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25 August 2021

Project Number 20221913.001A

Diana Gomez  
Environmental Engineer  
InGauge  
Level 3, 16 McDougall Street  
Milton, Queensland,

**Attention: Diana Gomez**

**Subject:** EP187 – Carpentaria-1 Well Flowback Water Risk Assessment  
Wastewater Risk Assessment

Dear Diana,

Kleinfelder provides this letter report to comply with Ministerial Condition 3 of the Carpentaria-1 Well, within exploration tenement EP187, approval notice.

The assessment was conducted using laboratory water quality data supplied to Kleinfelder by InGauge. The water samples were collected by InGauge and ALS Environmental measured the analyte concentrations.

All analytes specified in the Code<sup>1</sup> were analysed with the required laboratory limits of reporting.

Analyte concentrations in the water samples were compared against the Australian National Water Quality Management Strategy, which for freshwater refers to the:

- Australian and New Zealand Environment and Conservation Council, 2000. Guidelines for fresh and marine quality water. (ANZECC)
- For water dependent ecosystems and (WDES) 99% species protection (ecosystem with high conservation value).

The assessment objective is to comply with Section C.3 of the Code. It is understood the flowback water is stored on-site in a bunded, above ground, treatment tank with a dry season storage limit of 2.8 ML and a 0.8 ML storage limit in the wet season.

In conclusion:

- The nearest surface water receptor is an unnamed, non-perennial creek located approximately 0.9 km to the Site's south.
- The flowback water analyte concentrations from samples collected exceeded the adopted WDES screening criteria for pH, TDS, some metals, petroleum hydrocarbons (C10-C40) and phenol, indicating that if a release reached the creek or any local waterbody, it would pose an unacceptable ecological risk. It should be noted that the evaporative process to reduce final disposal volumes is anticipated to raise concentration levels of contaminants of concern.
- As per the chemical risk assessment, no chemicals at their maximum concentration, and under a hypothetical maximum release scenario would result:
  - In soil levels above conservative screening criteria protective of terrestrial receptors

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<sup>1</sup> Northern Territory Department of Natural Resources, 2019. Code of practice: Onshore petroleum activities in the Northern Territory.



- The avian source-pathway-receptor linkage via accidental ingestion is considered complete, however, the risk is considered reduced as the anticipated water volume ingested would be significantly below the normal daily water intake
- The source-pathway-receptor linkage from storage tank to water beds is considered incomplete for the surface water receptors and improbable to be reached.
- Based on the flowback water storage tank leak and spill precautions at the site the risk to groundwater, soil and terrestrial receptors is considered incomplete.
- Based on the laboratory analyses and this ecological assessment, the flowback water is not suitable for disposal at the site.

## 1 INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by Imperial Oil and Gas Pty Limited (Imperial) to complete a risk review of flowback wastewater from the Carpentaria-1 Well (the Site). The well is located within the EP187 tenement and was drilled to assess potential unconventional gas production from the subsurface shale formations. The Site location is shown in **Figure 1**.

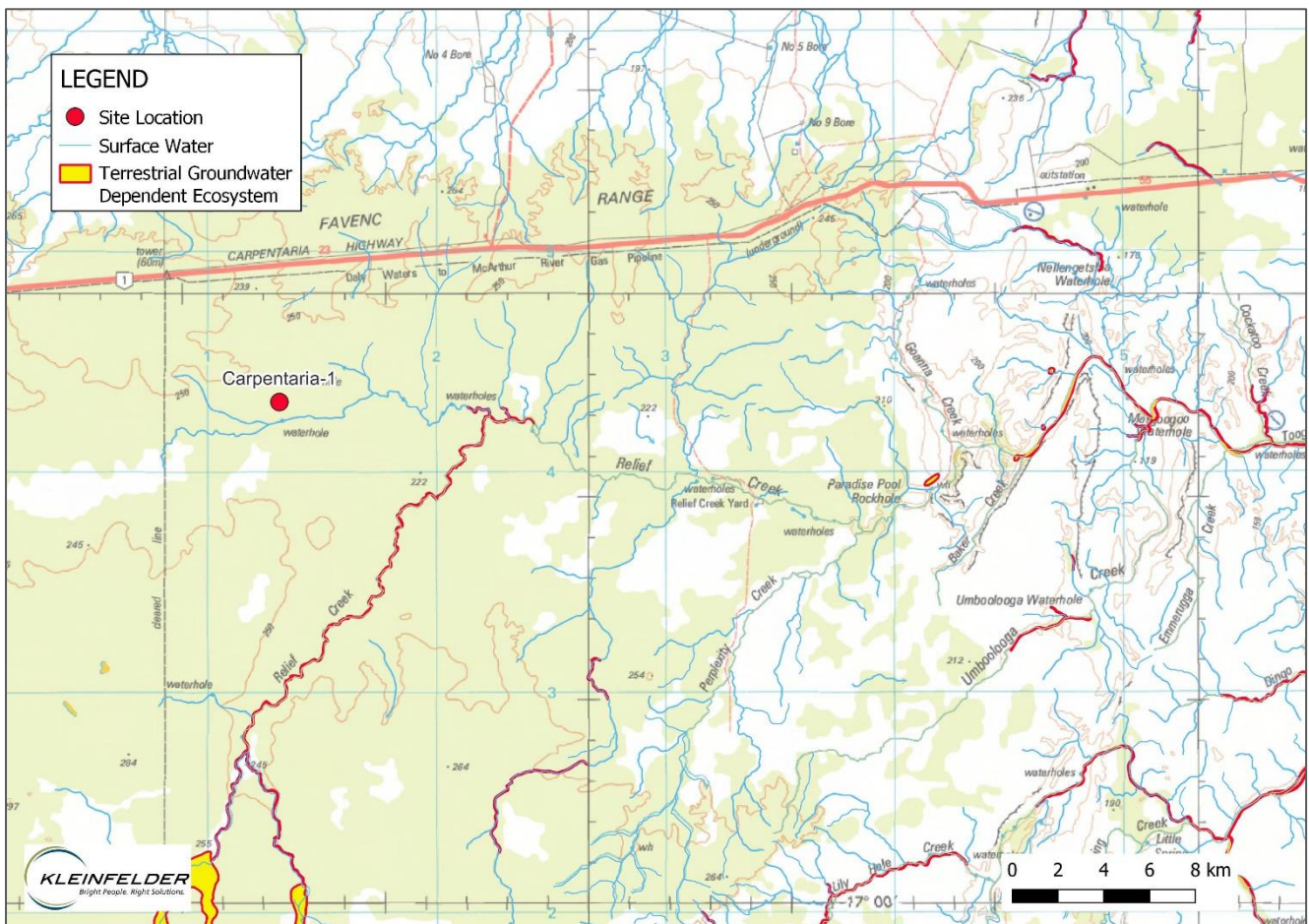


Figure 1: Site location

## 2 BACKGROUND AND OBJECTIVES

The wastewater on site is a mixture of hydraulic fracturing fluids and geological formation water. Hydraulic fracturing fluids typically contain water, sand and a mixture of additive chemicals that are friction reducers, biocides, stabilisers and corrosion preventers and typically contain elevated salt, metals, organic compounds and have the potential for naturally occurring radioactive materials (NORM)<sup>2</sup>. When the pressure from the hydraulic

<sup>2</sup> Groundwater Protection Council, 2016. How casing protects groundwater. [gwpc.org/topics/hydraulic-fracturing/how-casing-protects-groundwater](http://gwpc.org/topics/hydraulic-fracturing/how-casing-protects-groundwater)



fracturing process is released, the injected fluid flows back to the surface (i.e., flowback water or produced water). The flowback water is currently being treated in an above ground tank for future disposal or reuse.

Due to the generally elevated analyte concentrations in flowback water, accidental spills during treatment and transport can pose risks to nearby sensitive receptors. The Northern Territory Department of Environment, Parks and Water Security (DEPWS, formerly the Department of Environment and Natural Resources, DENR) and Department of Industry, Tourism and Trade (DITT, formerly the Department of Primary Industry and Resources, DPIR) sets out the requirements for wastewater management (including flowback water) in a Code of Practice<sup>3</sup>, which includes the requirement for a wastewater management plan, which contains a risk assessment related to potential impacts from the flowback water to the environment, is provided in the environmental management plan for the Site.

Kleinfelder understands that the flowback water is treated on site in a bunded, double-lined treatment tank with a leak detection system that has a dry season storage limit of 2.8 ML and a wet season storage limit of 0.8 ML. It is understood that following the exploration works completion, the intention is to evaporate as much water as practicable from the treatment tank prior to decommissioning, with the residual waste then being disposed in Jackson, Queensland

Samples from two locations were supplied to the laboratory for chemical concentration determination:

- Choke – a manifold used to control the flowback fluid surface return rate.
- Treatment tank – flowback fluid evaporation treatment tank

The objective of this assessment is to:

- Conduct a qualitative ecological risk assessment (Tier 1) by comparing the flowback water hydrochemical parameters specified in the Code to the adopted WDES screening criteria (**Section 4**).
- Review the risks posed by the flowback water quality to sensitive terrestrial (flora and fauna), soil and groundwater receptors.

It is anticipated that the results from this review will be incorporated into the wastewater management plan risk assessment.

### 3 SITE SETTING

The Site is situated at approximately 195 mAHD in the Gulf Fall and Uplands bioregion<sup>4</sup>, which has a monsoonal climate (humid, wet summers and dry winters) and is approximately 230 km from the Gulf of Carpentaria. Water courses in the immediate Site area are non-perennial and drain to the McArthur River, which is perennial near the Gulf of Carpentaria.

The nearest surface water body to the Site is an unnamed creek and waterhole located approximately 0.9 km to south. The creek discharges to the non-perennial Relief Creek, approximately 9 km from the Site. Relief Creek has been identified as a low potential terrestrial groundwater dependent ecosystem<sup>5</sup>, suggesting the water table aquifer in the area could be shallow. However, from information provided by InGauge the shallowest groundwater in the Site area is approximately 63 metres below the ground surface.

EHS Support<sup>6</sup> modelled leaks (1 to 100 kL) and a catastrophic spill (1 ML) from the treatment tank and determined that the risks to groundwater were low and that the released water would be unlikely to migrate further than the well pad (10 ha) via overland flow. The risk of a significant tank leak is managed by bunding and the double lining of the treatment tank. Any ongoing leak from either a tank or inground built pond would be detected by the leak detection system, which would allow early repair, hence reducing any risks.

<sup>3</sup> Northern Territory Department of Natural Resources, 2019. Code of practice: Onshore petroleum activities in the Northern Territory.

<sup>4</sup> Department of Agriculture, Water and the Environment, 2012. Interim biogeographic regionalisation for Australia, Version

<sup>5</sup> Bureau of Meteorology. Groundwater dependent ecosystems atlas. [bom.gov.au/water/groundwater/gde/index.shtml](http://bom.gov.au/water/groundwater/gde/index.shtml)

<sup>6</sup> EHS Support, 2021. Hydraulic stimulation chemical risk assessment update. Imperial Oil and Gas Exploration Permit 187.



Controls are in place to impede access from native fauna to the tanks, although the accidental use (i.e., a bird inadvertently landing on the water surface in the treatment tank) is considered possible by avian species.

## 4 SCREENING CRITERIA

The screening criteria was selected based on the site location, receiving water body and terrestrial and avian wildlife. For this, the Australian National Water Quality Management Strategy, 2018, was used which for freshwater refers to the:

- Australian and New Zealand Environment and Conservation Council, 2000. Guidelines for fresh and marine quality water. (ANZECC)
- For water dependent ecosystems and species (WDES) 99% species protection and where applicable “tropical Australia” screening criteria are selected based on the Site’s location.

Where a chemical’s concentration is above the laboratory reporting limit and does not have ANZECC screening criteria, the chemical concentration is screened against:

- National Health and Medical Research Council, 2021. Australian Drinking Water Guidelines 6 2011. (ADWG).
- United States Environmental Protection Agency, 2021. Regional Screening Levels (RSLs). Resident tapwater.

Exceedance of the ADWG or RSL does not necessarily indicate the chemical may pose a risk; the screening is to provide information of where a chemical is present that may require further investigation.

The EHS Tier 1 chemical risk assessment identified that five chemicals within the fracturing fluid required further assessment. The Tier 2 risk assessment determined that the risks posed by the five chemicals were acceptable for human (worker) and avian receptors.

### 4.1 SCREENED CHEMICALS

The chemicals of concern, with required limits of reporting concentrations, are outlined in Section C.8 of the Code. It is noted that following the submission of the June 2021 choke and treatment tank samples for the majority of metals (total and dissolved) the laboratory LOR was raised from the LORs required by the Code to 10 times higher than the requirement due to sample matrix interferences.

## 5 LABORATORY RESULTS AND DISCUSSION

All chemicals listed in the Code were analysed at a laboratory with National Association of Testing Authorities accreditation to measure those analytes in water. Laboratory results are summarised in **Attachment 1**, and the laboratory certificates of analysis are presented in **Attachment 2**. Where the laboratory limit of reporting (LOR) is greater than the screening criteria, the analyte is marked as exceeding the criteria.

Water samples from the treatment tank and choke were submitted for chemical analyses, with samples collected on 4<sup>th</sup> June, 23<sup>rd</sup> June, 25<sup>th</sup> June, 4<sup>th</sup> July, 14<sup>th</sup> July and 16<sup>th</sup> July 2021 (14 samples).

The treatment tank flowback water hydrochemical parameters are considered the most important with regards to the screening assessment, as this represents the greatest potential risk to the environment if not well managed. However, it is not anticipated that with the current controls in place, flowback water will present a risk to terrestrial/avian wildlife, water bodies or humans.

### 5.1 PHYSICOCHEMICAL PARAMETERS

Dissolved oxygen, total dissolved solids (TDS) concentrations and pH values exceeded the screening criteria in the majority of samples.

During a leak or release, the dissolved oxygen would be expected to equilibrate with the atmosphere and hence is unlikely to adversely impact organisms within the surface water receptor; however, the TDS concentration is unlikely to be influenced by this process although it is likely to increase during evaporation.





The treatment tank flowback water TDS concentration exceeds the adopted screening criteria (200 mg/L). The choke sample TDS concentrations are consistently higher than the treatment tank TDS concentration. Choke sample TDS concentrations are influenced directly by salts leached from the formation. Tank sample TDS concentrations would be reduced in the early stage of filling due to the influence of the freshwater used to hold the liner in place initially. As the tank fills TDS concentrations within would be influenced more by the leached salts in flowback. Given the depth of the well, it is possible that flowback water temperature at the choke exceeds that of the ambient standing water in the tank, resulting in solubility differences.

## 5.2 NUTRIENTS

Nutrients, total nitrogen, reactive phosphorous and total phosphorous concentrations are above the screening criteria in all samples,

## 5.3 DISSOLVED METALS

Total metal concentrations are not discussed as the ANZECC screening procedure is to assess total metals and then dissolved metals if total metals exceed the screening criteria.

In accordance with the ANZECC, the dissolved metal screening criteria for cadmium, copper, lead, nickel, and zinc have been adjusted for hardness (mean treatment water alkalinity, as  $\text{CaCO}_3 = 152 \text{ mg/L}$ ). The presence of dissolved and total organic carbon can affect metal bioavailability, as metals can adsorb strongly to this material. However, as stated in the ANZECC, the hardness modification is sufficient to account for the organic carbon adsorption influence.

Where ANZECC screening criteria are available, the dissolved metal concentrations in all samples exceeded the screening criteria (see **Attachment 1**). Boron concentrations exceed the screening criteria significantly, however the majority of other metal concentrations generally exceeded the screening criteria by a lesser factor .

## 5.4 RADIOACTIVITY

There are no ANZECC screening criteria for radioactivity. The adopted screening criteria are from the ADWG; however, it is noted that without knowing the background radioactivity in the regional surface water, a potential impact on a local water-dependent ecosystem is uncertain. In addition, the ADWG screening criteria assumes a mean human daily water consumption is 2 L/day, which would not be a volume consumed by native mammals and birds (see EHS Support report) and the regular consumption of saline water in the flowback water treatment tank by local fauna is unlikely as a freshwater pond is present next to the tank. Nonetheless, as a preliminary screening measure, the ADWG are used to screen the total alpha and beta radioactivity in the waters, with the annual dose calculated using the method in the ADWG Section 7.6.2.

The calculated annual dose for the combined alpha and beta activity exceeded the 1 mSv/year screening criteria in four of the seven treatment tank samples (2.5 to 10.4 mSv/year). It is noted that the three initial samples were below the screening criteria, with the later samples above the screening criteria, which could suggest NORM build-up of radioactive material within the treatment tank. The choke flowback water samples calculated annual doses were above the treatment tank doses in all cases and the screening criteria.

## 5.5 PETROLEUM HYDROCARBON COMPOUNDS (PHC)

More than one PHC, i.e., benzene, toluene, ethylbenzene, ortho-xylene (BTEX), naphthalene and C6-C40 total recoverable hydrocarbons (TRH), were above the laboratory LOR in all samples.

No BTEX compound concentrations exceeded the screening criteria, although the naphthalene laboratory LOR (5  $\mu\text{g/L}$ ) was higher than the screening criteria (2.5  $\mu\text{g/L}$ ) in the 4<sup>th</sup> June treatment tank sample. The naphthalene concentration in all other treatment tank samples was below the laboratory LOR (1  $\mu\text{g/L}$ ).

There are no ANZECC high-reliability freshwater TRH screening criteria, however, the marine low-reliability screening criteria (70  $\mu\text{g/L}$ ) is exceeded by all samples (180 to 8,680  $\mu\text{g/L}$ ) for the C10-C40 TRH fraction.

## 5.6 POLYCYCLIC AROMATIC HYDROCARBON COMPOUNDS (PAH)

The laboratory LOR specified in the Code is greater than the ANZECC screening criteria for all compounds, where screening criteria are available. However, the only PAH above the laboratory LOR is phenanthrene, where low



concentrations were reported from the choke samples. All treatment tank samples were reported to have PAH concentrations below the LOR.

## 5.7 PHENOLS

Phenol concentrations were above the screening criteria (85 µg/L) in six of the seven treatment tank samples (105 to 228 µg/L), with only the 4<sup>th</sup> June sample (79 µg/L) below the screening criteria.

Low 2,4-dinitrophenol concentrations (0.4 to 1.1 µg/L) were reported above the laboratory LOR (0.1 µg/L) in samples collected after 4<sup>th</sup> June, where the LOR was 4 µg/L.

## 5.8 ORGANIC CARBON

There are no screening criteria for organic carbon. Total organic carbon concentrations in the treatment tank samples range from 990 to 1,280 mg/L.

# 6 PETROLEUM (ENVIRONMENT) REGULATIONS 2016 REPORTING

The Regulations<sup>7</sup>, Part 3A, 37A (flowback fluid) and 37B (produced water), subsections 2(a) to 2(h) require the following to be reported to the Minister within six months of the flowback occurring and produced water extraction:

*(a) The identity of any chemical or NORM found in the flowback fluid/produced water.*

The chemicals required to be monitored are outlined in Section C.8 of the NT Code of Practice: Onshore Petroleum Activities and are presented in **Attachment A**.

