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Geotechnical Engineering
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Sound & Vibration
Occupational Hygiene

RCA ref 14302-742/1

16 August 2022

Johnson Property Group
Corner of Whistler Drive & Armitage Way
Cooranbong NSW 2265

Attention: Mr Michael Wratten

JUNE 2022 GROUNDWATER AND SEDIMENT SAMPLING
TRINITY POINT MARINA, MORISSET PARK

1 INTRODUCTION

This report details the findings of groundwater and sediment sampling conducted at the Trinity Point Marina, Morisset Park NSW.

The sampling was undertaken to comply with the requirements for monitoring outlined in Sections 2.4 and 2.5 of the Construction Environmental Management Plan (CEMP, Ref [1]) for the Marina as detailed below.

Section 2.4 of the CEMP states that groundwater monitoring is to be undertaken upstream and downstream of the Underground Petroleum Storage System (UPSS) at points 'E' and 'F' as per the site Environment Protection Licence (EPL) No 20631. The groundwater monitoring locations are shown below on **Figure 1**, as extracted from the "EPL Boundary and Water Quality Sampling Points" plan provided as part of the Environmental Monitoring information on the Trinity Point Marina website (https://trinitypointmarina.com.au/about/trinity-point-marina-monitoring). Monthly groundwater monitoring, which is undertaken separately, involves the inspection of groundwater for visual assessment of the presence of oil and grease. Annual groundwater monitoring, which forms part of the scope of this assessment, requires collected samples to be analysed for total petroleum hydrocarbons (TPH). It is noted that **Figure 1** includes surface water monitoring locations, assessment of which are not included in this report.

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Section 2.5 of the CEMP (Ref [1]) states that Section C13 of the Concept Approval for the Marina requires that analysis of contaminant levels in the bed sediments in the area of the proposed marina is undertaken as part of the Stage 1 Marina Environmental Performance Monitoring. The CEMP (Ref [1]) states that an assessment of baseline sediment quality data indicated that lake bed sediments at the site are generally not contaminated, although slightly elevated concentrations of arsenic and cadmium have been detected. Sediment samples were required to be collected once midway through the Stage 1 construction period and then annually for a maximum of five (5) years following commencement of operation to demonstrate that marina operations do not impact sediment quality conditions. The CEMP (Ref [1]) states that the sediment samples are to be collected from four (4) 'impact' locations within the current marina layout as were assessed during the baseline monitoring period with an additional two (2) locations positioned in adjacent non-impacted areas to provide reference data for the four (4) 'impact' locations. The two (2) non-impacted sediment locations are identified as EPL Point A and Point C on **Figure 1** below. The four (4) sediment sampling locations as extracted from the CEMP (Ref [1]) are presented on **Figure 2**.

Figure 1 *Trinity Point Marina "EPL Boundary and Water Quality Sampling Points" showing groundwater, surface water and sediment sampling locations.*

Figure 2 *Extract from CEMP (Ref [1]) identifying sediment 'impact' locations.*

It is understood that this round of monitoring comprises the second of the post construction annual monitoring events. RCA have been provided with the results of sediment sampling conducted by Enviropacific in April 2019 (Ref [2]) which RCA understands were collected to establish background contaminant levels present proximal to the marina prior to occupation and these have been used in RCA's assessment.

2 FIELDWORK

An environmental technician undertook the fieldwork on 22 June 2022. The scope of work included:

- The collection of groundwater samples from existing monitoring wells MW5 and MW6 which are identified as points 'E' and 'F' in the site EPL as shown above in **Figure 1**.
    - Both bores were dipped to determine the depth of groundwater and then purged of at least three (3) bore volumes prior to sample collection.

  - Samples were collected by designated hand bailer and were analysed by a NATA accredited laboratory for total recoverable hydrocarbons (TRH[1]) and benzene, toluene, ethylbenzene, xylene (BTEX).

- The collection of six (6) sediment samples comprising the four (4) sediment sample locations identified in the CEMP as shown on **Figure 2** and two (2) sediment samples from a boat within Lake Macquarie at EPL Points A and C as shown on **Figure 1**.

  - All sediment samples were collected with a (Petite) Ponar sampler which facilitates the collection of sediment samples from below the water. The samples were collected from the surface of the sediment to approximately 0.1m below the surface.

  - Samples were analysed by a NATA accredited laboratory for metals, total organic carbon (TOC) and tributyl tin (TBT) as specified in the CEMP (Ref [1]).

There were no other indications of contamination observed during sampling of groundwater or sediment.

Field sheets are attached.

3 APPLICABLE GUIDELINE CRITERIA

3.1 GROUNDWATER

The Guidelines for the Assessment and Management of Groundwater Contamination have been introduced by the NSW DECC (Ref [3]) and recommend that AWQ Guidelines (Ref [4]) investigation levels be adopted as groundwater investigation levels (GIL) for aquatic ecosystems and ADWG (Ref [5]) for drinking water GIL. It is noted that the AWQ Guidelines (Ref [4]) have since been replaced by ANZG (Ref [6]) and as such RCA have used the most recent guidelines in accordance with the following information.

