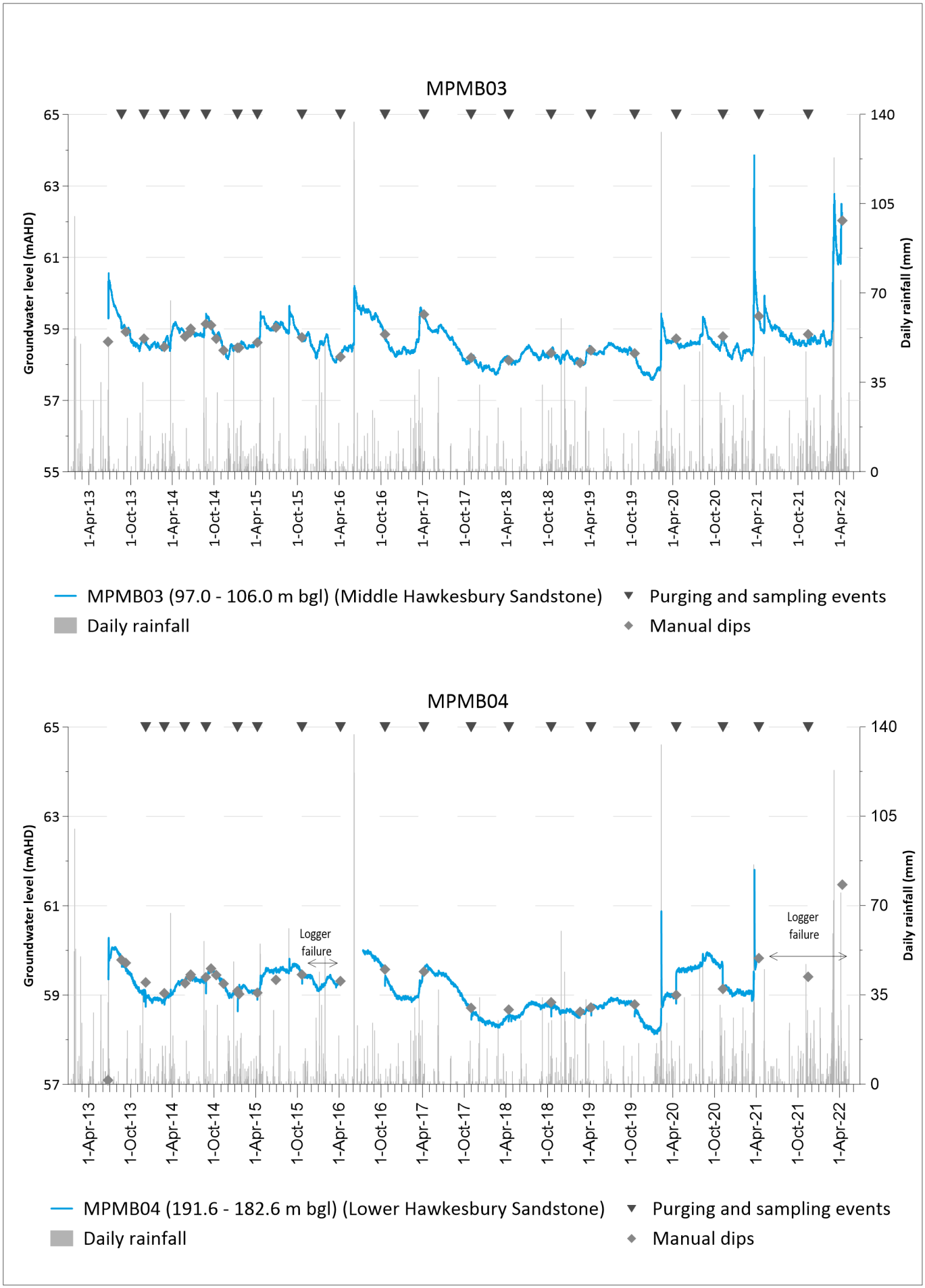
°C	degrees Celsius
L/s	litres per second
m	metres
mAHD	metres Australian Height Datum
mbgl	metres below ground level
m/d	metres per day
mg/L	milligrams per litre
µg/L	micrograms per litre
mV	millivolt
µS/cm	microSiemens per centimetre

Appendix A
Groundwater hydrographs

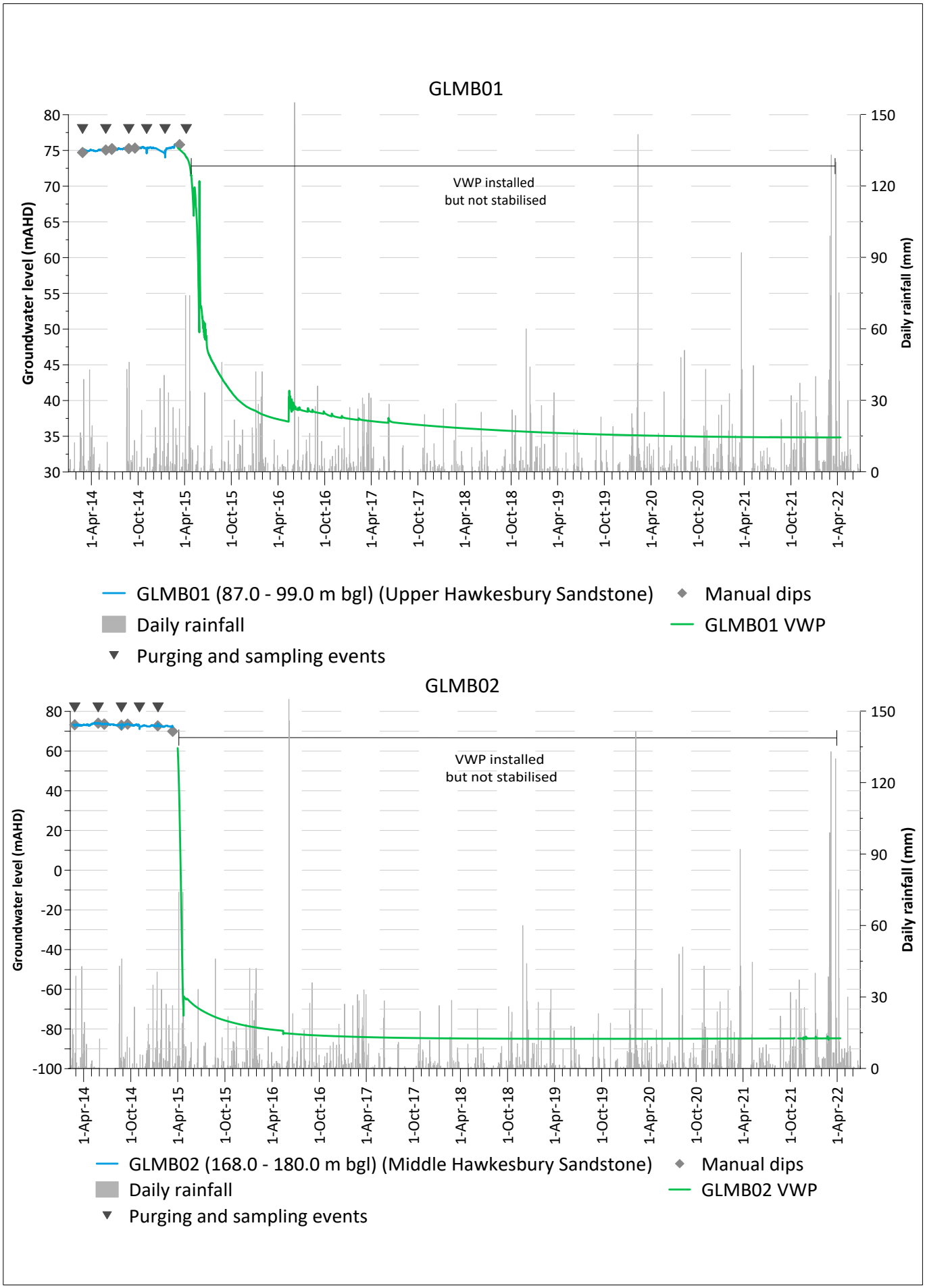
EMM
creating opportunities



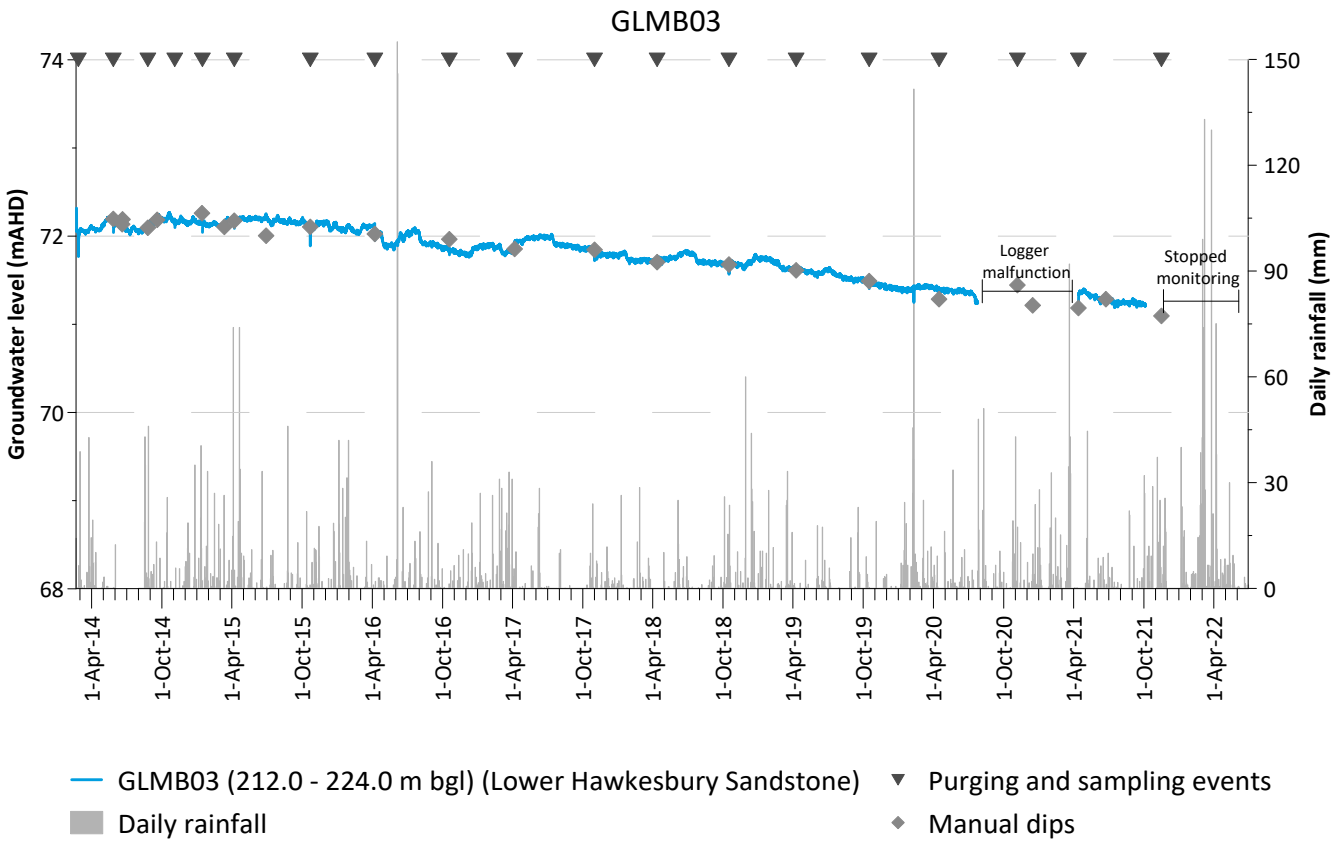
MPMB01 and MPMB02 hydrographs
Camden Gas Project
2021-2022 Water Monitoring Report
Figure A.1



MPMB03 and MPMB04 hydrographs
Camden Gas Project
2021 - 2022 Water Monitoring Report
Figure A.2



GLMB01 and GLMB02 hydrographs
Camden Gas Project
2021 - 2022 Water Monitoring Report
Figure A.3



GLMB03 hydrograph
Camden Gas Project
2021 - 2022 Water Monitoring Report
Figure A.4

Appendix B
Water quality summary table

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SUMMARY TABLE B.1 - Water quality results at the Glenlee and Menangle Park sites (2021/22 monitoring year)