*(b) The concentration of any chemical or NORM found in the flowback fluid/produced water.*

- flowback water results above the laboratory limit of reporting (LOR) from the June 2021 samples were related to total uranium and total thorium (both 0.003 mg/L).
- The dissolved uranium concentration sample was equivalent to the laboratory LOR (0.001 mg/L).
- Uranium and thorium were below the laboratory LOR in all other sample dates, although it is noted that the laboratory LOR was raised from the Code requirement (0.001 mg/L to 0.01 mg/L) in the samples submitted for analysis after June 2021 due to sample matrix interferences.

*(c) Details regarding how any chemical or NORM has been or will be managed.*

The details regarding how the flowback/produced water management are provided in the site's wastewater management plan<sup>8</sup>, and include:

- Storage and freeboard management – Tanks designed and constructed to Australian Standards AS1554.1 and AS3990,
- double lining,
- fitted with a leak detection system, and
- freeboard of 1.6m for the wet season and 0.5 m in the dry season. The freeboard is maintained by a high-level alarm sensor calibrated for the wet and dry season freeboards. Freeboard was determined for 1:1000 ARI

*(d) Details regarding how any chemical or NORM has been or will be transported.*

When disposal is required, the wastewater will be transported by providers that comply with NT Waste Management and Pollution Control Act 1998 and have a valid licence under the same Act.

*(e) Details regarding how any chemical or NORM has been or will be treated.*

Wastewater will be treated in above ground open tanks with the volume reduced through evaporation.

*(f) Details regarding any action proposed to be taken to prevent any chemical or NORM spill.*

<sup>7</sup> Northern Territory Government, 2016. Petroleum (Environment) Regulations.

<sup>8</sup> Imperial Oil and Gas, 2021. Wastewater management plan. 2021 Carpentaria 1 work program. EP187.



Wastewater spill prevention is outlined in the Spill Management Plan<sup>9</sup>, and includes:

- Tanks designed and constructed to Australian Standards AS1554.1 and AS3990
- double lining,
- fitted with a leak detection system
- located within bunded lease pad to contain 110% of the volume of the largest tank,
- Routine inspections for wet and dry season, and
- Procedures to manage water when rainfall events or wet season forecasted.

*(g) Details of the emergency contingency plan included in the environment management plan to which the activity relates.*

An emergency response plan for the site has been prepared<sup>10</sup> and includes management plans for:

- Environmental incidents (hazardous spills) and stakeholder communication and incident (regulatory) notification.

*(h) The requirements in relation to the management of any chemical or NORM of the prescribed chemical legislation.*

Flowback and produced water is managed in accordance with the Code and the approved EMP. The flowback water is classified as listed waste under the Northern Territory Waste Management and Pollution Control Act 1998. Refer to Attachment 06.01 of the EMP for full Chemical Risk Assessment.

## 7 SOURCE PATHWAY RECEPTOR

EHS conducted a chemical risk assessment for the Carpentaria 1 Well hydraulic fracturing works that identified the following potentially pathways of exposure to flowback water :

Hydraulic fracturing:

- Human and environmental receptors exposed to surface water bodies that received runoff from an accidental release during hydraulic fracturing activities.

Treatment and disposal:

- Human and environmental receptor exposure to flowback water from an accidental treatment tank release.
- Human and environmental receptor exposure to chemicals as a result of accidental release during flowback water transport from the well lease to a disposal/management facility.
- Human and environmental receptors exposed to surface water bodies that received runoff from an accidental release of flowback water.
- Environmental (avian) receptor exposure to open-topped treatment tank flowback water.

### 7.1 HUMAN RECEPTOR EXPOSURE

Hydraulic fracturing operations and spills are controlled by engineering and management procedures presented in the approved EMP. Some controls include:

Volatile organic compound inhalation is a potential complete pathway for on-site workers; however, no volatile chemicals exceed the probable exposure scenario (NEPM HSL C<sup>11</sup>). Personal protective equipment is in place to reduce human exposure.

<sup>9</sup> Imperial Oil and Gas, 2021. Spill management plan. 2021 Carpentaria 1 work program. EP187.

<sup>10</sup> Imperial Oil and Gas, 2021. Emergency response plan. EMP IMP3-4. NT Exploration Permit (EP)187.

<sup>11</sup> National Environment Protection (Assessment of Site Contamination) Amendment Measure, 2013. Schedule 1B. Guideline on investigation levels for soil and groundwater. HSL C – recreational open space screening criteria.



The EHS Tier 2 risk did not identify any unacceptable human receptor exposure pathways.

## 7.2 TERRESTRIAL RECEPTOR EXPOSURE

The site is enclosed by a 2m high fence that restricts access by native fauna and livestock. The treatment tank steel panel construction further restricts the probability that native fauna enter the site inadvertently making it unlikely for livestock to access the stored water.

Compacted soil within the well pad and bunded treatment tank areas protects sub-surface soil from infiltration as well as the spill reaching the surrounding vegetation that could provide habitat for wildlife; thereby reducing any risk to terrestrial receptors from operations.

In addition, the site's Spill Management Plan allows for the efficient containment and remediation of any accidental flowback water release.

### 7.2.1 Avian Receptor Exposure

The Tier 2 avian receptor exposure modelling indicates that there were no unacceptable risks posed by the water stored in the treatment tanks due to the amount of water that could potentially be intake daily would not exceed the threshold for a hazard quotient.

## 7.3 SURFACE WATER RECEPTOR EXPOSURE

The EHS surface overland flow modelling indicates that, in the case of a catastrophic treatment tank release the bund will restrict the flow to an approximate five hectare radius, which is within the site boundary, thereby reducing any water migration risk to the nearest surface water receptor (0.9 km).

## 7.4 GROUNDWATER RECEPTOR EXPOSURE

Compacted soil within the well pad, controls implemented for safe operations, and the distance to the water table makes it unlikely for any spill infiltration to reach the groundwater table. As outlined in the EHS risk assessment; infiltration would take 158 years (through siltstone) and 115 days if the surficial sequence is consistent with limestone to reach groundwater at a depth of approximately 50m below ground level. Therefore, it is not anticipated that a single release would infiltrate to groundwater.

# 8 CONCLUSIONS

Based on the hydrochemical review, the contaminants of concern are pH, metals, TDS, PHC and phenols in wastewater. The Site is situated in an undisturbed setting and the flowback water is treated in a purpose-built treatment tank. Direct leakage to the nearest surface water receptor is unlikely to be occurring at the present time as this would have been noted by the leak detection unit on the tank. Hence the S-P-R linkages to sensitive receptors is not complete.

From the review undertaken, the following can be concluded:

- Surface water bodies in the Site's regional area are non-perennial, likely only flowing during the wet season.
- The nearest surface water body to the Site is an unnamed creek and waterhole, located approximately 0.9 km to the south. The creek discharges to the non-perennial Relief Creek, which ultimately discharges to the McArthur River and the Gulf of Carpentaria, approximately 230 km to the east.
- Relief Creek is designated a low potential groundwater dependent ecosystem; however, no information was found regarding the presence of a shallow water table in the regional area.
- Accounting for freeboard maintenance requirements, the Site has a capacity to store 2.8 ML of flowback water in the dry season and 0.8 ML in the wet season. The planned disposal method involves water evaporation followed by residual water disposal in Jackson (Queensland).





- The flowback water has pH values and dissolved oxygen, TDS, nutrient, dissolved metals, C10-C40 PHC and phenol concentrations that exceed the WDES screening criteria.
- The evaporation treatment process is anticipated to increase the TDS concentrations and that of other contaminants of concern.
- The S-P-R linkage to the nearby surface water bodies is considered incomplete. The avian S-P-R is considered incomplete for the use of the ponds as a water source. The accidental ingestion pathway is considered complete, but not significant for the current water condition.
- No impact to terrestrial or avian wildlife is anticipated if any incidental spill occurred as it will still be contained within the bunded area
- It will take too long for any spill infiltration to reach 50m depth. It is very improbable that contamination of groundwater table can occur from wastewater contained in the treatment tank.

Based on the laboratory results for the analytes specified in the Code:

- The treatment tank water should not be disposed on the Site surface (including for dust suppression) unless a further ecological and human health risk assessment is conducted (i.e., referring to direct contact and accidental ingestion) and which takes account of concentrating factors following evaporation.
- The water should not be disposed to or in the vicinity of waterways or water bodies.

## 9 SUITABLY QUALIFIED PERSON STATEMENT

Kleinfelder has nominated Stuart Graham as being a Suitability Qualified Person to undertake the water quality review for Imperial. Stuart's qualifications and experience in the field of water quality assessment are presented below.

Item	Experience
Qualifications	PhD Geochemistry (Monash) New South Wales Department of Planning, Industry and Environment – Suitably Qualified Person to undertake PFAS exposure pathway reviews (surface and groundwater)
Kleinfelder Roles	Associate Hydrogeologist Technical Lead
Relevant Experience	Groundwater dependent ecosystem risk assessments for proposed windfarm quarries where water table lowering was required. Reviewed water table fluctuations and expected impacts to water quality discharging to the GDE.
	Industrial water quality review for proposed use suitability, including potential human health risks.
	Multiple water quality and excavation inflow assessments, including assessing suitability for disposal to water infrastructure (sewer).
	Water quality assessment for irrigation suitability.
	Ecological risk assessment for hexavalent chromium and nitrate impacted groundwater discharging nearby river, including production of 3D fate and transport model to estimate contaminant mass at point of discharge.
Memberships	Multiple landfill water (and leachate) quality reviews
	International Association of Hydrogeologists.
	Association of Applied Geochemists.
	Australian Land and Groundwater Association.

If you require additional information or clarification, please contact the undersigned at +61 61 7 4957 5036.



Sincerely,

**Kleinfelder Australia Pty Ltd**

**Stuart Graham**

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**Adam Marshall BSc (Hons) FGS, MEIANZ**

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## Attachments

[Attachment 1: Laboratory results summary](#)

[Attachment 2: Laboratory certificates of analysis](#)



# ATTACHMENT 1: LABORATORY RESULTS SUMMARY



Attachment 1: Laboratory Results Summary

CHEMICAL GROUP			PHYSICOCHEMICAL PARAMETERS						NUTRIENTS						ANIONS							DISSOLVED CATIONS									
ANALYTE			Dissolved Oxygen	Electrical Conductivity @ 25 °C	Total Dissolved Solids @180°C	Suspended Solids (SS)	pH	Sodium Adsorption Ratio	Nitrate as N	Nitrite as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Ammonia as N	Reactive Phosphorus as P	Total Phosphorus as P	Sulfate	Chloride	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as HCO3	Hydroxide Alkalinity as CaCO3	Total Alkalinity as CaCO3	Fluoride	Bromide	Total Cyanide	Sodium	Magnesium	Potassium	Calcium	Sodium	
LABORATORY LOR			mg/L	µS/cm	mg/L	mg/L	pH Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LIMIT OF REPORTING			0.1	1	10	5	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.01	1	1	1	1	1	1	1	1	0.1	0.01	0.004	1	1	1	1	1	
WDES (99%)			~7.0		20 - 250		6.0 - 7.5		1.0		0.005		0.006	0.005	0.01																
ADWG			Not necessary		1200		6.5-8.5															1.5									
RSL Tap								7300	460													180		2.7							
RSL Tap_MCL								10	1													4		0.2							
LAB. RPT	DATE	SAMPLE ID																													
ES2122535009	04/06/2021	Flowback Storage Tank	0.7	16300	11500	364	6.21	25.4	<0.01	<0.01	68.8	68.8	2.83	0.04	1.58	174	5300	<1	260	317	<1	260	0.8	67	<0.004	2570	142	93	544	2870	
ES2122535008	04/06/2021	Choke	1.8	99100	77100	124	6.96	54.2	0.04	<0.01	96.7	96.7	29.5	<0.25	<1.00	<1	41900	<1	238	290	<1	238	1.0	614	<0.004	17200	1190	200	5670	17400	
ES2123872001	23/06/2021	Flowback Storage Tank	1.2	30800	23800	136	5.44	32.0	<0.10	<0.01	68.3	68.3	6.54	<0.02	0.81	111	11600	<1	203	248	<1	203	0.7	99.5	<0.020	5700	344	116	1840	5700	
ES2123872002	23/06/2021	Choke	1.7	124000	142000	55	6.18	57.8	0.17	<0.01	112	112	54.0	9.31	<10.0	<20	82000	<1	187	228	<1	187	0.4	976	<0.020	28900	2410	248	15000	28900	
ES2123872003	25/06/2021	Flowback Storage Tank	1.2	32700	27200	44	5.25	32.1	<0.10	<0.01	69.5	69.5	3.74	0.08	0.75	77	12700	<1	190	232	<1	190	0.6	165	<0.020	5960	375	112	1990	5960	
ES2123872004	25/06/2021	Choke	1.6	122000	140000	22	6.11	58.2	<0.10	<0.01	102	102	52.4	3.6	<5.00	<20	86600	<1	154	188	<1	154	0.4	996	<0.020	30200	2540	275	16200	30200	
ES2123872005	04/07/2021	Flowback Storage Tank	7.1	47700	45000	67	4.75	36.8	<0.10	<0.01	76.7	76.7	5.54	0.64	0.73	6	21200	<1	96	117	<1	96	0.6	269	<0.020	9420	673	137	3840	9420	
ES2123872006	04/07/2021	Choke	5.7	141000	183000	46	5.90	63.4	<0.10	<0.01	103	103	62.0	9.26	<10.0	<20	109000	<1	108	132	<1	108	0.3	1300	<0.020	37100	3360	286	20400	37100	
ES2125934003	14/07/2021	Flowback Storage Tank	7.7	55100	46200	----	4.68	38.9	0.01	<0.01	83.6	83.6	7.86	<0.50	0.75	6	29700	<1	77	94	<1	77	0.5	346	<0.008	10900	808	168	4610	10900	
ES2125934004	14/07/2021	Choke	6.0	236000	186000	----	5.83	64.5	<0.01	<0.01	130	130	78.6	<5.00	<5.00	<100	121000	<1	104	127	<1	104	0.3	1830	<0.020	39500	3610	307	22500	39500	
ES2125934005	09/07/2021	Flowback Storage Tank	6.5	53000	48400	----	4.74	37.2	0.01	<0.01	84.1	84.1	7.55	<0.50	0.72	4	25500	<1	92	112	<1	92	0.5	319	<0.008	9800	705	158	4080	9800	
ES2125934006	09/07/2021	Choke	6.9	229000	189000	----	5.83	63.6	0.01	<0.01	120	120	80.0	<5.00	<5.00	<100	119000	<1	94	115	<1	94	0.3	1980	<0.020	37000	3280	298	20200	37000	
ES2127207001	16/07/2021	Flowback Storage Tank	7.0	67500	47000	94	4.83	42.3	<0.01	<0.01	83.7	83.7	7.77	1.09	1.02	4	25200	<1	147	179	<1	147	0.7	377	<0.020	12400	933	162	4970	12400	
ES2127207002	16/07/2021	Choke	4.7	257000	182000	<5	6.25	70.1	<0.01	<0.01	116	116	82.8	2.66	<5.00	<100	120000	<1	116	142	<1	116	0.6	1520	<0.008	44000	4030	337	23200	44000	

Attachment 1: Laboratory Results Summary

CHEMICAL GROUP			TOTAL CATIONS					DISSOLVED METALS																							
ANALYTE			Magnesium	Potassium	Calcium	Aluminium	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc	Aluminium	Antimony
LABORATORY LOR			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
<b>LIMIT OF REPORTING</b>			1	1	1	0.01	0.001	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.05	0.001	0.0001	0.001	0.001	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005	0.01	0.001
<b>WDES (99%)</b>						0.027		0.001			0.09	0.0003			0.004		0.008	1.2	0.00006		0.032	0.005	0.00002					0.010	0.027		
<b>ADWG</b>							0.003	0.01	2	0.06	4	0.002			2	c	0.01	0.5	0.001	0.05	0.02	0.01	0.1				0.017				0.003
<b>RSL Tap</b>						4600	0.27	1.4	64	0.064	910			3.4	180	3200				23	18	23	1.5	2700		2700	0.91	0.6	2300	4600	0.27
<b>RSL Tap_MCL</b>							0.006	0.01	2	0.004			0.1		1.3			0.002			0.05					0.03					0.006
LAB. RPT	DATE	SAMPLE ID																													
ES2122535009	04/06/2021	Flowback Storage Tank	147	110	604	0.09	0.038	0.021	3.56	<0.001	35.8	0.0003	0.009	0.008	0.029	5.73	0.034	1.72	<0.0001	0.056	0.047	<0.01	<0.001	22.6	<0.001	<0.001	0.001	0.02	0.183	0.17	0.046
ES2122535008	04/06/2021	Choke	1240	224	5780	<0.10	0.033	0.018	203	<0.001	49.7	0.0022	0.018	0.008	0.157	11.9	0.012	14.5	<0.0001	0.073	0.107	<0.01	<0.010	215	<0.001	<0.001	0.003	<0.01	0.399	0.24	0.036
ES2123872001	23/06/2021	Flowback Storage Tank	344	116	1840	0.16	0.038	0.018	14.5	<0.010	48.7	<0.0010	0.012	<0.010	0.015	13.2	0.039	4.87	<0.0001	0.058	0.047	<0.10	<0.010	91.1	<0.010	<0.010	<0.010	<0.10	0.318	0.16	0.038
ES2123872002	23/06/2021	Choke	2410	248	15000	<0.10	0.018	0.010	1180	<0.010	38.3	0.0035	0.022	<0.010	<0.010	109	0.011	36.4	<0.0001	0.031	0.030	<0.10	<0.010	847	<0.010	<0.010	<0.010	<0.10	1.09	<0.10	0.018
ES2123872003	25/06/2021	Flowback Storage Tank	375	112	1990	0.17	0.038	0.020	18.4	<0.010	47.7	0.0012	0.012	<0.010	0.012	14.7	0.034	5.27	<0.0001	0.056	0.052	<0.10	<0.010	99.6	<0.010	<0.010	<0.010	<0.10	0.332	0.17	0.038
ES2123872004	25/06/2021	Choke	2540	275	16200	<0.10	0.015	0.013	1300	<0.010	35.5	<0.0010	0.016	<0.010	<0.010	94.6	<0.010	36.1	<0.0001	0.044	0.034	<0.10	<0.010	852	<0.010	<0.010	<0.010	<0.10	0.901	<0.10	0.015
ES2123872005	04/07/2021	Flowback Storage Tank	673	137	3840	0.21	0.037	0.020	97.2	<0.010	46.6	<0.0010	0.013	<0.010	0.028	27.6	0.036	9.51	<0.0001	0.054	0.048	<0.10	<0.010	206	<0.010	<0.010	<0.010	<0.10	0.409	0.21	0.037
ES2123872006	04/07/2021	Choke	3360	286	20400	<0.10	<0.010	0.010	1910	<0.010	26.0	<0.0010	0.014	<0.010	<0.010	120	<0.010	50.8	<0.0001	0.020	0.017	<0.10	<0.010	1250	<0.010	<0.010	<0.010	<0.10	0.999	<0.10	<0.010
ES2125934003	14/07/2021	Flowback Storage Tank	808	168	4610	0.29	0.035	0.022	184	<0.010	43.1	<0.0010	0.014	<0.010	0.076	31.1	0.036	12.2	<0.0001	0.052	0.056	<0.10	<0.010	244	<0.010	<0.010	<0.010	<0.10	0.479	0.29	0.035
ES2125934004	14/07/2021	Choke	3610	307	22500	<0.10	0.013	0.015	2260	<0.010	20.5	<0.0010	0.021	<0.010	<0.010	160	<0.010	55.3	<0.0001	0.052	0.023	<0.10	0.016	1310	<0.010	<0.010	<0.010	<0.10	1.14	<0.10	0.013
ES2125934005	09/07/2021	Flowback Storage Tank	705	158	4080	0.27	0.034	0.021	141	<0.010	41.7	<0.0010	0.014	<0.010	0.071	27.4	0.034	10.7	<0.0001	0.051	0.054	<0.10	<0.010	213	<0.010	<0.010	<0.010	<0.10	0.439	0.27	0.034
ES2125934006	09/07/2021	Choke	3280	298	20200	<0.10	<0.010	0.010	1980	<0.010	20.8	<0.0010	0.012	<0.010	<0.010	110	<0.010	46.9	<0.0001	0.021	0.017	<0.10	0.012	1140	<0.010	<0.010	<0.010	<0.10	1.03	<0.10	<0.010
ES2127207001	16/07/2021	Flowback Storage Tank	933	162	4970	0.24	0.045	0.019	201	<0.010	47.9	<0.0010	0.012	<0.010	0.093	36.9	0.033	13.0	<0.0001	0.054	0.060	<0.10	<0.010	279	<0.010	<0.010	<0.010	<0.10	0.458	0.24	0.045
ES2127207002	16/07/2021	Choke	4030	337	23200	<0.20	<0.020	<0.020	2290	<0.020	23.7	<0.0020	<0.020	<0.020	<0.020	172	<0.020	57.0	<0.0001	0.060	0.023	<0.20	<0.020	1510	<0.020	<0.020	<0.020	<0.20	0.902	<0.20	<0.020