The ANZG (Ref [6]) are complex guidelines that consider not only the level of protection (e.g. 99% or 95%) but also the state of the receiving water (e.g. moderately disturbed). For the protection of aquatic ecosystems the DECC recommend the use of 95% protection for all analytes with the exception of carcinogenic analytes for which the 99% protection value should be used. The following comments are additionally made:

- Where the existing generic GIL is below the naturally occurring background concentration of a particular contaminant, the background concentration becomes the default GIL.

[1] Laboratory analysis of hydrocarbons is reported as total recoverable hydrocarbons (TRH). This testing method includes all forms of hydrocarbons, not just petroleum hydrocarbons and therefore can be considered a conservative measure against the chosen TPH criteria. Further laboratory analysis using a silica gel clean up (TRH_{sg}) is considered to enable a better identification of the extent of petroleum based contamination

- Where PQL are greater than the recommended GIL the PQL is adopted as the GIL. Where background concentrations are proven to be greater than the GIL, the background concentration is adopted as the GIL.

- Where there is insufficient data for the derivation of marine water criteria it is allowable to use fresh water criteria as low reliability criteria.

RCA considers that the receiving water is Lake Macquarie and so has used the 95% marine water guideline criteria.

The ADWG (Ref [5]) document provides a framework for drinking water quality management and assessment. The framework provided in this document has been adopted for the evaluation of contaminants in groundwater where groundwater can be, or is being, extracted and used for drinking water purpose. It is not considered likely that groundwater would be extracted from use and as such this comparison is considered highly conservative.

Schedule B1 of the ASC NEPM (Ref [7]) provides generic health screening levels (HSL) for groundwater, for protection of human health from petroleum hydrocarbon vapours, based on the following land use scenarios:

- HSL 'A' Residential with garden/ accessible soil (home grown produce <10% fruit and vegetable intake (no poultry). This category includes children's day care centres, preschools and primary schools.

- HSL 'B' Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high rise buildings and flats.

- HSL 'C' Public open space such as parks, playgrounds, playing fields (e.g. ovals) secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves).

- HSL 'D' Commercial/industrial such as shops, offices, factories and industrial sites.

RCA considers that the marina comprises both public open space and commercial/industrial areas: the HSL 'D' criteria presume that there is some potential for accumulation of vapours within enclosed spaces. For the purpose of this assessment the HSL 'D' criteria which are the most conservative have been used for this assessment.

It is noted that the HSL apply to groundwater at 2m below the surface. Both monitoring wells had shallower groundwater depth and as such the HSL are not directly applicable.

3.2 SEDIMENT

Two (2) criteria for the assessment of sediment are listed in Table 1 of the ANZG toxicant default guideline values for sediment quality (Ref [6]). The default guideline values (DGV) indicate the concentrations below which there is a low risk of unacceptable effects occurring, and should be used, with other lines of evidence, to protect aquatic ecosystems where the DGV is exceeded or where toxicant concentrations in the sediment are trending towards the DGV. The 'upper' guideline values (GV-High) provide an indication of concentrations at which toxicity-related adverse effects would be expected to be observed. The ANZG (Ref [6]) states that the GV-High value should only be used as an indicator of potential high-level toxicity problems, not as a guideline value to ensure protection of ecosystems.

4 RESULTS

Results have been compared against the guidelines detailed in the previous section and are presented in the tables attached to this report. A summary is as follows:

- All TRH and BTEX concentrations in groundwater were below the laboratory limit of detection and were therefore below the relevant guideline human health and ecological criteria.
- Sed-1 sampling site had exceeded the DGV limit for copper but did not exceed the GV-High limit. This was the only exceedance from all the samples.
- Concentrations of metals and TBT in all sediment samples were below the default guideline values.
- Results of total organic carbon were low and relatively consistent across all samples. The samples from the 'impact' locations were slightly higher than those from 'non-impact' locations. There are no guidelines for total organic carbon.
- The trend for Aluminium and iron has indicated it is increasing in the sediment across all sites.

Laboratory report sheets are attached.

5 DISCUSSION AND CONCLUSION

The concentrations observed in the groundwater samples upgradient and downgradient of the UPSS were all below the laboratory detection limit and indicate that there has been no detectable impact to the groundwater from the UPSS.

Whilst the June 2022 results show a general increase in most metals concentrations, the concentrations reported in the sediment samples were all below the default guideline values for sediment and as such there is not considered to be potential for adverse environmental impact from the concentrations.

The cause of increased concentrations is unknown and may be related to sediment movement within Lake Macquarie, new sediment being deposited on the base of the Lake from flood events or different sampling methodology between events. It is not considered that there would be significant biodegradation effects for the analysed compounds.

The cause of increased concentrations is unknown and may be related to sediment

movement within Lake Macquarie, new sediment being deposited on the base of the Lake

from flood events (see below rainfall comparison statistics from the previous year) or different sampling methodology between events. It is not considered that there would be significant biodegradation effects for the analysed compounds.

There is clear evidence from January to July 2021 in comparison to Jan to July 2022 of significant elevated rainfall. As demonstrated in the below table this identifies increased potential of sediment movement.

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul
Rainfall (mm) for year 2021	*104.8*	*155.8*	*421.6*	*56.4*	*26*	*42.8*	*29.2*
Rainfall (mm) for year 2022	152.2	247.6	425.8	117.6	103.4	11	402.8

Results of the sampling points do not exceed the guidelines and therefore, do not pose a risk

Based on these results RCA makes no further recommendations than the next annual monitoring event be undertaken as per the requirements of the CEMP (Ref [1]).

