COPPING REFUSE DISPOSAL SITE GROUNDWATER AND SURFACE WATER MONITORING:

6 MONTHLY REPORT – JUNE 2022

Prepared for

Southern Waste Solutions

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List of Abbreviations

AGV	Agricultural Guideline Values
AHD	Australian Height Datum
ALS	Australian Laboratory Services
CLBP	C-Cell Leachate Balancing Pond
COD	Chemical Oxygen Demand
CDS	Copping Disposal Site
CRT	Carlton River Tributary
DGV	Default Guideline Value
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DPIWE	Department of Natural Resources and Environment Tasmania
EC	Electrical Conductivity
EPA	Environment Protection Authority
EPN	Environment Protection Notice
HHERA	Human Health and Ecological Risk Assessment
L/N Ratio	Leachate / Non-leachate Ratio
LOR	Limit of Reporting
m^2	Metres Squared
NATA	National Association of Testing Authorities
NEMP	National Environmental Management Plan
PFAS	per-and poly-fluoroalkyl substances
pH	Measure of the acidity or alkalinity of a solution
PSWPD	Primary Stormwater Pond Drain to March at the Carlton River Tributary
RL	Reduced Level
SSGV	Site Specific Guidelines Values
SWL	Standing Water Level
TAN	Total ammonia Nitrogen
TCN	Total Cyanide
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TRH	Total Recoverable Hydrocarbon
TSS	Total Suspended Solids
TP	Total Phosphorous
Reactive-P	Orthophosphate as P

1 INTRODUCTION

1 INTRODUCTION

Elgin Associates Pty Ltd (Elgin) has prepared this 6-monthly environmental monitoring report for the June 2022 sampling round for the Copping Disposal Site (CDS). The CDS is a Category 2 Landfill located approximately 3.5 km southwest of the township of Copping in south-eastern Tasmania. This report has been prepared to meet the requirements of Environment Protection Notice (EPN) 690/1 (2004 version). Permits have also been granted under the *Land Use Planning and Approvals Act 1993* in relation to the following site activities:

- **Permit Conditions – Environmental 8700 (2012) -** Relates to the construction and operation of the Category C Waste Depot Cell 'C-cell'. Section M3 - *Monitoring of leachate and groundwater* lists where monitoring must be carried out and the monitoring frequency.

- **Permit Conditions – Environmental 9931 (2019) -** Relates to the construction and operation of a pilot scale wetland and biofilter system based on phytoremediation. Section M1 - M3 details that the groundwater monitoring program specified in Attachment 2 must be implemented and reported to the Director on a quarterly basis.

Elgin is aware of amendments to the EPN monitoring program implemented prior to Elgin's involvement; these amendments are summarised in **Table 1.**

Table 1: EPN Monitoring Amendments.

Date	Condition	Item	Summary
September 2020	Condition M1 Permit No 2018 - 138 Part PCE No 9931.	Copping pilot wetland monitoring program.	Cease testing of Group 4 organics (TPH, BTEX, PAH's OCP/OPPs, PCBs). Applies to wetland bores (BH24A, BH24B, BH25A and BH25B) and surface water samples except the primary leachate pond (SS1). If any Group 4 organics are detected in B-cell leachate all testing required by the Permit must recommence immediately.
	Condition M2 Permit No 46/98 as varied by EPN No 690/1.	B-cell monitoring program.	Cease testing of Group 4 organics in all bore and surface sample sites – excepting the Primary Leachate Pond (SS1). If any Group 4 organics are detected in SS1 testing to be recommences as directed by the Permit
	Condition M3 & M5 Permit No DA2012:76 Part B PCE No 8700.46/98 as varied by EPN No 690/1.	C-cell monitoring program.	Cease testing of C-cell pond leakage pits (SS8 and SS14) and the upstream bores (BH13 and BH18A and BH18B) for Group 4 organics. If any Group 4 organics are detected in C-cell leachate pond (SS9 and SS10) all testing as required by the permit must recommence immediately.
February 2021	Condition M6 (4) (4.3) Permit No PCE 8700 (DA2012:76).	Copping C-cell weekly monitoring, electrical conductivity management triggers.	Proposes the use of electrical conductivity (EC) triggers for the management of liquid observed in Witness Sumps. The variation relates to weekly monitoring undertaken by SWS.

1 INTRODUCTION

Elgin understands that the Environment Protection Authority Tasmania (EPA) is in the process finalizing a consolidated EPN which will effectively combine the regulation of Stage 1A (existing) and Stage 1B (proposed). The intention is that CDS activities will have monitoring conditions which are consistent, and one sampling and testing regime will satisfy the permit conditions for all activities.

2 SCOPE OF WORKS

This report documents a 6-monthly groundwater and surface water sampling event performed by Elgin to satisfy CDS surface water and groundwater monitoring requirements. Monitoring has been undertaken at the CDS since October 2001 (AquaSci, 2020) with samples analysed for a range of grouped parameters consistent with EPN 690/1 and past monitoring.

2.1 Monitoring Sites

Surface water and groundwater samples were collected on the 14th and 15th of June 2022. In total 10 surface water samples were collected and subject to Groups 1, 2, 3 and PFAS surface water parameters and 19 groundwater bore samples were collected and subject to Groups 1, 2, 3 and PFAS bore parameters. Hydrostatic and physicochemical parameters were also obtained prior to sampling. Surface and groundwater sampling locations are indicated in the attached **Figure AT1** and details of each sample location are summarised in **Table 2** and **Table 3.** Field parameters recorded included: temperature, dissolved oxygen, electrical conductivity, pH, redox potential (converted into calomel) and turbidity.

Table 2: Surface waters sample locations

Sample Ref	Sample type	Location description	Comment
SS1	Leachate	B-cell Primary Leachate Pond	
SS2	Stormwater	B-cell Secondary Stormwater Pond	Water level low in pond. Thin layer of ice on surface during sample collection.
SS3	Stormwater	B-cell Primary Stormwater Pond	
SS4	Leachate	B-cell Primary leachate pond liner underdrain pit (seepage pit)	Approximately 20-30cm of water in pit
SS5	Stormwater/ Drainage line	Primary stormwater pond drains to marsh and Carlton River Tributary (CRT)	Discharges into receiving surface water ecological environment.
SS6	Creek	CRT upstream of discharge from stormwater pond and marsh, 340 m upstream SS7	
SS7	Creek	CRT downstream of discharge from stormwater pond, 25m downstream marsh discharge creek	
SS8	Leachate	C-cell leachate balancing pond seepage pit	Not sampled - Dry
SS9	Leachate	C-cell leachate balancing pond	
SS10	Leachate	C-cell main leachate pond	
SS11	Leachate	C-cell main leachate pond seepage pit	Not sampled - Dry
SS14	Stormwater	Secondary stormwater pond seepage pit	
SS15	Creek	Marsh Creek	Record field parameters only
SS16	Creek	Permanent pool upstream of Marsh Creek CRT confluence	Record field parameters only
SS17	Leachate	Leachate treatment wetlands influent sump	No sample required
SS18	Leachate	Leachate treatment wetlands effluent sump	No sample required

2 SCOPE OF WORKS

Table 3: Groundwater bore sample locations

Sample	Location / bore depth	Comment
Upgradient bores		
BH13	Upgradient reference bore (13.5 m)	Access road impassable to vehicles due to wet conditions. Bore gauged only, unable to be sampled.
BH18A, BH18B	C-cell upgradient reference bores – east (34.8 m and 19.3 m respectively)	• BH18B - hydrostatic parameters only. • BH18A - could not be purged prior to sampling due to insufficient water. Sample collected with bailer.
BH21	South-western upgradient bore (30.4 m)	
BH22	North-eastern upgradient reference bore (20 m)	
Leachate treatment wetland bores		
BH24A, BH24B	Wetland bore north (12.4 m and 3 m respectively)	
BH25A, BH25B	Wetland bore south (9.5 m and 2.8 m respectively)	
Near B-cell groundwater bores		
BH10C, BH10D	Near Cell 9 bore (12.4 m and 7 m respectively)	
Near C-cell / irrigation area bores		
BH14A, BH14B	C-cell SW bores (24.4 m and 11.6 m respectively)	BH14B hydrostatic parameters only
BH15A, BH15B	C-cell western bores (29.7 m and 13.6 m respectively)	• Landfill gas present in both bores • BH15B – Sampled with bailer, insufficient water to purge.
BH2	North-western downgradient bore/C-cell downgradient bores (11.3 m)	
BH12A, BH12B	Irrigation area bore (21.6 m and 5.5 m respectively)	
BH23	Near Cell 10 bores (15.4 m)	
Near leachate pond groundwater bores		
BH7	Primary leachate pond bore	
BH1	North of C-cell leachate pond bore (22.93 m)	
BH19	C-cell leachate pond bore	

2.2 Monitoring Fieldwork

At the time of sampling the weather was overcast. Temperatures were low at the beginning of each day and a thin covering of ice was observed on some standing surface water sites such as SS2. Sufficient water was present to collect surface water samples from the Primary Stormwater Pond Drain at the Carlton River Tributary (SS5) and the Carton River Tributary downstream site (SS7), both of which have been dry in previous rounds. In addition, physicochemical parameters were obtained from Marsh Creek (SS15) and the Confluence Pool (SS16).

3 LEGISLATIVE FRAMEWORK

The EPN for the site was issued under Section 44(1)d of the *Environmental Management and Pollution Control Act 1994 (EMPCA).* Also applicable is the *State Polices and Projects Act 1993* for protection of land, surface water and groundwater from the site, which includes:

- The amended National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM, 2013), which became a state policy in Tasmania under the *State Policies and Projects Act 1993.*
- *The State Policy on Water Quality Management 1997* which defines protected environmental values (PEVs) for waters in Tasmania that include surface waters (including estuaries), coastal waters and groundwater. Surface waters in proximity to the Site include the Carlton River Tributary (CRT) and groundwater is also present beneath the region.

3.1 Protected Environmental Values – Surface Water

Protected environmental values for receiving waterways are based on the *State Policy on Water Quality Management 1997* (State Policy) and *Environmental Management Goals for Tasmanian Surface Waters – Catchments* and are summarised below.

Land Tenure: Surface Waters on Private and Public Land.

Protected Environmental Values:

- The CRT is classified as 'freshwater' (flowing) with a moderately to heavily disturbed ecosystem due to agricultural activities, land clearing and forestry plantations.