Attachment 1: Laboratory Results Summary

CHEMICAL GROUP			TOTAL METALS																				ALPHA-BETA ACTIVITY								
ANALYTE			Arsenic	Beryllium	Barium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Reactive Silica	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc	Gross alpha	Gross beta activity -40K	Gross beta	Total alpha and beta	Annual dose	Benzene
LABORATORY LOR			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Bq/L	Bq/L	Bq/L	Bq/L	mSv/yr	µg/L	
LIMIT OF REPORTING			0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0.01	0.05	0.001	0.001	0.001	0.001	0.001	0.01	0.005	0.05	0.1	0.1	0.1	-	1
WDES (99%)			0.001			0.09	0.00006			0.001			1.2	0.00006		0.008	0.005		0.00002						0.0024						600
ADWG			0.01	0.06	2	4	0.002			2	1		0.5	0.001	0.05	0.02	0.01	80	0.1				0.017							1	0.001
RSL Tap			1.4	0.064	64	910				180	3200				23	18	23		1.5	2700		2700	0.91	0.6	2300						610
RSL Tap_MCL			0.01	0.004	2			0.1								1.3															5
LAB. RPT	DATE	SAMPLE ID																													
ES2122535009	04/06/2021	Flowback Storage Tank	0.019	<0.001	8.2	51.4	0.0003	0.010	0.006	0.062	6.09	0.076	1.81	<0.0001	0.057	0.041	<0.01	36.9	<0.001	30	0.003	0.004	0.003	0.04	0.161	<0.26	<0.53	2.08	2.08	0.58	6
ES2122535008	04/06/2021	Choke	0.044	<0.010	237	78.9	0.0034	0.039	<0.010	0.346	26.5	0.030	14.8	<0.0001	0.079	0.121	<0.10	21.7	<0.010	280	<0.010	<0.010	<0.010	<0.10	0.331	8.04	34.8	40.4	48.44	13.6	24
ES2123872001	23/06/2021	Flowback Storage Tank	0.018	<0.010	14.5	48.7	<0.0010	0.012	<0.010	0.015	13.2	0.039	4.87	<0.0001	0.058	0.047	<0.10	37.4	<0.010	91.1	<0.010	<0.010	<0.10	<0.10	0.318	<0.54	<1.08	2.85	2.85	0.80	2
ES2123872002	23/06/2021	Choke	0.010	<0.010	1180	38.3	0.0035	0.022	<0.010	<0.010	109	0.011	36.4	<0.0001	0.031	0.030	<0.10	19.0	<0.010	847	<0.010	<0.010	<0.010	<0.10	1.09	8.65	112	120	128.65	36.2	36
ES2123872003	25/06/2021	Flowback Storage Tank	0.020	<0.010	18.4	47.7	0.0012	0.012	<0.010	0.012	14.7	0.034	5.27	<0.0001	0.056	0.052	<0.10	37.0	<0.010	99.6	<0.010	<0.010	<0.10	<0.10	0.332	<0.59	<1.18	1.99	1.99	0.56	3
ES2123872004	25/06/2021	Choke	0.013	<0.010	1300	35.5	<0.0010	0.016	<0.010	<0.010	94.6	<0.010	36.1	<0.0001	0.044	0.034	<0.10	17.3	<0.010	852	<0.010	<0.010	<0.010	<0.10	0.901	14.4	134	142	156.4	44.0	47
ES2123872005	04/07/2021	Flowback Storage Tank	0.020	<0.010	97.2	46.6	<0.0010	0.013	<0.010	0.028	27.6	0.036	9.51	<0.0001	0.054	0.048	<0.10	38.4	<0.010	206	<0.010	<0.010	<0.010	<0.10	0.409	<0.92	4.91	9.05	9.05	2.54	4
ES2123872006	04/07/2021	Choke	0.010	<0.010	1910	26.0	<0.0010	0.014	<0.010	<0.010	120	<0.010	50.8	<0.0001	0.020	0.017	<0.10	20.0	<0.010	1250	<0.010	<0.010	<0.010	<0.10	0.999	22.3	187	195	217.3	61.1	45
ES2125934003	14/07/2021	Flowback Storage Tank	0.022	<0.010	184	43.1	<0.0010	0.014	<0.010	0.076	31.1	0.036	12.2	<0.0001	0.052	0.056	<0.10	43.6	<0.010	244	<0.010	<0.010	<0.010	<0.10	0.479	6.88	25.4	30	36.88	10.4	1
ES2125934004	14/07/2021	Choke	0.015	<0.010	2260	20.5	<0.0010	0.021	<0.010	<0.010	160	<0.010	55.3	<0.0001	0.052	0.023	<0.10	13.0	0.016	1310	<0.010	<0.010	<0.010	<0.10	1.14	71.0	422	431	502	141	32
ES2125934005	09/07/2021	Flowback Storage Tank	0.021	<0.010	141	41.7	<0.0010	0.014	<0.010	0.071	27.4	0.034	10.7	<0.0001	0.051	0.054	<0.10	38.7	<0.010	213	<0.010	<0.010	<0.010	<0.10	0.439	3.19	17.3	21.4	24.59	6.91	1
ES2125934006	09/07/2021	Choke	0.010	<0.010	1980	20.8	<0.0010	0.012	<0.010	<0.010	110	<0.010	46.9	<0.0001	0.021	0.017	<0.10	14.0	0.012	1140	<0.010	<0.010	<0.010	<0.10	1.03	82.8	376	385	467.8	132	35
ES2127207001	16/07/2021	Flowback Storage Tank	0.019	<0.010	201	47.9	<0.0010	0.012	<0.010	0.093	36.9	0.033	13.0	<0.0001	0.054	0.060	<0.10	39.7	<0.010	279	<0.010	<0.010	<0.010	<0.10	0.458	3.78	16	20.4	24.18	6.80	2
ES2127207002	16/07/2021	Choke	<0.020	<0.020	2290	23.7	<0.0020	<0.020	<0.020	<0.020	172	<0.020	57.0	<0.0001	0.060	0.023	<0.20	39.0	<0.020	1510	<0.020	<0.020	<0.020	<0.20	0.902	52.2	270	280	332.2	93.4	20



Attachment 1: Laboratory Results Summary

CHEMICAL GROUP			PHENOLS																							CARBON						
ANALYTE			Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Total PAH	BaP TEQ	2-Chlorophenol	2,4-Dichlorophenol	2,6-Dichlorophenol	4-Chloro-3-methylphenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,3,5,6-Tetrachlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	Pentachlorophenol	Sum of Phenols (halogenated)	Phenol	2-Methylphenol	3- & 4-Methylphenol	2-Nitrophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	4-Nitrophenol	2-Methyl-4,6-dinitrophenol	Dinoseb	2-Cyclohexyl-4,6-Dinitrophenol	Cresols (Total)	Dissolved Organic Carbon	Total Organic Carbon	Total Inorganic Carbon	
LABORATORY LOR			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LIMIT OF REPORTING			1	1	1	0.5	0.5	0.05	0.05	0.1	0.05	0.1	0.1	2	2	0.05	2	0.1	4	4	0.1	0.1	100	0.1	0.05	0.1	50	4	1	1	1	
WDES (99%)								340	120				3			3.6		85					13									
ADWG								0.3								0.01																
RSL Tap								1000	190		5200	2900	30			29		140000	12000	6700			3100	1200			54	54				
RSL Tap_MCL																1										7						
LAB. RPT	DATE	SAMPLE ID																														
ES2122535009	04/06/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<2	<2	<2	<4	<2	<2	<2	<2	<2	<2	79	<4	19	<4	<4	<100	<50	<50	<50	<50	<4	19	960	990	46
ES2122535008	04/06/2021	Choke	<1.0	<1.0	<1.0	<0.5	<0.5	<2	<2	<2	<4	<2	<2	<2	<2	<2	<2	<4	<4	<4	<4	<4	<100	<50	<50	<50	<50	<4	1610	1710	58	
ES2123872001	23/06/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	168	----	----	<0.1	0.4	----	<0.1	<0.05	<0.1	----	----	1230	1280	48	
ES2123872002	23/06/2021	Choke	<1.0	<1.0	<1.0	<0.5	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	4.5	----	----	<0.1	0.8	----	<0.1	<0.10	<0.1	----	----	1510	1530	58	
ES2123872003	25/06/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.20	<0.2	<0.2	<0.20	<0.2	<0.2	----	----	<0.20	----	228	----	----	<0.2	1.1	----	<0.2	<0.05	<0.1	----	----	1220	1250	28	
ES2123872004	25/06/2021	Choke	<1.0	<1.0	<1.0	1.4	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	15.8	----	----	<0.1	3.3	----	<0.1	<0.10	<0.1	----	----	1390	1410	46	
ES2123872005	04/07/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	223	----	----	<0.1	0.7	----	<0.1	<0.05	<0.1	----	----	1220	1220	17	
ES2123872006	04/07/2021	Choke	<1.0	<1.0	<1.0	7.9	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	6.7	----	----	<0.1	0.9	----	<0.1	<0.10	<0.1	----	----	1110	1110	35	
ES2125934003	14/07/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.19	<0.2	<0.2	<0.19	<0.2	<0.2	----	----	<0.19	----	105	----	----	<0.2	0.4	----	<0.2	<0.05	<0.1	----	----	1170	1140	6	
ES2125934004	14/07/2021	Choke	<1.0	<1.0	<1.0	14.8	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	5	----	----	<0.1	0.4	----	<0.1	<0.05	<0.1	----	----	969	973	36	
ES2125934005	09/07/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	152	----	----	<0.1	0.5	----	<0.1	<0.05	<0.1	----	----	1180	1200	9	
ES2125934006	09/07/2021	Choke	<1.0	<1.0	<1.0	1.3	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	4.7	----	----	<0.1	0.8	----	<0.1	<0.05	<0.1	----	----	969	966	33	
ES2127207001	16/07/2021	Flowback Storage Tank	<1.0	<1.0	<1.0	<0.5	<0.5	<0.19	<0.2	<0.2	<0.19	<0.2	<0.2	----	----	<0.19	----	147	----	----	<0.2	0.5	----	<0.2	<0.10	<0.1	----	----	1190	1210	<1	
ES2127207002	16/07/2021	Choke	<1.0	<1.0	<1.0	2.3	<0.5	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	----	----	<0.05	----	4.6	----	----	<0.1	0.7	----	<0.1	<0.10	<0.1	----	----	910	911	12	





# ATTACHMENT 2: LABORATORY CERTIFICATES OF ANALYSIS





## CERTIFICATE OF ANALYSIS

**Work Order** : **ES2122535**  
**Client** : **IMPERIAL OIL AND GAS**  
**Contact** : JON BENNETT  
**Address** : LEVEL 7, 151 MACQUARIE STREET  
 SYDNEY NSW, AUSTRALIA 2000  
  
**Telephone** : ----  
**Project** : EP187  
**Order number** : ----  
**C-O-C number** : ----  
**Sampler** : Chris Schilling  
**Site** : ----  
**Quote number** : SY/153/21 V3  
**No. of samples received** : 9  
**No. of samples analysed** : 9

**Page** : 1 of 19  
**Laboratory** : Environmental Division Sydney  
**Contact** : Customer Services ES  
**Address** : 277-289 Woodpark Road Smithfield NSW Australia 2164  
  
**Telephone** : +61-2-8784 8555  
**Date Samples Received** : 18-Jun-2021 09:20  
**Date Analysis Commenced** : 18-Jun-2021  
**Issue Date** : 05-Jul-2021 13:04



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Titus Vimalasiri	Metals Teamleader	Radionuclides, Fyshwick, ACT
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.

- EK057G, EK071G: LOR raised for Nitrite and Reactive Phosphorus on sample no:7 due to insufficient sample.
- EG035: LOR raised for Mercury due to sample matrix (viscous after adding acid).
- EK067G: LOR raised for Total Phosphorus on sample no:8 due to sample matrix.
- 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.
- 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.
- EK010, LOR raised due to sample matrix.
- EG020T: Some samples required dilution (X10) prior to digestion for EG020A-T due to matrix interference (high sediment content) and LOR's have been raised accordingly.
- EG020A: LORs have been raised for some samples due to matrix interference (High sample salinity)
- EG020: It has been confirmed by re-digestion and re-analysis that total Zinc concentration is less than dissolved for sample ES2122535-#008. For all other samples and analytes where dissolved is greater than total, the difference is within experimental variation of the methods.
- EP075-EM: Poor surrogate recoveries for sample ES2122535-008 due to matrix interference. Insufficient sample remains to confirm via extraction and re-analysis
- EK059G:LOR raised due to sample matrix.
- EK071G:LOR raised due to sample matrix.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EP002 : It has been noted that DOC is greater than TOC for various samples, however this difference is within the limits of experimental variation.
- EP007 : It has been noted that TIC is greater than TC for sample 3, however this difference is within the limits of experimental variation.
- EP075(SIM), EP071: Particular samples required dilution prior to extraction due to matrix interferences. LOR values have been adjusted accordingly.
- LOR for Gross Alpha and Gross Beta raised due to high solid content.
- EP080: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- 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		RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
		Sampling date / time		16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005
				Result	Result	Result	Result	Result
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	7.32	7.29	7.98	8.73	10.3
<b>EA006: Sodium Adsorption Ratio (SAR)</b>								
^ Sodium Adsorption Ratio	----	0.01	-	----	----	0.92	2.16	23.0
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	1140	1180	1220	2640	3140
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	662	696	776	4020	3230
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	1	mg/L	<1	4	----	----	----
Suspended Solids (SS)	----	5	mg/L	----	----	<5	120	6590
<b>EA250: Gross Alpha and Beta Activity</b>								
Gross beta	----	0.10	Bq/L	0.53	0.63	0.73	0.79	0.78
<b>ED036: Alkalinity in Formation Water</b>								
Bicarbonate Alkalinity as HCO3	----	1	mg/L	----	----	594	667	<1
Total Alkalinity as HCO3	----	1	mg/L	----	----	594	919	1150
<b>ED037P: Alkalinity by PC Titrator</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	45
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	207	899
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	431	427	487	547	<1
Total Alkalinity as CaCO3	----	1	mg/L	431	427	487	753	944
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	78	97	81	77	74
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	67	74	93	525	516
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	128	131	122	188	22
Magnesium	7439-95-4	1	mg/L	46	49	45	49	9
Sodium	7440-23-5	1	mg/L	40	42	47	129	507
Potassium	7440-09-7	1	mg/L	17	15	23	34	29
<b>ED093T: Total Major Cations</b>								
Calcium	7440-70-2	1	mg/L	128	126	119	239	146
Magnesium	7439-95-4	1	mg/L	50	51	49	57	37
Sodium	7440-23-5	1	mg/L	44	46	50	149	538