Yours faithfully
RCA AUSTRALIA

Laura Schofield
Environmental Laboratory Manager

Dr Neena Tewari
Senior Microbiologist

ATTACHMENTS
Field Sheets
Summary of Results
Laboratory Report Sheets

REFERENCES

[1] Haskoning Australia Pty Ltd, *Trinity Point Marina – CEMP*, December 2015

[2] Enviropacfic, *Annual Sediment Sampling and analysis Report*, January 2021

[3] DECC, *Contaminated Sites – Guidelines for the Assessment and Management of Contaminated Groundwater*, March 2007.

[4] ANZECC, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, October 2000.

[5] ANZG, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.,* August 2018. Available at www.waterquality.gov.au/anz-guidelines.

[6] National Health and Medical Research Council, *Australian Drinking Water Guidelines*, 2011.

NEPC, *National Environment Protection (Assessment of Site Contamination) Measure*, 1999 as amended 2013.

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ENV-F108-3

Ground Water Sampling Field Sheet

Client: Trinity Point Job Number: 14302

Technician: SK/MH Date Sampled: 22/6/22

Meter(s) Used: N/A

Sample Number	Bore ID	Time Sampled	Depth to Aquifer (m)	Pipe Height (m)	Depth to Aquifer from Surface (m)	Temp (°C)	pH	Other Analysis (Include Measurement Units)			
0622 14302 003	MW5	10:45	1.02	Ground		17°c					
0622 14302 004	MW6	11:20	1.40	Ground		18°c					

Comments:

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ENV-F033-4

BOREHOLE PURGING LOG SHEET – Trinity Point

Bore No.	Date	Start Time	End Time	Depth to Water Surface (m) x	Depth Bore Bottom (m) y	Water Column (m) z	Calculated Water Volume (L)* v	Calculated Volume to Purge (L) p	Actual Volume Purged (L)	Start Colour of Water	End Colour of Water	Purged By:	Comments
				x (value)	y (value)	$z = (y-x)$	$v = z \times 9.50$	$p = v \times 3$					
MW 5	22/6/22	10:08 am	10:30 am	1.02	2.71				48.1	Clear	8/10 clear	MM	
MW6	22/6/22	10:32 am	11:00 am	1.40	3.13	1.73	16.4	49.3	49	Clear	Clear	MM	

*Calculated water volume based on 1 linear meter of 50mm bore pipe using equation $V = \pi r^2 h$. Where V = volume in Litres.

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CMT-WS1028/1

SAMPLING DETAIL SHEET

10:30

Job No: 14302 Client Ref: Point A sed Date Received: 22/6/22
Location: Point A Material Description: Silty sand (dark brown)
Date Sampled: 22/6/22 By: SN Supplied by Client: Yes / No
Sampling Method: Pitet Ponar Bag 4 of 4
Tests Requested: Refer to COC

Job No: 14302 Client Ref: Point C sed Date Received: 22/6/22
Location: Point C sed Material Description: Silty Sand. (dark brown)
10:51 Date Sampled: 22/6/22 By: SN Supplied by Client: Yes / No
Sampling Method: Pitet ponar Bag 4 of 4
Tests Requested: Refer to COC

Job No: 14302 Client Ref: Sed 1 Date Received: 22/6/22
Location: Point Sed 1 Material Description: silty Sand. (dark brown)
11:12 Date Sampled: 22/6/22 By: SH Supplied by Client: Yes / No
Sampling Method: Petit Poner Bag 4 of 4
Tests Requested: Refer to COC

Job No: 14302 Client Ref: Sed 2 Date Received: 22/6/22
Location: Point Sed 2 Material Description: SITY SAND (dark brown)
11:30 Date Sampled: 22/6/22 By: SH Supplied by Client: Yes / No
Sampling Method: Petite Poner Bag 4 of 4
Tests Requested: Refer to COC

Job No: 14302 Client Ref: Sed 4 Date Received: 22/6/22
Location: Points Sed 4 Material Description: Silty Sand (dark brown)
11:49 Date Sampled: 22/6/22 By: NL Supplied by Client: Yes / No
Sampling Method: Petite Poner Bag 4 of 4
Tests Requested:

Back of Sheet for Sed 3

RCA Australia	Tested by:	Date:
Laboratory Site No: 9804 / _____ (Circle one)	Checked by:	Date:

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CONSTRUCTION MATERIALS TESTING

CMT-WS1028/1

SAMPLING DETAIL SHEET

Job No: 14302 Client Ref: Sed 3 Date Received: 22/6/22
Location: SED 3 Material Description: Silty Sand
Date Sampled: 22/6/22 By: SN Supplied by Client: Yes /(No)
Sampling Method: Petite Ponar Bag 1 of ______
Tests Requested: Refer to COC

Job No: ______ Client Ref: ______ Date Received: ______
Location: ______ Material Description: ______
Date Sampled: ______ By: ______ Supplied by Client: Yes /No
Sampling Method: ______ Bag 1 of ______
Tests Requested: ______