Adopted water quality guidelines to protect the above PEVs for surface water included:

- Default Guideline Values (DGVs) from the State Policy which are in turn referenced from the latest edition of the Australian Water Quality Guidelines for Marine and Freshwater Quality (ANZG 2018) and Australian Drinking Water Guidelines (NHMRC 2019).
- Site specific guidelines values (SSGV) detailed below; and
- PFAS guideline values from the PFAS National Environment Management Plan v2.0 (2020).

Comparison of water quality data from the upstream CRT reference site (SS6) indicated that several parameters were consistently above DGVs (AquaSci, 2019g) and may therefore not represent reliable parameter trigger levels. Site specific guidelines values (SSGV) were subsequently developed by AquaSci based on 18 years of monitoring data between 2001 – 2018. In accordance with ANZECC/ARMCANZ (2000) guidelines 80th and 20th percentile values were utilised as SSGV's.

The application of the 80th and 20th percentiles may be overly conservative for some parameters considering the ephemeral nature of the CRT. By virtue, an 80th percentile protection level results in 20% of the highest 'background' concentrations being reported above the criteria. The criteria are therefore inherently conservative and SSGV exceedance should therefore be viewed in the context of providing an early indication of changes to water quality which require further consideration to assess if the parameter is within historical limits and the potential for impact to ecological receptors.

SSGV's have also be determined for the CRT downstream reference site (SS7) considering water quality differences exist between the upstream site believed to be due to groundwater discharge in the Marsh

which were not believed to be attributable to the activities on the CDS. SSGV's should be reviewed and revised periodically so that the influence of changes to site characteristics and the effects of long-term climatic change are considered.

SSGV's for the Carlton River upstream of tidal influences (DPIPWE, 2008; EPA, 2019) have been included and will be considered if potential impacts downstream of the CRT are detected and require assessment. Agricultural guidelines values (ANZG 2018) have also been referenced to assess impacts on potential downstream agricultural activities in addition to surface waters ecosystem protection groundwater values (ANZG 2018). Tabulated surface water results that incorporate these SSGVs are provided in the attached **Table AT1**.

3.2 Protected Environmental Values – Groundwater

A requirement of the EPN 490/1 is that groundwater quality be assessed against ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality guidelines which were superseded by the ANZG (2018) guidelines of the same name. . Application of guideline values should be considered in the context of the site and its setting because parameters are capable of naturally exceeding the values.

Protected environmental values for underlying groundwater is based on the State Policy which identifies PEVs according to groundwater category which is defined by total dissolved solids (TDS). TDS data from registered groundwater bores within 1 km of the site previously indicated groundwater TDS ranging from 3,500-13,000 mg/L and would be classified as Category C. Upgradient groundwater quality was also assessed based on the minimum and maximum TDS of upgradient bores detailed in **Table 4.** Based on these bores groundwater is classified as Category B and C.

Table 4: Maximum and minimum TDS in upgradient bores

Bore ID	Data range	Min	Max	Classification
BH13	2013-2021	2,400	4,100	B
BH21	2019-2022	1,200	1,400	B
BH22	Sep 2020-2022	1,100	3,900	B, C
BH18A	2016-2020	2,200	3,000	B

Based on these TDS values, the groundwater can be classified as Category B. Protected environmental values under Category B include:

- Irrigation
- Industry
- Stock; and
- Ecosystem protection.

3 LEGISLATIVE FRAMEWORK

The Department of Primary Industries, Parks, Water and Environment Groundwater Information Access Portal, accessed 13 January 2022, detailed four registered bores within 1 km of the CDS site. The status of the bores is listed as 'capped'. Additional details of the bores are provided in **Table 5**.

Table 5: Registered groundwater bores within 1 km of the CDS site

Bore ID	Type	Drilled date	Depth (m)	Reported TDS	Status
16565	Bore	1996	23.50	4,300	Capped
16566	Bore	1996	11.50	3,600	Capped
16567	Bore	1996	20.80	4,300	Capped
16568	Bore	1996	12.00	5,700	Capped

In addition to the bores detailed in Table 5, three bores drilled in 2019 ranging in depth from 30 to 102 m were also indicated approximately 1 km to the northeast of the CDS. These bores are also listed as being capped or abandoned.

The nearest registered functioning bore is bore 3358 located approximately 4.6 km to the north-east of the CDS. The bore extends to 42 m depth and although it is listed as functioning its status has not updated since 1997, therefore it may not still be in use.

It is understood that cattle graze on land to the east of Blue Hill Road, which is used to access the CDS, and that a paddock within the CDS is sub-let for grazing. However, based on the absence of registered abstraction wells within 2 km of the CDS, groundwater underlying and near the CDS is not considered to be currently abstracted for industry or stock uses.

Considering the steep topography and shallow soils, which are not conductive to agriculture grazing use, future abstraction for stock use in the vicinity of the CDS is considered unlikely. In addition, naturally occurring elevated salinity in most of the aquifers underlying the CDS would likely render groundwater unsuitable for other sensitive uses, such as irrigation or domestic use. Consequently, groundwater quality was assessed for ecosystem protection of surface waters where groundwater may discharge, inferred to be the CRT.

Upgradient groundwater quality was also taken into account to assist in identifying site derived contamination against regional catchment ambient levels. Tabulated groundwater results that incorporate SSGVs for CRT are provided in the **Attached Table AT2**.

4 METEOROLOGICAL RECORDS

Rainfall data was obtained from the Bureau of Meteorology (BOM) Yaxley Estate (92153) weather station, approximately 3 km to the northeast of the CDS. Prior to 2012 meteorological rainfall data was obtained from a nearby BOM monitoring station referred to as 'Copping' (92074), which is no longer operational.

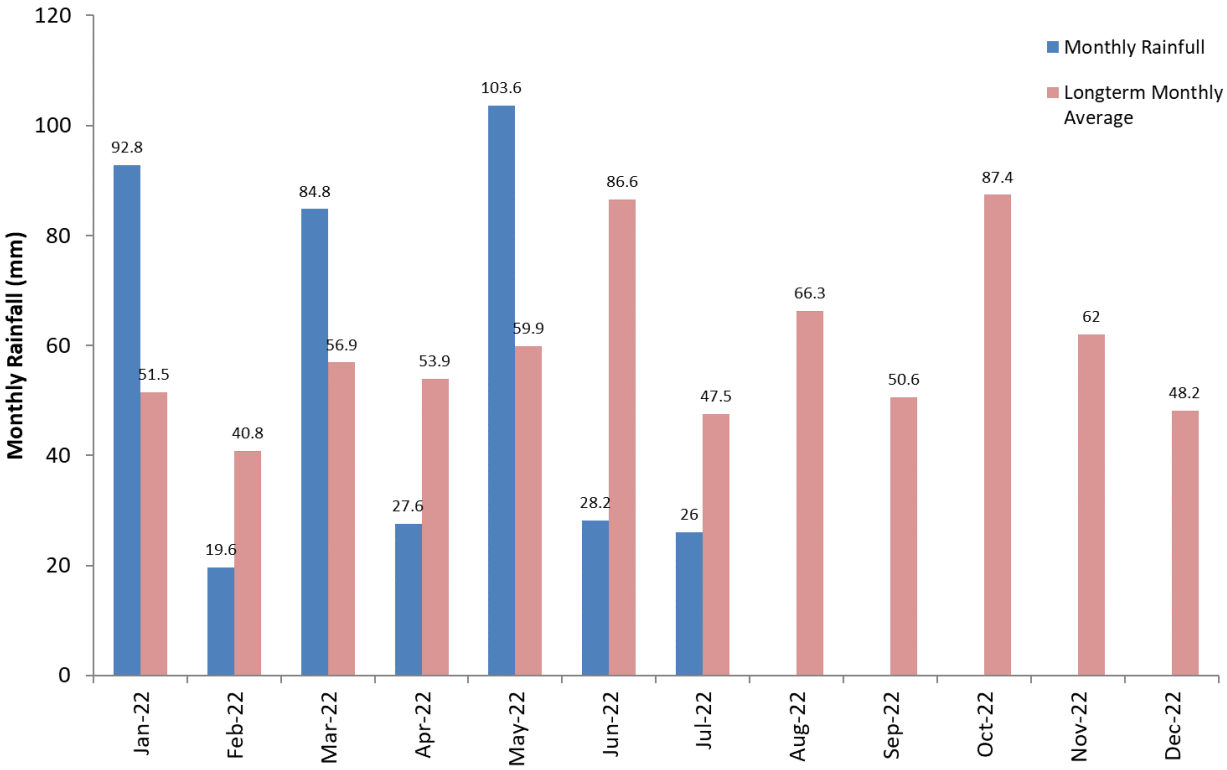
In the seven days prior to the 14th of June 2022 6-monthly sampling event, there was 25.6 mm of rainfall across the region all of which fell the day prior to sampling on the 13th June. During the sampling 2.6 mm was recorded on the 14th of June and none on the 15 and 16th. The rainfall over this period leading up to sampling was sufficient to allow the sampling of surface waters at all sampling locations.

Daily and monthly rainfall data is summarised is **Table 6** and **Figure 1** and **Figure 2**. Rainfall above the long-term average fell in May 2022, which was followed by two months of below average rainfall in June and July. Rainfall in July was 26 mm, which is below the long-term average of 47.5 mm.

Table 6: Rainfall at Copping Yaxley Estate Prior to Sampling.