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>ED093T: Total Major Cations - Continued</b>									
Potassium	7440-09-7	1	mg/L	16	14	25	39	34	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	<0.01	<0.01	0.07	
Antimony	7440-36-0	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.002	<0.001	0.004	0.003	
Beryllium	7440-41-7	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.107	0.125	0.118	0.116	0.143	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Cobalt	7440-48-4	0.001	mg/L	----	----	0.002	0.003	0.004	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.002	0.005	0.011	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Lithium	7439-93-2	0.001	mg/L	0.036	0.040	----	----	----	
Manganese	7439-96-5	0.001	mg/L	0.222	0.575	0.148	0.110	0.008	
Molybdenum	7439-98-7	0.001	mg/L	----	----	<0.001	0.005	0.006	
Nickel	7440-02-0	0.001	mg/L	----	----	0.004	0.004	0.005	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	0.496	0.504	0.485	2.36	0.549	
Thorium	7440-29-1	0.001	mg/L	----	----	<0.001	0.001	<0.001	
Tin	7440-31-5	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Uranium	7440-61-1	0.001	mg/L	----	----	0.001	0.002	0.002	
Vanadium	7440-62-2	0.01	mg/L	----	----	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	0.006	0.007	0.016	0.032	<0.050	
Boron	7440-42-8	0.05	mg/L	0.13	0.14	0.11	65.3	59.2	
Iron	7439-89-6	0.05	mg/L	0.44	0.67	0.16	<0.05	<0.05	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	<0.01	0.02	0.41	
Antimony	7440-36-0	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	<0.001	0.008	0.008	
Beryllium	7440-41-7	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Barium	7440-39-3	0.001	mg/L	0.110	0.126	0.126	0.147	0.133	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Cobalt	7440-48-4	0.001	mg/L	----	----	0.002	0.002	0.004	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.005	0.007	0.008	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Lithium	7439-93-2	0.001	mg/L	0.034	0.039	----	----	----	
Manganese	7439-96-5	0.001	mg/L	0.226	0.597	0.148	0.175	0.133	
Molybdenum	7439-98-7	0.001	mg/L	----	----	<0.001	0.004	0.003	
Nickel	7440-02-0	0.001	mg/L	----	----	0.005	0.005	0.006	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Strontium	7440-24-6	0.001	mg/L	0.495	0.494	0.489	4.14	3.22	
Thorium	7440-29-1	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Tin	7440-31-5	0.001	mg/L	----	----	<0.001	<0.001	<0.001	
Uranium	7440-61-1	0.001	mg/L	----	----	0.002	0.001	0.002	
Vanadium	7440-62-2	0.01	mg/L	----	----	<0.01	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	0.014	<0.005	0.017	0.048	0.036	
Boron	7440-42-8	0.05	mg/L	0.08	0.11	0.12	104	99.6	
Iron	7439-89-6	0.05	mg/L	0.64	0.80	0.40	0.17	0.17	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0010	<0.0010	
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	30.8	29.9	31.6	34.2	9.18	
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
Free Chlorine	----	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
Monochloramine	10599-90-3	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
Dichloroamine	3400-09-7	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
Combined Chlorine	----	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	----	----	<0.02	<0.04	<0.04	
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	----	----	<0.004	<0.004	<0.004	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.4	0.4	0.3	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	----	----	0.07	0.11	0.16	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.06	<0.01	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	0.06	<0.01	0.02	<0.10	0.04	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.06	<0.01	0.02	<0.10	0.04	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	----	0.2	316	176	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	----	----	0.2	316	176	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	----	----	<0.01	8.42	5.01	
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	----	----	<0.01	0.48	0.12	
<b>EN055: Ionic Balance</b>									
∅ Total Anions	----	0.01	meq/L	12.1	12.6	----	----	----	
∅ Total Cations	----	0.01	meq/L	12.3	12.8	----	----	----	
∅ Ionic Balance	----	0.01	%	0.91	0.56	----	----	----	
<b>EP002: Dissolved Organic Carbon (DOC)</b>									
Dissolved Organic Carbon	----	1	mg/L	----	----	9	1110	1060	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	----	----	5	1120	1070	
<b>EP006 Total Inorganic Carbon</b>									
Total Inorganic Carbon	----	1	mg/L	----	----	126	143	90	
<b>EP007 Total Carbon</b>									
Total Carbon	TC	1	mg/L	----	----	119	1280	1140	
<b>EP010: Formaldehyde</b>									
Formaldehyde	50-00-0	0.1	mg/L	----	----	0.2	0.1	0.2	
<b>EP025: Oxygen - Dissolved (DO)</b>									
Dissolved Oxygen	----	0.1	mg/L	----	----	9.2	10.1	10.6	
<b>EP033: C1 - C4 Hydrocarbon Gases</b>									
Methane	74-82-8	10	µg/L	<10	<10	<10	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EP033: C1 - C4 Hydrocarbon Gases - Continued</b>									
Ethane	74-84-0	10	µg/L	<10	<10	<10	----	----	
Propane	74-98-6	10	µg/L	<10	<10	<10	----	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Benzo(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
3-Methylcholanthrene	56-49-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.8	<1.1	
7.12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.1	
^ 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	
<b>EP075A: Phenolic Compounds (Halogenated)</b>									
2-Chlorophenol	95-57-8	2	µg/L	----	----	<2	<2	<2	
2,4-Dichlorophenol	120-83-2	2	µg/L	----	----	<2	<2	<2	
2,6-Dichlorophenol	87-65-0	2	µg/L	----	----	<2	<2	<2	
4-Chloro-3-methylphenol	59-50-7	4	µg/L	----	----	<4	<4	<4	
2,4,5-Trichlorophenol	95-95-4	2	µg/L	----	----	<2	<2	<2	
2,4,6-Trichlorophenol	88-06-2	2	µg/L	----	----	<2	<2	<2	
2,3,5,6-Tetrachlorophenol	935-95-5	2	µg/L	----	----	<2	<2	<2	
2,3,4,5 & 2,3,4,6-Tetrachlorophenol	4901-51-3/58-90-2	2	µg/L	----	----	<2	<2	<2	
Pentachlorophenol	87-86-5	2	µg/L	----	----	<2	<2	<2	
^ Sum of Phenols (halogenated)	----	2	µg/L	----	----	<2	<2	<2	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EP075A: Phenolic Compounds (Halogenated) - Continued</b>									
<b>EP075A: Phenolic Compounds (Non-halogenated)</b>									
Phenol	108-95-2	4	µg/L	----	----	<4	<4	<4	
2-Methylphenol	95-48-7	4	µg/L	----	----	<4	<4	<4	
3- & 4-Methylphenol	1319-77-3	4	µg/L	----	----	<4	<4	<4	
2-Nitrophenol	88-75-5	4	µg/L	----	----	<4	<4	<4	
2,4-Dimethylphenol	105-67-9	4	µg/L	----	----	<4	<4	<4	
2,4-Dinitrophenol	51-28-5	100	µg/L	----	----	<100	<100	<100	
4-Nitrophenol	100-02-7	50	µg/L	----	----	<50	<50	<50	
2-Methyl-4,6-dinitrophenol	8071-51-0	50	µg/L	----	----	<50	<50	<50	
Dinoseb	88-85-7	50	µg/L	----	----	<50	<50	<50	
2-Cyclohexyl-4,6-Dinitrophenol	131-89-5	50	µg/L	----	----	<50	<50	<50	
^ Cresols (Total)	----	4	µg/L	----	----	<4	<4	<4	
^ Sum of Phenols (non-halogenated)	----	4	µg/L	----	----	<4	<4	<4	
<b>EP075B: Polynuclear Aromatic Hydrocarbons</b>									
Benzo(a)pyrene	50-32-8	0.50	µg/L	----	----	<0.50	<0.50	<0.50	
<b>EP075C: Phthalate Esters</b>									
bis(2-ethylhexyl) phthalate	117-81-7	10	µg/L	----	----	<10	10	<10	
<b>EP075E: Nitroaromatics and Ketones</b>									
2,4-Dinitrotoluene	121-14-2	4	µg/L	----	----	<4	<4	<4	
Nitrobenzene	98-95-3	2	µg/L	----	----	<2	<2	<2	
<b>EP075I: Organochlorine Pesticides</b>									
alpha-BHC	319-84-6	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
Heptachlor	76-44-8	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
Aldrin	309-00-2	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
cis-Chlordane	5103-71-9	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
trans-Chlordane	5103-74-2	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
4,4`-DDE	72-55-9	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
Dieldrin	60-57-1	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
4,4`-DDD	72-54-8	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
4,4`-DDT	50-29-3	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
^ Chlordane	57-74-9	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	----	----	<0.5	<0.5	<0.5	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<100	<100	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EP080/071: Total Petroleum Hydrocarbons - Continued</b>									
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	180	80	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	1480	1520	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	1400	850	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	3060	2450	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<100	<100	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<100	<100	
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	360	420	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	2300	1830	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	540	290	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	3200	2540	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	360	420	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<5	<5	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<5	<5	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<5	<5	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<5	<5	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<5	<5	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<5	<5	
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<5	<5	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5	
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	----	----	0.336	0.970	0.700	
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	0.05	0.11	<0.05	<0.05	<0.05	
Gross beta activity - 40K	----	0.10	Bq/L	<0.10	0.25	<0.10	<0.10	0.17	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	25.8	28.1	29.4	24.8	20.0	
2-Chlorophenol-D4	93951-73-6	1.0	%	48.1	53.4	64.1	63.2	30.2	
2,4,6-Tribromophenol	118-79-6	1.0	%	52.9	58.3	63.2	59.3	23.1	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	51.2	55.0	57.2	68.8	61.9	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	HF Fluids A (Stage 1)	HF Fluids A (Stage 1)	HF Fluids B (Stage 2)
Sampling date / time				16-Jun-2021 08:00	16-Jun-2021 08:50	04-Jun-2021 11:00	04-Jun-2021 15:10	04-Jun-2021 08:45	
Compound	CAS Number	LOR	Unit	ES2122535-001	ES2122535-002	ES2122535-003	ES2122535-004	ES2122535-005	
				Result	Result	Result	Result	Result	
<b>EP075(SIM)T: PAH Surrogates - Continued</b>									
Anthracene-d10	1719-06-8	1.0	%	68.7	71.8	86.0	90.9	82.4	
4-Terphenyl-d14	1718-51-0	1.0	%	69.1	73.6	90.1	93.4	75.4	
<b>EP075S: Acid Extractable Surrogates (Waste Classification)</b>									
Phenol-d6	13127-88-3	0.25	%	----	----	47.6	44.2	47.1	
2-Chlorophenol-D4	93951-73-6	0.25	%	----	----	91.4	92.8	97.5	
2,4,6-Tribromophenol	118-79-6	0.25	%	----	----	82.5	87.4	95.5	
<b>EP075T: Base/Neutral Extractable Surrogates (Waste Classification)</b>									
Nitrobenzene-D5	4165-60-0	0.25	%	----	----	98.6	84.8	108	
1,2-Dichlorobenzene-D4	2199-69-1	0.25	%	----	----	91.9	70.8	79.7	
2-Fluorobiphenyl	321-60-8	0.25	%	----	----	72.4	56.8	69.4	
Anthracene-d10	1719-06-8	0.25	%	----	----	110	87.8	102	
4-Terphenyl-d14	1718-51-0	0.25	%	----	----	96.3	66.3	99.8	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	98.6	99.7	98.1	110	113	
Toluene-D8	2037-26-5	2	%	100	101	99.6	112	112	
4-Bromofluorobenzene	460-00-4	2	%	96.8	97.9	95.3	107	107	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
		Sampling date / time		04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----
				Result	Result	Result	Result	----
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	10.3	10.5	6.96	6.21	----
<b>EA006: Sodium Adsorption Ratio (SAR)</b>								
^ Sodium Adsorption Ratio	----	0.01	-	18.1	4.69	54.2	25.4	----
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	3120	3170	99100	16300	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	2790	----	77100	11500	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	3280	----	124	364	----
<b>EA250: Gross Alpha and Beta Activity</b>								
Gross beta	----	0.10	Bq/L	0.39	0.43	40.4	2.08	----
<b>ED036: Alkalinity in Formation Water</b>								
Bicarbonate Alkalinity as HCO3	----	1	mg/L	<1	<1	290	317	----
Total Alkalinity as HCO3	----	1	mg/L	986	1120	290	317	----
<b>ED037P: Alkalinity by PC Titrator</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	121	130	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	687	785	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	238	260	----
Total Alkalinity as CaCO3	----	1	mg/L	808	915	238	260	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	70	126	<1	174	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	506	493	41900	5300	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	25	4	5670	544	----
Magnesium	7439-95-4	1	mg/L	16	3	1190	142	----
Sodium	7440-23-5	1	mg/L	472	51	17200	2570	----
Potassium	7440-09-7	1	mg/L	27	4	200	93	----
<b>ED093T: Total Major Cations</b>								
Calcium	7440-70-2	1	mg/L	170	251	5780	604	----
Magnesium	7439-95-4	1	mg/L	44	58	1240	147	----
Sodium	7440-23-5	1	mg/L	528	510	17400	2870	----
Potassium	7440-09-7	1	mg/L	31	31	224	110	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.10	<0.10	0.09	----	
Antimony	7440-36-0	0.001	mg/L	0.003	0.001	0.033	0.038	----	
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.018	0.021	----	
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Barium	7440-39-3	0.001	mg/L	0.005	0.042	203	3.56	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0006	0.0022	0.0003	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	0.002	0.018	0.009	----	
Cobalt	7440-48-4	0.001	mg/L	0.004	0.004	0.008	0.008	----	
Copper	7440-50-8	0.001	mg/L	0.005	0.005	0.157	0.029	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.012	0.034	----	
Manganese	7439-96-5	0.001	mg/L	0.012	0.008	14.5	1.72	----	
Molybdenum	7439-98-7	0.001	mg/L	0.005	0.010	0.073	0.056	----	
Nickel	7440-02-0	0.001	mg/L	0.005	0.003	0.107	0.047	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.010	<0.001	----	
Strontium	7440-24-6	0.001	mg/L	0.691	0.062	215	22.6	----	
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Uranium	7440-61-1	0.001	mg/L	0.002	<0.001	0.003	0.001	----	
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	0.02	----	
Zinc	7440-66-6	0.005	mg/L	0.030	0.028	0.399	0.183	----	
Boron	7440-42-8	0.05	mg/L	68.8	60.8	49.7	35.8	----	
Iron	7439-89-6	0.05	mg/L	<0.05	0.68	11.9	5.73	----	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	0.04	0.65	0.24	0.17	----	
Antimony	7440-36-0	0.001	mg/L	0.004	<0.001	0.036	0.046	----	
Arsenic	7440-38-2	0.001	mg/L	0.010	0.017	0.044	0.019	----	
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.010	<0.001	----	
Barium	7440-39-3	0.001	mg/L	0.086	0.172	237	8.20	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0034	0.0003	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.039	0.010	----	
Cobalt	7440-48-4	0.001	mg/L	0.003	0.003	<0.010	0.006	----	
Copper	7440-50-8	0.001	mg/L	0.006	0.008	0.346	0.062	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.030	0.076	----	
Manganese	7439-96-5	0.001	mg/L	0.149	0.238	14.8	1.81	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Molybdenum	7439-98-7	0.001	mg/L	0.003	0.005	0.079	0.057	----	
Nickel	7440-02-0	0.001	mg/L	0.006	0.005	0.121	0.041	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.10	<0.01	----	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.010	<0.001	----	
Strontium	7440-24-6	0.001	mg/L	3.55	5.96	280	30.0	----	
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.010	0.003	----	
Tin	7440-31-5	0.001	mg/L	<0.001	0.001	<0.010	0.004	----	
Uranium	7440-61-1	0.001	mg/L	0.001	0.002	<0.010	0.003	----	
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.10	0.04	----	
Zinc	7440-66-6	0.005	mg/L	0.028	0.040	0.331	0.161	----	
Boron	7440-42-8	0.05	mg/L	127	130	78.9	51.4	----	
Iron	7439-89-6	0.05	mg/L	0.08	0.51	26.5	6.09	----	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0010	<0.0010	<0.0001	<0.0001	----	
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	8.14	5.32	21.7	36.9	----	
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
Free Chlorine	----	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
Monochloramine	10599-90-3	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
Dichloroamine	3400-09-7	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
Combined Chlorine	----	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	<0.04	<0.04	<0.20	<0.10	----	
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	1.0	0.8	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	0.06	0.11	29.5	2.83	----	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	0.01	<0.10	<0.01	<0.01	----	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EK058G: Nitrate as N by Discrete Analyser - Continued</b>									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.10	0.04	<0.01	----	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.10	0.04	<0.01	----	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	181	188	96.7	68.8	----	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	181	188	96.7	68.8	----	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	7.09	3.95	<1.00	1.58	----	
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.02	<0.10	<0.25	0.04	----	
<b>EP002: Dissolved Organic Carbon (DOC)</b>									
Dissolved Organic Carbon	----	1	mg/L	1040	1020	1610	960	----	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	1020	1000	1710	990	----	
<b>EP006 Total Inorganic Carbon</b>									
Total Inorganic Carbon	----	1	mg/L	76	82	58	46	----	
<b>EP007 Total Carbon</b>									
Total Carbon	TC	1	mg/L	1110	1090	1710	1140	----	
<b>EP010: Formaldehyde</b>									
Formaldehyde	50-00-0	0.1	mg/L	0.2	0.2	18.1	3.3	----	
<b>EP025: Oxygen - Dissolved (DO)</b>									
Dissolved Oxygen	----	0.1	mg/L	9.7	9.8	1.8	0.7	----	
<b>EP033: C1 - C4 Hydrocarbon Gases</b>									
Methane	74-82-8	10	µg/L	----	----	1870	207	----	
Ethane	74-84-0	10	µg/L	----	----	824	97	----	
Propane	74-98-6	10	µg/L	----	----	164	12	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
3-Methylcholanthrene	56-49-5	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.8	<1.9	<0.5	<0.5	----	
7.12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.9	<1.0	<1.0	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<1.0	<0.5	<0.5	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<1.0	<0.5	<0.5	----	
<b>EP075A: Phenolic Compounds (Halogenated)</b>									
2-Chlorophenol	95-57-8	2	µg/L	<2	<2	<2	<2	----	
2,4-Dichlorophenol	120-83-2	2	µg/L	<2	<2	<2	<2	----	
2,6-Dichlorophenol	87-65-0	2	µg/L	<2	<2	<2	<2	----	
4-Chloro-3-methylphenol	59-50-7	4	µg/L	<4	<4	<4	<4	----	
2,4,5-Trichlorophenol	95-95-4	2	µg/L	<2	<2	<2	<2	----	
2,4,6-Trichlorophenol	88-06-2	2	µg/L	<2	<2	<2	<2	----	
2,3,5,6-Tetrachlorophenol	935-95-5	2	µg/L	<2	<2	<2	<2	----	
2,3,4,5 & 2,3,4,6-Tetrachlorophenol	4901-51-3/58-90-2	2	µg/L	<2	<2	<2	<2	----	
Pentachlorophenol	87-86-5	2	µg/L	<2	<2	<2	<2	----	
^ Sum of Phenols (halogenated)	----	2	µg/L	<2	<2	<2	<2	----	
<b>EP075A: Phenolic Compounds (Non-halogenated)</b>									
Phenol	108-95-2	4	µg/L	<4	<4	<4	<b>79</b>	----	
2-Methylphenol	95-48-7	4	µg/L	<4	<4	<4	<4	----	
3- & 4-Methylphenol	1319-77-3	4	µg/L	<4	<4	<4	<b>19</b>	----	
2-Nitrophenol	88-75-5	4	µg/L	<4	<4	<4	<4	----	
2,4-Dimethylphenol	105-67-9	4	µg/L	<4	<4	<4	<4	----	
2,4-Dinitrophenol	51-28-5	100	µg/L	<100	<100	<100	<100	----	
4-Nitrophenol	100-02-7	50	µg/L	<50	<50	<50	<50	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EP075A: Phenolic Compounds (Non-halogenated) - Continued</b>									
2-Methyl-4,6-dinitrophenol	8071-51-0	50	µg/L	<50	<50	<50	<50	----	
Dinoseb	88-85-7	50	µg/L	<50	<50	<50	<50	----	
2-Cyclohexyl-4,6-Dinitrophenol	131-89-5	50	µg/L	<50	<50	<50	<50	----	
^ Cresols (Total)	----	4	µg/L	<4	<4	<4	19	----	
^ Sum of Phenols (non-halogenated)	----	4	µg/L	<4	<4	<4	98	----	
<b>EP075B: Polynuclear Aromatic Hydrocarbons</b>									
Benzo(a)pyrene	50-32-8	0.50	µg/L	<0.50	<0.50	<0.50	<0.50	----	
<b>EP075C: Phthalate Esters</b>									
bis(2-ethylhexyl) phthalate	117-81-7	10	µg/L	<10	<10	<10	<10	----	
<b>EP075E: Nitroaromatics and Ketones</b>									
2,4-Dinitrotoluene	121-14-2	4	µg/L	<4	<4	<4	<4	----	
Nitrobenzene	98-95-3	2	µg/L	<2	<2	<2	<2	----	
<b>EP075I: Organochlorine Pesticides</b>									
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
4,4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
4,4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
4,4`-DDT	50-29-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
^ Chlordane	57-74-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<100	<100	<100	50	----	
C10 - C14 Fraction	----	50	µg/L	110	<120	230	220	----	
C15 - C28 Fraction	----	100	µg/L	1220	2510	1250	690	----	
C29 - C36 Fraction	----	50	µg/L	900	820	820	500	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	2230	3330	2300	1410	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<100	<100	<100	50	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<100	<100	<100	40	----	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>									
>C10 - C16 Fraction	----	100	µg/L	230	220	290	200	----	
>C16 - C34 Fraction	----	100	µg/L	1780	2980	1820	990	----	
>C34 - C40 Fraction	----	100	µg/L	260	230	270	270	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	2270	3430	2380	1460	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	230	220	290	200	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<5	<5	24	6	----	
Toluene	108-88-3	2	µg/L	<5	<5	30	7	----	
Ethylbenzene	100-41-4	2	µg/L	<5	<5	<5	<2	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<5	<5	10	2	----	
ortho-Xylene	95-47-6	2	µg/L	<5	<5	<5	<2	----	
^ Total Xylenes	----	2	µg/L	<5	<5	10	2	----	
^ Sum of BTEX	----	1	µg/L	<5	<5	64	15	----	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----	
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	0.640	0.640	614	67.0	----	
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	<0.05	<0.05	8.04	<0.26	----	
Gross beta activity - 40K	----	0.10	Bq/L	<0.10	0.41	34.8	<0.53	----	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	23.3	25.5	25.3	28.8	----	
2-Chlorophenol-D4	93951-73-6	1.0	%	30.6	29.8	67.9	60.4	----	
2,4,6-Tribromophenol	118-79-6	1.0	%	20.8	19.3	59.6	68.5	----	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	86.3	58.0	58.2	66.3	----	
Anthracene-d10	1719-06-8	1.0	%	88.7	95.9	72.3	65.3	----	
4-Terphenyl-d14	1718-51-0	1.0	%	88.6	78.9	107	77.0	----	
<b>EP075S: Acid Extractable Surrogates (Waste Classification)</b>									
Phenol-d6	13127-88-3	0.25	%	34.2	41.6	Not Determined	47.1	----	
2-Chlorophenol-D4	93951-73-6	0.25	%	72.5	102	Not Determined	87.6	----	
2,4,6-Tribromophenol	118-79-6	0.25	%	47.6	85.8	Not Determined	97.5	----	
<b>EP075T: Base/Neutral Extractable Surrogates (Waste Classification)</b>									
Nitrobenzene-D5	4165-60-0	0.25	%	77.0	92.6	89.8	83.4	----	



### Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HF Fluids D (Stage 4)	HF Fluids C (Stage 3)	Flowback - Choke	Flowback - Pond	----
Sampling date / time				04-Jun-2021 08:48	04-Jun-2021 10:30	04-Jun-2021 16:14	04-Jun-2021 16:45	----	
Compound	CAS Number	LOR	Unit	ES2122535-006	ES2122535-007	ES2122535-008	ES2122535-009	-----	
				Result	Result	Result	Result	----	
<b>EP075T: Base/Neutral Extractable Surrogates (Waste Classification) - Continued</b>									
1,2-Dichlorobenzene-D4	2199-69-1	0.25	%	48.0	76.2	59.3	72.2	----	
2-Fluorobiphenyl	321-60-8	0.25	%	52.3	58.8	62.0	57.7	----	
Anthracene-d10	1719-06-8	0.25	%	55.1	106	33.5	91.4	----	
4-Terphenyl-d14	1718-51-0	0.25	%	52.9	87.5	100	101	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	109	109	112	108	----	
Toluene-D8	2037-26-5	2	%	114	115	112	105	----	
4-Bromofluorobenzene	460-00-4	2	%	105	110	107	103	----	



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
<b>EP075S: Acid Extractable Surrogates (Waste Classification)</b>			
Phenol-d6	13127-88-3	13	57
2-Chlorophenol-D4	93951-73-6	33	118
2,4,6-Tribromophenol	118-79-6	28	135
<b>EP075T: Base/Neutral Extractable Surrogates (Waste Classification)</b>			
Nitrobenzene-D5	4165-60-0	41	136
1,2-Dichlorobenzene-D4	2199-69-1	42	134
2-Fluorobiphenyl	321-60-8	45	137
Anthracene-d10	1719-06-8	53	141
4-Terphenyl-d14	1718-51-0	43	136
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
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 Canberra, NATA accreditation no. 992.

(WATER) EA250: Gross Alpha and Beta Activity

(WATER) EA250CA: Gross Alpha and Beta Activity

Analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no. 13778 (Chemistry).

(WATER) EP075A: Phenolic Compounds (Halogenated)

(WATER) EP075A: Phenolic Compounds (Non-halogenated)

(WATER) EP075I: Organochlorine Pesticides

(WATER) EP075B: Polynuclear Aromatic Hydrocarbons

(WATER) EP075E: Nitroaromatics and Ketones

(WATER) EP075C: Phthalate Esters

(WATER) EP075T: Base/Neutral Extractable Surrogates (Waste Classification)

(WATER) EP075S: Acid Extractable Surrogates (Waste Classification)

## CERTIFICATE OF ANALYSIS

**Work Order** : **ES2123872**  
**Client** : **IMPERIAL OIL AND GAS**  
**Contact** : JON BENNETT  
**Address** : LEVEL 7, 151 MACQUARIE STREET  
 SYDNEY NSW, AUSTRALIA 2000  
  
**Telephone** : ----  
**Project** : EP187  
**Order number** : ----  
**C-O-C number** : ----  
**Sampler** : Chris Schilling, Tim Galmesa  
**Site** : ----  
**Quote number** : SY/153/21 V3  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 18  
**Laboratory** : Environmental Division Sydney  
**Contact** : Customer Services ES  
**Address** : 277-289 Woodpark Road Smithfield NSW Australia 2164  
  
**Telephone** : +61-2-8784 8555  
**Date Samples Received** : 07-Jul-2021 07:00  
**Date Analysis Commenced** : 07-Jul-2021  
**Issue Date** : 26-Jul-2021 10:07



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
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Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
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Titus Vimalasiri	Metals Teamleader	Radionuclides, Fyshwick, ACT
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## 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.

- EP247: Poor matrix spike recovery for particular compounds due to matrix interferences.
- EP247 :Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EK058G/EK059G: LOR raised for NOx and Nitrate on various samples due to sample matrix.
- EK067G: LOR raised for TP on a few samples due to sample matrix.
- EK026SF: LOR raised for Total CN samples 1,2,3,4,5,6 due to sample matrix.
- EK067G: LOR raised for TP on sample 6 due to sample matrix.
- 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.
- EP080: Results for Es2123872-001 and -002 has been confirmed by re-analysis.
- EG035T: Poor matrix spike recovery was obtained for Mercury on sample ES2123872 #2. Confirmed by re-analysis.
- EG035F: Poor matrix spike recovery was obtained for Mercury on sample ES2123872 # 2. Confirmed by re-analysis.
- ED093/EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- EG020: LORs have been raised for some samples due to matrix interference (High sample salinity)
- EK010, LOR raised for Chlorine due to samples matrix.
- EK071G:LOR raised due to sample matrix.
- ED041G:LOR raised due to sample matrix.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- LOR for Gross Alpha and Gross Beta raised due to high solid content.
- EP080: Particular sample(s) required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP132: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP132: Where reported, Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene.



- 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.
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## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Choke	Flowback Storage Tank (80%)	CHOKE	Flowback Storage Tank (80%)
Sampling date / time					23-Jun-2021 09:00	23-Jun-2021 10:00	25-Jun-2021 11:00	25-Jun-2021 14:00	04-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005	
				Result	Result	Result	Result	Result	
<b>EA005P: pH by PC Titrator</b>									
pH Value	----	0.01	pH Unit	5.44	6.18	5.25	6.11	4.75	
<b>EA006: Sodium Adsorption Ratio (SAR)</b>									
^ Sodium Adsorption Ratio	----	0.01	-	32.0	57.8	32.1	58.2	36.8	
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	30800	124000	32700	122000	47700	
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>									
Total Dissolved Solids @180°C	----	10	mg/L	23800	142000	27200	140000	45000	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	136	55	44	22	67	
<b>EA250: Gross Alpha and Beta Activity</b>									
Gross beta	----	0.10	Bq/L	2.85	120	1.99	142	9.05	
<b>ED036: Alkalinity in Formation Water</b>									
Bicarbonate Alkalinity as HCO <sub>3</sub>	----	1	mg/L	248	228	232	188	117	
Total Alkalinity as HCO <sub>3</sub>	----	1	mg/L	248	228	232	188	117	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	203	187	190	154	96	
Total Alkalinity as CaCO <sub>3</sub>	----	1	mg/L	203	187	190	154	96	
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	111	<20	77	<20	6	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	11600	82000	12700	86600	21200	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	1840	15000	1990	16200	3840	
Magnesium	7439-95-4	1	mg/L	344	2410	375	2540	673	
Sodium	7440-23-5	1	mg/L	5700	28900	5960	30200	9420	
Potassium	7440-09-7	1	mg/L	116	248	112	275	137	
<b>ED093T: Total Major Cations</b>									
Calcium	7440-70-2	1	mg/L	1960	13500	2130	17400	4030	
Magnesium	7439-95-4	1	mg/L	386	2650	395	2820	717	
Sodium	7440-23-5	1	mg/L	6130	31900	6190	33200	9760	
Potassium	7440-09-7	1	mg/L	132	266	119	295	144	



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Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005
Sampling date / time				Result	Result	Result	Result	Result
<b>EG020F: Dissolved Metals by ICP-MS</b>								
Aluminium	7429-90-5	0.01	mg/L	0.16	<0.10	0.17	<0.10	0.21
Antimony	7440-36-0	0.001	mg/L	0.038	0.018	0.038	0.015	0.037
Arsenic	7440-38-2	0.001	mg/L	0.018	0.010	0.020	0.013	0.020
Beryllium	7440-41-7	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Barium	7440-39-3	0.001	mg/L	14.5	1180	18.4	1300	97.2
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	0.0035	0.0012	<0.0010	<0.0010
Chromium	7440-47-3	0.001	mg/L	0.012	0.022	0.012	0.016	0.013
Cobalt	7440-48-4	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	7440-50-8	0.001	mg/L	0.015	<0.010	0.012	<0.010	0.028
Lead	7439-92-1	0.001	mg/L	0.039	0.011	0.034	<0.010	0.036
Manganese	7439-96-5	0.001	mg/L	4.87	36.4	5.27	36.1	9.51
Molybdenum	7439-98-7	0.001	mg/L	0.058	0.031	0.056	0.044	0.054
Nickel	7440-02-0	0.001	mg/L	0.047	0.030	0.052	0.034	0.048
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Silver	7440-22-4	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium	7440-24-6	0.001	mg/L	91.1	847	99.6	852	206
Thorium	7440-29-1	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Tin	7440-31-5	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	7440-61-1	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc	7440-66-6	0.005	mg/L	0.318	1.09	0.332	0.901	0.409
Boron	7440-42-8	0.05	mg/L	48.7	38.3	47.7	35.5	46.6
Iron	7439-89-6	0.05	mg/L	13.2	109	14.7	94.6	27.6
<b>EG020T: Total Metals by ICP-MS</b>								
Aluminium	7429-90-5	0.01	mg/L	0.32	0.19	0.20	<0.10	0.27
Antimony	7440-36-0	0.001	mg/L	0.041	0.021	0.038	0.016	0.038
Arsenic	7440-38-2	0.001	mg/L	0.021	0.011	0.021	0.016	0.021
Beryllium	7440-41-7	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Barium	7440-39-3	0.001	mg/L	15.4	1250	16.0	1410	107
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	0.0036	<0.0010	<0.0010	<0.0010
Chromium	7440-47-3	0.001	mg/L	0.010	0.028	0.014	0.028	0.016
Cobalt	7440-48-4	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	7440-50-8	0.001	mg/L	0.049	0.011	0.043	<0.010	0.044
Lead	7439-92-1	0.001	mg/L	0.047	0.018	0.035	0.015	0.036



## Analytical Results

Sub-Matrix: WATER  
 (Matrix: WATER)

Sample ID

				Flowback Storage Tank (80%)	Choke	Flowback Storage Tank (80%)	CHOKE	Flowback Storage Tank (80%)
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Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005
Sampling date / time				Result	Result	Result	Result	Result
<b>EG020T: Total Metals by ICP-MS - Continued</b>								
Manganese	7439-96-5	0.001	mg/L	5.34	36.5	5.52	40.0	9.96
Molybdenum	7439-98-7	0.001	mg/L	0.063	0.041	0.063	0.050	0.059
Nickel	7440-02-0	0.001	mg/L	0.044	0.032	0.057	0.046	0.057
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Silver	7440-22-4	0.001	mg/L	<0.010	0.016	<0.010	<0.010	<0.010
Strontium	7440-24-6	0.001	mg/L	86.8	765	111	942	223
Thorium	7440-29-1	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Tin	7440-31-5	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	7440-61-1	0.001	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium	7440-62-2	0.01	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc	7440-66-6	0.005	mg/L	0.322	1.08	0.354	1.02	0.439
Boron	7440-42-8	0.05	mg/L	49.1	39.1	51.3	41.2	50.8
Iron	7439-89-6	0.05	mg/L	14.7	108	15.5	104	29.5
<b>EG035F: Dissolved Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EG035T: Total Recoverable Mercury by FIMS</b>								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<b>EG052G: Silica by Discrete Analyser</b>								
Reactive Silica	----	0.05	mg/L	37.4	19.0	37.0	17.3	38.4
<b>EK010-1: Chlorine</b>								
Total Residual Chlorine	----	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
Free Chlorine	----	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
Monochloramine	10599-90-3	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
Dichloroamine	3400-09-7	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
Combined Chlorine	----	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	<0.10	<0.20	<0.10	<0.20	<0.10
<b>EK026SF: Total CN by Segmented Flow Analyser</b>								
Total Cyanide	57-12-5	0.004	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.7	0.4	0.6	0.4	0.6
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	6.54	54.0	3.74	52.4	5.54
<b>EK057G: Nitrite as N by Discrete Analyser</b>								



## Analytical Results

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Sampling date / time					23-Jun-2021 09:00	23-Jun-2021 10:00	25-Jun-2021 11:00	25-Jun-2021 14:00	04-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005	
				Result	Result	Result	Result	Result	
<b>EK057G: Nitrite as N by Discrete Analyser - Continued</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	0.17	<0.10	<0.10	<0.10	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	0.17	<0.10	<0.10	<0.10	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	68.3	112	69.5	102	76.7	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	68.3	112	69.5	102	76.7	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.81	<10.0	0.75	<5.00	0.73	
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.02	9.31	0.08	3.60	0.64	
<b>EP002: Dissolved Organic Carbon (DOC)</b>									
Dissolved Organic Carbon	----	1	mg/L	1230	1510	1220	1390	1220	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	1280	1530	1250	1410	1220	
<b>EP006 Total Inorganic Carbon</b>									
Total Inorganic Carbon	----	1	mg/L	48	58	28	46	17	
<b>EP007 Total Carbon</b>									
Total Carbon	TC	1	mg/L	1420	1600	1230	1460	1240	
<b>EP010: Formaldehyde</b>									
Formaldehyde	50-00-0	0.1	mg/L	4.9	21.7	5.6	22.3	11.0	
<b>EP025: Oxygen - Dissolved (DO)</b>									
Dissolved Oxygen	----	0.1	mg/L	1.2	1.7	1.2	1.6	7.1	
<b>EP033: C1 - C4 Hydrocarbon Gases</b>									
Methane	74-82-8	10	µg/L	30	1570	60	1610	81	
Ethane	74-84-0	10	µg/L	23	1020	36	1180	52	
Propane	74-98-6	10	µg/L	<10	239	<10	198	<10	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
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	