Job No: ______ Client Ref: ______ Date Received: ______
Location: ______ Material Description: ______
Date Sampled: ______ By: ______ Supplied by Client: Yes /No
Sampling Method: ______ Bag 1 of ______
Tests Requested: ______

Job No: ______ Client Ref: ______ Date Received: ______
Location: ______ Material Description: ______
Date Sampled: ______ By: ______ Supplied by Client: Yes /No
Sampling Method: ______ Bag 1 of ______
Tests Requested: ______

Job No: ______ Client Ref: ______ Date Received: ______
Location: ______ Material Description: ______
Date Sampled: ______ By: ______ Supplied by Client: Yes /No
Sampling Method: ______ Bag 1 of ______
Tests Requested: ______

RCA Australia	**Tested by**:	**Date**:
Laboratory Site No: 9804 / ______ (Circle one)	**Checked by**:	**Date**:

Sample Identification	PQL	Guideline[A]		Sed-1	Sed-1	Sed-1	Sed-2	Sed-2	Sed-2	Sed-3	Sed-3	Sed-3	Sed-4
Date		DGV	GV-High	19/8/20	26/5/21	22/6/22	19/8/20	26/5/21	22/6/22	19/8/20	26/5/21	22/6/22	19/8/20
Sample Profile				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Sample Purpose				Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
Sample collected by				RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK	RCA-SK
Metals													
Aluminium	50			3560	7460	11800	3980	7560	8810	4380	9990	11700	3590
Antimony	5	2	25	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic	5	20	70	10	9	6	11	12	11	8	12	8	8
Cadmium	1	1.5	10	<1	1	1	<1	<1	<1	<1	<1	<1	<1
Chromium	2	80	370	9	11	14	5	10	10	5	13	13	5
Cobalt	2			3	4	4	4	6	5	3	6	5	3
Copper	5	65	270	33	44	**83**	19	35	30	16	39	48	16
Iron	50			7090	14600	15300	8630	15400	12200	8140	18500	15800	6550
Lead	5	50	220	12	13	14	7	14	10	7	16	14	6
Manganese	5			58	163	158	121	192	151	116	247	218	91
Nickel	2	21	52	4	6	7	3	6	4	2	7	6	2
Selenium	5			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	2	1	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Vanadium	5			11	26	31	11	24	19	12	30	26	12
Zinc	5	200	410	78	97	132	53	94	78	52	102	112	44
Mercury	0.1	0.15	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organometallics													
Tributyltin	0.5	9	70	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Organics													
Total Organic Carbon	0.02			1.61	2	4.46	2	1.63	1.96	1.69	1.99	2.5	1.04

All results are in units of mg/kg except Total Organic Carbon which is in %.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presented by laboratory

[A] ANZG Toxicant default guideline values for sediment quality, Table 1

DGV = Detault Guideline Value

GV-High = Upper Guideline Value

Results shown in **BOLD** are in excess of the DGV

Results shown in shading are in excess of the GV-High

Sample Identification	PQL	Guideline[A]		Sed-4	Sed-4	Point A	Point A	Point A	Point A	Point C	Point C	Point C	Point C
Date		DGV	GV-High	26/5/21	22/6/22	17/4/19	19/8/20	26/5/21	22/6/22	17/4/19	19/8/20	26/5/21	22/6/22
Sample Profile				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Sample Purpose				Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
Sample collected by				RCA-SK	RCA-SK	Enviropacific	RCA-SK	RCA-SK	RCA-SK	Enviropacific	RCA-SK	RCA-SK	RCA-SK
Metals													
Aluminium	50			5340	6310	11200	2870	4260	5620	7530	1940	15700	7860
Antimony	5	2	25	<5	<5	<0.5	<5	<5	<5	<0.5	<5	<5	<5
Arsenic	5	20	70	7	5	17.7	7	10	13	11.2	<5	19	8
Cadmium	1	1.5	10	<1	<1	0.8	<1	<1	<1	0.7	<1	<1	<1
Chromium	2	80	370	7	7	16.5	4	6	7	12.6	2	19	9
Cobalt	2			4	3	6.9	2	3	4	5.5	<2	8	4
Copper	5	65	270	26	28	52.4	11	20	15	41.6	10	44	26
Iron	50			10200	8300	25000	6800	9320	11800	18400	3280	28500	9860
Lead	5	50	220	8	8	22.3	6	8	8	19.2	<5	20	10
Manganese	5			154	130	323	58	85	85	243	43	408	106
Nickel	2	21	52	4	3	7.3	<2	4	3	5.8	<2	10	4
Selenium	5			<5	<5	2	<5	<5	<5	1.9	<5	<5	<5
Silver	2	1	4	<2	<2	0.1	<2	<2	<2	<0.1	<2	<2	<2
Vanadium	5			18	15	35.6	12	14	17	28.9	5	48	19
Zinc	5	200	410	64	57	128	35	50	46	93	25	152	64
Mercury	0.1	0.15	1	<0.1	<0.1	0.07	<0.1	<0.1	<0.1	0.06	<0.1	<0.1	<0.1
Organometallics													
Tributyltin	0.5	9	70	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Organics													
Total Organic Carbon	0.02			1.35	1	2.46	0.88	1.28	0.76	1.56	0.96	1.92	0.98

All results are in units of mg/kg except Total Organic Carbon which is in %.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is