			Site ID	GLMB03		MPMB01		MPMB02		MPMB03		MPMB04		ANZECC 2000 guideline values for fresh water ecosystem 95%*	NR	
			Date	24/06/2021	15/11/2021	15/11/2021	13/04/2022	15/11/2021	13/04/2022	15/11/2021	22/04/2022	15/11/2021	22/04/2022		15/11/2021	13/04/2022
			Lab report number	ES2123587	ES2141417	ES2141417	ES2213055	ES2141417	ES2213055	ES2141417	ES2213939	ES2141417	ES2213939		ES2141417	ES2213055
Chemical group	**Analyte**	**Unit**	**Limit of reporting (LOR)**													
General parameters	pH (field)	pH units		-	-		5.39	-	6.56	-	-	-	-	6.5 - 8.0**	-	6.11
	pH (lab)***	pH units		7.58	7.70	5.75	6.12	6.71	6.99	7.84	7.35	8.91	9.10	6.5 - 8.0**	6.85	6.83
	Electrical conductivity (field)	uS/cm		-	-	-	743	-	307	-	-	-	-	125 - 2,200**	-	140
	Electrical Conductivity @ 25°C	µS/cm	1	5,260	4,780	736	708	816	300	1,050	196	387	216		355	113
	Temperature (field)	°C		-	-	-	24.8	-	24.8	-	-	-	-		-	19.9
	Dissolved oxygen (field)	mg/L		-	-	-	7.16	-	4.01	-	-	-	-		-	7.38
	Dissolved oxygen (field)	%		-	-	-	87	-	45.2	-	-	-	-	80 - 110**	-	83.4
	Total dissolved solids (field)	mg/L		-	-	-	481	-	200	-	-	-	-		-	91
	Total Dissolved Solids @180°C	mg/L	10	3,060	3,010	436	434	456	150	605	140	228	137		255	69
	Suspended Solids (SS)	mg/L	5	89	71	11	283	15	69	12	74	8	40		14	6
	Redox (field)	mV		-	-	-	129	-	46	-	-	-	-		-	55
Analytical results – alkalinity	Alkalinity (Bicarbonate as $CaCO_3$)	mg/L	1	2,240	1,710	33	21	177	86	498	89	80	67		85	17
	Alkalinity (Carbonate as $CaCO_3$)	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	54	19		<1	<1
	Alkalinity (Hydroxide) as $CaCO_3$	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
	Alkalinity (total) as $CaCO_3$	mg/L	1	2,240	1,710	33	21	177	86	498	89	134	86		85	17
Analytical results – nutrients	Ammonia as N	mg/L	0.01	3.37	2.4	<0.01	0.02	0.09	0.07	0.89	0.41	0.48	0.33	0.02*	0.04	0.07
	Nitrite + Nitrate as N	mg/L	0.01	<0.01	<0.01	0.48	0.66	<0.01	0.02	<0.01	<0.01	<0.01	<0.01		0.28	0.21
	Nitrite (as N)	mg/L	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
	Nitrate (as N)	mg/L	0.01	<0.01	<0.01	0.47	0.66	<0.01	0.02	<0.01	<0.01	<0.01	<0.01		0.28	0.21
	Reactive Phosphorus as P	mg/L	0.01	<0.05	0.09	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02*	0.01	<0.01
	Phosphorus	mg/L	0.01	<0.01	0.7	0.02	0.1	0.03	0.07	0.02	-	<0.01	-	0.05*	0.08	0.03
	TOC	mg/L	1	2	10	<1	<1	<1	6	<1	10	4	7		10	7
Inorganics	Cyanide Total	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007	<0.004	<0.004
	Calcium (filtered)	mg/L	1	193	275	8	9	31	11	89	14	4	3		11	4
	Chloride	mg/L	1	651	777	218	214	168	38	74	22	29	29		52	16
	Fluoride	mg/L	0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	0.2	0.1		0.1	<0.1
	Bromide	µg/L	10	1,440	1,350	356	401	242	88	19	49	50	49		100	50
	Bromine (filtered)	µg/L	100	1,500	1,700	400	500	300	100	100	<100	<100	<100		100	<100
	Reactive Silica	mg/L	0.05	27.5	10.5	16.4	16	11.3	6.35	8.38	4.29	2.13	1.92		4.97	4.35
	Sodium (filtered)	mg/L	1	1,050	836	90	92	76	30	106	15	73	39		48	12
	Magnesium (filtered)	mg/L	1	164	69	16	17	30	12	22	10	2	2		8	3
	Potassium (filtered)	mg/L	1	38	32	1	1	3	3	13	5	7	6		6	2
	Anions Total	meq/L	0.01	63.1	56.1	6.87	6.54	8.4	2.96	12	2.4	3.5	2.58		3.46	0.92
	Ionic Balance	%	0.01	5.01	0.44	9.7	5.35	4.97	-	3.63	-	3.09	-		0.12	-
	Cations Total	meq/L	0.01	69.8	56.6	5.66	5.88	7.61	2.92	11.2	2.3	3.72	2.16		3.45	1.02
	Sulfate as SO_4 - Turbidimetric (filtered)	mg/L	1	<1	<10	3	4	6	8	<1	<1	<1	2		14	6
Organics	Methane	µg/L	10	27	13.2	0.013	<0.01	0.348	0.083	45.3	11	44.4	12.1	0	<0.01	0.126
	Ethane	µg/L	10	133	66	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10
	Ethene	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10
Dissolved metals	Aluminium (filtered)	mg/L	0.01	<0.01	<0.01	0.01	0.03	<0.01	0.1	<0.01	0.23	<0.01	0.25	0.055	0.02	0.23
	Arsenic (filtered)	mg/L	0.001	0.021	0.007	<0.001	<0.001	0.006	0.005	0.005	0.004	<0.001	<0.001		0.001	<0.001
	Barium (filtered)	mg/L	0.001	42.7	19.3	0.506	0.436	0.489	0.137	3.12	0.179	0.552	0.295		0.094	0.025
	Beryllium (filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
	Boron (filtered)	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.37	<0.05	<0.05
	Uranium (filtered)	mg/L	0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
	Antimony (filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
	Cadmium (filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
	Molybdenum (filtered)	mg/L	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		<0.001	<0.001
	Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001
	Cobalt (filtered)	mg/L	0.001	<0.001	0.004	0.033	0.028	0.002	0.009	0.001	0.005	<0.001	<0.001		<0.001	<0.001
	Copper (filtered)	mg/L	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0014	0.002	<0.001
	Strontium (filtered)	mg/L	0.001	8.12	5.17	0.098	0.097	0.349	0.118	0.847	0.104	0.121	0.072		0.098	0.03
	Iron (filtered)	mg/L	0.05	0.66	5.72	0.1	<0.05	3.9	1.38	2.27	3.2	<0.05	0.19		0.16	0.48
	Lead (filtered)	mg/L	0.001	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.0034	<0.001	<0.001
	Manganese (filtered)	mg/L	0.001	0.023	0.113	0.367	0.353	0.186	0.269	0.08	0.987	0.005	0.009	1.9	0.016	0.158
	Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	<0.0001	<0.0001
	Nickel (filtered)	mg/L	0.001	<0.001	0.016	0.012	0.01	0.002	0.008	<0.001	0.003	<0.001	<0.001	0.011	0.002	<0.001
	Selenium (filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01
	Vanadium (filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
	Zinc (filtered)	mg/L	0.005	0.13	13.6	0.034	0.03	<0.005	0.005	<0.005	0.008	0.024	0.687	0.008	<0.005	0.01
Normal alkanes	Butane	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
	Butene	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10
	Propane	mg/L	0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
	Propene	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10
Aromatic hydrocarbons	Benzene	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	950	<1	<1
	Ethylbenzene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	<2
	Toluene	µg/L	2	50	<2	<2	<2	<2	<2	<2	<2	8	3		<2	<2
	Total BTEX	µg/L	1	50	<1	<1	<1	<1	<1	<1	<1	8	3		<1	<1
	Xylene (m & p)	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	<2
	Xylene (o)	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	350	<2	<2
	Xylene Total	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	<2
Phenolic compounds	2,4,5-Trichlorophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	2,4,6-Trichlorophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	20	<1.0	<1.0
	2,4-Dichlorophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	160	<1.0	<1.0
	2,4-Dimethylphenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	2,6-Dichlorophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	2-Chlorophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	490	<1.0	<1.0
	2-Nitrophenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	2-Methylphenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	3&4-Methylphenol (m&p-cresol)	µg/L	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		<2.0	<2.0
	Pentachlorophenol	µg/L	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	10	<2.0	<2.0
	4-chloro-3-methylphenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Phenol	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	320	<1.0	<1.0
Total recoverable hydrocarbons	C10-C16	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C10-C16 (F2 minus Naphthalene)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C10-C40 (Sum of total)	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C16-C34	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C34-C40	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C6-C10	µg/L	20	70	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20
	C6-C10 (F1 minus BTEX)	µg/L	20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20
Polycyclic aromatic hydrocarbons	Naphthalene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	16	<1.0	<1.0
	Acenaphthene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Acenaphthylene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Anthracene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Benz(a)anthracene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Benzo(a) pyrene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
	Benzo(a)pyrene TEQ calc (Zero)	µg/L	0.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005
	Benzo(b+j)fluoranthene	µg/L	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010
	Benzo(g,h,i)perylene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Benzo(k)fluoranthene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Chrysene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Dibenz(a,h)anthracene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Fluoranthene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Fluorene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	PAHs (Sum of total)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Phenanthrene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
	Pyrene	µg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0	<1.0
Total Petroleum Hydrocarbons	+C10-C36 (Sum of total)	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	<50
	C15-C28	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		<100	<100
	C10-C14	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	<50
	C29-C36	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	<50
	C6-C9	µg/L	20	70	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20

Notes: * ANZECC (2000) Water Quality Guidelines only apply to Nepean River (NR) sample.

** ANZECC (2000) Water Quality Guidelines: 95% protection levels for the protection of freshwater aquatic ecosystems, south-east Australia, low lying river ecosystems.

*** pH (lab) was generally analysed outside of recommended holding times.

Appendix C
Laboratory reports

EMM
creating opportunities

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2123587**	Page	: 1 of 8
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEN GAS PROJECT J200417	Date Samples Received	: 24-Jun-2021 17:00
Order number	: ----	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: ----	Issue Date	: 02-Jul-2021 16:59
Sampler	: Claire Corthier, Steve Rocks		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: Bromine quantification may be unreliable due to its low solubility in acid, leading to variable volatility during measurement by ICPMS.
- EK071G:LOR raised due to sample matrix.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	TB	TS	----	----
			Sampling date / time	[24-Jun-2021]	21-Jun-2021 00:00	21-Jun-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2123587-001	ES2123587-002	ES2123587-003	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.58**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**5260**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**3060**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**89**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**2240**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**2240**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**651**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**193**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**164**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**1050**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**38**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.021**	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	**42.7**	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.023**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	TB	TS	----	----
			Sampling date / time	[24-Jun-2021]	21-Jun-2021 00:00	21-Jun-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2123587-001	ES2123587-002	ES2123587-003	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.130**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	**8.12**	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.66**	----	----	----	----
Bromine	7726-95-6	0.1	mg/L	**1.5**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG052G: Silica by Discrete Analyser								
Reactive Silica	----	0.05	mg/L	**27.5**	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**3.37**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.05	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**63.1**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**69.8**	----	----	----	----
ø Ionic Balance	----	0.01	%	**5.01**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	TB	TS	----	----
			Sampling date / time	[24-Jun-2021]	21-Jun-2021 00:00	21-Jun-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2123587-001	ES2123587-002	ES2123587-003	--------	--------
				Result	Result	Result	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**2**	----	----	----	----
EP033: C1 - C4 Hydrocarbon Gases								
Methane	74-82-8	10	µg/L	**27000**	----	----	----	----
Ethene	74-85-1	10	µg/L	<10	----	----	----	----
Ethane	74-84-0	10	µg/L	**133**	----	----	----	----
Propene	115-07-1	10	µg/L	<10	----	----	----	----
Propane	74-98-6	10	µg/L	**40**	----	----	----	----
Butene	25167-67-3	10	µg/L	<10	----	----	----	----
Butane	106-97-8	10	µg/L	<10	----	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	----	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	----	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	----	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	----	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	----	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	----	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	----	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	----	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	----	----	----	----
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	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GLMB03	TB	TS	----	----
				Sampling date / time	[24-Jun-2021]	21-Jun-2021 00:00	21-Jun-2021 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2123587-001	ES2123587-002	ES2123587-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
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		**70**	<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		**70**	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		**20**	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	**15**	----	----
Toluene	108-88-3	2	µg/L		**50**	<2	**16**	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	**15**	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	**14**	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	**15**	----	----
^ Total Xylenes	----	2	µg/L		<2	<2	**29**	----	----
^ Sum of BTEX	----	1	µg/L		**50**	<1	**75**	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	**18**	----	----
ED009: Anions									
Bromide	24959-67-9	0.010	mg/L		**1.44**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GLMB03	TB	TS	----	----
				Sampling date / time	[24-Jun-2021]	21-Jun-2021 00:00	21-Jun-2021 00:00	----	----
Compound	CAS Number	LOR	Unit		ES2123587-001	ES2123587-002	ES2123587-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**28.8**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		**51.0**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		**42.5**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**61.4**	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%		**67.7**	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		**86.6**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**117**	**106**	**105**	----	----
Toluene-D8	2037-26-5	2	%		**116**	**108**	**108**	----	----
4-Bromofluorobenzene	460-00-4	2	%		**116**	**101**	**103**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) 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