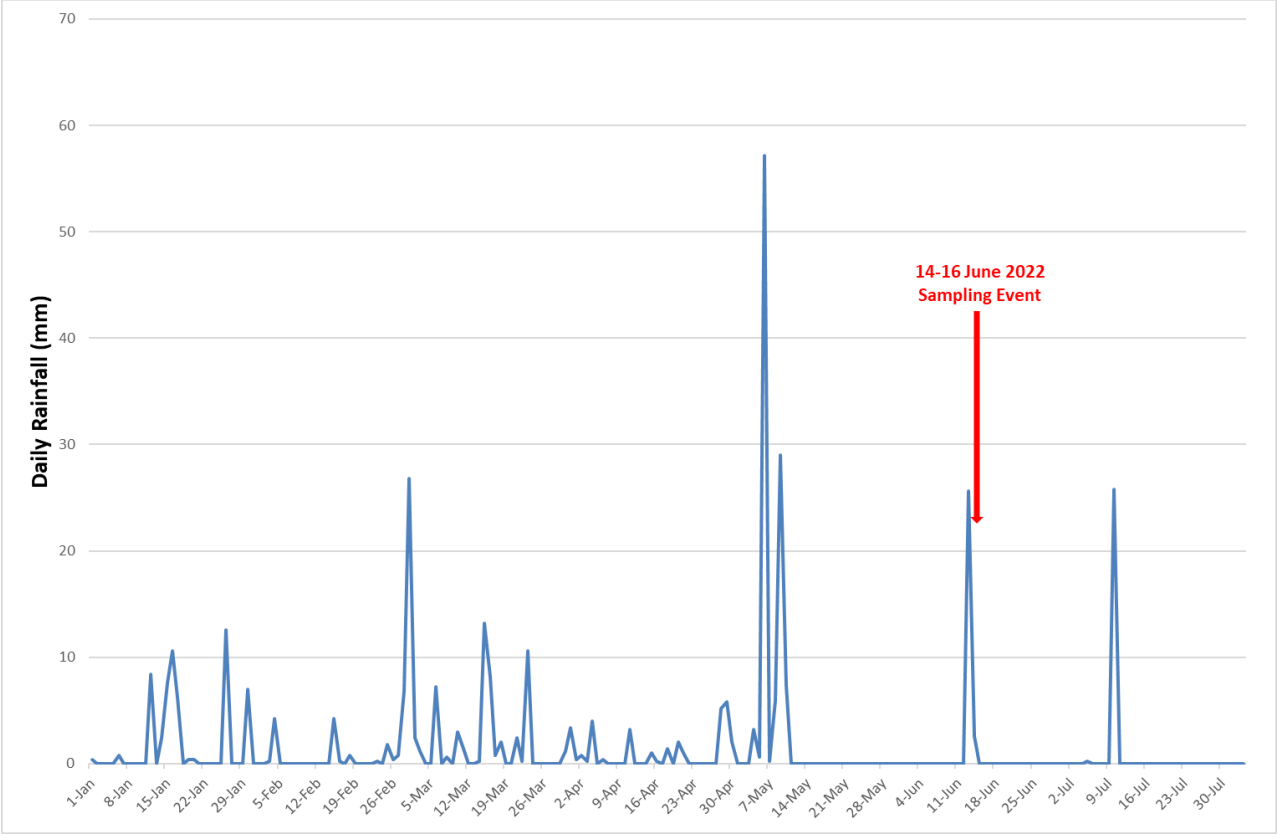
Monitoring Event	Rainfall 24hrs prior (mm)	Rainfall 7 days prior (mm)	Rainfall month prior (mm)
14-16 June 2022	25.6	25.6	103.6

Figure 1: 2022 Monthly Rainfall - Yaxley Estate Monitoring Station



4 METEOROLGICAL RECORDS

Figure 2: Copping daily rainfall - Copping Yaxley Estate monitoring station



5 ASSESSMENT METHODOLOGY

5.1 Water quality guidelines

The water quality guidelines have been derived based on the legislative framework and protected environmental values detailed in Section 3. Surface water and groundwater DGVs and SSGVs are detailed in **Table 7 and Table 8.**

5.1.1 Site specific guidelines values – physicochemical parameters

Table 7: Site specific guidelines values – physicochemical parameters (mg/L)

		Upstream		Downstream		
	Carlton R	CRT - SS6		CRT - SS7		DGV Agricultural Waters
Parameter	EPA Tas (2019)	AquaSci (2019)		AquaSci (2019)		ANZG (2018)
	SSGV (Aq Eco)	SSGV (Aq Eco)	Range (min-max)	SSGV (Aq Eco)	Range (min-max)	
Physico-chemical						
Water temperature	**6.5-15.0**	7.4-16.7	5.2-24.6	6.9-15.0	5.4-28.1	-
pH	**7.4-7.9**	7.1-7.8	6.6-9.0	7.1-7.7	6.6-7.9	6 - 9
Conductivity (mS/cm)	**526-1,184**	1,910	298-3,530	2,610	349-4,010	<950-<12,200 (s.d.)
Total dissolved solids		1,100	210-2,200	1,560	290-2,700	<2,000-<4,000 livestock (s.d.)
Chemical oxygen demand		68	5-160	71.6	5-110	-
Total suspended solids		6.8	<2-24	8	<2-22	-
Alkalinity as $CaCO_3$		130	19-180	156	22-280	-
Total nitrogen as N	**0.894**	1.2	0.26-4.30	1.06	0.29-2.60	25-125 STV, 5L TV
Total Ammonia as N	**0.012**	0.0035	<0.003-0.720	0.0049	<0.002-0.160	-
Nitrate as N	**0.125**	0.022	<0.003-5.000	0.078	<0.003-1.100	<400 livestock (as NO_3)
Nitrite as N	**0.003**	0.005	<0.002-0.034	0.006	<0.002-0.011	<30 livestock (as NO_2)
Total phosphorus as P	**0.021**	0.032	<0.005-0.085	0.025	<0.005-0.053	0.08-12 STV, 0.05 LTV
Orthophosphate as P	**0.006**	0.004	<0.003-0.0032	0.003	<0.003-0.022	-
Dissolved organic carbon	-	23	5.0-37.0	23	6.2-48	-
Major ions						
Chloride as Cl	-	628	97-1,000	934	110-1,100	25->700 (foliar injury - s.d.)
Sulphur as SO_4	-	50	13-84	71	13-84	<1,100 stock (sulfate)
Magnesium as Mg	-	78	9-130	140	12-160	<2,000 cattle
Potassium as K	-	4	1-18	4	1.6-4.2	<115->460 (foliar injury - s.d.)
Sodium as Na	-	210	47-340	310	54-440	-
Calcium as Ca	-	43	8-84	78.5	9-110	-

Notes

Site specific guidelines values developed by AquaSci

Units in mg/L unless stated otherwise

DVG - Default Guidelines Value 20% - 80% percentile of 2001 to 2018 data

20 % percentile adopted where low parameter levels may be a stressor

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6)

5.1.2 Generic guideline values – metals and metalloids

Guidelines values for metals and metalloids are provided nationally within ANZG (2018). Most refer to ANZECC/ARMCANZ (2000) guidelines. The guidelines adopted to the CDS are detailed in **Table 8**.

Table 8: Default guideline values for ecosystem protection and livestock agriculture (mg/L)

Parameter	DGV Aquatic Ecosystems ANZG (2018)	DGV Agricultural Waters ANZG (2018)		
		Short term TV	Long term TV	SD limit
Free CN	0.007	-	-	-
Aluminium	0.055	-	-	-
Arsenic	-	2	0.1	0.5-5.0
Arsenic (As III)	0.024	-	-	-
Arsenic (As V)	0.013	-	-	-
Cadmium	0.0002	0.05	0.01	0.01
Copper	0.0014	5	0.2	<0.4-<5
Chromium	-	1	0.1	1
Chromium (Cr VI)	0.01	-	-	-
Chromium (Cr III)	0.0033	-	-	-
Iron	-	-	-	-
Lead	0.0034	5	2	0.1
Manganese	1.9	10	0.2	-
Mercury	0.00006 (inorganic) [1]	0.002	0.002	-
Nickel	0.011	2	0.2	-
Selenium	0.005 (total) [1]	0.05	0.02	0.02
Vanadium	0.006 (low reliability)	0.5	0.1	
Zinc	0.008	2	2	20
BTEX				
Benzene	0.950	-	-	-
m & p-xylene	p 0.200	-	-	-
o-xylene	0.350	-	-	-
Notes				
Site specific guidelines values developed by AquaSci				
TV - trigger value				
SD - Species dependent limit (livestock)				
[1] 99 % species protection				

5.1.3 Per - and Polyfluoroalkylated Substances (PFAS)

Per-and poly-fluoroalkyl substances (PFAS) are a group of synthetic organic compounds present in a wide range of manufactured products. PFAS are man-made chemicals, and their presence have become ubiquitous in the environment globally. PFAS have several chemical properties which are required to be considered when assessing its behavior in the environment and the risk to human health and ecological receptors.

These properties include:

- A persistence in the environment resistant to physical, chemical, and biological degradation.
- Have the potential for bioaccumulation in humans, plants and animals and biomagnify with each trophic level of a food chain.
- Some PFAS chemicals known as precursors can transform into perfluoroalkyl acids (PFAAs) which can also present a risk to health and the environment.

Considering the absence of groundwater abstraction bores or surface water abstraction for beneficial use in the vicinity of CDS, freshwater ecological receptors are considered to represent the most sensitive exposure receptor. The PFAS National Environmental Management Plan (NEMP) provides national guidance on the management of PFAS contamination in the environment. The *PFAS NEMP Version 2.0, January 2020* ecological freshwater was quality guidelines have been adopted.

5 ASSESSMENT METHODOLOGY

Guideline values are inherently conservative and should also consider site specific environmental characteristics in consultation with the regulator. The NEMP freshwater ecological water guideline values are provided in **Table 9**. The presence of PFAS above the relevant guidelines values acts as a trigger to undertake further investigation.

Table 9: Freshwater ecological water guidelines values (µg/L)

Exposure scenario	PFOS	PFOA	Comments
High conservation - 99% Species protection [1]	0.00023	19	The 99% protection level for PFOS often represents the limit of detection which can be adopted in some circumstances.
Slightly to moderately disturbed - 95% Species protection	0.13	220	
Highly disturbed - 90% Species protection	2	632	
Highly disturbed - 80% Species protection	31	1,824	

Note: Guideline adopted

The ecological guideline values detailed in **Table 9** were developed through the Water Quality Guidelines Framework toxicant default guideline value publication approval process, which is separate from the NEMP. For contaminants that have the potential to bioaccumulate, which includes PFAS the framework specifics that the 99% species protection DGV should be used for assessing bioaccumulation in slightly to moderately disturbed ecosystems.

The CRT represents the primary receiving surface water body for the CDS and has previously been designated as *'slightly to moderately disturbed'* with a 95% protection level. The 95% protection level have previously been applied and is applied in this report, however talking into account the WQG framework and PFAS bio-accumulative properties 99% species protection should be adopted. Lowering the PFAS reporting limit would also enable earlier detection of PFAS which is a potential leachate indicator due to its elevated presence in B-cell and C-cell leachate.

The current limit of reporting (LOR) for PFOS is 0.01 µg/L which is above the 99% protection level of 0.00023 µg/L. If applied the application of 99% protection criteria in future sampling events will therefore require the LOR to be lowered. Lower PFOS reporting limits of 0.0002 µg/L are possible, however in some instances this level cannot be achieve.

5.2 Sampling methodology

The assessment was undertaken in general accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (amended 2013) ('ASC-NEPM') guidelines and Elgin standard operating procedures.

Following previous recommendations and in accordance with current best practice, groundwater samples were obtained using a low flow 'no purge' sampling technique, which reduced groundwater agitation and enabled the collection of samples which were more representative of aquifer conditions.