[A] ANZG Toxicant default guideline values for sediment quality, Table 1

DGV = Detault Guideline Value

GV-High = Upper Guideline Value

Results shown in **BOLD** are in excess of the DGV

Results shown in shading are in excess of the GV-High

Sample Identification	PQL	Human Health (Vapour Based) Guideline [A]		MW5	MW5	MW6
Sample Depth (m) [B]		HSL 'D'		1.13	1.02	0.96
Date		SAND 2-<4m	SAND 4-<8m	26/5/21	22/6/22	26/5/21
Dominant Stratum [C]				Sand	Sand	Sand
Sample Purpose				Monitoring	Monitoring	Monitoring
Sample collected by				RCA-SK	RCA-SK	RCA-SK
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)						
Benzene	1	5000	5000	<1	<1	<1
Toluene	2	NL	NL	<2	<2	<2
Ethylbenzene	2	NL	NL	<2	<2	<2
meta- and para-Xylene	2			<2	<2	<2
ortho-Xylene	2			<2	<2	<2
Total Xylenes	4	NL	NL	2	<2	2
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	5	NL	NL	<5	<5	<5
Total Recoverable Hydrocarbons (TRH)						
TRH C_6-C_{10}	20			<20	<20	<20
TRH >C_{10}-C_{16}	100			<100	<100	<100
TRH >C_{16}-C_{34}	100			<100	<100	<100
TRH >C_{34}-C_{40}	100			<100	<100	<100
F1	20	6000	6000	<20	<20	<20
F2	100	NL	NL	<50	<50	<50

All results are in units of μg/L

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from by laboratory

F1 = TRH C_6-C_{10} minus BTEX. F1 PQL deemed equal TRH C_6-C_{10}.

F2 = TRH >C_{10}-C_{16} minus naphthalene. F2 PQL deemed = TRH >C_{10}-C_{16}.

[A] ASC NEPM 1999 (as amended 2013) Vapour Based Health Screening Level (HSL) 'C' (Parks/Open space)

[B] Sample depths presented are as encountered prior to commencement of sampling

[C] Note that this is a generalisation for the purpose of comparing to the HSL criteria. Where two strata equally represented, most c criterion used

NL designates 'Not Limiting' indicating that the pore water concentration required to constitute a vapour risk is higher than the sol for that compound based on a petroleum mixture. Vapour is therefore not a risk for this compound.

Results for TRH have been compared to TPH guidelines.

Results shown in shading are in excess of the HSL

Where summation required (Xylene, F1, F2) calculation includes components reported as non detected as 1/2 PQL.

Sample Identification	PQL	**Human Health (Vapour Based) Guideline [A]**		MW6
Sample Depth (m) [B]		**HSL 'D'**		1.4
Date		SAND 2-<4m	SAND 4-<8m	22/6/22
Dominant Stratum [C]				Sand
Sample Purpose				Monitoring
Sample collected by				RCA-SK
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)				
Benzene	1	5000	5000	<1
Toluene	2	NL	NL	<2
Ethylbenzene	2	NL	NL	<2
meta- and para-Xylene	2			<2
ortho-Xylene	2			<2
Total Xylenes	4	NL	NL	<2
Polycyclic Aromatic Hydrocarbons (PAH)				
Naphthalene	5	NL	NL	<5
Total Recoverable Hydrocarbons (TRH)				
TRH C_6-C_{10}	20			<20
TRH >C_{10}-C_{16}	100			<100
TRH >C_{16}-C_{34}	100			<100
TRH >C_{34}-C_{40}	100			<100
F1	20	6000	6000	<20
F2	100	NL	NL	<50

All results are in units of µg/L

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all com that presented by laboratory

F1 = TRH C_6-C_{10} minus BTEX. F1 PQL deemed equal TRH C_6-C_{10}.

F2 = TRH >C_{10}-C_{16} minus naphthalene. F2 PQL deemed = TRH >C_{10}-C_{16}.

[A] ASC NEPM 1999 (as amended 2013) Vapour Based Health Screening Level (HSL

[B] Sample depths presented are as encountered prior to commencement of sampling

[C] Note that this is a generalisation for the purpose of comparing to the HSL criteria. conservative criterion used

NL designates 'Not Limiting' indicating that the pore water concentration required to ubility capacity for that compound based on a petroleum mixture. Vapour is therefore not a risk for

Results for TRH have been compared to TPH guidelines.

Results shown in shading are in excess of the HSL

Where summation required (Xylene, F1, F2) calculation includes components repor

Sample Identification	PQL	**Aquatic Ecosystem Guideline [A]**	**Human Health (Ingestion) Guideline [B]**	MW5	MW5
Sample Depth (m) [C]		95% Marine		1.13	1.02
Date				26/5/21	22/6/22
		Sample Purpose		Monitoring	Monitoring
		Sample collected by		RCA-SK	RCA-SK
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)					
Benzene	1	700	1	<1	<1
Toluene	2	*180*	800	<2	<2
Ethylbenzene	2	*5*	300	<2	<2
meta- and para-Xylene	2	*275*		<2	<2
ortho-Xylene	2	*350*		<2	<2
Total Xylenes	4		600	2	2
Total Recoverable Hydrocarbons (TRH)					
TRH C_6-C_{10}	20			<20	<20
TRH >C_{10}-C_{16}	100			<100	<100
TRH >C_{16}-C_{34}	100			<100	<100
TRH >C_{34}-C_{40}	100			<100	<100
TRH C_6-C_{40}	320	*7*		160	<100

All results are in units of μg/L

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presente laboratory

[A] % Protection Level for Receiving Water Type.