QUALITY CONTROL REPORT

Work Order	: **ES2123587**	Page	: 1 of 12
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEN GAS PROJECT J200417	Date Samples Received	: 24-Jun-2021
Order number	: ----	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: ----	Issue Date	: 02-Jul-2021
Sampler	: Claire Corthier, Steve Rocks		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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 (%)	Acceptable RPD (%)
ED009: Anions (QC Lot: 3762059)									
EP2107077-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	0.099	0.097	2.0	No Limit
EP2107211-006	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	47.2	47.3	0.2	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3758724)									
ES2123662-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.71	7.71	0.0	0% - 20%
ES2123662-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.92	7.86	0.8	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 3758721)									
ES2123662-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	10200	10300	0.4	0% - 20%
ES2123546-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	7670	7710	0.5	0% - 20%
ES2123662-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	10500	10500	0.2	0% - 20%
ES2123265-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	64	63	2.3	0% - 20%
ES2123718-007	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	19500	19500	0.1	0% - 20%
ES2123718-017	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	24	25	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3763437)									
ES2123468-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2100	2090	0.6	0% - 20%
ES2123582-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	21200	21600	2.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3763438)									
ES2123468-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	88	88	0.0	0% - 50%
ES2123582-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	9	19	69.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3758723)									
ES2123546-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	321	288	10.7	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	213	187	13.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	535	476	11.7	0% - 20%
ES2123662-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 3758723) - continued									
ES2123662-001	Anonymous	ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	716	668	6.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	716	668	6.8	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757053)									
ES2123625-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	20	20	0.0	0% - 50%
ES2123378-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	676	669	1.2	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757054)									
ES2123581-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	36	36	0.0	0% - 20%
ES2123378-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	521	520	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3764658)									
EW2102812-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	17	17	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	18	18	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
ES2123587-001	GLMB03	ED093F: Calcium	7440-70-2	1	mg/L	193	192	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	164	160	2.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1050	1020	2.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	38	38	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3764657)									
ES2123819-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.018	0.019	0.0	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.068	0.066	2.8	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.03	0.03	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	0.1	0.0	No Limit
ES2123587-001	GLMB03	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3764657) - continued									
ES2123587-001	GLMB03	EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.021	0.021	0.0	0% - 20%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	42.7	42.9	0.5	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.023	0.022	0.0	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.130	0.129	0.0	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.66	0.64	2.5	0% - 50%
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	1.5	1.5	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3764660)									
ES2123888-006	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.060	0.058	2.5	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
ES2123587-001	GLMB03	EG020B-F: Strontium	7440-24-6	0.001	mg/L	8.12	8.17	0.6	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3764659)									
ES2123859-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2123587-001	GLMB03	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG052G: Silica by Discrete Analyser (QC Lot: 3757058)									
ES2123581-001	Anonymous	EG052G: Reactive Silica	----	0.05	mg/L	11.2	11.4	2.4	0% - 20%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 3756320)									
ES2123516-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.012	0.013	8.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 3758722)									
ES2123265-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.0	No Limit
ES2123718-007	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.6	0.6	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3762028)									
ES2123262-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.07	0.06	20.2	No Limit
ES2123595-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.06	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3757055)									
ES2123378-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3762029)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3762029) - continued									
ES2123262-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2123595-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3762023)									
ES2123262-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.66	0.66	0.0	0% - 20%
ES2123598-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	1.39	1.50	7.8	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 3757057)									
ES2123557-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3760318)									
ES2123312-004	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
ES2123582-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 3757674)									
EB2117686-001	Anonymous	EP033: Methane	74-82-8	10	µg/L	14900	14700	1.9	0% - 20%
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
ES2123460-007	Anonymous	EP033: Methane	74-82-8	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3760347)									
ES2123349-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2123591-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	130	120	10.1	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3760347)									
ES2123349-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2123591-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 3760347)									
ES2123349-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 3760347) - continued									
ES2123591-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED009: Anions (QCLot: 3762059)								
ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	2 mg/L	103	93.0	109
EA005P: pH by PC Titrator (QCLot: 3758724)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.8	101
				----	7 pH Unit	101	99.2	101
EA010P: Conductivity by PC Titrator (QCLot: 3758721)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	220 µS/cm	103	91.1	107
				<1	2100 µS/cm	103	93.2	108
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3763437)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	93.8	87.0	109
				<10	293 mg/L	110	75.2	126
				<10	2835 mg/L	104	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3763438)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	88.7	83.0	129
				<5	1000 mg/L	94.4	82.0	110
				<5	463 mg/L	97.1	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 3758723)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	101	81.0	111
				----	50 mg/L	103	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757053)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.9	82.0	122
				<1	500 mg/L	101	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 3757054)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	100	80.9	127
				<1	1000 mg/L	100	80.9	127
ED093F: Dissolved Major Cations (QCLot: 3764658)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.4	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.0	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.2	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.0	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 3764657)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	83.8	80.0	116
EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	0.02 mg/L	93.3	70.0	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	88.1	85.0	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	87.0	85.0	115

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3764657) - continued								
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	86.0	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	86.6	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	85.9	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	85.9	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	87.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	86.4	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	87.5	82.0	110
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	88.8	79.0	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	86.7	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	86.4	85.0	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	89.4	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	85.0	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	87.2	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	86.8	82.0	112
EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 3764660)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	83.8	81.0	113
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	0.1 mg/L	86.9	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 3764659)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.1	83.0	105
EG052G: Silica by Discrete Analyser (QCLot: 3757058)								
EG052G: Reactive Silica	----	0.05	mg/L	<0.05	5 mg/L	99.8	92.0	118
				<0.05	0.5 mg/L	95.6	80.0	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3756320)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	116	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 3758722)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	98.8	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3762028)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	101	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3757055)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	102	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3762029)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	91.0	113
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3762023)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	96.2	71.0	101
				<0.01	0.442 mg/L	# 116	72.0	108
				<0.01	1 mg/L	114	70.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3757057)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	99.2	85.0	117
EP005: Total Organic Carbon (TOC) (QCLot: 3760318)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	93.7	72.0	120
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 3757674)								
EP033: Methane	74-82-8	10	µg/L	<10	28.48 µg/L	99.6	86.0	114
EP033: Ethene	74-85-1	10	µg/L	<10	50.29 µg/L	99.3	87.0	111
EP033: Ethane	74-84-0	10	µg/L	<10	54.43 µg/L	101	87.0	111
EP033: Propene	115-07-1	10	µg/L	<10	73.97 µg/L	99.7	85.0	113
EP033: Propane	74-98-6	10	µg/L	<10	78.28 µg/L	102	84.0	112
EP033: Butene	25167-67-3	10	µg/L	<10	99.61 µg/L	102	83.0	115
EP033: Butane	106-97-8	10	µg/L	<10	102.18 µg/L	104	85.0	115
EP075(SIM)A: Phenolic Compounds (QCLot: 3757060)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	34.3	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	70.6	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	68.6	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	58.1	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	73.0	48.0	100
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	74.4	49.0	99.0
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	74.9	53.0	105
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	69.2	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	68.0	53.0	99.0
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	68.7	50.0	106
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	70.2	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	39.5	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3757060)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	77.2	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	69.2	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	74.1	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	71.5	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	77.1	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	78.9	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	76.7	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	80.0	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	76.2	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	76.1	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	74.2	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	79.5	63.0	115

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3757060) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	70.1	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	70.4	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	73.5	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	69.1	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3757061)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	76.9	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	80.8	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	98.2	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3760347)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	76.8	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3757061)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	68.3	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	86.6	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	83.1	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3760347)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	81.0	75.0	127
EP080: BTEXN (QCLot: 3760347)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	80.3	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	90.7	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	92.0	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	92.1	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	92.5	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	95.4	70.0	120

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**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED009: Anions (QCLot: 3762059)							
EP2107077-001	Anonymous	ED009-X: Bromide	24959-67-9	0.2 mg/L	95.5	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757053)							
ES2123378-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 3757054)							
ES2123378-002	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 3764657)							
ES2123574-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	112	70.0	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	108	70.0	130
		EG020A-F: Barium	7440-39-3	1 mg/L	115	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	111	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	114	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	126	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	126	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	111	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	118	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	116	70.0	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	104	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	117	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3764659)							
ES2123819-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	86.2	70.0	130
EG052G: Silica by Discrete Analyser (QCLot: 3757058)							
ES2123581-001	Anonymous	EG052G: Reactive Silica	----	5 mg/L	110	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3756320)							
ES2123516-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	94.4	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 3758722)							
ES2123265-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	93.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3762028)							
ES2123262-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	96.0	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3757055)							
ES2123378-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	108	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3762029)							
ES2123262-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	99.5	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3762023)							
ES2123262-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	105	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3757057)							
ES2123557-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	101	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3760318)							
ES2123313-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	121	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 3757674)							
EB2117686-002	Anonymous	EP033: Methane	74-82-8	28.48 µg/L	# Not Determined	70.0	130
		EP033: Ethene	74-85-1	50.29 µg/L	93.3	70.0	130
		EP033: Ethane	74-84-0	54.43 µg/L	99.6	70.0	130
		EP033: Propene	115-07-1	73.97 µg/L	97.2	70.0	130
		EP033: Propane	74-98-6	78.28 µg/L	99.2	70.0	130
		EP033: Butene	25167-67-3	99.61 µg/L	96.1	70.0	130
		EP033: Butane	106-97-8	102.18 µg/L	98.7	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3760347)							
ES2123349-004	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	93.1	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3760347)							
ES2123349-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	92.1	70.0	130
EP080: BTEXN (QCLot: 3760347)							
ES2123349-004	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.6	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	93.6	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	94.4	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	91.4	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	90.2	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	95.1	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2123587**	Page	: 1 of 11
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEN GAS PROJECT J200417	Date Samples Received	: 24-Jun-2021
Site	: ----	Issue Date	: 02-Jul-2021
Sampler	: Claire Corthier, Steve Rocks	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

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.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **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 : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EK067G: Total Phosphorus as P by Discrete Analyser	QC-MRG2-37620230	----	**Total Phosphorus as P**	----	116 %	72.0-108%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2123378--002	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	ES2123378--002	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP033: C1 - C4 Hydrocarbon Gases	EB2117686--002	Anonymous	**Methane**	74-82-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

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	17	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
Laboratory Control Samples (LCS)					
Conductivity by PC Titrator	4	50	8.00	8.33	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	17	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***	*Due for extraction*	*Evaluation*	*Analysis* ***Date analysed***	*Due for analysis*	*Evaluation*

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
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	25-Jun-2021	✓
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	22-Jul-2021	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
GLMB03	**24-Jun-2021**	**----**	----	----	**29-Jun-2021**	01-Jul-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
GLMB03	**24-Jun-2021**	**----**	----	----	**29-Jun-2021**	01-Jul-2021	✓
ED009: Anions							
Clear Plastic Bottle - Natural (ED009-X)							
GLMB03	**24-Jun-2021**	**----**	----	----	**29-Jun-2021**	22-Jul-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	08-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	22-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	22-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
GLMB03	**24-Jun-2021**	**----**	----	----	**30-Jun-2021**	22-Jul-2021	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020B-F)							
GLMB03	**24-Jun-2021**	**----**	----	----	**30-Jun-2021**	22-Dec-2021	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
GLMB03	**24-Jun-2021**	**----**	----	----	**01-Jul-2021**	22-Jul-2021	✓
EG052G: Silica by Discrete Analyser							
Clear Plastic Bottle - Natural (EG052G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	22-Jul-2021	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	08-Jul-2021	✓

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
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	22-Jul-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**29-Jun-2021**	22-Jul-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	26-Jun-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**29-Jun-2021**	22-Jul-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
GLMB03	**24-Jun-2021**	**29-Jun-2021**	22-Jul-2021	✓	**29-Jun-2021**	22-Jul-2021	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	26-Jun-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
GLMB03	**24-Jun-2021**	**----**	----	----	**28-Jun-2021**	22-Jul-2021	✓
EP033: C1 - C4 Hydrocarbon Gases							
Amber VOC Vial - Sulfuric Acid (EP033)							
GLMB03	**24-Jun-2021**	**----**	----	----	**25-Jun-2021**	08-Jul-2021	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
GLMB03	**24-Jun-2021**	**25-Jun-2021**	01-Jul-2021	✓	**29-Jun-2021**	04-Aug-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
GLMB03	**24-Jun-2021**	**25-Jun-2021**	01-Jul-2021	✓	**29-Jun-2021**	04-Aug-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
GLMB03	**24-Jun-2021**	**25-Jun-2021**	01-Jul-2021	✓	**29-Jun-2021**	04-Aug-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TB	**21-Jun-2021**	**01-Jul-2021**	05-Jul-2021	✓	**01-Jul-2021**	05-Jul-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03	**24-Jun-2021**	**01-Jul-2021**	08-Jul-2021	✓	**01-Jul-2021**	08-Jul-2021	✓

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)							
GLMB03	**24-Jun-2021**	**25-Jun-2021**	01-Jul-2021	✓	**29-Jun-2021**	04-Aug-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TB	**21-Jun-2021**	**01-Jul-2021**	05-Jul-2021	✓	**01-Jul-2021**	05-Jul-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03	**24-Jun-2021**	**01-Jul-2021**	08-Jul-2021	✓	**01-Jul-2021**	08-Jul-2021	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
TB, TS	**21-Jun-2021**	**01-Jul-2021**	05-Jul-2021	✓	**01-Jul-2021**	05-Jul-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03	**24-Jun-2021**	**01-Jul-2021**	08-Jul-2021	✓	**01-Jul-2021**	08-Jul-2021	✓

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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	6	50	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	4	50	**8.00**	**8.33**	×	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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 Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	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)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	50	**2.00**	**1.67**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**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)							