5 ASSESSMENT METHODOLOGY

5.3 Quality assurance and quality control

Prior to the current sampling round no field quality assurance sampling was routinely undertaken. The collection of quality control samples is necessary to provide confidence in the results of the sampling program. Field quality control samples can be used to assess:

- If a contaminant has been introduced into a sample during collection, transport or in the laboratory
- how close the result is to its true value (accuracy); and
- the repeatability of the results (precision).

The sampling program had the following samples collected for quality assurance/quality control:

- Blind field duplicate samples at rate of 1 per 20 primary samples. The field duplicate was analysed by the primary laboratory ALS.
- Rinsate blank collected off reusable equipment and single use items (gloves, water pump and dip meter) at rate of 1 per day.
- Field blank sent to laboratory with samples at rate of 1 per day and analysed if any contaminants are reported in the rinsate blank samples.

5.3.1 Sample equipment decontamination

Reusable equipment was decontaminated between samples with the following protocol:

- Initial rinse to remove any sediment.
- Wash in dilute solution of Liquinox detergent.
- First rinse in potable water

5.3.2 Laboratory analysis

Water samples were couriered in ice-packed eskies to ALS Environmental (ALS) who are a NATA accredited laboratory under chain of custody documentation for analysis. Laboratory certificates, chain of custody documentation and sample receipt notification are provided in **Appendix F**.

5.3.3 Data validation

The analytical data was checked and validated for its reliability and suitability for interpretive use, based on guidance in the NEPM ASC (2013). The data validation review is included in **Appendix C**, along with tabulated field duplicate results with RPD calculations, rinsate and trip blank results.

Key checks in the data validation process included:

- Samples were received by the laboratories in chilled eskies and in good condition;
- All samples were analysed as required on the chain of custody, and within recommended holding times;
- Field sample-id's in lab reports correlate to COC and field sample records;
- Review of rinsate and field blank results where applicable;
- Review of laboratory duplicate results and relative percent differences (RPDs);
- Review of field duplicate and triplicate sample results and RPDs;
- Review of internal laboratory QAQC sample results, including laboratory check samples, matrix spike/matrix spike duplicate and surrogates met laboratory requirements; and
- The presence of potentially anomalous results.

5 ASSESSMENT METHODOLOGY

Following a review of data validation results the following is noted:

- Total aluminium was detected in two rinsate blank samples collected on the 14 and 16th of June, 0.02 mg/L and 0.3 mg/L respectively.
- Total iron (0.22 mg/L) and zinc (0.01 mg/L) were also detected on rinsate blank sample collected on the 16th June.

The detection of the metals in the rinsate blank samples was unexpected. No metals were detected in the field blank samples from the same days (14th and 16 June) therefore the source of contamination is not considered to be from the container used to courier the samples to the laboratory or contamination introduced at the laboratory.

Taking into account that aluminum was also detected from the rinsate sample poured over nitrile gloves, which are a dedicated disposable item, the most likely source is considered to be the water used to wash the equipment and not cross contamination from the previous groundwater samples. A clean reliable source of rinsate water is not available onsite therefore potable water was transported to site in containers for the first and second wash of equipment. In future sampling rounds a third rinse will be undertaken using laboratory supplied rinsate water or deionised water to reduce the possibility of potential metal contamination.

Although isolated metals were detected in two rinsate samples, taking into account the absence of metals in the other quality assurance samples and the overall findings of the review, the dataset is considered sufficiently reliable and suitable for interpretive use.

6 DISCUSSION OF RESULTS

Analytical results from the samples collected in June 2022 are tabulated in **Appendix A** and bore gauging data in **Appendix D**. Preliminary analytical results for all parameters over the monitoring period have been provided to SWS. Observations and trends of the data points are summarized in the following sections.

6.1 Surface water chemistry

The June 2022 surface water analytical results are summarised in Table 10 and grouped based on their location and sample type.

6 DISCUSSION OF RESULTS

Table 10: Surface water analytical summary table – June 2022

				Leachate Ponds			Seepage pits	Secondary Stormwater System	
Parameter Group	**Contaminant**	CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)	CRT - SS6, AquaSci (2019) - (max)	Primary leachate pond	C-Cell leachate balancing pond	C-Cell main leachate pond	Primary leachate pond seepage pit	B-Cell Secondary Stormwater Pond	Secondary stormwater pond seepage pit
				SS1	**SS9**	**SS10**	**SS4**	**SS2**	**SS14**
L-N Ratio	Modified Mulvey L/N Ratio	-	-	**YES**	NO	NO	NO	**YES**	NO
Field Parameters	Temp	7.4-16.7	**5.2-24.6**	9.8	5.1	4.5	9.1	3.2	10.4
	DO (%)			23	92	97	63	91	84
	DO (ppm)			2.5	11.6	12.2	7.1	12.2	9.3
	Electrical Conductivity (SPC)	1910	**3530**	**14949**	3263	**7264**	**6670**	367	3171
	pH	7.1-7.8	**6.6-9.0**	7.6	7.6	7.6	7.2	8.0	7.4
	Redox Potential (Calomel)			-62	91	88	-76	46	68
	Turbidity			30	20	8.3	14	31	0.3
Physico-Chemical	Total Dissolved Solids (TDS)			7810	2730	7970	3910	162	1750
	Suspended Solids (SS)	6.8	**24**	15	**72**	**69**	**34**	18	6
	Dissolved Organic Carbon	22	**37**	**484**	**43**	28	12	6	8
	Chemical Oxygen Demand	68	**160**	**1870**	**178**	116	<50	15	27
	Total Cyanide	0.007		0.018	<0.004	<0.004	<0.004	<0.004	<0.004
Alkalinity	Hydroxide Alkalinity as CaCO3			<1	<1	<1	<1	<1	<1
	Carbonate Alkalinity as CaCO3			<1	9	<1	<1	<1	<1
	Bicarbonate Alkalinity as CaCO3			4170	164	39	707	32	68
	Total Alkalinity as CaCO3	130	**180**	**4170**	173	39	**707**	32	68
Nutrients	Ammonia as N	0.035	**0.72**	**680**	<0.005	**0.98**	**1.12**	0.136	<0.005
	Nitrite as N	0.005	**0.034**	<0.200	<0.002	0.028	**0.048**	0.002	<0.002
	Nitrate as N	0.022	**5**	<0.200	<0.002	0.969	0.925	0.017	2.27
	Nitrite + Nitrate as N			<0.200	<0.002	0.997	0.973	0.019	2.27
	Total Kjeldahl Nitrogen as N	-	-	685	4.18	3.53	1.32	0.74	0.43
	Total Nitrogen as N	1.2	**4.3**	**685**	4.18	**4.53**	2.29	1	2.7
	Total Phosphorous as P	0.032	**0.085**	**4.3**	<0.010	0.039	<0.005	0.017	0.009
	Reactive Phosphorus as P	0.004	**0.032**	**3.46**	0.003	<0.001	0.012	0.001	**0.057**
Bacteriol.	Escherichia coli	-	-	290	30	20	0	26	4
Anions and Cations	Sulphur as SO4=								
	Sulfate as SO4-			<1	1660	5290	180	51	124
	Chloride as Cl-			3130	146	183	1670	17	855
	Dissolved Calcium as Ca			97	127	368	209	12	31
	Dissolved Magnesium as Mg			263	339	996	291	12	60
	Dissolved Sodium as Na			1640	252	484	814	14	475
	Dissolved Potassium as K			185	16	26	4	2	10
Dissolved Metals	Aluminium as Al	0.055		0.1	0.02	0.35	0.01	0.16	<0.01
	Arsenic as As	0.024		0.074	0.112	0.008	<0.001	<0.001	0.003
	Cadmium as Cd	0.0002		<0.0002	0.0013	0.163	<0.0001	<0.0001	0.0003
	Chromium as Cr	0.001		0.107	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper as Cu	0.0014		0.002	0.001	0.015	<0.001	<0.001	0.004
	Iron as Fe			1.05	<0.05	<0.05	0.38	0.08	<0.05
	Lead as Pb	0.0034		0.002	<0.001	<0.001	<0.001	<0.001	<0.001
	Manganese as Mn	1.9		0.458	0.111	9.61	0.368	0.004	0.004
	Mercury as Hg	0.00006		<0.0010	<0.0001	0.0004	<0.0001	<0.0001	<0.0001
	Nickel as Ni	0.011		0.137	0.039	0.95	0.004	0.001	0.006
	Selenium as Se	0.005		<0.02	<0.01	0.02	<0.01	<0.01	<0.01
	Vanadium as V	0.006L		0.08	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc as Zn	0.008		0.045	0.056	8.39	<0.005	<0.005	0.011
PFAS	PFOS	0.13		0.5	0.06	0.02	<0.01	<0.01	0.02
	PFOA	220		0.81	0.23	0.27	0.01	<0.01	0.09

Table 11: Surface water analytical summary table – June 2022 (continued)