[B] Australian Drinking Water Guidelines, 2011.

[C] Sample depths presented are as encountered prior to commencement of sampling

Ecological guidelines in *italics* are low level reliability guidelines

Results for TRH have been compared to TPH guidelines.

Results shown in **BOLD** are in excess of the 95% aquatic ecosystems guidelines

Results shown in underline are in excess of the human health (ingestion) guideline

Where summation required (Xylene,TRH) calculation includes components reported as non detected as 1/2 PQL.

Sample Identification	PQL	MW6	MW6
Sample Depth (m) [C]		0.96	1.4
Date		26/5/21	22/6/22
		Monitoring	Monitoring
		RCA-SK	RCA-SK
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)			
Benzene	1	<1	<1
Toluene	2	<2	<2
Ethylbenzene	2	<2	<2
meta- and para-Xylene	2	<2	<2
ortho-Xylene	2	<2	<2
Total Xylenes	4	2	2
Total Recoverable Hydrocarbons (TRH)			
TRH C_6-C_{10}	20	<20	<20
TRH >C_{10}-C_{16}	100	<100	<100
TRH >C_{16}-C_{34}	100	<100	<100
TRH >C_{34}-C_{40}	100	<100	<100
TRH C_6-C_{40}	320	160	<100

All results are in units of µg/L

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, Pted by laboratory

[A] % Protection Level for Receiving Water Type.

[B] Australian Drinking Water Guidelines, 2011.

[C] Sample depths presented are as encountered prior to commenceme

Ecological guidelines in *italics* are low level reliability guidelines

Results for TRH have been compared to TPH guidelines.

Results shown in **BOLD** are in excess of the 95% aquatic ecosystems

Results shown in underline are in excess of the human health (ingestic

Where summation required (Xylene,TRH) calculation includes compon

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2221897**	Page	: 1 of 6
Client	: **ROBERT CARR & ASSOCIATES P/L**	Laboratory	: Environmental Division Sydney
Contact	: MS LAURA SCHOFIELD	Contact	: Juliana Gonzalez
Address	: 92 HILL STREET CARRINGTON NSW 2294	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 49029200	Telephone	: +61-2-8784 8555
Project	: 14302	Date Samples Received	: 22-Jun-2022 15:43
Order number	: ----	Date Analysis Commenced	: 25-Jun-2022
C-O-C number	: ----	Issue Date	: 01-Jul-2022 13:08
Sampler	: ----		
Site	: Trinity point		
Quote number	: SYBQ/400/21		
No. of samples received	: 8		
No. of samples analysed	: 8		

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 Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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 Contract for details.

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

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	Sed 1	Sed 2	Sed 3	Sed 4	Point A
				Sampling date / time	22-Jun-2022 00:00	22-Jun-2022 00:00	22-Jun-2022 00:00	22-Jun-2022 00:00	22-Jun-2022 00:00
Compound	CAS Number	LOR	Unit		ES2221897-001	ES2221897-002	ES2221897-003	ES2221897-004	ES2221897-005
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		73.1	58.7	69.7	53.7	38.6
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		11800	8810	11700	6310	5620
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg		6	11	8	5	13
Cadmium	7440-43-9	1	mg/kg		1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		14	10	13	7	7
Cobalt	7440-48-4	2	mg/kg		4	5	5	3	4
Copper	7440-50-8	5	mg/kg		83	30	48	28	15
Iron	7439-89-6	50	mg/kg		15300	12200	15800	8300	11800
Lead	7439-92-1	5	mg/kg		14	10	14	8	8
Manganese	7439-96-5	5	mg/kg		158	151	218	130	85
Nickel	7440-02-0	2	mg/kg		7	4	6	3	3
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Silver	7440-22-4	2	mg/kg		<2	<2	<2	<2	<2
Vanadium	7440-62-2	5	mg/kg		31	19	26	15	17
Zinc	7440-66-6	5	mg/kg		132	78	112	57	46
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		4.46	1.96	2.50	1.00	0.76
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<0.5	<0.5	<0.5	<0.5
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		76.2	71.8	87.2	80.4	78.5

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	Point C	----	----	----	----
				Sampling date / time	22-Jun-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2221897-006	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		47.8	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		7860	----	----	----	----
Antimony	7440-36-0	5	mg/kg		<5	----	----	----	----
Arsenic	7440-38-2	5	mg/kg		8	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg		9	----	----	----	----
Cobalt	7440-48-4	2	mg/kg		4	----	----	----	----
Copper	7440-50-8	5	mg/kg		26	----	----	----	----
Iron	7439-89-6	50	mg/kg		9860	----	----	----	----
Lead	7439-92-1	5	mg/kg		10	----	----	----	----
Manganese	7439-96-5	5	mg/kg		106	----	----	----	----
Nickel	7440-02-0	2	mg/kg		4	----	----	----	----
Selenium	7782-49-2	5	mg/kg		<5	----	----	----	----
Silver	7440-22-4	2	mg/kg		<2	----	----	----	----
Vanadium	7440-62-2	5	mg/kg		19	----	----	----	----
Zinc	7440-66-6	5	mg/kg		64	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.98	----	----	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		67.0	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW 5	MW 6	----	----	----
			Sampling date / time	22-Jun-2022 00:00	22-Jun-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2221897-007	ES2221897-008	--------	--------	--------
				Result	Result	----	----	----
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	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**121**	**118**	----	----	----
Toluene-D8	2037-26-5	2	%	**99.3**	**98.4**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**106**	**106**	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130