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*	
Matrix Spikes (MS) - Continued							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	17	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**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
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
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.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-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.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Silica (Reactive) by Discrete Analyser	EG052G	WATER	In house: Referenced to APHA 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM Schedule B(3).
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
C1 - C4 Gases	EP033	WATER	Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, US EPA - Region 1, EPA New England, July 2001. Automated static headspace, dual column GC/FID. A 12 mL sample is pipetted into a 20 mL headspace vial containing 3g of sodium chloride and sealed. Each sample is equilibrated with shaking at 40 degrees C for 10 minutes prior to analysis by GC/FID using a pair of PLOT columns of different polarity.
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)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 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 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)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2141417**	Page	: 1 of 13
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 16-Nov-2021 11:30
Order number	: ----	Date Analysis Commenced	: 16-Nov-2021
C-O-C number	: ----	Issue Date	: 23-Nov-2021 18:27
Sampler	: Claire Corthier, Lachlan Lewis		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 9		
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 Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: Bromine quantification may be unreliable due to its low solubility in acid, leading to variable volatility during measurement by ICPMS.
- ED041G:LOR raised due to sample matrix.
- TDS by method EA-015 may bias high for sample 6 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EN055: Ionic Balance out of acceptable limits for sample ES2141417-#002 due to analytes not quantified in this report.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	MPMB01	MPMB02	MPMB03	MPMB04
			Sampling date / time	15-Nov-2021 15:55	15-Nov-2021 09:25	15-Nov-2021 11:45	15-Nov-2021 10:00	15-Nov-2021 11:00
Compound	CAS Number	LOR	Unit	ES2141417-001	ES2141417-002	ES2141417-003	ES2141417-004	ES2141417-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.70	5.75	6.71	7.84	8.91
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	4780	736	816	1050	387
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	3010	436	456	605	228
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	71	11	15	12	8
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	54
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1710	33	177	498	80
Total Alkalinity as CaCO3	----	1	mg/L	1710	33	177	498	134
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	3	6	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	777	218	168	74	29
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	275	8	31	89	4
Magnesium	7439-95-4	1	mg/L	69	16	30	22	2
Sodium	7440-23-5	1	mg/L	836	90	76	106	73
Potassium	7440-09-7	1	mg/L	32	1	3	13	7
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	0.007	<0.001	0.006	0.005	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Barium	7440-39-3	0.001	mg/L	19.3	0.506	0.489	3.12	0.552
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	7440-48-4	0.001	mg/L	0.004	0.033	0.002	0.001	<0.001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.002	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.113	0.367	0.186	0.080	0.005
Nickel	7440-02-0	0.001	mg/L	0.016	0.012	0.002	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	MPMB01	MPMB02	MPMB03	MPMB04
			Sampling date / time	15-Nov-2021 15:55	15-Nov-2021 09:25	15-Nov-2021 11:45	15-Nov-2021 10:00	15-Nov-2021 11:00
Compound	CAS Number	LOR	Unit	ES2141417-001	ES2141417-002	ES2141417-003	ES2141417-004	ES2141417-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	**0.007**	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**13.6**	**0.034**	<0.005	<0.005	**0.024**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	**0.001**
Strontium	7440-24-6	0.001	mg/L	**5.17**	**0.098**	**0.349**	**0.847**	**0.121**
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	7439-89-6	0.05	mg/L	**5.72**	**0.10**	**3.90**	**2.27**	<0.05
Bromine	7726-95-6	0.1	mg/L	**1.7**	**0.4**	**0.3**	**0.1**	<0.1
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG052G: Silica by Discrete Analyser								
Reactive Silica	----	0.05	mg/L	**10.5**	**16.4**	**11.3**	**8.38**	**2.13**
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	**0.1**	**0.1**	**0.2**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**2.40**	<0.01	**0.09**	**0.89**	**0.48**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	**0.01**	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	**0.47**	<0.01	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.48**	<0.01	<0.01	<0.01
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.70**	**0.02**	**0.03**	**0.02**	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.09**	<0.01	**0.01**	<0.01	<0.01
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**56.1**	**6.87**	**8.40**	**12.0**	**3.50**
ø Total Cations	----	0.01	meq/L	**----**	**----**	**7.61**	**----**	**----**
ø Total Cations	----	0.01	meq/L	**56.6**	**5.66**	**----**	**11.2**	**3.72**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	MPMB01	MPMB02	MPMB03	MPMB04
			Sampling date / time	15-Nov-2021 15:55	15-Nov-2021 09:25	15-Nov-2021 11:45	15-Nov-2021 10:00	15-Nov-2021 11:00
Compound	CAS Number	LOR	Unit	ES2141417-001	ES2141417-002	ES2141417-003	ES2141417-004	ES2141417-005
				Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued								
ø Ionic Balance	----	0.01	%	**----**	**----**	**4.97**	**----**	**----**
ø Ionic Balance	----	0.01	%	**0.44**	**9.70**	**----**	**3.63**	**3.09**
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**10**	<1	<1	<1	**4**
EP033: C1 - C4 Hydrocarbon Gases								
Methane	74-82-8	10	µg/L	**13200**	**13**	**348**	**45300**	**44400**
Ethene	74-85-1	10	µg/L	<10	<10	<10	<10	<10
Ethane	74-84-0	10	µg/L	**66**	<10	<10	<10	<10
Propene	115-07-1	10	µg/L	<10	<10	<10	<10	<10
Propane	74-98-6	10	µg/L	<10	<10	<10	<10	<10
Butene	25167-67-3	10	µg/L	<10	<10	<10	<10	<10
Butane	106-97-8	10	µg/L	<10	<10	<10	<10	<10
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GLMB03	MPMB01	MPMB02	MPMB03	MPMB04
			Sampling date / time	15-Nov-2021 15:55	15-Nov-2021 09:25	15-Nov-2021 11:45	15-Nov-2021 10:00	15-Nov-2021 11:00
Compound	CAS Number	LOR	Unit	ES2141417-001	ES2141417-002	ES2141417-003	ES2141417-004	ES2141417-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
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	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<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	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >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	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	8
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	8
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GLMB03	MPMB01	MPMB02	MPMB03	MPMB04
				Sampling date / time	15-Nov-2021 15:55	15-Nov-2021 09:25	15-Nov-2021 11:45	15-Nov-2021 10:00	15-Nov-2021 11:00
Compound	CAS Number	LOR	Unit		ES2141417-001	ES2141417-002	ES2141417-003	ES2141417-004	ES2141417-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ED009: Anions									
Bromide	24959-67-9	0.010	mg/L		**1.35**	**0.356**	**0.242**	**0.019**	**0.050**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**18.0**	**21.2**	**19.8**	**20.5**	**17.0**
2-Chlorophenol-D4	93951-73-6	1.0	%		**37.9**	**45.3**	**46.8**	**45.5**	**21.2**
2.4.6-Tribromophenol	118-79-6	1.0	%		**52.8**	**68.0**	**63.8**	**58.5**	**21.5**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**53.1**	**57.1**	**57.0**	**55.6**	**64.9**
Anthracene-d10	1719-06-8	1.0	%		**74.0**	**82.1**	**74.6**	**84.5**	**77.0**
4-Terphenyl-d14	1718-51-0	1.0	%		**84.8**	**91.6**	**83.9**	**95.3**	**84.9**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**75.7**	**99.3**	**131**	**132**
Toluene-D8	2037-26-5	2	%		**97.3**	**81.2**	**102**	**102**	**102**
4-Bromofluorobenzene	460-00-4	2	%		**95.9**	**85.1**	**95.3**	**101**	**98.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	NR	QA1	TB	TS	----
			Sampling date / time	15-Nov-2021 11:30	15-Nov-2021 00:00	11-Nov-2021 00:00	10-Nov-2021 00:00	----
Compound	CAS Number	LOR	Unit	ES2141417-006	ES2141417-013	ES2141417-014	ES2141417-015	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.85**	**9.19**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**355**	**393**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**255**	**224**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**14**	<5	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**56**	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**85**	**74**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**85**	**129**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**14**	**3**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**52**	**31**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**11**	**4**	----	----	----
Magnesium	7439-95-4	1	mg/L	**8**	**2**	----	----	----
Sodium	7440-23-5	1	mg/L	**48**	**74**	----	----	----
Potassium	7440-09-7	1	mg/L	**6**	**7**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	<0.01	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.094**	**0.568**	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.016**	**0.002**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	NR	QA1	TB	TS	----
			Sampling date / time	15-Nov-2021 11:30	15-Nov-2021 00:00	11-Nov-2021 00:00	10-Nov-2021 00:00	----
Compound	CAS Number	LOR	Unit	ES2141417-006	ES2141417-013	ES2141417-014	ES2141417-015	--------
				Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.025**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	**0.001**	----	----	----
Strontium	7440-24-6	0.001	mg/L	**0.098**	**0.125**	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.16**	<0.05	----	----	----
Bromine	7726-95-6	0.1	mg/L	**0.1**	<0.1	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EG052G: Silica by Discrete Analyser								
Reactive Silica	----	0.05	mg/L	**4.97**	**2.14**	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.2**	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.04**	**0.47**	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.28**	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.28**	<0.01	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.08**	<0.01	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	<0.01	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**3.46**	**3.51**	----	----	----
ø Total Cations	----	0.01	meq/L	**3.45**	**3.76**	----	----	----
ø Ionic Balance	----	0.01	%	**0.12**	**3.40**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	NR	QA1	TB	TS	----
			Sampling date / time	15-Nov-2021 11:30	15-Nov-2021 00:00	11-Nov-2021 00:00	10-Nov-2021 00:00	----
Compound	CAS Number	LOR	Unit	ES2141417-006	ES2141417-013	ES2141417-014	ES2141417-015	--------
				Result	Result	Result	Result	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**10**	**4**	----	----	----
EP033: C1 - C4 Hydrocarbon Gases								
Methane	74-82-8	10	µg/L	<10	**43200**	----	----	----
Ethene	74-85-1	10	µg/L	<10	<10	----	----	----
Ethane	74-84-0	10	µg/L	<10	<10	----	----	----
Propene	115-07-1	10	µg/L	<10	<10	----	----	----
Propane	74-98-6	10	µg/L	<10	<10	----	----	----
Butene	25167-67-3	10	µg/L	<10	<10	----	----	----
Butane	106-97-8	10	µg/L	<10	<10	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	----	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	NR	QA1	TB	TS	----
			Sampling date / time	15-Nov-2021 11:30	15-Nov-2021 00:00	11-Nov-2021 00:00	10-Nov-2021 00:00	----
Compound	CAS Number	LOR	Unit	ES2141417-006	ES2141417-013	ES2141417-014	ES2141417-015	--------
				Result	Result	Result	Result	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	**16**	----
Toluene	108-88-3	2	µg/L	<2	**7**	<2	**16**	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	**15**	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	**15**	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	**14**	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	**29**	----
^ Sum of BTEX	----	1	µg/L	<1	**7**	<1	**76**	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	**17**	----
ED009: Anions								
Bromide	24959-67-9	0.010	mg/L	**0.100**	**0.051**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	NR	QA1	TB	TS	----
				Sampling date / time	15-Nov-2021 11:30	15-Nov-2021 00:00	11-Nov-2021 00:00	10-Nov-2021 00:00	----
Compound	CAS Number	LOR	Unit		ES2141417-006	ES2141417-013	ES2141417-014	ES2141417-015	--------
					Result	Result	Result	Result	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		16.4	18.0	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		31.8	20.9	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		52.0	22.1	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		54.7	64.5	----	----	----
Anthracene-d10	1719-06-8	1.0	%		62.3	74.1	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		67.2	82.0	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		129	119	130	126	----
Toluene-D8	2037-26-5	2	%		103	92.0	96.9	93.7	----
4-Bromofluorobenzene	460-00-4	2	%		97.0	89.9	95.3	94.4	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) 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

QUALITY CONTROL REPORT

Work Order	: **ES2141417**	Page	: 1 of 12
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 16-Nov-2021
Order number	: ----	Date Analysis Commenced	: 16-Nov-2021
C-O-C number	: ----	Issue Date	: 23-Nov-2021
Sampler	: Claire Corthier, Lachlan Lewis		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 9		
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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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.