				Primary Stormwater System / Receiving Environment				
Parameter Group	**Contaminant**	CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)	CRT - SS6, AquaSci (2019) - (max)	Primary stormwater pond	Pond drain to Marsh Creek	CRT upstream sample	CRT downstream site	Percentage difference between SS6 & SS7
				SS3	**SS5**	**SS6**	**SS7**	**-**
L-N Ratio	Modified Mulvey L/N Ratio	-	-	NO	NO	NO	NO	-
Field Parameters	Temp	7.4-16.7	**5.2-24.6**	5.6	5.6	4.8	5.2	8%
	DO (%)			90	105	98	94	-3%
	DO (ppm)			11.3	13.1	12.5	12.0	-4%
	Electrical Conductivity (SPC)	1910	**3530**	638	712	432	522	21%
	pH	7.1-7.8	**6.6-9.0**	8.0	7.7	7.7	7.8	1%
	Redox Potential (Calomel)			-69	-5	5	4	-20%
	Turbidity			246	243	30	48	61%
Physico-Chemical	Total Dissolved Solids (TDS)			448	629	316	373	18%
	Suspended Solids (SS)	6.8	**24**	**95**	**160**	9	21	133%
	Dissolved Organic Carbon	22	**37**	16	16	22	21	-5%
	Chemical Oxygen Demand	68	**160**	95	93	76	73	-4%
	Total Cyanide	0.007		<0.004	<0.004	<0.004	<0.004	0%
Alkalinity	Hydroxide Alkalinity as CaCO3			<1	<1	<1	<1	0%
	Carbonate Alkalinity as CaCO3			<1	<1	<1	<1	0%
	Bicarbonate Alkalinity as CaCO3			73	71	30	39	30%
	Total Alkalinity as CaCO3	130	**180**	73	71	30	39	30%
Nutrients	Ammonia as N	0.035	**0.72**	0.212	0.232	<0.050	<0.050	0%
	Nitrite as N	0.005	**0.034**	<0.020	<0.020	<0.020	<0.020	0%
	Nitrate as N	0.022	**5**	0.467	0.239	<0.020	0.044	-
	Nitrite + Nitrate as N			0.467	0.239	<0.020	0.044	-
	Total Kjeldahl Nitrogen as N	-	-	0.43	0.85	0.67	0.51	-24%
	Total Nitrogen as N	1.2	**4.3**	0.9	1.09	0.67	0.55	-18%
	Total Phosphorous as P	0.032	**0.085**	<0.050	<0.050	<0.050	<0.050	0%
	Reactive Phosphorus as P	0.004	**0.032**	0.025	0.019	<0.010	<0.010	0%
Bacteriol.	Escherichia coli	-	-	350	240	170	160	-6%
Anions and Cations	Sulphur as SO4=							
	Sulfate as SO4-			36	39	19	20	5%
	Chloride as Cl-			55	159	100	124	24%
	Dissolved Calcium as Ca			8	19	11	13	18%
	Dissolved Magnesium as Mg			9	22	13	16	23%
	Dissolved Sodium as Na			60	91	56	64	14%
	Dissolved Potassium as K			2	2	3	3	0%
Dissolved Metals	Aluminium as Al	0.055		0.06	0.11	1.2	1.11	-7%
	Arsenic as As	0.024		<0.001	<0.001	<0.001	<0.001	0%
	Cadmium as Cd	0.0002		0.0003	0.0002	<0.0001	<0.0001	0%
	Chromium as Cr	0.001		<0.001	<0.001	0.002	0.001	-50%
	Copper as Cu	0.0014		0.003	0.003	0.003	0.003	0%
	Iron as Fe			0.43	0.83	1.08	1.12	4%
	Lead as Pb	0.0034		<0.001	<0.001	<0.001	<0.001	0%
	Manganese as Mn	1.9		0.015	0.018	0.008	0.008	0%
	Mercury as Hg	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	0%
	Nickel as Ni	0.011		0.003	0.003	0.002	0.002	0%
	Selenium as Se	0.005		<0.01	<0.01	<0.01	<0.01	0%
	Vanadium as V	0.006L		<0.01	<0.01	<0.01	<0.01	0%
	Zinc as Zn	0.008		0.01	0.012	0.005	0.009	80%
PFAS	PFOS	0.13		<0.01	<0.01	<0.01	<0.01	0%
	PFOA	220		<0.01	<0.01	<0.01	<0.01	0%

6 DISCUSSION OF RESULTS

6.1.1 Leachate ponds (SS1, SS9 and SS10)

Analytical concentrations for leachate in ponds SS1, SS9 and SS10 were below the historical maximum in SS1 (Primary C-cell leachate Pond) with the exception of EC (14,949 µg/), dissolved Pb (0.002 mg/L) and total Cr (0.148 mg/L).

- The previous EC maximum of 14,910 at SS1 was reported in July 2010 and EC shows an increasing overall trend since monitoring began in 2001.
- Dissolved chromium below the maximum may be due to elevated metals associated with insoluble chromium in the SS01 leachate sample.
- As would be expected for leachate, a range of physicochemical parameters at SS01 were reported above the SSGV and generic values for ecosystem protection and the modified Mulvey L/N ratio of 0.52 which was calculated above 0.1. Dissolved metals above the assessment criteria included Al, As, Cr, Cu, Ni, V and Zn. PFOS was reported at 0.5 µg/L and above the ecological assessment criteria of 0.13 µg/L.

The Main C-cell Leachate Pond (SS10) is reported to have been receiving leachate from the C-cell since 2018. The composition of both the C-cell leachate ponds has been historically variable which has previously been attributed to variability in waste inputs and climate.

- SS10 had a higher EC 7,264 µS/cm compared to a lower measurement of 3,263 µg/L in the C-cell Leachate Balancing Pond (SS9), however both were below historical maximum concentrations.
- The ionic balance of the B-cell leachate (SS1) and the C-cell leachate (SS9 and SS10) is quite different. SS1 is characterised by elevated sulfate and low chloride and sodium concentrations compared to SS9 and SS10.
- Multiple physicochemical parameters and most of the dissolved metals tested were reported above the ecological assessment criteria in SS9 and SS10.
- PFAS and PFOA was also detected in SS9 and SS10 with concentrations below the assessment criteria.

Whilst the leachate sampled in the SS1, SS9 and SS10 ponds exceeded ecological assessment criteria for parameters noted above, the leachate in the ponds was observed to be contained as per design with no discharge or pathway to the environment. Therefore, the risk to the receiving environment from leachate in these ponds is low.

6.1.2 Leachate pond seepage pits (SS4, SS8 and SS11)

The C-cell Leachate Balancing Pond Seepage Pit (SS8) and the C-cell Main Leachate Pond (SS11) were dry during the June sampling event. Parameters were below the historical maximums in the Primary Leachate Pond Seepage Pit SS4 with the exception of total alkalinity and sulfate, with respective concentrations of 707 mg/L and 180 mg/L.

6.1.3 Secondary stormwater system (SS2 and SS14)

The water level in the B-cell Secondary Stormwater Pond (SS2) was low at the time of sampling and a thin layer of ice covered the pond. The Pond is not currently in use as part of the site's stormwater system and SWS advised that during the reporting period it was used to temporarily store C-Cell leachate before it was pumped to the C-Cell Lower Balancing Pond (SS9). Since removal of this leachate, it had accumulated site

runoff as reflected in its low EC of 367 µS/cm (compared to typical leachate EC of 14,949 µS/cm as reflected in SS1).

Parameters were below the historical maximums and below the ecosystem protection criteria with the exception of pH, TDS, ammonia and aluminum. The modified Mulvey L/N ratio was calculated at 0.154. The L/N ratio was last reported above 0.1 in SS2 in December 2019, and the pond was not sampled in January 2020 and June 2021 due to insufficient water. Whilst a ratio above 0.1 may indicate the presence of leachate, this was not supported by other lines of evidence that included the low EC, the relatively low COD and metal concentrations and non-detection of PFAS. These latter results indicate that the water in the pond consists of site runoff.

6.1.4 Primary stormwater system and receiving environment (SS3-7, SS15, SS16)

Water in the Primary Stormwater Pond (SS3) was characteristically turbid, and the water level was not sufficiently high to flow over the spillway and there was no discharge from the Pond downstream to the drain that runs to Marsh Creek. Parameters tested were within historical ranges and below historical maximums. pH, suspended solids, COD, nutrients, and dissolved metals including Al, Cd, Cu and Zn were reported above the ecosystem protection criteria.

Sufficient water was present at surface sample site SS5, which is located on the drain that runs to Marsh Creek and the CRT, and also hosts a marshy reach which is a groundwater discharge zone and also accepts sheet runoff from surrounding ground. Analytical concentrations were below the historical maximums with the exception of total Cd, however soluble Cd was reported below the assessment criteria. Physicochemical parameters including suspended solids (95 mg/L) and COD (95 mg/L) were above the respective assessment criteria of 6.8 mg/L and 68 mg/L. Nutrients (Nitrate, Total N, Reactive P) and metals Al, Cd, Cu and Zn were reported at or above the criteria. EC, alkalinity and major ions levels at SS5 were greater than those in the upstream sample location SS3. This has previously been attributed to discharge of more saline groundwater into the drain between the two sample locations.

The change (expressed as a percentage) in analytes concentrations between the upstream (SS6) and downstream (SS7) CRT sample sites is provided in **Table 10**. Turbidity increased by 61% (30 to 48 NTU) and suspended solids by 133% (9 to 21 mg/L) between the upstream and downstream sample sites, however on both occasions the actual concentrations were below historical maximums and relatively low, therefore the percentage increase appears high.

Overall, there were no significant differences in anion and cation concentrations and most dissolved metal concentrations were not detected. For metals that were detected, concentrations were either lower downstream or within the range of expected variation such as observed for Fe and Zn (Fe 1.08 to 1.12 mg/L and Zn 0.005 to 0.009 mg/L). Only nitrate and Zn increased above the ecological assessment criteria between the upstream and downstream sample sites. Nitrate was at LOR in SS6 and 0.044 mg/L in SS7, with the latter above the assessment criteria of 0.022 mg/L.

6.1.5 Potential leachate indicators - Surface water

Leachate indicators have been selected based on elevated concentrations in B-cell and C-cell leachate (as represented by SS1 and SS9) and relative absence or presence at low concentrations in background sample locations. The primary leachate indicators are listed below.

- Dissolved organic carbon
- Chemical oxygen demand

6 DISCUSSION OF RESULTS

- Total alkalinity
- Total nitrogen
- Dissolved potassium
- arsenic
- Dissolved chromium
- Sum PFAS.

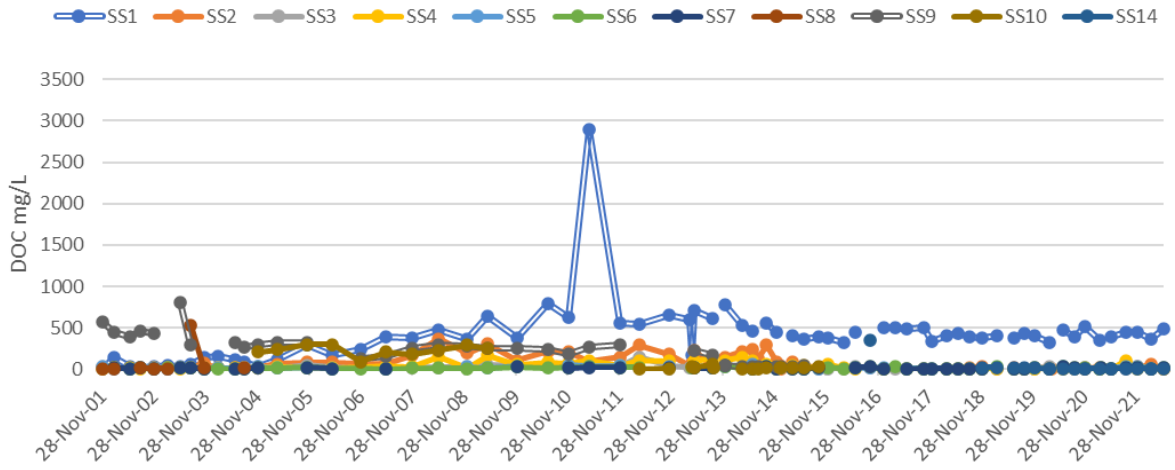
In the case of potassium, arsenic and chromium soluble concentrations have been selected over total because soluble metals as an indicator are less influenced by particulates in the sample, which can become elevated due to suspended sediments or sample disturbance, particularly in groundwater.