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

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EP090S: Organotin Surrogate

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

(SOIL) EP090: Organotin Compounds

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2221897**	Page	: 1 of 7
Client	: **ROBERT CARR & ASSOCIATES P/L**	Laboratory	: Environmental Division Sydney
Contact	: MS LAURA SCHOFIELD	Contact	: Juliana Gonzalez
Address	: 92 HILL STREET CARRINGTON NSW 2294	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 49029200	Telephone	: +61-2-8784 8555
Project	: 14302	Date Samples Received	: 22-Jun-2022
Order number	: ----	Date Analysis Commenced	: 25-Jun-2022
C-O-C number	: ----	Issue Date	: 01-Jul-2022
Sampler	: ----		
Site	: Trinity point		
Quote number	: SYBQ/400/21		
No. of samples received	: 8		
No. of samples analysed	: 8		

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 Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4421599)									
ES2221571-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	10	12	25.0	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	265	274	3.3	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	45	46	0.0	0% - 20%
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	15	8.7	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	818	756	8.0	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	461	420	9.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	36700	34700	5.5	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	5890	6540	10.5	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	50000	47700	4.8	0% - 20%
ES2221897-005	Point A	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	8	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	13	15	18.4	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	14	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	9	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4421599) - continued									
ES2221897-005	Point A	EG005T: Manganese	7439-96-5	5	mg/kg	85	94	9.6	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	17	19	11.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	46	47	3.2	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	5620	5500	2.0	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	11800	13600	13.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4421600)									
ES2221571-001	Anonymous	EA055: Moisture Content	----	0.1	%	58.6	59.8	2.1	0% - 20%
ES2221881-007	Anonymous	EA055: Moisture Content	----	0.1	%	26.3	26.9	2.3	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4421601)									
ES2221897-006	Point C	EA055: Moisture Content	----	0.1	%	47.8	51.9	8.3	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4421594)									
ES2221897-005	Point A	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2221502-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 4424927)									
ES2221897-001	Sed 1	EP003: Total Organic Carbon	----	0.02	%	4.46	4.52	1.3	0% - 20%
EP090: Organotin Compounds (QC Lot: 4422079)									
EM2211875-002	Anonymous	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	847	851	0.4	0% - 20%
ES2221897-002	Sed 2	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	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 (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4424388)									
ES2221777-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2221877-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4424388)									
ES2221777-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2221877-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4424388)									
ES2221777-001	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
ES2221877-004	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

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: 4424388) - continued									
ES2221877-004	Anonymous	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: **SOIL**

				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
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4421599)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	15070 mg/kg	113	82.0	119
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	97.7	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	88.3	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	108	68.0	132
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	10.4 mg/kg	93.7	83.0	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	110	89.0	111
EG005T: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	107	89.0	112
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	98.5	82.0	119
EG005T: Manganese	7439-96-5	5	mg/kg	<5	534 mg/kg	105	83.0	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	94.7	80.0	120
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.3 mg/kg	112	42.0	158
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	58.6 mg/kg	115	75.0	125
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	88.6	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4421594)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	100	70.0	125
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 4424927)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.55 %	105	80.0	120
				<0.02	27.5 %	101	80.0	120
EP090: Organotin Compounds (QCLot: 4422079)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	124	52.0	139

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
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4420098)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	62.8	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	78.8	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	83.8	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4424388)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	103	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4420098)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	64.6	57.9	119

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
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4420098) - continued								
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	82.3	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	82.1	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4424388)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	111	75.0	127
EP080: BTEXN (QCLot: 4424388)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	94.8	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	101	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	110	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	104	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	94.5	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: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4421599)							
ES2221571-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	103	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	113	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	# Not Determined	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	104	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	76.9	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	124	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	# Not Determined	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4421594)							
ES2221502-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	96.2	70.0	130
EP090: Organotin Compounds (QCLot: 4422079)							
EM2211875-003	Anonymous	EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	# Not Determined	20.0	130

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4424388)							
ES2221777-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	121	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4424388)							
ES2221777-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	122	70.0	130
EP080: BTEXN (QCLot: 4424388)							
ES2221777-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	99.0	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	98.6	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	99.9	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	101	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	104	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	92.5	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2221897**	Page	: 1 of 6
Client	: **ROBERT CARR & ASSOCIATES P/L**	Laboratory	: Environmental Division Sydney
Contact	: MS LAURA SCHOFIELD	Telephone	: +61-2-8784 8555
Project	: 14302	Date Samples Received	: 22-Jun-2022
Site	: Trinity point	Issue Date	: 01-Jul-2022
Sampler	: ----	No. of samples received	: 8
Order number	: ----	No. of samples analysed	: 8