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Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005	
				Result	Result	Result	Result	Result	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
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	1.4	<1.0	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(b+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	
3-Methylcholanthrene	56-49-5	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	
7.12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
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	1.4	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	50	210	80	170	180	
C10 - C14 Fraction	----	50	µg/L	330	520	380	560	280	
C15 - C28 Fraction	----	100	µg/L	3760	1130	920	3250	950	
C29 - C36 Fraction	----	50	µg/L	3610	250	720	350	540	
^ C10 - C36 Fraction (sum)	----	50	µg/L	7700	1900	2020	4160	1770	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	40	220	70	170	160	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	40	120	60	40	150	
>C10 - C16 Fraction	----	100	µg/L	380	660	300	1000	250	
>C16 - C34 Fraction	----	100	µg/L	6280	1140	1330	2960	1280	
>C34 - C40 Fraction	----	100	µg/L	2020	<100	430	170	240	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	8680	1800	2060	4130	1770	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	380	660	300	990	250	
<b>EP080: BTEXN</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Choke	Flowback Storage Tank (80%)	CHOKE	Flowback Storage Tank (80%)
Sampling date / time					23-Jun-2021 09:00	23-Jun-2021 10:00	25-Jun-2021 11:00	25-Jun-2021 14:00	04-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005	
				Result	Result	Result	Result	Result	
<b>EP080: BTEXN - Continued</b>									
Benzene	71-43-2	1	µg/L	2	36	3	47	4	
Toluene	108-88-3	2	µg/L	2	42	3	55	4	
Ethylbenzene	100-41-4	2	µg/L	<2	<5	<2	2	<2	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	16	<2	18	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	6	<2	6	<2	
^ Total Xylenes	----	2	µg/L	<2	22	<2	24	<2	
^ Sum of BTEX	----	1	µg/L	4	100	6	128	8	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	8	<5	
<b>EP132A: Phenolic Compounds</b>									
2-Chlorophenol	95-57-8	0.05	µg/L	<0.05	<0.05	<0.20	<0.05	<0.05	
4-Chloro-3-methylphenol	59-50-7	0.05	µg/L	<0.05	<0.05	<0.20	<0.05	<0.05	
m-Cresol	108-39-4	0.1	µg/L	0.4	0.7	0.7	3.9	1.1	
o-Cresol	95-48-7	0.1	µg/L	0.7	1.2	1.5	7.8	1.0	
p-Cresol	106-44-5	0.1	µg/L	22.1	1.6	32.0	4.7	32.6	
2,4-Dichlorophenol	120-83-2	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
2,6-Dichlorophenol	87-65-0	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
2,4-Dimethylphenol	105-67-9	0.1	µg/L	0.4	0.8	1.1	3.3	0.7	
Hexachlorophene	70-30-4	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
2-Nitrophenol	88-75-5	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
4-Nitrophenol	100-02-7	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
Pentachlorophenol	87-86-5	0.05	µg/L	<0.05	<0.05	<0.20	<0.05	<0.05	
Phenol	108-95-2	0.1	µg/L	168	4.5	228	15.8	223	
2,3,4,6-Tetrachlorophenol	58-90-2	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
2,4,5-Trichlorophenol	95-95-4	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
2,4,6-Trichlorophenol	88-06-2	0.1	µg/L	<0.1	<0.1	<0.2	<0.1	<0.1	
<b>EP247: Phenolics and Related Compounds</b>									
2,4-Dinitrophenol	51-28-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
2-Methyl-4,6-dinitrophenol	8071-51-0	0.05	µg/L	<0.05	<0.10	<0.05	<0.10	<0.05	
4-Nonylphenol (mixture of isomers)	84852-15-3	0.10	µg/L	<0.10	<1.00	<0.10	<1.00	<0.10	
Hexachlorophene	70-30-4	0.10	µg/L	<0.10	<0.50	<0.10	<0.50	<0.10	
4-Nitrophenol	100-02-7	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
4-Chloro-3-methylphenol	59-50-7	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
Pentachlorophenol	87-86-5	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Choke	Flowback Storage Tank (80%)	CHOKE	Flowback Storage Tank (80%)
Sampling date / time					23-Jun-2021 09:00	23-Jun-2021 10:00	25-Jun-2021 11:00	25-Jun-2021 14:00	04-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2123872-001	ES2123872-002	ES2123872-003	ES2123872-004	ES2123872-005	
				Result	Result	Result	Result	Result	
<b>EP247: Phenolics and Related Compounds - Continued</b>									
Dinoseb	88-85-7	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
Dalapon	75-99-0	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
Bisphenol-A	80-05-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	99.5	976	165	996	269	
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	<0.54	8.65	<0.59	14.4	<0.92	
Gross beta activity - 40K	----	0.10	Bq/L	<1.08	112	<1.18	134	4.91	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	25.2	25.4	25.1	29.6	25.5	
2-Chlorophenol-D4	93951-73-6	1.0	%	49.4	46.5	56.6	51.4	43.1	
2,4,6-Tribromophenol	118-79-6	1.0	%	84.1	66.5	81.6	74.0	61.8	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	67.7	56.5	68.1	67.5	51.5	
Anthracene-d10	1719-06-8	1.0	%	99.1	74.5	65.6	67.6	71.0	
4-Terphenyl-d14	1718-51-0	1.0	%	85.8	72.3	82.0	85.2	63.2	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	111	109	119	107	123	
Toluene-D8	2037-26-5	2	%	101	106	106	98.6	109	
4-Bromofluorobenzene	460-00-4	2	%	105	105	115	104	118	
<b>EP132S: Acid Extractable Surrogates</b>									
2-Fluorophenol	367-12-4	0.1	%	58.6	55.1	81.9	79.3	56.3	
Phenol-d6	13127-88-3	0.1	%	56.5	54.8	73.2	80.6	39.3	
2-Chlorophenol-D4	93951-73-6	0.1	%	70.3	61.5	107	88.4	94.4	
2,4,6-Tribromophenol	118-79-6	0.1	%	86.7	74.0	119	86.4	88.6	
<b>EP132T: Base/Neutral Extractable Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.1	%	73.9	59.3	105	83.2	81.4	
Anthracene-d10	1719-06-8	0.1	%	70.5	62.6	112	87.1	75.0	
4-Terphenyl-d14	1718-51-0	0.1	%	72.8	59.4	119	102	68.3	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		SEPARATOR	----	----	----	----
Sampling date / time		04-Jul-2021 06:00		----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----
				Result	----	----	----	----
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	5.90	----	----	----	----
<b>EA006: Sodium Adsorption Ratio (SAR)</b>								
^ Sodium Adsorption Ratio	----	0.01	-	63.4	----	----	----	----
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	141000	----	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	183000	----	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	46	----	----	----	----
<b>EA250: Gross Alpha and Beta Activity</b>								
Gross beta	----	0.10	Bq/L	195	----	----	----	----
<b>ED036: Alkalinity in Formation Water</b>								
Bicarbonate Alkalinity as HCO3	----	1	mg/L	132	----	----	----	----
Total Alkalinity as HCO3	----	1	mg/L	132	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>								
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	108	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	108	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<20	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	109000	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	20400	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3360	----	----	----	----
Sodium	7440-23-5	1	mg/L	37100	----	----	----	----
Potassium	7440-09-7	1	mg/L	286	----	----	----	----
<b>ED093T: Total Major Cations</b>								
Calcium	7440-70-2	1	mg/L	22700	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3500	----	----	----	----
Sodium	7440-23-5	1	mg/L	39000	----	----	----	----
Potassium	7440-09-7	1	mg/L	306	----	----	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SEPARATOR	---	---	---	---
Sampling date / time				04-Jul-2021 06:00	---	---	---	---	---
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	<0.10	---	---	---	---	---
Antimony	7440-36-0	0.001	mg/L	<0.010	---	---	---	---	---
Arsenic	7440-38-2	0.001	mg/L	<b>0.010</b>	---	---	---	---	---
Beryllium	7440-41-7	0.001	mg/L	<0.010	---	---	---	---	---
Barium	7440-39-3	0.001	mg/L	<b>1910</b>	---	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	---	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	<b>0.014</b>	---	---	---	---	---
Cobalt	7440-48-4	0.001	mg/L	<0.010	---	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.010	---	---	---	---	---
Lead	7439-92-1	0.001	mg/L	<0.010	---	---	---	---	---
Manganese	7439-96-5	0.001	mg/L	<b>50.8</b>	---	---	---	---	---
Molybdenum	7439-98-7	0.001	mg/L	<b>0.020</b>	---	---	---	---	---
Nickel	7440-02-0	0.001	mg/L	<b>0.017</b>	---	---	---	---	---
Selenium	7782-49-2	0.01	mg/L	<0.10	---	---	---	---	---
Silver	7440-22-4	0.001	mg/L	<0.010	---	---	---	---	---
Strontium	7440-24-6	0.001	mg/L	<b>1250</b>	---	---	---	---	---
Thorium	7440-29-1	0.001	mg/L	<0.010	---	---	---	---	---
Tin	7440-31-5	0.001	mg/L	<0.010	---	---	---	---	---
Uranium	7440-61-1	0.001	mg/L	<0.010	---	---	---	---	---
Vanadium	7440-62-2	0.01	mg/L	<0.10	---	---	---	---	---
Zinc	7440-66-6	0.005	mg/L	<b>0.999</b>	---	---	---	---	---
Boron	7440-42-8	0.05	mg/L	<b>26.0</b>	---	---	---	---	---
Iron	7439-89-6	0.05	mg/L	<b>120</b>	---	---	---	---	---
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	<0.10	---	---	---	---	---
Antimony	7440-36-0	0.001	mg/L	<0.010	---	---	---	---	---
Arsenic	7440-38-2	0.001	mg/L	<b>0.014</b>	---	---	---	---	---
Beryllium	7440-41-7	0.001	mg/L	<0.010	---	---	---	---	---
Barium	7440-39-3	0.001	mg/L	<b>2080</b>	---	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	---	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	<b>0.018</b>	---	---	---	---	---
Cobalt	7440-48-4	0.001	mg/L	<0.010	---	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.010	---	---	---	---	---
Lead	7439-92-1	0.001	mg/L	<b>0.014</b>	---	---	---	---	---
Manganese	7439-96-5	0.001	mg/L	<b>54.8</b>	---	---	---	---	---



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SEPARATOR	----	----	----	----
Sampling date / time				04-Jul-2021 06:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Molybdenum	7439-98-7	0.001	mg/L	0.033	----	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.026	----	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.10	----	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.010	----	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	1330	----	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.010	----	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.010	----	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.010	----	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.10	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	1.03	----	----	----	----	----
Boron	7440-42-8	0.05	mg/L	29.7	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	135	----	----	----	----	----
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	20.0	----	----	----	----	----
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Free Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Monochloramine	10599-90-3	0.02	mg/L	<0.20	----	----	----	----	----
Dichloroamine	3400-09-7	0.02	mg/L	<0.20	----	----	----	----	----
Combined Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	<0.20	----	----	----	----	----
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	<0.020	----	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	62.0	----	----	----	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SEPARATOR	----	----	----	----
Sampling date / time			04-Jul-2021 06:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----
				Result	----	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser - Continued</b>								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	103	----	----	----	----
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>								
^ Total Nitrogen as N	----	0.1	mg/L	103	----	----	----	----
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>								
Total Phosphorus as P	----	0.01	mg/L	<10.0	----	----	----	----
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	9.26	----	----	----	----
<b>EP002: Dissolved Organic Carbon (DOC)</b>								
Dissolved Organic Carbon	----	1	mg/L	1110	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	1110	----	----	----	----
<b>EP006 Total Inorganic Carbon</b>								
Total Inorganic Carbon	----	1	mg/L	35	----	----	----	----
<b>EP007 Total Carbon</b>								
Total Carbon	TC	1	mg/L	1080	----	----	----	----
<b>EP010: Formaldehyde</b>								
Formaldehyde	50-00-0	0.1	mg/L	25.2	----	----	----	----
<b>EP025: Oxygen - Dissolved (DO)</b>								
Dissolved Oxygen	----	0.1	mg/L	5.7	----	----	----	----
<b>EP033: C1 - C4 Hydrocarbon Gases</b>								
Methane	74-82-8	10	µg/L	1710	----	----	----	----
Ethane	74-84-0	10	µg/L	1140	----	----	----	----
Propane	74-98-6	10	µg/L	191	----	----	----	----
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>								
Naphthalene	91-20-3	1.0	µg/L	4.7	----	----	----	----
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	1.4	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	1.8	----	----	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SEPARATOR	----	----	----	----
Sampling date / time				04-Jul-2021 06:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----	
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----	
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----	
3-Methylcholanthrene	56-49-5	1.0	µg/L	<1.0	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----	
7,12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	----	----	----	----	
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	7.9	----	----	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	150	----	----	----	----	
C10 - C14 Fraction	----	50	µg/L	220	----	----	----	----	
C15 - C28 Fraction	----	100	µg/L	530	----	----	----	----	
C29 - C36 Fraction	----	50	µg/L	110	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	860	----	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	160	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	50	----	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	260	----	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	520	----	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	780	----	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	250	----	----	----	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	45	----	----	----	----	
Toluene	108-88-3	2	µg/L	49	----	----	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SEPARATOR	----	----	----	----
Sampling date / time				04-Jul-2021 06:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP080: BTEXN - Continued</b>									
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	15	----	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	5	----	----	----	----	
^ Total Xylenes	----	2	µg/L	20	----	----	----	----	
^ Sum of BTEX	----	1	µg/L	114	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	8	----	----	----	----	
<b>EP132A: Phenolic Compounds</b>									
2-Chlorophenol	95-57-8	0.05	µg/L	<0.05	----	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.05	µg/L	<0.05	----	----	----	----	
m-Cresol	108-39-4	0.1	µg/L	1.0	----	----	----	----	
o-Cresol	95-48-7	0.1	µg/L	1.7	----	----	----	----	
p-Cresol	106-44-5	0.1	µg/L	1.7	----	----	----	----	
2,4-Dichlorophenol	120-83-2	0.1	µg/L	<0.1	----	----	----	----	
2,6-Dichlorophenol	87-65-0	0.1	µg/L	<0.1	----	----	----	----	
2,4-Dimethylphenol	105-67-9	0.1	µg/L	0.9	----	----	----	----	
Hexachlorophene	70-30-4	0.1	µg/L	<0.1	----	----	----	----	
2-Nitrophenol	88-75-5	0.1	µg/L	<0.1	----	----	----	----	
4-Nitrophenol	100-02-7	0.1	µg/L	<0.1	----	----	----	----	
Pentachlorophenol	87-86-5	0.05	µg/L	<0.05	----	----	----	----	
Phenol	108-95-2	0.1	µg/L	6.7	----	----	----	----	
2,3,4,6-Tetrachlorophenol	58-90-2	0.1	µg/L	<0.1	----	----	----	----	
2,4,5-Trichlorophenol	95-95-4	0.1	µg/L	<0.1	----	----	----	----	
2,4,6-Trichlorophenol	88-06-2	0.1	µg/L	<0.1	----	----	----	----	
<b>EP247: Phenolics and Related Compounds</b>									
2,4-Dinitrophenol	51-28-5	0.01	µg/L	<0.01	----	----	----	----	
2-Methyl-4,6-dinitrophenol	8071-51-0	0.05	µg/L	<0.10	----	----	----	----	
4-Nonylphenol (mixture of isomers)	84852-15-3	0.10	µg/L	<1.00	----	----	----	----	
Hexachlorophene	70-30-4	0.10	µg/L	<0.50	----	----	----	----	
4-Nitrophenol	100-02-7	0.10	µg/L	<0.10	----	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.10	µg/L	<0.10	----	----	----	----	
Pentachlorophenol	87-86-5	0.10	µg/L	<0.10	----	----	----	----	
Dinoseb	88-85-7	0.10	µg/L	<0.10	----	----	----	----	
Dalapon	75-99-0	0.10	µg/L	<0.10	----	----	----	----	
Bisphenol-A	80-05-7	0.05	µg/L	<0.05	----	----	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SEPARATOR	----	----	----	----
Sampling date / time				04-Jul-2021 06:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2123872-006	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	1300	----	----	----	----	----
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	22.3	----	----	----	----	----
Gross beta activity - 40K	----	0.10	Bq/L	187	----	----	----	----	----
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	24.8	----	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	54.5	----	----	----	----	----
2,4,6-Tribromophenol	118-79-6	1.0	%	67.2	----	----	----	----	----
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	59.0	----	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	79.3	----	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	83.7	----	----	----	----	----
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	122	----	----	----	----	----
Toluene-D8	2037-26-5	2	%	105	----	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	116	----	----	----	----	----
<b>EP132S: Acid Extractable Surrogates</b>									
2-Fluorophenol	367-12-4	0.1	%	79.0	----	----	----	----	----
Phenol-d6	13127-88-3	0.1	%	84.4	----	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	76.8	----	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	65.9	----	----	----	----	----
<b>EP132T: Base/Neutral Extractable Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.1	%	69.4	----	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	77.3	----	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	75.3	----	----	----	----	----



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
<b>EP132S: Acid Extractable Surrogates</b>			
2-Fluorophenol	367-12-4	12	94
Phenol-d6	13127-88-3	10	65
2-Chlorophenol-D4	93951-73-6	37	139
2,4,6-Tribromophenol	118-79-6	35	151
<b>EP132T: Base/Neutral Extractable Surrogates</b>			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144

## Inter-Laboratory Testing

Analysis conducted by ALS Canberra, NATA accreditation no. 992.

(WATER) EA250: Gross Alpha and Beta Activity

(WATER) EA250CA: Gross Alpha and Beta Activity

## CERTIFICATE OF ANALYSIS

**Work Order** : **ES2125934**  
**Client** : **IMPERIAL OIL AND GAS**  
**Contact** : JON BENNETT  
**Address** : LEVEL 7, 151 MACQUARIE STREET  
 SYDNEY NSW, AUSTRALIA 2000  
  
**Telephone** : ----  
**Project** : EP187  
**Order number** : ----  
**C-O-C number** : ----  
**Sampler** : Chris Schilling  
**Site** : ----  
**Quote number** : SY/153/21 V3  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 18  
**Laboratory** : Environmental Division Sydney  
**Contact** : Customer Services ES  
**Address** : 277-289 Woodpark Road Smithfield NSW Australia 2164  
  
**Telephone** : +61-2-8784 8555  
**Date Samples Received** : 16-Jul-2021 06:00  
**Date Analysis Commenced** : 16-Jul-2021  
**Issue Date** : 31-Jul-2021 12:19



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Titus Vimalasiri	Metals Teamleader	Radionuclides, Fyshwick, ACT



## 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.

- EP247: Poor matrix spike recovery for particular compounds due to matrix interferences.
- EP247 :Particular samples required dilution due to sample matrix .
- ED041G: LOR raised for Sulfate on samples 4 and 6 due to sample matrix.
- EK067G: LOR raised for TP on samples 4 and 6 due to sample matrix.
- EK071G: LOR raised for Reavtive P on samples 4 and 6 due to sample matrix.
- EK026SF : LOR raised for Total CN various samples due to sample matrix.
- 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.
- EP080: Batch ES2125934-4 and 6 results has been confirmed by re-analysis.
- EK010, LOR raised for Chlorine due to sample matrix.
- EG020: LOR's have been raised due to matrix interference. (High Total Dissolved Solids)
- EK071G:LOR raised for Reactive P analysis on samples ES2125934-3 and 5 due to sample matrix.
- ED093/EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- TDS by method EA-015 may bias high for samples 5 and 6 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EP002: It has been noted that DOC is greater than TOC for sample 3 and 6, however this difference is within the limits of experimental variation.
- LOR for Gross Alpha and Gross Beta raised due to high solid content.
- EP132: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly. Poor surrogate recovery due to sample matrix interferences.
- EP132: Where reported, Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene.
- 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		RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank	
Sampling date / time		14-Jul-2021 08:50		14-Jul-2021 09:25		14-Jul-2021 06:00		09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EA005P: pH by PC Titrator</b>									
pH Value	----	0.01	pH Unit	7.12	6.91	4.68	5.83	4.74	
<b>EA006: Sodium Adsorption Ratio (SAR)</b>									
^ Sodium Adsorption Ratio	----	0.01	-	----	----	38.9	64.5	37.2	
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm	1100	1160	55100	236000	53000	
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>									
Total Dissolved Solids @180°C	----	10	mg/L	689	702	46200	186000	48400	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	1	mg/L	2	3	----	----	----	
Suspended Solids (SS)	----	5	mg/L	----	----	33	15	51	
<b>EA250: Gross Alpha and Beta Activity</b>									
Gross beta	----	0.10	Bq/L	0.59	0.66	30.0	431	21.4	
<b>ED036: Alkalinity in Formation Water</b>									
Bicarbonate Alkalinity as HCO3	----	1	mg/L	----	----	94	127	112	
Total Alkalinity as HCO3	----	1	mg/L	----	----	94	127	112	
<b>ED037P: Alkalinity by PC Titrator</b>									
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	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	438	426	77	104	92	
Total Alkalinity as CaCO3	----	1	mg/L	438	426	77	104	92	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	73	93	6	<100	4	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	77	88	29700	121000	25500	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	128	127	4610	22500	4080	
Magnesium	7439-95-4	1	mg/L	49	53	808	3610	705	
Sodium	7440-23-5	1	mg/L	43	46	10900	39500	9800	
Potassium	7440-09-7	1	mg/L	15	14	168	307	158	
<b>ED093T: Total Major Cations</b>									
Calcium	7440-70-2	1	mg/L	146	147	4610	23000	4270	
Magnesium	7439-95-4	1	mg/L	48	50	839	3750	769	
Sodium	7440-23-5	1	mg/L	45	48	11100	39800	10400	