In addition to the leachate indicators listed leachate/non-leachate ratios have been developed and applied. The identification of leachate using the ratio is based on increases in the concentration of cations elevated in leachate such as potassium and ammonium relative to background cations such as sodium, calcium, and magnesium. Applying a leachate/non-leachate ration (L/N ratio) ratio can be advantageous because it allows comparison of groundwaters which have significantly different chemistries, such as perched and groundwater in the main aquifer.

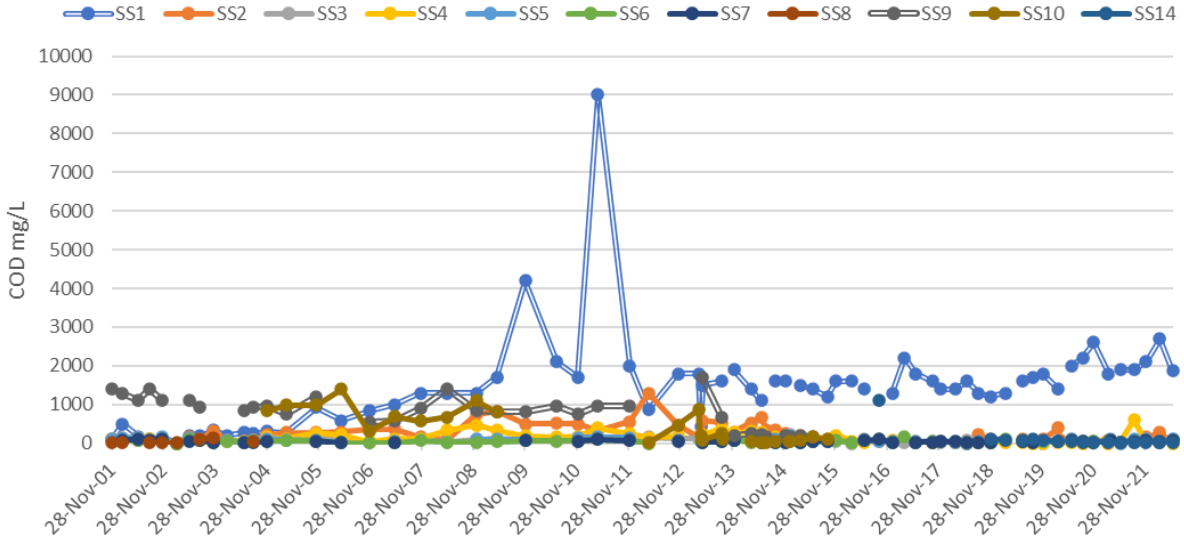
Temporal concentrations of each indicator are graphically displayed in the following section with a summary of the trends.

6 DISCUSSION OF RESULTS

Dissolved Organic Carbon - Surface waters



Chemical oxygen demand - Surface waters

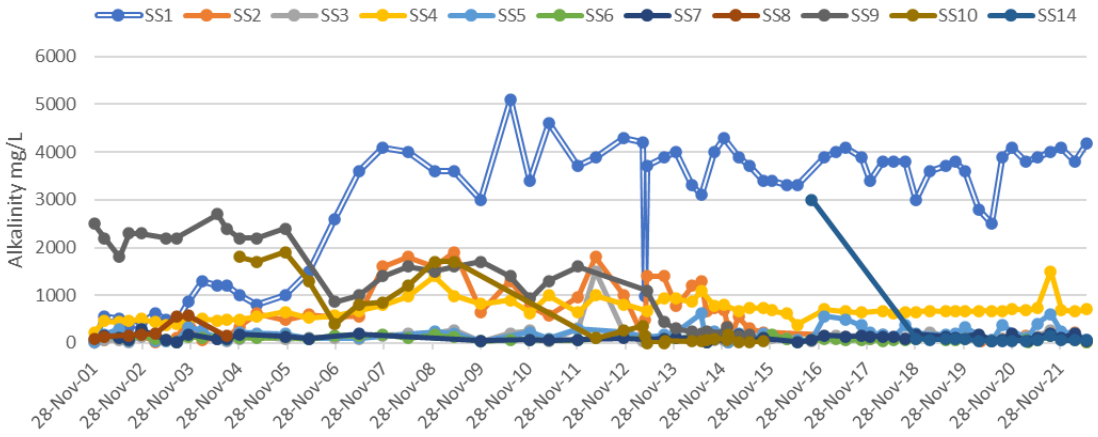


DOC and COD trend summary

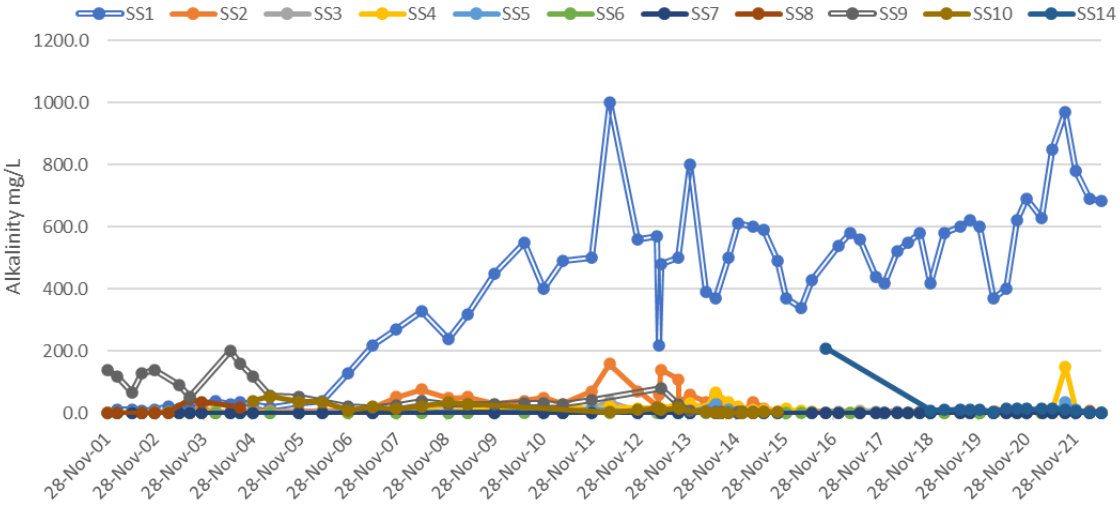
- DOC and COD show similar trends between 2001 and 2021.
- DOC and COD was variable in surface water locations SS2, SS4 and SS10 from the start of sampling until 2016.
- Since 2016 DOC and COD in most of the surface sample locations have remained low and stable with no increasing trends.
- DOC has not increased, and COD shows a very slight increase in the B-Cell Primary Leachate Pond (SS1) since 2014.
- No surface water sample sites discharging into receiving waters display increasing trends.

6 DISCUSSION OF RESULTS

Total alkalinity - Surface waters



Total nitrogen - Surface waters

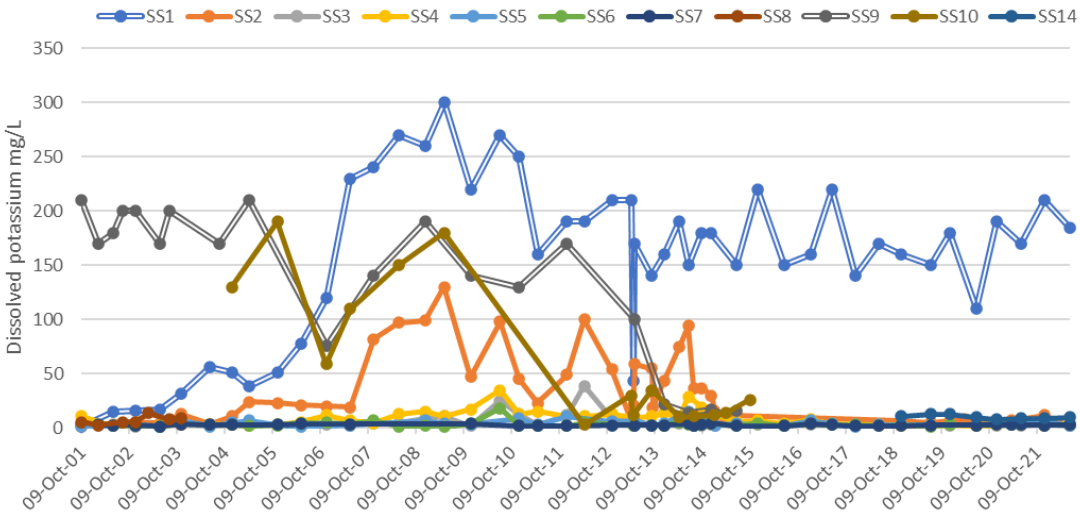


Alkalinity and nitrogen trend summary

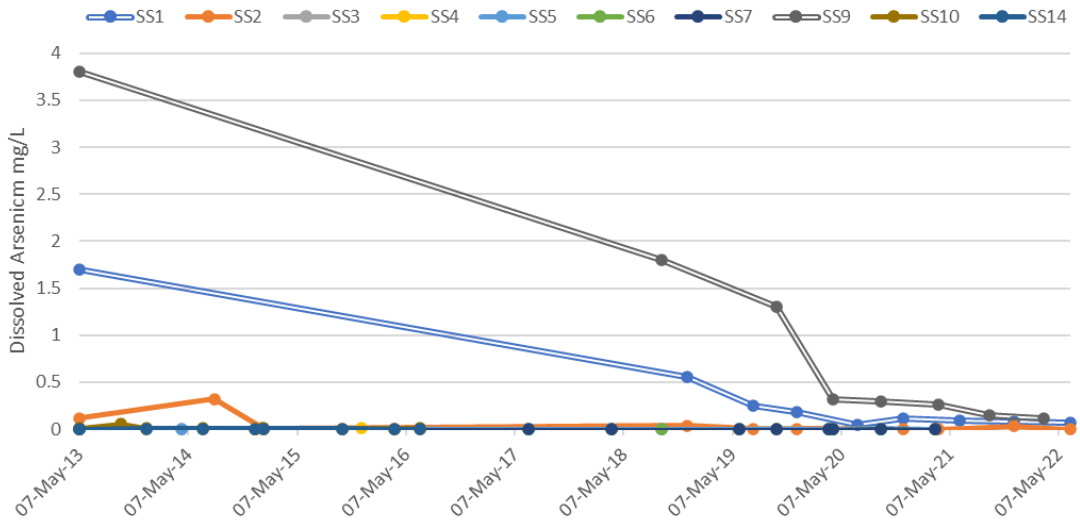
- Alkalinity in the B-cell leachate pond fluctuated between 3,000 to 4,000 mg/L and nitrogen between 400 mg/L to 800 mg/L since 2014.
- Alkalinity and nitrogen have remained stable with low concentrations in the majority of surface water sample location since 2015.
- Alkalinity and nitrogen levels increased in the B-Cell leachate pond underdrain pit (SS4) in September 2021. It is understood from AquaSci that the cause for the increase was investigated and believed to be associated with a leak in the leachate pond liner which was subsequently repaired. Concentrations subsequently returned to typical concentrations in ensuing monitoring rounds.