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 (%)	Acceptable RPD (%)
ED009: Anions (QC Lot: 4018791)									
ES2141417-001	GLMB03	ED009-X: Bromide	24959-67-9	0.01	mg/L	1.35	1.35	0.0	0% - 20%
ES2141504-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	1.01	1.02	0.9	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4018181)									
ES2141498-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.55	7.74	2.5	0% - 20%
ES2141417-001	GLMB03	EA005-P: pH Value	----	0.01	pH Unit	7.70	7.73	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4018182)									
ES2141525-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1100	1100	0.0	0% - 20%
ES2141417-001	GLMB03	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	4780	4730	1.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4024248)									
ES2141252-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	457	472	3.3	0% - 20%
ES2141417-004	MPMB03	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	605	598	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4024249)									
ES2141252-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	11	8	34.7	No Limit
ES2141417-004	MPMB03	EA025H: Suspended Solids (SS)	----	5	mg/L	12	12	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4018184)									
ES2141417-001	GLMB03	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1710	1740	1.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	1710	1740	1.5	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4018209)									
ES2141417-001	GLMB03	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	<10	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 4018210)									
ES2141417-001	GLMB03	ED045G: Chloride	16887-00-6	1	mg/L	777	782	0.7	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 (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 4024290)									
ES2141360-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	13	13	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	13	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
ES2141223-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	139	138	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	54	53	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	49	48	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	14	14	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4024289)									
ES2141381-002	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.096	0.094	2.1	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
ES2141223-002	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.517	0.521	0.7	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	0.002	0.002	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4024291)									
ES2141381-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.021	0.020	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.099	0.096	3.5	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.01	0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.10	0.09	12.8	No Limit
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES2141433-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.642	0.647	0.8	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.008	0.008	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4024291) - continued									
ES2141433-003	Anonymous	EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	4.03	4.01	0.3	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.008	0.008	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.06	0.06	0.0	No Limit
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	0.8	0.8	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4024287)									
ES2141223-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2141378-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4024293)									
ES2141417-006	NR	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG052G: Silica by Discrete Analyser (QC Lot: 4018208)									
ES2141417-001	GLMB03	EG052G: Reactive Silica	----	0.05	mg/L	10.5	10.3	1.5	0% - 20%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4022978)									
ES2141334-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2140778-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4022981)									
ES2141417-013	QA1	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
WN2113254-006	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4018183)									
ES2141417-001	GLMB03	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4024186)									
ES2141417-003	MPMB02	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.09	0.09	0.0	No Limit
ES2141329-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	2.80	2.89	3.4	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4018206)									
ES2141417-001	GLMB03	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4024185)									
ES2141417-003	MPMB02	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2141329-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	11.0	11.0	0.1	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4024182)									
ES2141118-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2141411-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4018207)									
ES2141417-001	GLMB03	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.09	0.09	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4019185)									
ES2141187-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	28	27	0.0	0% - 20%
ES2141417-001	GLMB03	EP005: Total Organic Carbon	----	1	mg/L	10	10	0.0	0% - 50%
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 4023122)									
ES2141417-001	GLMB03	EP033: Methane	74-82-8	10	µg/L	13200	13000	2.0	0% - 20%
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	66	65	2.3	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
ES2141433-006	Anonymous	EP033: Methane	74-82-8	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4022332)									
ES2141223-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2141417-001	GLMB03	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4022332)									
ES2141223-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2141417-001	GLMB03	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4022332)									
ES2141223-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2141417-001	GLMB03	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 4022332) - continued									
ES2141417-001	GLMB03	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED009: Anions (QCLot: 4018791)								
ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	2 mg/L	96.6	93.0	109
EA005P: pH by PC Titrator (QCLot: 4018181)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.8	101
				----	7 pH Unit	100	99.2	101
EA010P: Conductivity by PC Titrator (QCLot: 4018182)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	220 µS/cm	92.1	91.1	107
				<1	2100 µS/cm	98.9	93.2	108
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4024248)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	96.8	87.0	109
				<10	293 mg/L	108	75.2	126
				<10	2835 mg/L	104	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4024249)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	93.3	83.0	129
				<5	1000 mg/L	101	82.0	110
				<5	463 mg/L	102	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 4018184)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	103	81.0	111
				----	50 mg/L	116	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4018209)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	82.0	122
				<1	500 mg/L	104	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4018210)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	101	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4024290)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.0	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.9	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.6	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.8	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4024289)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	95.2	81.0	113
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	0.1 mg/L	95.6	85.0	115
EG020F: Dissolved Metals by ICP-MS (QCLot: 4024291)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4024291) - continued								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	93.4	80.0	116
EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	0.02 mg/L	96.1	70.0	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	94.2	85.0	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	96.8	85.0	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	97.5	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.2	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.3	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.1	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.6	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	96.1	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	95.9	82.0	110
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	99.6	79.0	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	93.1	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	92.9	85.0	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	98.0	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.4	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.7	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	101	82.0	112
EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 4024292)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	94.6	81.0	113
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	0.1 mg/L	98.6	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 4024287)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.9	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 4024293)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.8	83.0	105
EG052G: Silica by Discrete Analyser (QCLot: 4018208)								
EG052G: Reactive Silica	----	0.05	mg/L	<0.05	5 mg/L	94.2	92.0	118
				<0.05	0.5 mg/L	104	80.0	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4022978)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	111	73.0	133
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4022981)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	123	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4018183)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	110	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4024186)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	105	90.0	114

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4018206)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	102	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4024185)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4024182)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	95.1	71.0	101
				<0.01	0.442 mg/L	105	72.0	108
				<0.01	1 mg/L	110	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4018207)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	101	85.0	117
EP005: Total Organic Carbon (TOC) (QCLot: 4019185)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	91.2	72.0	120
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4023122)								
EP033: Methane	74-82-8	10	µg/L	<10	28.48 µg/L	95.9	86.0	114
EP033: Ethene	74-85-1	10	µg/L	<10	50.29 µg/L	95.5	87.0	111
EP033: Ethane	74-84-0	10	µg/L	<10	54.43 µg/L	96.9	87.0	111
EP033: Propene	115-07-1	10	µg/L	<10	73.97 µg/L	96.3	85.0	113
EP033: Propane	74-98-6	10	µg/L	<10	78.28 µg/L	97.1	84.0	112
EP033: Butene	25167-67-3	10	µg/L	<10	99.61 µg/L	99.1	83.0	115
EP033: Butane	106-97-8	10	µg/L	<10	102.18 µg/L	98.4	85.0	115
EP075(SIM)A: Phenolic Compounds (QCLot: 4019342)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	40.9	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	75.6	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	74.4	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	60.5	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	73.6	48.0	100
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	72.9	49.0	99.0
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	78.7	53.0	105
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	70.6	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	71.6	53.0	99.0
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	83.8	50.0	106
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	71.7	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	44.2	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4019342)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	66.1	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	73.3	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	67.9	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	91.2	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	72.1	62.6	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4019342) - continued								
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	79.2	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	80.0	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	82.8	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	68.9	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	75.8	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	72.4	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	83.5	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	87.8	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	78.9	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	67.3	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	69.9	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4019343)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	70.2	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	75.4	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	87.0	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4022332)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	95.6	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4019343)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	73.2	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	82.1	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	70.0	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4022332)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	84.3	75.0	127
EP080: BTEXN (QCLot: 4022332)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	90.5	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	93.9	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	90.5	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	88.2	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	94.7	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	98.9	70.0	120

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED009: Anions (QCLot: 4018791)							
ES2141417-001	GLMB03	ED009-X: Bromide	24959-67-9	0.2 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4018209)							
ES2141417-001	GLMB03	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	107	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4018210)							
ES2141417-001	GLMB03	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4024291)							
ES2141381-003	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	90.6	70.0	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	93.6	70.0	130
		EG020A-F: Barium	7440-39-3	1 mg/L	89.3	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	91.0	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	89.0	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	83.7	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	87.9	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	82.0	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	90.9	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	88.1	70.0	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	89.5	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	90.0	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4024287)							
ES2141223-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	91.6	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4024293)							
ES2141417-005	MPMB04	EG035F: Mercury	7439-97-6	0.01 mg/L	95.4	70.0	130
EG052G: Silica by Discrete Analyser (QCLot: 4018208)							
ES2141417-001	GLMB03	EG052G: Reactive Silica	----	5 mg/L	103	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4022978)							
ES2140778-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	93.1	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4022981)							
ES2141417-013	QA1	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	106	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4018183)							
ES2141417-001	GLMB03	EK040P: Fluoride	16984-48-8	5 mg/L	105	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4024186)							
ES2141329-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	70.8	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4018206)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4018206) - continued							
ES2141417-001	GLMB03	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	117	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4024185)							
ES2141329-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4024182)							
ES2141329-001	Anonymous	EK067G: Total Phosphorus as P	----	10 mg/L	114	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4018207)							
ES2141417-001	GLMB03	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	97.6	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4019185)							
ES2141187-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4023122)							
ES2141417-002	MPMB01	EP033: Methane	74-82-8	28.48 µg/L	104	70.0	130
		EP033: Ethene	74-85-1	50.29 µg/L	96.1	70.0	130
		EP033: Ethane	74-84-0	54.43 µg/L	97.7	70.0	130
		EP033: Propene	115-07-1	73.97 µg/L	105	70.0	130
		EP033: Propane	74-98-6	78.28 µg/L	106	70.0	130
		EP033: Butene	25167-67-3	99.61 µg/L	98.0	70.0	130
		EP033: Butane	106-97-8	102.18 µg/L	99.2	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4022332)							
ES2141223-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	101	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4022332)							
ES2141223-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	96.2	70.0	130
EP080: BTEXN (QCLot: 4022332)							
ES2141223-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	91.1	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	94.5	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	93.7	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	92.7	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	95.6	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	84.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2141417**	Page	: 1 of 13
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 16-Nov-2021
Site	: ----	Issue Date	: 23-Nov-2021
Sampler	: Claire Corthier, Lachlan Lewis	No. of samples received	: 9
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.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED009: Anions	ES2141417--001	GLMB03	**Bromide**	24959-67-9	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	ES2141417--001	GLMB03	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	ES2141329--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
GLMB03,	MPMB01,	----	----	----	16-Nov-2021	15-Nov-2021	**1**
MPMB02,	MPMB03,						
MPMB04,	NR,						
QA1							

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	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	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			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	15-Nov-2021	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	13-Dec-2021	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	22-Nov-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	22-Nov-2021	✓
ED009: Anions							
Clear Plastic Bottle - Natural (ED009-X)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**17-Nov-2021**	13-Dec-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	29-Nov-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	13-Dec-2021	✓

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
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	13-Dec-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	13-Dec-2021	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020B-F)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	14-May-2022	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	13-Dec-2021	✓
EG052G: Silica by Discrete Analyser							
Clear Plastic Bottle - Natural (EG052G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	13-Dec-2021	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**18-Nov-2021**	29-Nov-2021	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	13-Dec-2021	✓

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
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	13-Dec-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	17-Nov-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**19-Nov-2021**	13-Dec-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**19-Nov-2021**	13-Dec-2021	✓	**19-Nov-2021**	13-Dec-2021	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**16-Nov-2021**	17-Nov-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**17-Nov-2021**	13-Dec-2021	✓
EP033: C1 - C4 Hydrocarbon Gases							
Amber VOC Vial - Sulfuric Acid (EP033)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**----**	----	----	**18-Nov-2021**	29-Nov-2021	✓

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
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**17-Nov-2021**	22-Nov-2021	✓	**22-Nov-2021**	27-Dec-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**17-Nov-2021**	22-Nov-2021	✓	**22-Nov-2021**	27-Dec-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**17-Nov-2021**	22-Nov-2021	✓	**22-Nov-2021**	27-Dec-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TB	**11-Nov-2021**	**22-Nov-2021**	25-Nov-2021	✓	**22-Nov-2021**	25-Nov-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**22-Nov-2021**	29-Nov-2021	✓	**22-Nov-2021**	29-Nov-2021	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**17-Nov-2021**	22-Nov-2021	✓	**22-Nov-2021**	27-Dec-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TB	**11-Nov-2021**	**22-Nov-2021**	25-Nov-2021	✓	**22-Nov-2021**	25-Nov-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**22-Nov-2021**	29-Nov-2021	✓	**22-Nov-2021**	29-Nov-2021	✓

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: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
TS	**10-Nov-2021**	**22-Nov-2021**	24-Nov-2021	✓	**22-Nov-2021**	24-Nov-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
TB	**11-Nov-2021**	**22-Nov-2021**	25-Nov-2021	✓	**22-Nov-2021**	25-Nov-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
GLMB03, MPMB01, MPMB02, MPMB03, MPMB04, NR, QA1	**15-Nov-2021**	**22-Nov-2021**	29-Nov-2021	✓	**22-Nov-2021**	29-Nov-2021	✓

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)							
Alkalinity by PC Titrator	ED037-P	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	19	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	**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)							
Alkalinity by PC Titrator	ED037-P	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	8	**25.00**	**8.33**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	13	**15.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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 Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**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)							
Ammonia as N by Discrete analyser	EK055G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	8	**12.50**	**1.67**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	13	**15.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**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)							