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time				14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>ED093T: Total Major Cations - Continued</b>									
Potassium	7440-09-7	1	mg/L	15	15	169	319	165	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	0.29	<0.10	0.27	
Antimony	7440-36-0	0.001	mg/L	----	----	0.035	0.013	0.034	
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.002	0.022	0.015	0.021	
Beryllium	7440-41-7	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Barium	7440-39-3	0.001	mg/L	0.124	0.139	184	2260	141	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0010	<0.0010	<0.0010	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.014	0.021	0.014	
Cobalt	7440-48-4	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.076	<0.010	0.071	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.036	<0.010	0.034	
Lithium	7439-93-2	0.001	mg/L	0.013	0.018	----	----	----	
Manganese	7439-96-5	0.001	mg/L	0.323	0.645	12.2	55.3	10.7	
Molybdenum	7439-98-7	0.001	mg/L	----	----	0.052	0.052	0.051	
Nickel	7440-02-0	0.001	mg/L	----	----	0.056	0.023	0.054	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.10	<0.10	<0.10	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.010	0.016	<0.010	
Strontium	7440-24-6	0.001	mg/L	0.484	0.510	244	1310	213	
Thorium	7440-29-1	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Tin	7440-31-5	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Uranium	7440-61-1	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Vanadium	7440-62-2	0.01	mg/L	----	----	<0.10	<0.10	<0.10	
Zinc	7440-66-6	0.005	mg/L	0.013	0.013	0.479	1.14	0.439	
Boron	7440-42-8	0.05	mg/L	0.08	0.10	43.1	20.5	41.7	
Iron	7439-89-6	0.05	mg/L	0.50	1.05	31.1	160	27.4	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	0.38	0.14	0.37	
Antimony	7440-36-0	0.001	mg/L	----	----	0.039	0.017	0.036	
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.002	0.022	0.018	0.021	
Beryllium	7440-41-7	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Barium	7440-39-3	0.001	mg/L	0.129	0.143	181	2160	135	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0010	<0.0010	<0.0010	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.015	0.028	0.015	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time				14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Cobalt	7440-48-4	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<b>0.082</b>	<b>0.019</b>	<b>0.084</b>	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<b>0.036</b>	<b>0.035</b>	<b>0.034</b>	
Lithium	7439-93-2	0.001	mg/L	<b>0.032</b>	<b>0.034</b>	----	----	----	
Manganese	7439-96-5	0.001	mg/L	<b>0.326</b>	<b>0.668</b>	<b>12.5</b>	<b>56.5</b>	<b>11.4</b>	
Molybdenum	7439-98-7	0.001	mg/L	----	----	<b>0.054</b>	<b>0.058</b>	<b>0.055</b>	
Nickel	7440-02-0	0.001	mg/L	----	----	<b>0.054</b>	<b>0.028</b>	<b>0.057</b>	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.10	<0.10	<0.10	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.010	<b>0.015</b>	<0.010	
Strontium	7440-24-6	0.001	mg/L	<b>0.499</b>	<b>0.505</b>	<b>244</b>	<b>1260</b>	<b>217</b>	
Thorium	7440-29-1	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Tin	7440-31-5	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Uranium	7440-61-1	0.001	mg/L	----	----	<0.010	<0.010	<0.010	
Vanadium	7440-62-2	0.01	mg/L	----	----	<0.10	<0.10	<0.10	
Zinc	7440-66-6	0.005	mg/L	<b>0.013</b>	<b>0.013</b>	<b>0.490</b>	<b>1.21</b>	<b>0.473</b>	
Boron	7440-42-8	0.05	mg/L	<b>0.10</b>	<b>0.10</b>	<b>50.2</b>	<b>23.1</b>	<b>50.3</b>	
Iron	7439-89-6	0.05	mg/L	<b>0.79</b>	<b>1.28</b>	<b>33.0</b>	<b>177</b>	<b>30.7</b>	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	<b>30.5</b>	<b>29.6</b>	<b>43.6</b>	<b>13.0</b>	<b>38.7</b>	
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
Free Chlorine	----	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
Monochloramine	10599-90-3	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
Dichloroamine	3400-09-7	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
Combined Chlorine	----	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	----	----	<0.10	<0.20	<0.10	
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	----	----	<0.008	<0.020	<0.008	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	<b>0.3</b>	<b>0.4</b>	<b>0.5</b>	<b>0.3</b>	<b>0.5</b>	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time				14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	----	----	7.86	78.6	7.55	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	0.05	<0.01	0.01	<0.01	0.01	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	<0.01	0.01	<0.01	0.01	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	----	83.6	130	84.1	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	----	----	83.6	130	84.1	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	----	----	0.75	<5.00	0.72	
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	----	----	<0.50	<5.00	<0.50	
<b>EN055: Ionic Balance</b>									
∅ Total Anions	----	0.01	meq/L	12.4	12.9	----	----	----	
∅ Total Cations	----	0.01	meq/L	12.7	13.0	----	----	----	
∅ Ionic Balance	----	0.01	%	0.92	0.49	----	----	----	
<b>EP002: Dissolved Organic Carbon (DOC)</b>									
Dissolved Organic Carbon	----	1	mg/L	----	----	1170	969	1180	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	----	----	1140	973	1200	
<b>EP006 Total Inorganic Carbon</b>									
Total Inorganic Carbon	----	1	mg/L	----	----	6	36	9	
<b>EP007 Total Carbon</b>									
Total Carbon	TC	1	mg/L	----	----	1200	989	1210	
<b>EP010: Formaldehyde</b>									
Formaldehyde	50-00-0	0.1	mg/L	----	----	15.8	31.0	15.0	
<b>EP025: Oxygen - Dissolved (DO)</b>									
Dissolved Oxygen	----	0.1	mg/L	----	----	7.7	6.0	6.5	
<b>EP033: C1 - C4 Hydrocarbon Gases</b>									
Methane	74-82-8	10	µg/L	30	14	34	1720	28	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time					14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EP033: C1 - C4 Hydrocarbon Gases - Continued</b>									
Ethane	74-84-0	10	µg/L	<10	<10	22	1220	22	
Propane	74-98-6	10	µg/L	<10	<10	<10	202	<10	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	5.4	<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	3.3	<1.0	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	6.1	<1.0	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(b+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	
3-Methylcholanthrene	56-49-5	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	
7.12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
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	14.8	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<20	<20	1250	140	1140	
C10 - C14 Fraction	----	50	µg/L	<50	<50	660	380	660	
C15 - C28 Fraction	----	100	µg/L	<100	<100	750	1360	870	
C29 - C36 Fraction	----	50	µg/L	<50	<50	400	520	460	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	1810	2260	1990	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	1220	140	1110	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	1220	50	1110	
>C10 - C16 Fraction	----	100	µg/L	<100	<100	560	560	580	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time				14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>									
>C16 - C34 Fraction	----	100	µg/L	<100	<100	950	1540	1100	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	210	420	290	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	1720	2520	1970	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	560	550	580	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	<1	1	32	1	
Toluene	108-88-3	2	µg/L	<2	<2	<2	37	<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	13	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	4	<2	
^ Total Xylenes	----	2	µg/L	<2	<2	<2	17	<2	
^ Sum of BTEX	----	1	µg/L	<1	<1	1	86	1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	6	<5	
<b>EP132A: Phenolic Compounds</b>									
2-Chlorophenol	95-57-8	0.05	µg/L	----	----	<0.19	<0.05	<0.05	
4-Chloro-3-methylphenol	59-50-7	0.05	µg/L	----	----	<0.19	<0.05	<0.05	
m-Cresol	108-39-4	0.1	µg/L	----	----	0.4	0.7	0.5	
o-Cresol	95-48-7	0.1	µg/L	----	----	0.7	1.2	0.8	
p-Cresol	106-44-5	0.1	µg/L	----	----	19.1	1.3	26.3	
2,4-Dichlorophenol	120-83-2	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
2,6-Dichlorophenol	87-65-0	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
2,4-Dimethylphenol	105-67-9	0.1	µg/L	----	----	0.4	0.4	0.5	
Hexachlorophene	70-30-4	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
2-Nitrophenol	88-75-5	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
4-Nitrophenol	100-02-7	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
Pentachlorophenol	87-86-5	0.05	µg/L	----	----	<0.19	<0.05	<0.05	
Phenol	108-95-2	0.1	µg/L	----	----	105	5.0	152	
2,3,4,6-Tetrachlorophenol	58-90-2	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
2,4,5-Trichlorophenol	95-95-4	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
2,4,6-Trichlorophenol	88-06-2	0.1	µg/L	----	----	<0.2	<0.1	<0.1	
<b>EP247: Phenolics and Related Compounds</b>									
2,4-Dinitrophenol	51-28-5	0.01	µg/L	----	----	<0.01	<0.01	<0.01	
2-Methyl-4,6-dinitrophenol	8071-51-0	0.05	µg/L	----	----	<0.05	<0.05	<0.05	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time				14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00	
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EP247: Phenolics and Related Compounds - Continued</b>									
4-Nonylphenol (mixture of isomers)	84852-15-3	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
Hexachlorophene	70-30-4	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
4-Nitrophenol	100-02-7	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
4-Chloro-3-methylphenol	59-50-7	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
Pentachlorophenol	87-86-5	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
Dinoseb	88-85-7	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
Dalapon	75-99-0	0.10	µg/L	----	----	<0.10	<0.10	<0.10	
Bisphenol-A	80-05-7	0.05	µg/L	----	----	1.63	<0.05	<0.05	
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	----	----	346	1830	319	
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	0.19	0.29	6.88	71.0	3.19	
Gross beta activity - 40K	----	0.10	Bq/L	0.16	0.25	25.4	422	17.3	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	23.4	24.2	24.1	23.3	25.1	
2-Chlorophenol-D4	93951-73-6	1.0	%	58.9	59.2	63.6	57.6	51.5	
2,4,6-Tribromophenol	118-79-6	1.0	%	42.7	54.4	85.7	80.8	95.6	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	77.8	69.5	69.4	65.0	76.7	
Anthracene-d10	1719-06-8	1.0	%	78.3	78.6	75.5	81.8	81.0	
4-Terphenyl-d14	1718-51-0	1.0	%	94.2	98.7	88.9	99.6	96.9	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	101	99.2	91.4	98.7	94.5	
Toluene-D8	2037-26-5	2	%	109	105	106	113	113	
4-Bromofluorobenzene	460-00-4	2	%	115	112	107	115	114	
<b>EP132S: Acid Extractable Surrogates</b>									
2-Fluorophenol	367-12-4	0.1	%	----	----	56.9	51.5	40.5	
Phenol-d6	13127-88-3	0.1	%	----	----	53.5	51.3	56.3	
2-Chlorophenol-D4	93951-73-6	0.1	%	----	----	62.1	48.6	41.5	
2,4,6-Tribromophenol	118-79-6	0.1	%	----	----	53.8	43.0	37.3	
<b>EP132T: Base/Neutral Extractable Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.1	%	----	----	57.4	45.7	35.9	
Anthracene-d10	1719-06-8	0.1	%	----	----	76.9	54.9	42.6	





**Analytical Results**

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN041678	RN041800	Flowback Storage Tank (80%)	Separator	Flowback Storage Tank
Sampling date / time					14-Jul-2021 08:50	14-Jul-2021 09:25	14-Jul-2021 06:00	14-Jul-2021 06:00	09-Jul-2021 06:00
Compound	CAS Number	LOR	Unit	ES2125934-001	ES2125934-002	ES2125934-003	ES2125934-004	ES2125934-005	
				Result	Result	Result	Result	Result	
<b>EP132T: Base/Neutral Extractable Surrogates - Continued</b>									
4-Terphenyl-d14	1718-51-0	0.1	%	----	----	63.4	43.6	37.5	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		Separator	----	----	----	----
Sampling date / time		09-Jul-2021 06:00		----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----	-----
				Result	----	----	----	----
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	5.83	----	----	----	----
<b>EA006: Sodium Adsorption Ratio (SAR)</b>								
^ Sodium Adsorption Ratio	----	0.01	-	63.6	----	----	----	----
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	229000	----	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	189000	----	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
<b>EA250: Gross Alpha and Beta Activity</b>								
Gross beta	----	0.10	Bq/L	385	----	----	----	----
<b>ED036: Alkalinity in Formation Water</b>								
Bicarbonate Alkalinity as HCO3	----	1	mg/L	115	----	----	----	----
Total Alkalinity as HCO3	----	1	mg/L	115	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>								
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	94	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	94	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<100	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	119000	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	20200	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3280	----	----	----	----
Sodium	7440-23-5	1	mg/L	37000	----	----	----	----
Potassium	7440-09-7	1	mg/L	298	----	----	----	----
<b>ED093T: Total Major Cations</b>								
Calcium	7440-70-2	1	mg/L	23100	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3400	----	----	----	----
Sodium	7440-23-5	1	mg/L	36400	----	----	----	----
Potassium	7440-09-7	1	mg/L	299	----	----	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Separator	---	---	---	---
Sampling date / time				09-Jul-2021 06:00	---	---	---	---	---
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	<0.10	---	---	---	---	---
Antimony	7440-36-0	0.001	mg/L	<0.010	---	---	---	---	---
Arsenic	7440-38-2	0.001	mg/L	<b>0.010</b>	---	---	---	---	---
Beryllium	7440-41-7	0.001	mg/L	<0.010	---	---	---	---	---
Barium	7440-39-3	0.001	mg/L	<b>1980</b>	---	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	---	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	<b>0.012</b>	---	---	---	---	---
Cobalt	7440-48-4	0.001	mg/L	<0.010	---	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.010	---	---	---	---	---
Lead	7439-92-1	0.001	mg/L	<0.010	---	---	---	---	---
Manganese	7439-96-5	0.001	mg/L	<b>46.9</b>	---	---	---	---	---
Molybdenum	7439-98-7	0.001	mg/L	<b>0.021</b>	---	---	---	---	---
Nickel	7440-02-0	0.001	mg/L	<b>0.017</b>	---	---	---	---	---
Selenium	7782-49-2	0.01	mg/L	<0.10	---	---	---	---	---
Silver	7440-22-4	0.001	mg/L	<b>0.012</b>	---	---	---	---	---
Strontium	7440-24-6	0.001	mg/L	<b>1140</b>	---	---	---	---	---
Thorium	7440-29-1	0.001	mg/L	<0.010	---	---	---	---	---
Tin	7440-31-5	0.001	mg/L	<0.010	---	---	---	---	---
Uranium	7440-61-1	0.001	mg/L	<0.010	---	---	---	---	---
Vanadium	7440-62-2	0.01	mg/L	<0.10	---	---	---	---	---
Zinc	7440-66-6	0.005	mg/L	<b>1.03</b>	---	---	---	---	---
Boron	7440-42-8	0.05	mg/L	<b>20.8</b>	---	---	---	---	---
Iron	7439-89-6	0.05	mg/L	<b>110</b>	---	---	---	---	---
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	<0.10	---	---	---	---	---
Antimony	7440-36-0	0.001	mg/L	<0.010	---	---	---	---	---
Arsenic	7440-38-2	0.001	mg/L	<0.010	---	---	---	---	---
Beryllium	7440-41-7	0.001	mg/L	<0.010	---	---	---	---	---
Barium	7440-39-3	0.001	mg/L	<b>2130</b>	---	---	---	---	---
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	---	---	---	---	---
Chromium	7440-47-3	0.001	mg/L	<b>0.014</b>	---	---	---	---	---
Cobalt	7440-48-4	0.001	mg/L	<0.010	---	---	---	---	---
Copper	7440-50-8	0.001	mg/L	<0.010	---	---	---	---	---
Lead	7439-92-1	0.001	mg/L	<0.010	---	---	---	---	---
Manganese	7439-96-5	0.001	mg/L	<b>47.1</b>	---	---	---	---	---



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Separator	----	----	----	----
Sampling date / time				09-Jul-2021 06:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Molybdenum	7439-98-7	0.001	mg/L	0.021	----	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.016	----	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.10	----	----	----	----	----
Silver	7440-22-4	0.001	mg/L	0.012	----	----	----	----	----
Strontium	7440-24-6	0.001	mg/L	1250	----	----	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.010	----	----	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.010	----	----	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.010	----	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.10	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	1.04	----	----	----	----	----
Boron	7440-42-8	0.05	mg/L	22.6	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	136	----	----	----	----	----
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	14.0	----	----	----	----	----
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Free Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Monochloramine	10599-90-3	0.02	mg/L	<0.20	----	----	----	----	----
Dichloroamine	3400-09-7	0.02	mg/L	<0.20	----	----	----	----	----
Combined Chlorine	----	0.02	mg/L	<0.20	----	----	----	----	----
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	<0.20	----	----	----	----	----
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	<0.020	----	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	80.0	----	----	----	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	Separator	----	----	----	----
Sampling date / time		09-Jul-2021 06:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----
				Result	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser - Continued</b>							
Nitrate as N	14797-55-8	0.01	mg/L	0.01	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>							
Nitrite + Nitrate as N	----	0.01	mg/L	0.01	----	----	----
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>							
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	120	----	----	----
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>							
^ Total Nitrogen as N	----	0.1	mg/L	120	----	----	----
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>							
Total Phosphorus as P	----	0.01	mg/L	<5.00	----	----	----
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>							
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<5.00	----	----	----
<b>EP002: Dissolved Organic Carbon (DOC)</b>							
Dissolved Organic Carbon	----	1	mg/L	969	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>							
Total Organic Carbon	----	1	mg/L	966	----	----	----
<b>EP006 Total Inorganic Carbon</b>							
Total Inorganic Carbon	----	1	mg/L	33	----	----	----
<b>EP007 Total Carbon</b>							
Total Carbon	TC	1	mg/L	973	----	----	----
<b>EP010: Formaldehyde</b>							
Formaldehyde	50-00-0	0.1	mg/L	22.6	----	----	----
<b>EP025: Oxygen - Dissolved (DO)</b>							
Dissolved Oxygen	----	0.1	mg/L	6.9	----	----	----
<b>EP033: C1 - C4 Hydrocarbon Gases</b>							
Methane	74-82-8	10	µg/L	1440	----	----	----
Ethane	74-84-0	10	µg/L	939	----	----	----
Propane	74-98-6	10	µg/L	171	----	----	----
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>							
Naphthalene	91-20-3	1.0	µg/L	1.3	----	----	----
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	----	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Separator	----	----	----	----
Sampling date / time				09-Jul-2021 06:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----	----
3-Methylcholanthrene	56-49-5	1.0	µg/L	<1.0	----	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----	----
7.12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	----	----	----	----	----
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	<b>1.3</b>	----	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----	----
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<b>140</b>	----	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<b>70</b>	----	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<b>160</b>	----	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<b>60</b>	----	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<b>290</b>	----	----	----	----	----
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<b>140</b>	----	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<b>50</b>	----	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<b>180</b>	----	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<b>180</b>	----	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	----
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<b>35</b>	----	----	----	----	----
Toluene	108-88-3	2	µg/L	<b>39</b>	----	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	----





## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Separator	----	----	----	----
Sampling date / time				09-Jul-2021 06:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP080: BTEXN - Continued</b>									
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	12	----	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	4	----	----	----	----	
^ Total Xylenes	----	2	µg/L	16	----	----	----	----	
^ Sum of BTEX	----	1	µg/L	90	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	
<b>EP132A: Phenolic Compounds</b>									
2-Chlorophenol	95-57-8	0.05	µg/L	<0.05	----	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.05	µg/L	<0.05	----	----	----	----	
m-Cresol	108-39-4	0.1	µg/L	0.8	----	----	----	----	
o-Cresol	95-48-7	0.1	µg/L	1.5	----	----	----	----	
p-Cresol	106-44-5	0.1	µg/L	1.5	----	----	----	----	
2,4-Dichlorophenol	120-83-2	0.1	µg/L	<0.1	----	----	----	----	
2,6-Dichlorophenol	87-65-0	0.1	µg/L	<0.1	----	----	----	----	
2,4-Dimethylphenol	105-67-9	0.1	µg/L	0.8	----	----	----	----	
Hexachlorophene	70-30-4	0.1	µg/L	<0.1	----	----	----	----	
2-Nitrophenol	88-75-5	0.1	µg/L	<0.1	----	----	----	----	
4-Nitrophenol	100-02-7	0.1	µg/L	<0.1	----	----	----	----	
Pentachlorophenol	87-86-5	0.05	µg/L	<0.05	----	----	----	----	
Phenol	108-95-2	0.1	µg/L	4.7	----	----	----	----	
2,3,4,6-Tetrachlorophenol	58-90-2	0.1	µg/L	<0.1	----	----	----	----	
2,4,5-Trichlorophenol	95-95-4	0.1	µg/L	<0.1	----	----	----	----	
2,4,6-Trichlorophenol	88-06-2	0.1	µg/L	<0.1	----	----	----	----	
<b>EP247: Phenolics and Related Compounds</b>									
2,4-Dinitrophenol	51-28-5	0.01	µg/L	<0.01	----	----	----	----	
2-Methyl-4,6-dinitrophenol	8071-51-0	0.05	µg/L	<0.05	----	----	----	----	
4-Nonylphenol (mixture of isomers)	84852-15-3	0.10	µg/L	<0.10	----	----	----	----	
Hexachlorophene	70-30-4	0.10	µg/L	<0.10	----	----	----	----	
4-Nitrophenol	100-02-7	0.10	µg/L	<0.10	----	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.10	µg/L	<0.10	----	----	----	----	
Pentachlorophenol	87-86-5	0.10	µg/L	<0.10	----	----	----	----	
Dinoseb	88-85-7	0.10	µg/L	<0.10	----	----	----	----	
Dalapon	75-99-0	0.10	µg/L	<0.10	----	----	----	----	
Bisphenol-A	80-05-7	0.05	µg/L	<0.05	----	----	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID	Separator	----	----	----	----
		Sampling date / time	09-Jul-2021 06:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2125934-006	-----	-----	-----
				Result	----	----	----
<b>ED009: Anions</b>							
Bromide	24959-67-9	0.010	mg/L	1980	----	----	----
<b>EA250CA: Gross Alpha and Beta Activity</b>							
Gross alpha	----	0.05	Bq/L	82.8	----	----	----
Gross beta activity - 40K	----	0.10	Bq/L	376	----	----	----
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>							
Phenol-d6	13127-88-3	1.0	%	28.9	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	52.1	----	----	----
2,4,6-Tribromophenol	118-79-6	1.0	%	61.8	----	----	----
<b>EP075(SIM)T: PAH Surrogates</b>							
2-Fluorobiphenyl	321-60-8	1.0	%	56.9	----	----	----
Anthracene-d10	1719-06-8	1.0	%	70.6	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	95.2	----	----	----
<b>EP080S: TPH(V)/BTEX Surrogates</b>							
1,2-Dichloroethane-D4	17060-07-0	2	%	96.6	----	----	----
Toluene-D8	2037-26-5	2	%	112	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	111	----	----	----
<b>EP132S: Acid Extractable Surrogates</b>							
2-Fluorophenol	367-12-4	0.1	%	36.7	----	----	----
Phenol-d6	13127-88-3	0.1	%	36.7	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	38.3	----	----	----
2,4,6-Tribromophenol	118-79-6	0.1	%	33.9	----	----	----
<b>EP132T: Base/Neutral Extractable Surrogates</b>							
2-Fluorobiphenyl	321-60-8	0.1	%	37.0	----	----	----
Anthracene-d10	1719-06-8	0.1	%	40.5	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	36.6	----	----	----



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
<b>EP132S: Acid Extractable Surrogates</b>			
2-Fluorophenol	367-12-4	12	94
Phenol-d6	13127-88-3	10	65
2-Chlorophenol-D4	93951-73-6	37	139
2,4,6-Tribromophenol	118-79-6	35	151
<b>EP132T: Base/Neutral Extractable Surrogates</b>			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144

## Inter-Laboratory Testing

Analysis conducted by ALS Canberra, NATA accreditation no. 992.

(WATER) EA250: Gross Alpha and Beta Activity

(WATER) EA250CA: Gross Alpha and Beta Activity

## CERTIFICATE OF ANALYSIS

**Work Order** : **ES2127207**  
**Client** : **IMPERIAL OIL AND GAS**  
**Contact** : JON BENNETT  
**Address** : LEVEL 7, 151 MACQUARIE STREET  
 SYDNEY NSW, AUSTRALIA 2000  
  
**Telephone** : ----  
**Project** : EP187  
**Order number** : ----  
**C-O-C number** : ----  
**Sampler** : Chris Schilling  
**Site** : ----  
**Quote number** : SY/153/21 V3  
**No. of samples received** : 2  
**No. of samples analysed** : 2

**Page** : 1 of 10  
**Laboratory** : Environmental Division Sydney  
**Contact** : Customer Services ES  
**Address** : 277-289 Woodpark Road Smithfield NSW Australia 2164  
  
**Telephone** : +61-2-8784 8555  
**Date Samples Received** : 27-Jul-2021 06:30  
**Date Analysis Commenced** : 27-Jul-2021  
**Issue Date** : 05-Aug-2021 11:14



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Titus Vimalasiri	Metals Teamleader	Radionuclides, Fyshwick, ACT
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.

- EP247 :Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP247: Matrix spike recovery not determined due to dilution requirement.
- EK067G: LOR raised for Total Phosphorus on sample 2 due to sample matrix.
- ED041G: LOR raised for Sulfate on sample 2 due to sample matrix.
- EK026SF: LOR raised for Total CN sample1 due to sample matrix.
- Ek026SF: LOR raised for Total CN sample2 due to sample matrix.
- 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.
- EK010, LOR raised due to sample matrix.
- EG035: Poor matrix spike recovery was obtained for Mercury on sample ES2127207 # 2. Confirmed by re-analysis.
- ED093/ EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- EG020: LORs have been raised for some samples due to matrix interference (High sample salinity)
- EK067G:LOR raised due to sample matrix.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EK067G/EK071G: It has been noted that Reactive Phosphorus is greater than Total Phosphorus on sample 1, however this difference is within the limits of experimental variation.
- LOR for Gross Alpha and Gross Beta raised due to high solid content.
- EP080: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP132: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP132: Where reported, Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene.
- 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		Flowback Storage Tank (80%)	Seperator	----	----	----
		Sampling date / time		16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----
				Result	Result	---	---	---
<b>EA005P: pH by PC Titrator</b>								
pH Value	----	0.01	pH Unit	4.83	6.25	----	----	----
<b>EA006: Sodium Adsorption Ratio (SAR)</b>								
^ Sodium Adsorption Ratio	----	0.01	-	42.3	70.1	----	----	----
<b>EA010P: Conductivity by PC Titrator</b>								
Electrical Conductivity @ 25°C	----	1	µS/cm	67500	257000	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	47000	182000	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	94	<5	----	----	----
<b>EA250: Gross Alpha and Beta Activity</b>								
Gross beta	----	0.10	Bq/L	20.4	280	----	----	----
<b>ED036: Alkalinity in Formation Water</b>								
Bicarbonate Alkalinity as HCO3	----	1	mg/L	179	142	----	----	----
Total Alkalinity as HCO3	----	1	mg/L	179	142	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	147	116	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	147	116	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	<100	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	25200	120000	----	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	4970	23200	----	----	----
Magnesium	7439-95-4	1	mg/L	933	4030	----	----	----
Sodium	7440-23-5	1	mg/L	12400	44000	----	----	----
Potassium	7440-09-7	1	mg/L	162	337	----	----	----
<b>ED093T: Total Major Cations</b>								
Calcium	7440-70-2	1	mg/L	4840	22800	----	----	----
Magnesium	7439-95-4	1	mg/L	910	3920	----	----	----
Sodium	7440-23-5	1	mg/L	12100	42300	----	----	----
Potassium	7440-09-7	1	mg/L	156	334	----	----	----





## Analytical Results

Sub-Matrix: WATER  
 (Matrix: WATER)

Sample ID

				Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----
				Result	Result	---	---	---

### EG020F: Dissolved Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	0.24	<0.20	----	----	----
Antimony	7440-36-0	0.001	mg/L	0.045	<0.020	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.019	<0.020	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.010	<0.020	----	----	----
Barium	7440-39-3	0.001	mg/L	201	2290	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0020	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.012	<0.020	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.010	<0.020	----	----	----
Copper	7440-50-8	0.001	mg/L	0.093	<0.020	----	----	----
Lead	7439-92-1	0.001	mg/L	0.033	<0.020	----	----	----
Manganese	7439-96-5	0.001	mg/L	13.0	57.0	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.054	0.060	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.060	0.023	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.20	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.010	<0.020	----	----	----
Strontium	7440-24-6	0.001	mg/L	279	1510	----	----	----
Thorium	7440-29-1	0.001	mg/L	<0.010	<0.020	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.010	<0.020	----	----	----
Uranium	7440-61-1	0.001	mg/L	<0.010	<0.020	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.10	<0.20	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.458	0.902	----	----	----
Boron	7440-42-8	0.05	mg/L	47.9	23.7	----	----	----
Iron	7439-89-6	0.05	mg/L	36.9	172	----	----	----

### EG020T: Total Metals by ICP-MS

Aluminium	7429-90-5	0.01	mg/L	0.24	<0.20	----	----	----
Antimony	7440-36-0	0.001	mg/L	0.048	<0.020	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.020	<0.020	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.010	<0.020	----	----	----
Barium	7440-39-3	0.001	mg/L	200	2300	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0020	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.013	<0.020	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.010	<0.020	----	----	----
Copper	7440-50-8	0.001	mg/L	0.111	<0.020	----	----	----
Lead	7439-92-1	0.001	mg/L	0.032	<0.020	----	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----	
				Result	Result	---	---	---	
<b>EG020T: Total Metals by ICP-MS - Continued</b>									
Manganese	7439-96-5	0.001	mg/L	12.4	54.8	----	----	----	
Molybdenum	7439-98-7	0.001	mg/L	0.058	0.062	----	----	----	
Nickel	7440-02-0	0.001	mg/L	0.056	0.027	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.20	----	----	----	
Silver	7440-22-4	0.001	mg/L	<0.010	<0.020	----	----	----	
Strontium	7440-24-6	0.001	mg/L	278	1550	----	----	----	
Thorium	7440-29-1	0.001	mg/L	<0.010	<0.020	----	----	----	
Tin	7440-31-5	0.001	mg/L	<0.010	<0.020	----	----	----	
Uranium	7440-61-1	0.001	mg/L	<0.010	<0.020	----	----	----	
Vanadium	7440-62-2	0.01	mg/L	<0.10	<0.20	----	----	----	
Zinc	7440-66-6	0.005	mg/L	0.466	0.922	----	----	----	
Boron	7440-42-8	0.05	mg/L	47.0	22.0	----	----	----	
Iron	7439-89-6	0.05	mg/L	35.9	162	----	----	----	
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----	
<b>EG035T: Total Recoverable Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----	
<b>EG052G: Silica by Discrete Analyser</b>									
Reactive Silica	----	0.05	mg/L	39.7	39.0	----	----	----	
<b>EK010-1: Chlorine</b>									
Total Residual Chlorine	----	0.02	mg/L	<0.10	<0.20	----	----	----	
Free Chlorine	----	0.02	mg/L	<0.10	<0.20	----	----	----	
Monochloramine	10599-90-3	0.02	mg/L	<0.10	<0.20	----	----	----	
Dichloroamine	3400-09-7	0.02	mg/L	<0.10	<0.20	----	----	----	
Combined Chlorine	----	0.02	mg/L	<0.10	<0.20	----	----	----	
Free Chlorine as Sodium Hypochlorite	----	0.02	mg/L	<0.10	<0.20	----	----	----	
<b>EK026SF: Total CN by Segmented Flow Analyser</b>									
Total Cyanide	57-12-5	0.004	mg/L	<0.020	<0.008	----	----	----	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.7	0.6	----	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	7.77	82.8	----	----	----	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----	
				Result	Result	---	---	---	
<b>EK057G: Nitrite as N by Discrete Analyser - Continued</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	----	----	----	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	----	----	----	
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	83.7	116	----	----	----	
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L	83.7	116	----	----	----	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	1.02	<5.00	----	----	----	
<b>EK071G: Reactive Phosphorus as P by discrete analyser</b>									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	1.09	2.66	----	----	----	
<b>EP002: Dissolved Organic Carbon (DOC)</b>									
Dissolved Organic Carbon	----	1	mg/L	1190	910	----	----	----	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	1210	911	----	----	----	
<b>EP006 Total Inorganic Carbon</b>									
Total Inorganic Carbon	----	1	mg/L	<1	12	----	----	----	
<b>EP007 Total Carbon</b>									
Total Carbon	TC	1	mg/L	1220	920	----	----	----	
<b>EP010: Formaldehyde</b>									
Formaldehyde	50-00-0	0.1	mg/L	10.7	24.0	----	----	----	
<b>EP025: Oxygen - Dissolved (DO)</b>									
Dissolved Oxygen	----	0.1	mg/L	7.0	4.7	----	----	----	
<b>EP033: C1 - C4 Hydrocarbon Gases</b>									
Methane	74-82-8	10	µg/L	43	754	----	----	----	
Ethane	74-84-0	10	µg/L	29	338	----	----	----	
Propane	74-98-6	10	µg/L	<10	66	----	----	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1.0	µg/L	<1.0	1.2	----	----	----	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----	
				Result	Result	---	---	---	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued</b>									
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	1.1	----	----	----	
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	----	----	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----	
3-Methylcholanthrene	56-49-5	1.0	µg/L	<1.0	<1.0	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----	
7,12-Dimethylbenz(a)anthracene	57-97-6	1.0	µg/L	<1.0	<1.0	----	----	----	
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	2.3	----	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	----	----	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	320	130	----	----	----	
C10 - C14 Fraction	----	50	µg/L	580	<50	----	----	----	
C15 - C28 Fraction	----	100	µg/L	790	230	----	----	----	
C29 - C36 Fraction	----	50	µg/L	410	120	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	1780	350	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	300	120	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	300	<100	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	450	<100	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	990	280	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	300	<100	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	1740	280	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	450	<100	----	----	----	
<b>EP080: BTEXN</b>									



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----	
				Result	Result	---	---	---	
<b>EP080: BTEXN - Continued</b>									
Benzene	71-43-2	1	µg/L	2	20	----	----	----	
Toluene	108-88-3	2	µg/L	2	20	----	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	<5	----	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	6	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	<5	----	----	----	
^ Total Xylenes	----	2	µg/L	<2	6	----	----	----	
^ Sum of BTEX	----	1	µg/L	4	46	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----	
<b>EP132A: Phenolic Compounds</b>									
2-Chlorophenol	95-57-8	0.05	µg/L	<0.19	<0.05	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.05	µg/L	<0.19	<0.05	----	----	----	
m-Cresol	108-39-4	0.1	µg/L	0.5	0.6	----	----	----	
o-Cresol	95-48-7	0.1	µg/L	0.9	0.9	----	----	----	
p-Cresol	106-44-5	0.1	µg/L	24.0	1.1	----	----	----	
2,4-Dichlorophenol	120-83-2	0.1	µg/L	<0.2	<0.1	----	----	----	
2,6-Dichlorophenol	87-65-0	0.1	µg/L	<0.2	<0.1	----	----	----	
2,4-Dimethylphenol	105-67-9	0.1	µg/L	0.5	0.7	----	----	----	
Hexachlorophene	70-30-4	0.1	µg/L	<0.2	<0.1	----	----	----	
2-Nitrophenol	88-75-5	0.1	µg/L	<0.2	<0.1	----	----	----	
4-Nitrophenol	100-02-7	0.1	µg/L	<0.2	<0.1	----	----	----	
Pentachlorophenol	87-86-5	0.05	µg/L	<0.19	<0.05	----	----	----	
Phenol	108-95-2	0.1	µg/L	147	4.6	----	----	----	
2,3,4,6-Tetrachlorophenol	58-90-2	0.1	µg/L	<0.2	<0.1	----	----	----	
2,4,5-Trichlorophenol	95-95-4	0.1	µg/L	<0.2	<0.1	----	----	----	
2,4,6-Trichlorophenol	88-06-2	0.1	µg/L	<0.2	<0.1	----	----	----	
<b>EP247: Phenolics and Related Compounds</b>									
2,4-Dinitrophenol	51-28-5	0.01	µg/L	<0.01	<0.01	----	----	----	
2-Methyl-4,6-dinitrophenol	8071-51-0	0.05	µg/L	<0.10	<0.10	----	----	----	
4-Nonylphenol (mixture of isomers)	84852-15-3	0.10	µg/L	<1.00	<1.00	----	----	----	
Hexachlorophene	70-30-4	0.10	µg/L	<0.50	<0.50	----	----	----	
4-Nitrophenol	100-02-7	0.10	µg/L	<0.10	<0.10	----	----	----	
4-Chloro-3-methylphenol	59-50-7	0.10	µg/L	<0.10	<0.10	----	----	----	
Pentachlorophenol	87-86-5	0.10	µg/L	<0.10	<0.10	----	----	----	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Flowback Storage Tank (80%)	Seperator	----	----	----
Sampling date / time				16-Jul-2021 18:00	16-Jul-2021 18:00	----	----	----	
Compound	CAS Number	LOR	Unit	ES2127207-001	ES2127207-002	-----	-----	-----	
				Result	Result	---	---	---	
<b>EP247: Phenolics and Related Compounds - Continued</b>									
Dinoseb	88-85-7	0.10	µg/L	<0.10	<0.10	----	----	----	
Dalapon	75-99-0	0.10	µg/L	0.10	<0.10	----	----	----	
Bisphenol-A	80-05-7	0.05	µg/L	1.21	<0.05	----	----	----	
<b>ED009: Anions</b>									
Bromide	24959-67-9	0.010	mg/L	377	1520	----	----	----	
<b>EA250CA: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L	3.78	52.2	----	----	----	
Gross beta activity - 40K	----	0.10	Bq/L	16.0	270	----	----	----	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1.0	%	40.9	26.9	----	----	----	
2-Chlorophenol-D4	93951-73-6	1.0	%	52.6	34.8	----	----	----	
2,4,6-Tribromophenol	118-79-6	1.0	%	68.3	41.2	----	----	----	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1.0	%	63.5	42.1	----	----	----	
Anthracene-d10	1719-06-8	1.0	%	68.6	49.4	----	----	----	
4-Terphenyl-d14	1718-51-0	1.0	%	74.4	61.0	----	----	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	126	131	----	----	----	
Toluene-D8	2037-26-5	2	%	123	105	----	----	----	
4-Bromofluorobenzene	460-00-4	2	%	121	109	----	----	----	
<b>EP132S: Acid Extractable Surrogates</b>									
2-Fluorophenol	367-12-4	0.1	%	61.5	70.7	----	----	----	
Phenol-d6	13127-88-3	0.1	%	65.1	70.1	----	----	----	
2-Chlorophenol-D4	93951-73-6	0.1	%	72.5	70.8	----	----	----	
2,4,6-Tribromophenol	118-79-6	0.1	%	71.4	72.5	----	----	----	
<b>EP132T: Base/Neutral Extractable Surrogates</b>									
2-Fluorobiphenyl	321-60-8	0.1	%	62.8	74.5	----	----	----	
Anthracene-d10	1719-06-8	0.1	%	87.3	77.2	----	----	----	
4-Terphenyl-d14	1718-51-0	0.1	%	73.2	64.2	----	----	----	





## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
<b>EP132S: Acid Extractable Surrogates</b>			
2-Fluorophenol	367-12-4	12	94
Phenol-d6	13127-88-3	10	65
2-Chlorophenol-D4	93951-73-6	37	139
2,4,6-Tribromophenol	118-79-6	35	151
<b>EP132T: Base/Neutral Extractable Surrogates</b>			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144

## Inter-Laboratory Testing

Analysis conducted by ALS Canberra, NATA accreditation no. 992.

(WATER) EA250: Gross Alpha and Beta Activity

(WATER) EA250CA: Gross Alpha and Beta Activity