6 DISCUSSION OF RESULTS

Dissolved potassium - surface waters



Dissolved arsenic - surface waters

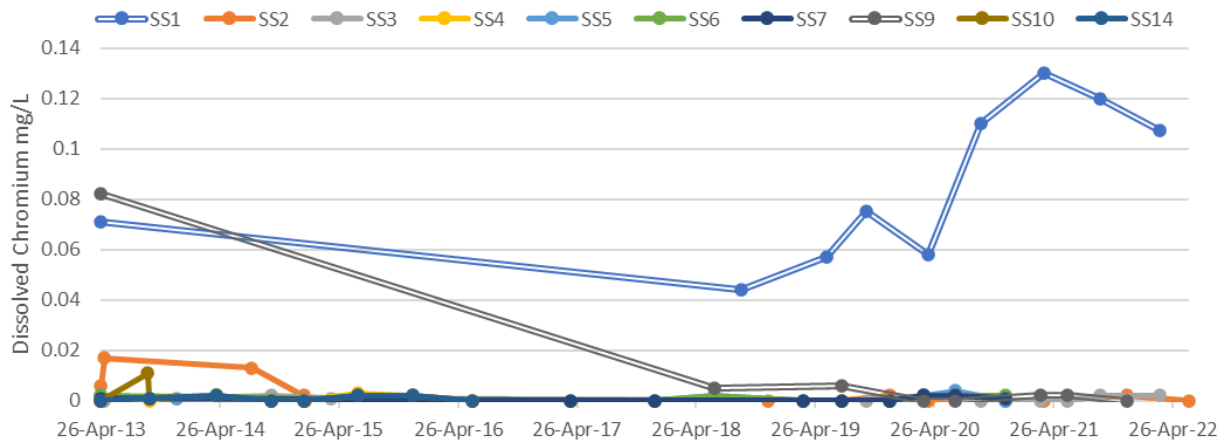


Potassium and arsenic trend summary

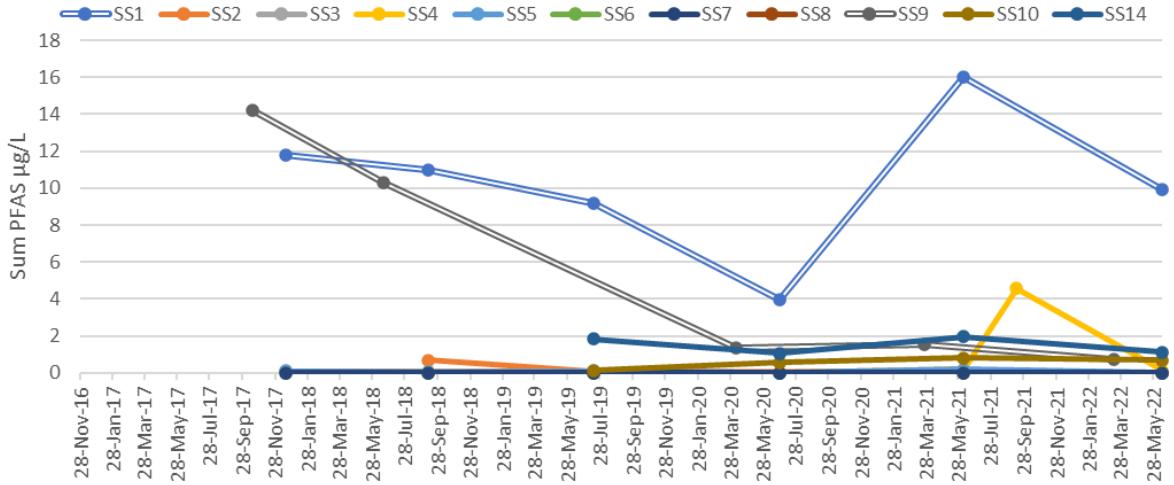
- Soluble K concentrations were variable in many leachate (SS1, SS4 and SS10) and B-Cell stormwater sampling sites (SS2) between 2001 and 2015.
- Since 2015 soluble K has decreased and stabilized in the surface sample sites with the exception of SS1.
- Soluble As concentrations have steadily decreased in B-Cell and C-Cell leachate sample sites SS1 and SS9 since As testing started in 2013.

6 DISCUSSION OF RESULTS

Dissolved chromium – surface waters



Sum PFAS – surface waters



Chromium and PFAS trend summary

- Soluble Cr increased in B-Cell leachate pond sample SS1 between 2020 and 2021 and has since decreased over the last 3 samples since 2021
- Since 2020 Cr concentrations in all the remaining surface sample sites remain low.
- PFAS concentrations increased in the B-Cell leachate pond samples SS1 between 2020 and 2021. This increase was mirrored in the B-Cell pond liner underdrain pit (SS4). The increased in SS4 is believed to be linked to the leak in the liner that was subsequently repaired.

6 DISCUSSION OF RESULTS

6.2 Groundwater

Groundwater monitoring bores are grouped based on their location and when they were installed. The groups include B-cell and C-cell bores, leachate wetland treatment bores and near leachate pond bores. The location and depth of the bores is provided in **Table 3**: Groundwater bore sampling locations, in **Section 2.1.**

Groundwater samples were obtained from 19 bores on the 14th and 16th June 2022. No sample was collected from bore BH13 because it could not be accessed. Samples were also not obtained from bores BH14B and BH18B as they are used to obtain gauging data only.

Consistent with previous monitoring rounds landfill gas emitted following the removal of the bore covers at bores BH15A and BH15B located close to the B-cell.

6.2.1 Groundwater Levels

Groundwater levels are tabulated in **Tables D1 and D2**. Depth to groundwater in June 2022 ranged from 0.0 m below ground level (BGL) in BH2 to 34.47 m BGL in BH18A. For BH2, this means that the water level occurs at ground surface. The average standing water level across the monitoring bores was 5.97 m BGL. This compares with 5.77 m BGL in March 2022 which represents a 0.2 m drop in average water level.

Where accurate surveyed bore elevation and coordinate data was available groundwater reduced levels to Australian Height Datum (AHD) were tabulated. The AHD levels are contoured on the attached **Figure AF2.** Groundwater elevations were highest in bores in the south and southeast portion of the CDS as represented by BH18B (74.92 mAHD), BH14B (61.54 mAHD) and BH14A (58.41 mAHD.

The contour plan indicates groundwater flow across the CDS is to the northwest towards the CRT and the marsh in the vicinity of surface sample SS5. The groundwater flow direction was consistent with the conceptual hydrological model developed by Cromer (Cromer 2018).

Temporal groundwater levels across the CDS are primarily influenced by changes in rainfall amount due to seasonal variability and longer-term climate change. Ground water levels in some bores such as BH7, BH14B and BH22 are more variable than other such bores such as BH13, which display minor changes in water levels over the same monitoring period.

Over the last 2 to 3 years water levels across nearly all the monitoring bores have increased. The one exception is monitoring bore BH10C located down hydraulic gradient of the B-Cell. Bore BH10c was installed in 2019, is 12.4 m deep and water levels dropped from 10.33 m in July 2019 to 10.99 m in June 2022. Although the cause for the fall in groundwater levels in BH10c is unknown, it is acknowledged that the falling trend is not consistent with the wider monitoring network over the same time period. As the bore has only been installed 3 years ago, monitoring over a longer timeline will help to determine if the decrease represent a long-term trend.