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*	
Matrix Spikes (MS) - Continued							
Ammonia as N by Discrete analyser	EK055G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	19	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	**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
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
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.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-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.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Silica (Reactive) by Discrete Analyser	EG052G	WATER	In house: Referenced to APHA 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM Schedule B(3).
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
C1 - C4 Gases	EP033	WATER	Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, US EPA - Region 1, EPA New England, July 2001. Automated static headspace, dual column GC/FID. A 12 mL sample is pipetted into a 20 mL headspace vial containing 3g of sodium chloride and sealed. Each sample is equilibrated with shaking at 40 degrees C for 10 minutes prior to analysis by GC/FID using a pair of PLOT columns of different polarity.
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)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 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 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)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2213055**	Page	: 1 of 9
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 13-Apr-2022 16:45
Order number	: ----	Date Analysis Commenced	: 14-Apr-2022
C-O-C number	: ----	Issue Date	: 22-Apr-2022 15:52
Sampler	: Claire Corthier		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	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.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: Bromine quantification may be unreliable due to its low solubility in acid, leading to variable volatility during measurement by ICPMS.
- EP080: Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEXN compounds spiked at 20 ug/L.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MPMB01	MPMB02	NR	QA1	Trip blank
			Sampling date / time	13-Apr-2022 10:30	13-Apr-2022 11:30	13-Apr-2022 12:00	13-Apr-2022 00:00	11-Apr-2022 00:00
Compound	CAS Number	LOR	Unit	ES2213055-001	ES2213055-002	ES2213055-003	ES2213055-004	ES2213055-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.12**	**6.99**	**6.83**	**6.07**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**708**	**300**	**113**	**709**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**434**	**150**	**69**	**396**	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**283**	**69**	**6**	**238**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**21**	**86**	**17**	**18**	----
Total Alkalinity as CaCO3	----	1	mg/L	**21**	**86**	**17**	**18**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**4**	**8**	**6**	**4**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**214**	**38**	**16**	**215**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**9**	**11**	**4**	**9**	----
Magnesium	7439-95-4	1	mg/L	**17**	**12**	**3**	**17**	----
Sodium	7440-23-5	1	mg/L	**92**	**30**	**12**	**93**	----
Potassium	7440-09-7	1	mg/L	**1**	**3**	**2**	**1**	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	**0.10**	**0.23**	**0.02**	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.005**	<0.001	<0.001	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
Barium	7440-39-3	0.001	mg/L	**0.436**	**0.137**	**0.025**	**0.443**	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Cobalt	7440-48-4	0.001	mg/L	**0.028**	**0.009**	<0.001	**0.028**	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L	**0.353**	**0.269**	**0.158**	**0.357**	----
Nickel	7440-02-0	0.001	mg/L	**0.010**	**0.008**	<0.001	**0.011**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MPMB01	MPMB02	NR	QA1	Trip blank
			Sampling date / time	13-Apr-2022 10:30	13-Apr-2022 11:30	13-Apr-2022 12:00	13-Apr-2022 00:00	11-Apr-2022 00:00
Compound	CAS Number	LOR	Unit	ES2213055-001	ES2213055-002	ES2213055-003	ES2213055-004	ES2213055-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L	**0.030**	**0.005**	**0.010**	**0.028**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**0.097**	**0.118**	**0.030**	**0.097**	----
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Iron	7439-89-6	0.05	mg/L	<0.05	**1.38**	**0.48**	<0.05	----
Bromine	7726-95-6	0.1	mg/L	**0.5**	**0.1**	<0.1	**0.4**	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG052G: Silica by Discrete Analyser								
Reactive Silica	----	0.05	mg/L	**16.0**	**6.35**	**4.35**	**16.0**	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.07**	**0.07**	<0.01	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.66**	**0.02**	**0.21**	**0.64**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.66**	**0.02**	**0.21**	**0.64**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.10**	**0.07**	**0.03**	**0.11**	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	**0.03**	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**6.54**	**2.96**	**0.92**	**6.51**	----
ø Total Cations	----	0.01	meq/L	**5.88**	**2.92**	**1.02**	**5.92**	----
ø Ionic Balance	----	0.01	%	**5.35**	----	----	**4.74**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MPMB01	MPMB02	NR	QA1	Trip blank
			Sampling date / time	13-Apr-2022 10:30	13-Apr-2022 11:30	13-Apr-2022 12:00	13-Apr-2022 00:00	11-Apr-2022 00:00
Compound	CAS Number	LOR	Unit	ES2213055-001	ES2213055-002	ES2213055-003	ES2213055-004	ES2213055-005
				Result	Result	Result	Result	Result
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	6	7	<1	----
EP033: C1 - C4 Hydrocarbon Gases								
Methane	74-82-8	10	µg/L	<10	83	126	<10	----
Ethene	74-85-1	10	µg/L	<10	<10	<10	<10	----
Ethane	74-84-0	10	µg/L	<10	<10	<10	<10	----
Propene	115-07-1	10	µg/L	<10	<10	<10	<10	----
Propane	74-98-6	10	µg/L	<10	<10	<10	<10	----
Butene	25167-67-3	10	µg/L	<10	<10	<10	<10	----
Butane	106-97-8	10	µg/L	<10	<10	<10	<10	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MPMB01	MPMB02	NR	QA1	Trip blank
				Sampling date / time	13-Apr-2022 10:30	13-Apr-2022 11:30	13-Apr-2022 12:00	13-Apr-2022 00:00	11-Apr-2022 00:00
Compound	CAS Number	LOR	Unit		ES2213055-001	ES2213055-002	ES2213055-003	ES2213055-004	ES2213055-005
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
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	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<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	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
ED009: Anions									
Bromide	24959-67-9	0.010	mg/L		**0.401**	**0.088**	**0.050**	**0.390**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MPMB01	MPMB02	NR	QA1	Trip blank
				Sampling date / time	13-Apr-2022 10:30	13-Apr-2022 11:30	13-Apr-2022 12:00	13-Apr-2022 00:00	11-Apr-2022 00:00
Compound	CAS Number	LOR	Unit		ES2213055-001	ES2213055-002	ES2213055-003	ES2213055-004	ES2213055-005
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		25.5	28.2	22.2	24.7	----
2-Chlorophenol-D4	93951-73-6	1.0	%		55.5	61.2	48.7	56.0	----
2.4.6-Tribromophenol	118-79-6	1.0	%		59.7	65.6	54.9	64.2	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		74.0	81.7	63.2	71.8	----
Anthracene-d10	1719-06-8	1.0	%		73.7	78.7	66.6	76.6	----
4-Terphenyl-d14	1718-51-0	1.0	%		72.7	77.6	67.2	77.9	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		115	122	118	111	107
Toluene-D8	2037-26-5	2	%		106	116	112	102	99.5
4-Bromofluorobenzene	460-00-4	2	%		101	119	105	96.6	94.8

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Trip spike	----	----	----	----
				Sampling date / time	13-Apr-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2213055-006	--------	--------	--------	--------
					Result	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		**18**	----	----	----	----
Toluene	108-88-3	2	µg/L		**16**	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		**17**	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		**16**	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		**17**	----	----	----	----
^ **Total Xylenes**	----	2	µg/L		**33**	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		**84**	----	----	----	----
Naphthalene	91-20-3	5	µg/L		**18**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**112**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**101**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**104**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) 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

QUALITY CONTROL REPORT

Work Order	: **ES2213055**	Page	: 1 of 13
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 13-Apr-2022
Order number	: ----	Date Analysis Commenced	: 14-Apr-2022
C-O-C number	: ----	Issue Date	: 22-Apr-2022
Sampler	: Claire Corthier		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	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.

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 (%)	Acceptable RPD (%)
ED009: Anions (QC Lot: 4291342)									
ES2212885-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	0.146	0.146	0.0	0% - 50%
EA005P: pH by PC Titrator (QC Lot: 4290129)									
ES2211906-020	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.37	7.41	0.5	0% - 20%
ES2212927-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.07	8.11	0.5	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4290136)									
ES2213072-011	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.09	7.37	3.9	0% - 20%
ES2213055-003	NR	EA005-P: pH Value	----	0.01	pH Unit	6.83	6.78	0.7	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4290130)									
ES2212814-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	65	65	0.0	0% - 20%
ES2213072-007	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	390	386	1.0	0% - 20%
ES2211906-020	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	6910	7000	1.3	0% - 20%
ES2213055-001	MPMB01	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	708	719	1.6	0% - 20%
ES2212927-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	915	929	1.4	0% - 20%
ES2213055-003	NR	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	113	110	2.7	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4289590)									
ES2212776-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5620	5820	3.4	0% - 20%
ES2212896-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	508	530	4.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4290212)									
ES2212884-004	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6170	6160	0.2	0% - 20%
ES2213003-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	11500	11200	3.2	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4289591)									
ES2212776-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	39	45	14.3	No Limit
ES2212896-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	34	35	4.3	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4290213)									
ES2212884-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	14	8	54.9	No Limit
ES2213003-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	92	94	1.9	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 4290135)									
ES2213055-001	MPMB01	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	21	21	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	21	21	0.0	0% - 20%
ES2213055-003	NR	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	17	16	10.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	17	16	10.0	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4288808)									
ES2213017-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	12	12	0.0	0% - 50%
ES2212989-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	113	114	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4288813)									
ES2213095-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	33	33	0.0	0% - 20%
ES2213055-003	NR	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	6	6	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 4288809)									
ES2213017-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.0	0% - 50%
ES2212989-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	444	447	0.7	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4288814)									
ES2213055-003	NR	ED045G: Chloride	16887-00-6	1	mg/L	16	16	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 4290907)									
ES2212665-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	77	76	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	242	239	1.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	6	5	0.0	No Limit
EW2201747-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	51	51	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	35	35	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	69	69	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4290909)									
ES2212709-001	Anonymous	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.383	0.393	2.4	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4290910)									
ES2212790-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4290910) - continued									
ES2212790-005	Anonymous	EG020A-F: Barium	7440-39-3	0.001	mg/L	0.021	0.019	11.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.013	0.012	9.4	0% - 50%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EW2201747-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.254	0.250	2.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.254	0.256	0.6	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.009	0.009	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.006	20.7	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.25	0.25	0.0	No Limit
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	0.2	0.1	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4290906)									
ES2212339-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.1 µg/L	<0.0001	0.0	No Limit
ES2212682-009	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG052G: Silica by Discrete Analyser (QC Lot: 4288811)									
ES2213017-006	Anonymous	EG052G: Reactive Silica	----	0.05	mg/L	1.62	1.70	4.8	0% - 20%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4287057)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4287057) - continued									
CA2202469-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2212836-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4290134)									
ES2213055-001	MPMB01	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES2213055-003	NR	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4291346)									
ES2213055-001	MPMB01	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4288807)									
ES2212989-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.39	0.39	0.0	0% - 20%
ES2213055-003	NR	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4291345)									
ES2212953-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	38.4	39.4	2.4	0% - 20%
ES2213055-001	MPMB01	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.66	0.66	0.0	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4291350)									
ES2212916-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.12	0.14	14.9	No Limit
ES2213014-006	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.28	0.29	0.0	0% - 50%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4288810)									
ES2213017-006	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2212989-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4288812)									
ES2213055-003	NR	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4286980)									
ES2212951-005	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	85	87	2.0	0% - 20%
ES2212988-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	7	7	0.0	No Limit
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 4288661)									
EM2206596-001	Anonymous	EP033: Methane	74-82-8	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
EM2206709-006	Anonymous	EP033: Methane	74-82-8	10	µg/L	2800	3130	11.0	0% - 20%
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 4288661) - continued									
EM2206709-006	Anonymous	EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4291434)									
ES2212853-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2213043-008	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4291434)									
ES2212853-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2213043-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4291434)									
ES2212853-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2213043-008	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED009: Anions (QCLot: 4291342)								
ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	2 mg/L	101	93.0	109
EA005P: pH by PC Titrator (QCLot: 4290129)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.8	101
				----	7 pH Unit	100	99.2	101
EA005P: pH by PC Titrator (QCLot: 4290136)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.8	101
				----	7 pH Unit	99.8	99.2	101
EA010P: Conductivity by PC Titrator (QCLot: 4290130)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	220 µS/cm	95.7	89.9	110
				<1	2100 µS/cm	98.7	90.2	111
				<1	58301 µS/cm	104	93.3	106
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4289590)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	102	87.0	109
				<10	293 mg/L	104	75.2	126
				<10	2460 mg/L	98.1	83.0	124
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4290212)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	98.6	87.0	109
				<10	293 mg/L	96.2	75.2	126
				<10	2460 mg/L	102	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4289591)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	102	82.0	110
				<5	835 mg/L	98.7	83.0	118
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4290213)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	83.0	129
				<5	1000 mg/L	98.0	82.0	110
				<5	835 mg/L	100	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 4290135)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	102	81.0	111
				----	50 mg/L	106	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4288808)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	82.0	122
				<1	500 mg/L	97.4	82.0	122
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4288813)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4288813) - continued								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	82.0	122
				<1	500 mg/L	100.0	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4288809)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	94.6	80.9	127
				<1	1000 mg/L	98.2	80.9	127
ED045G: Chloride by Discrete Analyser (QCLot: 4288814)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	94.3	80.9	127
				<1	1000 mg/L	98.5	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4290907)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	95.1	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	99.6	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.7	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4290909)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	89.6	81.0	113
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	0.1 mg/L	91.0	85.0	115
EG020F: Dissolved Metals by ICP-MS (QCLot: 4290910)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	87.2	80.0	116
EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	0.02 mg/L	88.2	70.0	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.5	85.0	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	95.8	85.0	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	91.9	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	92.5	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	88.7	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	91.3	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.5	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	87.0	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	87.8	82.0	110
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	95.1	79.0	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.0	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	88.3	85.0	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	88.4	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.4	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	100	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	85.2	82.0	112
EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 4290906)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	87.8	83.0	105

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG052G: Silica by Discrete Analyser (QCLot: 4288811)								
EG052G: Reactive Silica	----	0.05	mg/L	<0.05	5 mg/L	105	92.0	118
				<0.05	0.5 mg/L	104	80.0	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4287057)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	118	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4290134)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	104	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4291346)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	104	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4288807)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.4	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4291345)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4291350)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	100	71.3	126
				<0.01	0.442 mg/L	106	71.3	126
				<0.01	1 mg/L	98.3	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4288810)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	98.3	85.0	117
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4288812)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	94.6	85.0	117
EP005: Total Organic Carbon (TOC) (QCLot: 4286980)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	91.4	72.0	120
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4288661)								
EP033: Methane	74-82-8	10	µg/L	<10	28.48 µg/L	100	86.0	114
EP033: Ethene	74-85-1	10	µg/L	<10	50.29 µg/L	100	87.0	111
EP033: Ethane	74-84-0	10	µg/L	<10	54.43 µg/L	100	87.0	111
EP033: Propene	115-07-1	10	µg/L	<10	73.97 µg/L	101	85.0	113
EP033: Propane	74-98-6	10	µg/L	<10	78.28 µg/L	101	84.0	112
EP033: Butene	25167-67-3	10	µg/L	<10	99.61 µg/L	104	83.0	115
EP033: Butane	106-97-8	10	µg/L	<10	102.18 µg/L	105	85.0	115
EP075(SIM)A: Phenolic Compounds (QCLot: 4287663)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	48.1	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	78.6	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	77.9	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	66.6	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	70.0	48.0	100
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	76.8	49.0	99.0

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)A: Phenolic Compounds (QCLot: 4287663) - continued								
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	70.2	53.0	105
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	90.1	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	81.2	53.0	99.0
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	70.6	50.0	106
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	69.6	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	31.5	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4287663)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	76.7	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	91.9	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	88.5	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	85.8	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	69.9	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	69.6	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	67.6	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	67.2	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	68.4	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	68.5	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	86.9	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	76.8	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	70.2	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	71.4	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	71.5	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	71.1	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4287664)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	69.0	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	96.7	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	76.0	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4291434)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	98.6	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4287664)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	82.4	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	75.6	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	77.0	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4291434)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	101	75.0	127
EP080: BTEXN (QCLot: 4291434)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	100	70.0	122

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080: BTEXN (QCLot: 4291434) - continued								
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	99.6	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	105	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	102	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	106	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	102	70.0	120