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

- **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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005(ED093)T: Total Metals by ICP-AES	ES2221571--001	Anonymous	**Chromium**	7440-47-3	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005(ED093)T: Total Metals by ICP-AES	ES2221571--001	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP090: Organotin Compounds	EM2211875--003	Anonymous	**Tributyltin**	56573-85-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	3	31	9.68	10.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	15	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	15	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: **SOIL**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container / *Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*

Matrix: **SOIL**

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
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
Sed 1, Sed 2, Sed 3, Sed 4, Point A, Point C	**22-Jun-2022**	**----**	----	----	**25-Jun-2022**	06-Jul-2022	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
Sed 1, Sed 2, Sed 3, Sed 4, Point A, Point C	**22-Jun-2022**	**25-Jun-2022**	19-Dec-2022	✓	**27-Jun-2022**	19-Dec-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
Sed 1, Sed 2, Sed 3, Sed 4, Point A, Point C	**22-Jun-2022**	**25-Jun-2022**	20-Jul-2022	✓	**27-Jun-2022**	20-Jul-2022	✓
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003)							
Sed 1, Sed 2, Sed 3, Sed 4, Point A, Point C	**22-Jun-2022**	**28-Jun-2022**	20-Jul-2022	✓	**28-Jun-2022**	20-Jul-2022	✓
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090)							
Sed 1, Sed 2, Sed 3, Sed 4, Point A, Point C	**22-Jun-2022**	**27-Jun-2022**	06-Jul-2022	✓	**29-Jun-2022**	06-Aug-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
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
MW 5, MW 6	**22-Jun-2022**	**25-Jun-2022**	29-Jun-2022	✓	**28-Jun-2022**	04-Aug-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MW 5, MW 6	**22-Jun-2022**	**28-Jun-2022**	06-Jul-2022	✓	**28-Jun-2022**	06-Jul-2022	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
MW 5, MW 6	**22-Jun-2022**	**25-Jun-2022**	29-Jun-2022	✓	**28-Jun-2022**	04-Aug-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MW 5, MW 6	**22-Jun-2022**	**28-Jun-2022**	06-Jul-2022	✓	**28-Jun-2022**	06-Jul-2022	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
MW 5, MW 6	**22-Jun-2022**	**28-Jun-2022**	06-Jul-2022	✓	**28-Jun-2022**	06-Jul-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: **SOIL**

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)							
Moisture Content	EA055	3	31	9.68	10.00	×	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Organotin Analysis	EP090	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	6	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Organotin Analysis	EP090	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organotin Analysis	EP090	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	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 Duplicates (DUP)							
TRH - Semivolatile Fraction	EP071	0	15	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)							
TRH - Semivolatile Fraction	EP071	1	15	6.67	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)							
TRH - Semivolatile Fraction	EP071	1	15	6.67	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)							
TRH - Semivolatile Fraction	EP071	0	15	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
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automatically measured by infra-red detector.
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270 Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Dry and Pulverise (up to 100g)	GEO30	SOIL	#
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

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ENV-F103-4

Client Name: Johnson Property Group -Trinity Point
Client Site: Trinity point
Contact Name: Laura Schofield
Phone Number: 0403 699112
Email Report To: lauras@rca.com.au
Project Manager: Laura Schofield

Turnaround Required: ☐ Urgent ☐ Standard (5 Day)
Date Required: Standard
Expected Reporting Date: *(Laboratory Use Only)*

ANALYSIS REQUIRED

Page of

RCA Job Number: 14302

SAMPLE INFORMATION

	RCA Laboratories Environmental Sample Number	Client ID / Description	Date	Matrix	Total Samples	Metals as listed	Tri butyl tin	Total Organic Carbon	W-4				Notes: Al, Fe, Sb, As, Cd, Cr, Cu, Co, Pb, Mn, Ni, Se, Ag, Vn, Zn, Hg).
1	062214302-1 005	Sed 1	22/6/22	sed	4	x	x	x					Subcon / Forward Lab / Split WO
2	062214302-2 006	Sed 2	22/6/22	sed	4	x	x	x					Lab / Analysis: TCL & TIST -> BRISBANE
3	062214302-3 007	Sed 3	22/6/22	sed	4	x	x	x					Organised By / Date:
4	062214302-4 008	Sed 4	22/6/22	sed	4	x	x	x					Relinquished By / Date:
5	062214302-5 001	Point A	22/6/22	sed	4	x	x	x					Connote / Courier:
6	062214302-6 002	Point C	22/6/22	sed	4	x	x	x					WO No:
7	062214302-7 003	MW 5	22/6/22	water	3				x				Attached By PO Internal Sheet:
8	062214302-8 004	MW 6	22/6/22	water	3				x				

LAB OF ORIGIN: NEWCASTLE

Environmental Division Sydney
Work Order Reference
ES2221897

Telephone : +61-2-8784 8555

RELINQUISHED BY		RECEIVED BY		Laboratory use only (circle appropriate)
Name: SM	Date: 22/6/22	Name: JOB JONG	Date: 22/6/22	Received in good condition: Yes No
Of: RCALE	Time: 15:41	Of: RCALE 22/6/22	Time: 3:42pm.	Chilled: 17 3 ice Yes No

Rel 1-40B 22/6/22 5pm