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**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4288808)							
ES2212989-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4288813)							
ES2213055-003	NR	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	128	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4288809)							
ES2212989-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4288814)							
ES2213055-003	NR	ED045G: Chloride	16887-00-6	50 mg/L	107	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4290910)							
ES2212790-006	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	85.6	70.0	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	99.0	70.0	130
		EG020A-F: Barium	7440-39-3	1 mg/L	90.7	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	92.9	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	81.3	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	94.6	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	93.0	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	81.0	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	93.2	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	90.7	70.0	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	79.1	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	91.9	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 4290906)							
ES2212172-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	81.4	70.0	130
EG052G: Silica by Discrete Analyser (QCLot: 4288811)							
ES2213017-006	Anonymous	EG052G: Reactive Silica	----	5 mg/L	105	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4287057)							
ES2212836-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	116	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4290134)							
ES2213052-008	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	103	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4291346)							
ES2213055-001	MPMB01	EK055G: Ammonia as N	7664-41-7	1 mg/L	100	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4288807)							
ES2212989-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	103	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4291345)							
ES2213055-001	MPMB01	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	102	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4291350)							
ES2212953-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	# Not Determined	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4288810)							
ES2212989-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	97.0	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4288812)							
ES2213055-003	NR	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	99.7	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4286980)							
ES2212951-006	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	116	70.0	130
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4288661)							
EM2206629-001	Anonymous	EP033: Methane	74-82-8	28.48 µg/L	105	70.0	130
		EP033: Ethene	74-85-1	50.29 µg/L	99.0	70.0	130
		EP033: Ethane	74-84-0	54.43 µg/L	99.5	70.0	130
		EP033: Propene	115-07-1	73.97 µg/L	99.5	70.0	130
		EP033: Propane	74-98-6	78.28 µg/L	99.8	70.0	130
		EP033: Butene	25167-67-3	99.61 µg/L	102	70.0	130
		EP033: Butane	106-97-8	102.18 µg/L	103	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4291434)							
ES2212853-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	95.7	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4291434)							
ES2212853-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	94.4	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 4291434)							
ES2212853-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	103	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	101	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	102	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	102	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	104	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	94.3	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2213055**	Page	: 1 of 12
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Telephone	: +61 2 8784 8555
Project	: AGL CAMDEM GAS PROJECT J210490	Date Samples Received	: 13-Apr-2022
Site	: ----	Issue Date	: 22-Apr-2022
Sampler	: Claire Corthier	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6

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.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2212989--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	ES2212989--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK067G: Total Phosphorus as P by Discrete Analyser	ES2212953--001	Anonymous	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
MPMB01, NR,	MPMB02, QA1	----	----	----	16-Apr-2022	13-Apr-2022	**3**

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	4	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	12	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			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	13-Apr-2022	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	11-May-2022	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
MPMB01	**13-Apr-2022**	**----**	----	----	**15-Apr-2022**	20-Apr-2022	✓
Clear Plastic Bottle - Natural (EA015H)							
MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	20-Apr-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
MPMB01	**13-Apr-2022**	**----**	----	----	**15-Apr-2022**	20-Apr-2022	✓
Clear Plastic Bottle - Natural (EA025H)							
MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	20-Apr-2022	✓
ED009: Anions							
Clear Plastic Bottle - Natural (ED009-X)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	27-Apr-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	11-May-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	11-May-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓

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
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020B-F)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	10-Oct-2022	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**20-Apr-2022**	11-May-2022	✓
EG052G: Silica by Discrete Analyser							
Clear Plastic Bottle - Natural (EG052G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	11-May-2022	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	27-Apr-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**16-Apr-2022**	11-May-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Amber TOC Vial - Sulfuric Acid (EK055G)							
QA1	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
MPMB01, MPMB02, NR	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	15-Apr-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Amber TOC Vial - Sulfuric Acid (EK059G)							
QA1	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MPMB01, MPMB02, NR	**13-Apr-2022**	**----**	----	----	**19-Apr-2022**	11-May-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	11-May-2022	✓	**19-Apr-2022**	11-May-2022	✓

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
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	15-Apr-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
MPMB01, MPMB02, NR	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	11-May-2022	✓
Amber VOC Vial - Sulfuric Acid (EP005)							
QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	11-May-2022	✓
EP033: C1 - C4 Hydrocarbon Gases							
Amber VOC Vial - Sulfuric Acid (EP033)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**----**	----	----	**14-Apr-2022**	27-Apr-2022	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	20-Apr-2022	✓	**20-Apr-2022**	29-May-2022	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	20-Apr-2022	✓	**20-Apr-2022**	29-May-2022	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	20-Apr-2022	✓	**20-Apr-2022**	29-May-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Trip blank	**11-Apr-2022**	**19-Apr-2022**	25-Apr-2022	✓	**19-Apr-2022**	25-Apr-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	27-Apr-2022	✓	**19-Apr-2022**	27-Apr-2022	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	20-Apr-2022	✓	**20-Apr-2022**	29-May-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Trip blank	**11-Apr-2022**	**19-Apr-2022**	25-Apr-2022	✓	**19-Apr-2022**	25-Apr-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MPMB01, MPMB02, NR, QA1	**13-Apr-2022**	**19-Apr-2022**	27-Apr-2022	✓	**19-Apr-2022**	27-Apr-2022	✓

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: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
Trip blank	**11-Apr-2022**	**19-Apr-2022**	25-Apr-2022	✓	**19-Apr-2022**	25-Apr-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MPMB01, MPMB02, NR, QA1, Trip spike	**13-Apr-2022**	**19-Apr-2022**	27-Apr-2022	✓	**19-Apr-2022**	27-Apr-2022	✓

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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	4	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	**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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	5	60	**8.33**	**8.33**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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 Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	40	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	40	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**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)							
Ammonia as N by Discrete analyser	EK055G	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	60	**1.67**	**1.67**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**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)							

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*	
Matrix Spikes (MS) - Continued							
Ammonia as N by Discrete analyser	EK055G	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	4	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	0	4	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	**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
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
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.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-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.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Silica (Reactive) by Discrete Analyser	EG052G	WATER	In house: Referenced to APHA 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM Schedule B(3).
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
C1 - C4 Gases	EP033	WATER	Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, US EPA - Region 1, EPA New England, July 2001. Automated static headspace, dual column GC/FID. A 12 mL sample is pipetted into a 20 mL headspace vial containing 3g of sodium chloride and sealed. Each sample is equilibrated with shaking at 40 degrees C for 10 minutes prior to analysis by GC/FID using a pair of PLOT columns of different polarity.
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)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 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 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)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2213939**	Page	: 1 of 8
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: ----	Date Samples Received	: 22-Apr-2022 15:00
Order number	: ----	Date Analysis Commenced	: 23-Apr-2022
C-O-C number	: ----	Issue Date	: 02-May-2022 16:32
Sampler	: ALEX BAYER/CLAIRE CORTHIER		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 2		
No. of samples analysed	: 2		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	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.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EK040: Poor spike recovery for Fluoride, however insufficent sample amount remaining for confirmation analysis.
- EP080: Positive result for ES2213939-02 is confirmed by re-analysis.
- EG020: Bromine quantification may be unreliable due to its low solubility in acid, leading to variable volatility during measurement by ICPMS.
- TDS by method EA-015 may bias high for sample 1 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MPMB03	MPMB04	----	----	----
			Sampling date / time	22-Apr-2022 11:30	22-Apr-2022 10:30	----	----	----
Compound	CAS Number	LOR	Unit	ES2213939-001	ES2213939-002	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.35**	**9.10**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**196**	**216**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**140**	**137**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**74**	**40**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	**19**	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**89**	**67**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**89**	**86**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	**2**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**22**	**29**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**14**	**3**	----	----	----
Magnesium	7439-95-4	1	mg/L	**10**	**2**	----	----	----
Sodium	7440-23-5	1	mg/L	**15**	**39**	----	----	----
Potassium	7440-09-7	1	mg/L	**5**	**6**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.23**	**0.25**	----	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.179**	**0.295**	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	**0.005**	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.987**	**0.009**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.003**	<0.001	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MPMB03	MPMB04	----	----	----
				Sampling date / time	22-Apr-2022 11:30	22-Apr-2022 10:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2213939-001	ES2213939-002	--------	--------	--------
					Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Lead	7439-92-1	0.001	mg/L		<0.001	**0.003**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.008**	**0.687**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	----	----	----
Strontium	7440-24-6	0.001	mg/L		**0.104**	**0.072**	----	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	----	----	----
Iron	7439-89-6	0.05	mg/L		**3.20**	**0.19**	----	----	----
Bromine	7726-95-6	0.1	mg/L		<0.1	<0.1	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG052G: Silica by Discrete Analyser									
Reactive Silica	----	0.05	mg/L		**4.29**	**1.92**	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	**0.1**	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.41**	**0.33**	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.11**	**0.05**	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		**0.01**	<0.01	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**2.40**	**2.58**	----	----	----
ø Total Cations	----	0.01	meq/L		**2.30**	**2.16**	----	----	----
EP005: Total Organic Carbon (TOC)									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MPMB03	MPMB04	----	----	----
			Sampling date / time	22-Apr-2022 11:30	22-Apr-2022 10:30	----	----	----
Compound	CAS Number	LOR	Unit	ES2213939-001	ES2213939-002	--------	--------	--------
				Result	Result	----	----	----
EP005: Total Organic Carbon (TOC) - Continued								
Total Organic Carbon	----	1	mg/L	**10**	**7**	----	----	----
EP033: C1 - C4 Hydrocarbon Gases								
Methane	74-82-8	10	µg/L	**11000**	**12100**	----	----	----
Ethene	74-85-1	10	µg/L	<10	<10	----	----	----
Ethane	74-84-0	10	µg/L	<10	<10	----	----	----
Propene	115-07-1	10	µg/L	<10	<10	----	----	----
Propane	74-98-6	10	µg/L	<10	<10	----	----	----
Butene	25167-67-3	10	µg/L	<10	<10	----	----	----
Butane	106-97-8	10	µg/L	<10	<10	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	----	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MPMB03	MPMB04	----	----	----
				Sampling date / time	22-Apr-2022 11:30	22-Apr-2022 10:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2213939-001	ES2213939-002	--------	--------	--------
					Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	3	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L		<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	3	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
ED009: Anions									
Bromide	24959-67-9	0.010	mg/L		0.049	0.049	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MPMB03	MPMB04	----	----	----
				Sampling date / time	22-Apr-2022 11:30	22-Apr-2022 10:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2213939-001	ES2213939-002	--------	--------	--------
					Result	Result	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**26.0**	**26.0**	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		**65.0**	**31.4**	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		**64.2**	**21.9**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**72.5**	**62.0**	----	----	----
Anthracene-d10	1719-06-8	1.0	%		**88.1**	**76.5**	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		**88.0**	**77.3**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**93.6**	**100**	----	----	----
Toluene-D8	2037-26-5	2	%		**119**	**130**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**112**	**121**	----	----	----

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

QUALITY CONTROL REPORT

Work Order	: **ES2213939**	Page	: 1 of 11
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Contact	: Sepan Mahamad
Address	: Ground Floor Suite 1 20 Chandos Street St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: ----	Date Samples Received	: 22-Apr-2022
Order number	: ----	Date Analysis Commenced	: 23-Apr-2022
C-O-C number	: ----	Issue Date	: 02-May-2022
Sampler	: ALEX BAYER/CLAIRE CORTHIER		
Site	: ----		
Quote number	: SY/416/16 - AGL Camden Planned Event		
No. of samples received	: 2		
No. of samples analysed	: 2		

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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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	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.

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 (%)	Acceptable RPD (%)
ED009: Anions (QC Lot: 4310633)									
EP2204723-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	<0.010	0.0	No Limit
WN2204566-001	Anonymous	ED009-X: Bromide	24959-67-9	0.01	mg/L	0.162	0.159	1.9	0% - 50%
EA005P: pH by PC Titrator (QC Lot: 4302994)									
ES2213914-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.81	7.91	1.3	0% - 20%
ES2213912-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.68	6.68	0.0	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4302991)									
ES2214047-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	115	118	2.8	0% - 20%
ES2214017-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	122	117	4.0	0% - 20%
ES2213895-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	432	439	1.7	0% - 20%
ES2213912-006	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	96	98	1.3	0% - 20%
ES2213920-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	209	207	0.9	0% - 20%
ES2213679-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	19100	19400	1.7	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4310290)									
ES2213815-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	36600	36700	0.4	0% - 20%
ES2214062-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	105	118	11.8	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4310291)									
ES2213815-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2214062-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	261	256	2.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4302996)									
ES2213920-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	86	87	1.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	86	87	1.9	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 (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 4302996) - continued									
ES2214004-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	139	138	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	139	138	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4301241)									
ES2213995-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	9	0.0	No Limit
ES2213939-001	MPMB03	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 4301240)									
ES2213939-001	MPMB03	ED045G: Chloride	16887-00-6	1	mg/L	22	22	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4307603)									
ES2213912-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	5	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	17	17	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
ES2213939-001	MPMB03	ED093F: Calcium	7440-70-2	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	10	10	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	15	15	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4307606)									
ES2213939-001	MPMB03	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.179	0.178	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.005	0.004	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.987	0.994	0.7	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.008	0.008	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.23	0.22	0.0	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	3.20	3.22	0.5	0% - 20%
		EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4307607)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4307607) - continued									
ES2213939-001	MPMB03	EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.104	0.105	0.0	0% - 20%
		EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4307605)									
ES2213912-006	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2213939-001	MPMB03	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG052G: Silica by Discrete Analyser (QC Lot: 4301242)									
ES2213939-001	MPMB03	EG052G: Reactive Silica	----	0.05	mg/L	4.29	4.46	3.8	0% - 20%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4302039)									
ES2213629-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2213629-011	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4302995)									
ES2213914-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES2213920-004	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4306932)									
ES2213939-001	MPMB03	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.41	0.39	4.3	0% - 20%
ES2214163-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.10	0.10	0.0	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4301238)									
ES2213995-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<2.00	<2.00	0.0	No Limit
ES2213939-001	MPMB03	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4306933)									
ES2214078-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
ES2213939-001	MPMB03	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4306935)									
ES2213969-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.53	0.52	0.0	0% - 20%
ES2214078-006	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4301239)									
ES2213939-001	MPMB03	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.01	0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4302946)									
ES2213879-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
ES2213895-004	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 4305918)									
ES2213687-008	Anonymous	EP033: Methane	74-82-8	10	µg/L	365	353	3.4	0% - 20%
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP033: C1 - C4 Hydrocarbon Gases (QC Lot: 4305918) - continued									
ES2213831-001	Anonymous	EP033: Methane	74-82-8	10	µg/L	3250	3240	0.6	0% - 20%
		EP033: Ethene	74-85-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Ethane	74-84-0	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propene	115-07-1	10	µg/L	<10	<10	0.0	No Limit
		EP033: Propane	74-98-6	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butene	25167-67-3	10	µg/L	<10	<10	0.0	No Limit
		EP033: Butane	106-97-8	10	µg/L	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4304127)									
ES2213692-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2213797-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	270	260	0.0	0% - 50%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4304127)									
ES2213692-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2213797-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	260	260	0.0	0% - 50%
EP080: BTEXN (QC Lot: 4304127)									
ES2213692-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2213797-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	111	110	0.0	0% - 20%
		EP080: Toluene	108-88-3	2	µg/L	26	26	0.0	0% - 50%
		EP080: Ethylbenzene	100-41-4	2	µg/L	5	5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	35	36	2.8	0% - 50%
		EP080: ortho-Xylene	95-47-6	2	µg/L	16	17	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED009: Anions (QCLot: 4310633)								
ED009-X: Bromide	24959-67-9	0.01	mg/L	<0.010	2 mg/L	99.4	93.0	109
EA005P: pH by PC Titrator (QCLot: 4302994)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.5	98.8	101
				----	7 pH Unit	99.8	99.2	101
EA010P: Conductivity by PC Titrator (QCLot: 4302991)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	220 µS/cm	90.7	89.9	110
				<1	2100 µS/cm	96.0	90.2	111
				<1	58301 µS/cm	96.0	93.3	106
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4310290)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	95.2	87.0	109
				<10	293 mg/L	125	75.2	126
				<10	2460 mg/L	98.7	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4310291)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	83.0	129
				<5	1000 mg/L	95.1	82.0	110
				<5	835 mg/L	97.5	83.0	118
ED037P: Alkalinity by PC Titrator (QCLot: 4302996)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	96.2	81.0	111
				----	50 mg/L	115	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4301241)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	82.0	122
				<1	500 mg/L	104	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4301240)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	95.2	80.9	127
				<1	1000 mg/L	92.4	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4307603)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.9	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.1	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4307606)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	89.1	80.0	116
EG020A-F: Antimony	7440-36-0	0.001	mg/L	<0.001	0.02 mg/L	93.9	70.0	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.4	85.0	114

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4307606) - continued								
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	93.3	85.0	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	93.6	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	91.7	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.3	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	89.7	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	89.6	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	91.1	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	89.6	82.0	110
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	94.7	79.0	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.2	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	94.0	85.0	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	91.5	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	92.1	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	92.3	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	91.0	82.0	112
EG020A-F: Bromine	7726-95-6	0.1	mg/L	<0.1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 4307607)								
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	92.2	81.0	113
EG020B-F: Uranium	7440-61-1	0.001	mg/L	<0.001	0.1 mg/L	91.5	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 4307605)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.6	83.0	105
EG052G: Silica by Discrete Analyser (QCLot: 4301242)								
EG052G: Reactive Silica	----	0.05	mg/L	<0.05	5 mg/L	108	92.0	118
				<0.05	0.5 mg/L	106	80.0	120
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4302039)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	111	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4302995)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	94.8	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4306932)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	102	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4301238)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	103	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4306933)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.7	91.0	113
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4306935)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4306935) - continued								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	94.8	71.3	126
				<0.01	0.442 mg/L	103	71.3	126
				<0.01	1 mg/L	118	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4301239)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	100	85.0	117
EP005: Total Organic Carbon (TOC) (QCLot: 4302946)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	91.9	72.0	120
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4305918)								
EP033: Methane	74-82-8	10	µg/L	<10	28.48 µg/L	105	86.0	114
EP033: Ethene	74-85-1	10	µg/L	<10	50.29 µg/L	101	87.0	111
EP033: Ethane	74-84-0	10	µg/L	<10	54.43 µg/L	103	87.0	111
EP033: Propene	115-07-1	10	µg/L	<10	73.97 µg/L	103	85.0	113
EP033: Propane	74-98-6	10	µg/L	<10	78.28 µg/L	103	84.0	112
EP033: Butene	25167-67-3	10	µg/L	<10	99.61 µg/L	112	83.0	115
EP033: Butane	106-97-8	10	µg/L	<10	102.18 µg/L	112	85.0	115
EP075(SIM)A: Phenolic Compounds (QCLot: 4302848)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	35.9	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	71.8	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	74.7	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	60.1	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	74.7	48.0	100
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	72.9	49.0	99.0
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	67.8	53.0	105
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	66.4	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	81.9	53.0	99.0
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	85.5	50.0	106
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	91.8	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	38.5	10.0	95.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4302848)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	67.7	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	85.9	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	87.6	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	92.9	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	99.4	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	98.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	95.9	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	93.9	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	94.9	64.1	117

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 4302848) - continued								
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	88.0	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	97.1	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	83.4	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	90.5	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	93.3	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	91.0	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	91.4	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4302849)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	69.0	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	77.1	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	102	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4304127)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	89.8	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4302849)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	79.3	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	90.7	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	78.5	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4304127)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	90.9	75.0	127
EP080: BTEXN (QCLot: 4304127)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	88.6	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	109	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	107	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	112	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	108	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	70.0	120

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**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4301241)							
ES2213939-001	MPMB03	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	126	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 4301240)							
ES2213939-001	MPMB03	ED045G: Chloride	16887-00-6	50 mg/L	102	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4307606)							
ES2213939-002	MPMB04	EG020A-F: Arsenic	7440-38-2	1 mg/L	93.3	70.0	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	107	70.0	130
		EG020A-F: Barium	7440-39-3	1 mg/L	95.5	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	95.1	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	92.3	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	92.6	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	92.9	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	88.4	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	95.0	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	95.6	70.0	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	92.7	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	96.7	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4307605)							
ES2213912-003	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	94.2	70.0	130
EG052G: Silica by Discrete Analyser (QCLot: 4301242)							
ES2213939-001	MPMB03	EG052G: Reactive Silica	----	5 mg/L	103	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4302039)							
ES2213629-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	118	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4302995)							
ES2213914-002	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	# 49.5	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4306932)							
ES2213939-001	MPMB03	EK055G: Ammonia as N	7664-41-7	1 mg/L	93.6	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4301238)							
ES2213939-001	MPMB03	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	117	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4306933)							
ES2213939-001	MPMB03	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	95.6	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4306935)							
ES2213969-006	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	114	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4301239)							
ES2213939-001	MPMB03	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	102	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4302946)							
ES2213879-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	94.6	70.0	130
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4305918)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP033: C1 - C4 Hydrocarbon Gases (QCLot: 4305918) - continued							
ES2213804-006	Anonymous	EP033: Methane	74-82-8	28.48 µg/L	# Not Determined	70.0	130
		EP033: Ethene	74-85-1	50.29 µg/L	103	70.0	130
		EP033: Ethane	74-84-0	54.43 µg/L	104	70.0	130
		EP033: Propene	115-07-1	73.97 µg/L	108	70.0	130
		EP033: Propane	74-98-6	78.28 µg/L	108	70.0	130
		EP033: Butene	25167-67-3	99.61 µg/L	126	70.0	130
		EP033: Butane	106-97-8	102.18 µg/L	124	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4304127)							
ES2213692-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	90.2	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4304127)							
ES2213692-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	87.8	70.0	130
EP080: BTEXN (QCLot: 4304127)							
ES2213692-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	88.1	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	104	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	106	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	107	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	98.5	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2213939**	Page	: 1 of 11
Client	: **EMM CONSULTING PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Claire Corthier	Telephone	: +61 2 8784 8555
Project	: ----	Date Samples Received	: 22-Apr-2022
Site	: ----	Issue Date	: 02-May-2022
Sampler	: ALEX BAYER/CLAIRE CORTHIER	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

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.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK040P: Fluoride by PC Titrator	ES2213914--002	Anonymous	**Fluoride**	16984-48-8	49.5 %	70.0-130%	**Recovery less than lower data quality objective**
EP033: C1 - C4 Hydrocarbon Gases	ES2213804--006	Anonymous	**Methane**	74-82-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MPMB03, MPMB04	----	----	----	26-Apr-2022	22-Apr-2022	**4**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	10	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	10	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
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			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

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
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	22-Apr-2022	×
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	20-May-2022	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**28-Apr-2022**	29-Apr-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**28-Apr-2022**	29-Apr-2022	✓
ED009: Anions								
Clear Plastic Bottle - Natural (ED009-X)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**29-Apr-2022**	20-May-2022	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	06-May-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**23-Apr-2022**	20-May-2022	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**23-Apr-2022**	20-May-2022	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**28-Apr-2022**	20-May-2022	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020B-F)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**28-Apr-2022**	19-Oct-2022	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**28-Apr-2022**	20-May-2022	✓
EG052G: Silica by Discrete Analyser								
Clear Plastic Bottle - Natural (EG052G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**23-Apr-2022**	20-May-2022	✓
EK026SF: Total CN by Segmented Flow Analyser								
Opaque plastic bottle - NaOH (EK026SF)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	06-May-2022	✓

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
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural (EK040P)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	20-May-2022	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**27-Apr-2022**	20-May-2022	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**23-Apr-2022**	24-Apr-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**27-Apr-2022**	20-May-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
MPMB03,	MPMB04	**22-Apr-2022**	**27-Apr-2022**	20-May-2022	✓	**27-Apr-2022**	20-May-2022	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**23-Apr-2022**	24-Apr-2022	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**26-Apr-2022**	20-May-2022	✓
EP033: C1 - C4 Hydrocarbon Gases								
Amber VOC Vial - Sulfuric Acid (EP033)								
MPMB03,	MPMB04	**22-Apr-2022**	**----**	----	----	**27-Apr-2022**	06-May-2022	✓
EP075(SIM)A: Phenolic Compounds								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
MPMB03,	MPMB04	**22-Apr-2022**	**26-Apr-2022**	29-Apr-2022	✓	**29-Apr-2022**	05-Jun-2022	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP075(SIM))								
MPMB03,	MPMB04	**22-Apr-2022**	**26-Apr-2022**	29-Apr-2022	✓	**29-Apr-2022**	05-Jun-2022	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071)								
MPMB03,	MPMB04	**22-Apr-2022**	**26-Apr-2022**	29-Apr-2022	✓	**29-Apr-2022**	05-Jun-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
MPMB03,	MPMB04	**22-Apr-2022**	**27-Apr-2022**	06-May-2022	✓	**27-Apr-2022**	06-May-2022	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)								
MPMB03,	MPMB04	**22-Apr-2022**	**26-Apr-2022**	29-Apr-2022	✓	**29-Apr-2022**	05-Jun-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)								
MPMB03,	MPMB04	**22-Apr-2022**	**27-Apr-2022**	06-May-2022	✓	**27-Apr-2022**	06-May-2022	✓

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: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
MPMB03, MPMB04	**22-Apr-2022**	**27-Apr-2022**	06-May-2022	✓	**27-Apr-2022**	06-May-2022	✓

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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	10	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	5	60	**8.33**	**8.33**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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 Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	**15.00**	**15.00**	✓	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)							
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	60	**1.67**	**1.67**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**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)							

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*	
Matrix Spikes (MS) - Continued							
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
C1 - C4 Gases	EP033	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**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
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	10	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Silica (Reactive) by Discrete Analyser	EG052G	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	0	2	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**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
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
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.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-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.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Silica (Reactive) by Discrete Analyser	EG052G	WATER	In house: Referenced to APHA 4500-SiO2 D: Under Acdic conditions reactive silicon combines with ammonium molybdate to form a yellow molybdosilicic acid complex. This is reduced by 1-amino-2-naphthol-4-sulfonic acid to a silicomolybdenum blue complex which is measured by discrete analyser at 670 nm. This method is compliant with NEPM Schedule B(3).
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
C1 - C4 Gases	EP033	WATER	Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane, and Ethene, US EPA - Region 1, EPA New England, July 2001. Automated static headspace, dual column GC/FID. A 12 mL sample is pipetted into a 20 mL headspace vial containing 3g of sodium chloride and sealed. Each sample is equilibrated with shaking at 40 degrees C for 10 minutes prior to analysis by GC/FID using a pair of PLOT columns of different polarity.
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)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 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 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)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
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.

Australia

SYDNEY
Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 8.03 Level 8
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 9.02 Level 9
109 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Younge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
60 W 6th Ave Suite 200
Vancouver BC V5Y 1K1
T 604 999 8297

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au