6 DISCUSSION OF RESULTS

6.2.2 Groundwater Chemistry

The June 2022 groundwater analytical results are summarised in **Table 11.**

Table 12: Ground water analytical summary table – June 2022

Parameter Group	Contaminant	CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)	CRT - SS6, AquaSci (2019) - Range (min-max)	C-Cell Bores	C-Cell / Irrigation Wetland Bore	B-Cell / Irrigation Wetland Bore	B-Cell / Irrigation Wetland Bore	B-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore	C-Cell Bore	C-Cell Bore	C-Cell Bore
				BH1	**BH2**	**BH7**	**BH10C**	**BH10D**	**BH12A**	**BH12B**	**BH14A**	**BH15A**	**BH15B**
L-N Ratio	Modified Mulvey L/N Ratio	-	-	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Field Parameters	Bore depth			22.93	11.49	10.16	12.39	7.03	21.58	5.36	24.35	29.67	13.62
	Groundwater depth			5.46	0.00	0.78	1.40	0.94	3.01	3.21	7.19	14.18	12.44
	Static hydraulic head			17.48	11.49	9.39	10.99	6.09	18.57	2.16	17.16	15.49	1.18
	Vol Purged			3	3.5	3.5	2.5	2	3.5	3.5	5	3	--
	Temp	7.4-16.7	**5.2-24.6**	13.9	13.0	13.2	12.8	13.4	13.5	14.1	14.3	18.1	18.8
	DO (ppm)			1.4	0.6	6.1	6.9	2.0	0.7	3.8	0.6	0.7	1.8
	Electrical Conductivity (SPC)	1910	**3530**	**7663**	3094	**8424**	**8762**	**8792**	**4064**	**3654**	**4039**	**6134**	518
	pH	7.1-7.8	**6.6-9.0**	6.1	6.9	6.7	6.7	6.7	6.9	5.9	6.7	6.8	6.1
	Redox Potential (Calomel)			-92	4	-45.0	-113	-19	-76	66	-107	-150	-126
	Turbidity			3.3	5.0	7.6	23	28	19	258	85	76	54
Physico-Chemical	Total Dissolved Solids (TDS)			5510	1880	5240	5370	5440	2770	2280	2650	4900	560
	Dissolved Organic Carbon	22	**37**	32	8	7	7	4	7	8	6	22	49
	Chemical Oxygen Demand	68	**160**	<50	<10	<50	<50	<50	<10	32	<10	<50	64
	Total Cyanide	0.007		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Nutrients	Ammonia as N	0.035	**0.72**	0.09	<0.005	0.022	0.091	0.026	0.051	<0.005	0.056	0.008	0.717
	Nitrite as N	0.005	**0.034**	<0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Nitrate as N	0.022	**5**	0.01	0.082	0.004	0.006	0.032	0.046	0.018	0.148	<0.002	0.017
	Nitrite + Nitrate as N			0.01	0.088	0.004	0.006	0.032	0.046	0.018	0.148	<0.002	0.017
	Total Kjeldahl Nitrogen as N			0.25	<0.02	0.12	0.26	0.12	0.09	0.09	<0.01	0.18	2.42
	Total Nitrogen as N	1.2	**4.3**	0.26	0.08	0.12	0.27	0.15	0.14	0.11	0.12	0.18	2.44
	Total Phosphorous as P	0.032	**0.085**	0.047	0.036	**0.126**	0.041	0.03	<0.005	0.014	<0.005	<0.050	**0.499**
	Reactive Phosphorus as P	0.004	**0.032**	0.01	0.021	0.025	0.013	0.017	0.004	0.014	0.015	0.035	0.001
Anions and Cations	Sulphur as SO4=												
	Sulfate as SO4-			153	60	205	201	188	56	86	72	148	11
	Chloride as Cl-			2420	779	2760	2910	2940	1140	1060	992	1730	18
	Dissolved Calcium as Ca			443	160	369	388	315	186	34	205	264	65
	Dissolved Magnesium as Mg			478	157	403	440	478	90	80	234	377	32
	Dissolved Sodium as Na			482	228	818	829	867	458	525	294	416	88
	Dissolved Potassium as K			10	3	5	6	5	5	8	4	7	4
Dissolved Metals	Arsenic as As	0.024		<0.001	<0.001	0.002	0.007	<0.001	<0.001	<0.001	0.001	<0.001	0.002
	Cadmium as Cd	0.0002		<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Chromium as Cr	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper as Cu	0.0014		<0.001	<0.001	0.003	<0.001	0.004	<0.001	0.005	<0.001	<0.001	<0.001
	Iron as Fe			0.54	<0.05	0.61	1.02	<0.05	0.11	<0.05	0.63	3.15	11.9
	Lead as Pb	0.0034		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Manganese as Mn	1.9		0.712	0.181	1.08	1.64	0.393	1.56	0.031	0.329	0.158	3.07
	Mercury as Hg	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nickel as Ni	0.011		0.005	0.002	0.005	0.003	0.004	0.016	0.01	0.001	0.013	0.001
	Selenium as Se	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Vanadium as V	0.006L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc as Zn	0.008		0.008	0.006	0.011	0.012	0.027	0.005	0.034	0.013	0.008	<0.005
PFAS	PFOS	0.13		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
	PFOA	220		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.45

6 DISCUSSION OF RESULTS

Table 13: Ground water analytical summary table – June 2022

Parameter Group	Contaminant	Reference Bores	C-Cell Bores	Perimeter / Reference Bores	Perimeter / Reference Bores	C-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore	C-Cell / Irrigation Wetland Bore
		BH18A	**BH19**	**BH21**	**BH22**	**BH23**	**BH24A**	**BH24B**	**BH25A**	**BH25B**
L-N Ratio	Modified Mulvey L/N Ratio	NO	NO	NO	NO	NO	NO	NO	NO	NO
Field Parameters	Bore depth	34.91	8.96	31.13	19.95	15.37	12.43	3.03	10.07	3.55
	Groundwater depth	34.47	3.49	10.70	0.51	2.77	1.28	1.28	2.10	2.14
	Static hydraulic head	0.44	5.48	20.43	19.45	12.60	11.16	1.76	7.97	1.41
	Vol Purged	--	3	2.5	3	3	4	3	3	3
	Temp	11.4	14.2	13.1	13.4	13.6	13.4	13.6	12.7	12.6
	DO (ppm)	4.5	1.7	1.3	3.8	3.9	5.3	1.5	0.6	4.2
	Electrical Conductivity (SPC)	**4652**	**4356**	2393	1772	2558	**7084**	**6620**	**5106**	**6995**
	pH	7.4	5.9	7.2	7.0	6.9	6.6	6.6	6.3	6.2
	Redox Potential (Calomel)	52	48	-157	33	26	-51	25	-20	40
	Turbidity	2204	107	11	40	7.8	4.6	252	42	10
Physico-Chemical	Total Dissolved Solids (TDS)	3220	2860	1460	1060	1490	4260	3890	2880	4210
	Dissolved Organic Carbon	15	5	10	14	8	1	6	3	14
	Chemical Oxygen Demand	**272**	10	<10	16	<10	<50	<50	11	18
	Total Cyanide	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Nutrients	Ammonia as N	0.011	0.071	0.038	<0.005	<0.005	0.087	<0.005	0.011	<0.005
	Nitrite as N	<0.002	<0.002	<0.002	0.005	0.006	<0.002	<0.002	<0.002	<0.002
	Nitrate as N	0.513	<0.002	<0.002	2.76	0.117	<0.002	0.007	0.13	0.016
	Nitrite + Nitrate as N	0.513	<0.002	<0.002	2.76	0.123	<0.002	0.007	0.13	0.016
	Total Kjeldahl Nitrogen as N	0.47	0.08	0.14	<0.10	0.02	0.2	0.11	0.14	0.13
	Total Nitrogen as N	0.98	0.08	0.14	2.56	0.14	0.2	0.12	0.27	0.15
	Total Phosphorous as P	**1.44**	<0.005	<0.010	0.077	0.039	0.049	**0.13**	0.074	0.019
	Reactive Phosphorus as P	0.007	0.021	0.008	0.028	0.018	0.016	0.021	0.017	0.017
Anions and Cations	Sulphur as SO4=									
	Sulfate as SO4-	87	107	55	30	37	205	218	167	217
	Chloride as Cl-	1340	1260	601	291	611	2290	1870	1490	2320
	Dissolved Calcium as Ca	173	121	114	96	140	264	148	99	106
	Dissolved Magnesium as Mg	101	178	48	64	124	207	194	130	177
	Dissolved Sodium as Na	617	509	286	187	198	925	976	798	1080
	Dissolved Potassium as K	8	2	4	10	2	4	2	3	4
Dissolved Metals	Arsenic as As	0.003	<0.001	0.002	<0.001	0.004	0.001	<0.001	<0.001	<0.001
	Cadmium as Cd	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Chromium as Cr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper as Cu	0.002	<0.001	<0.001	0.004	0.001	<0.001	0.002	<0.001	0.003
	Iron as Fe	<0.05	<0.05	0.62	<0.05	<0.05	0.85	<0.05	0.13	<0.05
	Lead as Pb	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Manganese as Mn	0.142	0.056	0.536	<0.001	0.115	1.38	0.112	0.122	0.028
	Mercury as Hg	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nickel as Ni	0.002	0.021	0.012	0.001	0.003	0.004	0.018	0.01	0.02
	Selenium as Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Vanadium as V	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc as Zn	0.007	0.024	<0.005	0.006	0.007	0.008	0.009	0.019	0.022
PFAS	PFOS	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

6.2.3 Baseline reference bores (BH13, BH18A and BH22)

Water quality at the CDS is variable due to bores being installed into different aquifers with different hydrogeological and chemical properties. Bores BH13, BH18A and BH22 have historically been referred to as reference bores, however due to natural differences in groundwater chemistries direct comparison of groundwater chemistry of these wells to provide a clear indication of impact is limited. The reference bores have been used to demonstrate that changes in some parameters such as pH have broadly occurred across the whole monitoring network, indicative of aquifer recharge variability.

It is also noted that BH13 and BH18A are situated close or downgradient of potential sources of impact. In the case of BH13 it is close to the C-Cell leachate balancing pond, and across gradient from the new C-Cell leachate pond which has recently been constructed. Groundwater samples collected from BH18A located hydraulic upgradient of the C-Cell often contains insufficient water to purge the well before sampling and is therefore prone to sample induced disturbance and is infrequently sampled. As long-term monitoring data

is available in the older bores, comparison to the historical monitoring data is used to indicate potentially significant changes in chemistry.

6.2.4 B-Cell Groundwater Bores

Field parameters in bores BH10C and BH10D located down hydraulic gradient of the B-Cell were broadly comparable with the monitoring data from March 2022. EC in BH10C of 8,762 µs/cm was the same as the historical maximum of 8,761 µs/cm recorded in March 2022.

The increase in EC appears to have occurred across multiple bores between September 2021 and March 2022. Redox potential was historically low in BH10C (-113 mV); and a reduction of redox potential was apparent across multiple bores.

Physico-chemical and nutrients in bores BH10C and BH10D were broadly comparable with the March 2022 data. Total phosphorous and orthophosphate increased in both bores since March 2022 and the increase is also observed in the nearby leachate treatment wetland bores (BH24A/B and BH25A/B). The majority of dissolved metals were below or marginally above the LOR. Cu and Zn was slightly higher in the shallow bore (BH10D) and Fe and Mn were higher in the deeper bores (BH10C).

Bore BH23 is located between the B-Cell and downgradient bore BH2 to the northeast of the CDS. Sampling commenced in the bore in 2019. Most parameters were comparable with the historical monitoring data. Redox was slightly less than March 2022 reducing from 50 to 26 mV which is consistent with the other perimeter bores. Orthophosphate of 0.018 mg/L was above the historical maximum, however it was below the CRT-SS6 maximum range and orthophosphate in upgradient bore BH22 (0.028 mg/L).

Parameters in the B-cell leachate bore BH7 were comparable with the historical data. EC increased to 7,744 µs/cm after a historically low reading of 3,737 µs/cm was reported in March 2022.

Bore BH2 is a downgradient B-Cell bore situated near BH23. The bore is located within the marsh but receives flow of low EC groundwater from the east. Standing water levels in the bore are typically close to ground level and the bore has minimal drawdown during sampling. Field parameters were comparable to historical data ranges. Redox reduced to 4 mV since the last monitoring round and was close to the lowest redox recorded in June 2021. Total nitrogen decreased to a historical minimum of 0.08 mg/L from 2.0 mg/L in March 2022, and orthophosphate increased from 0.013 mg/L to 0.021 mg/L over the same period. Orthophosphate was lower than reported in nearby upgradient bore BH22 (0.028 mg/L).

Consistent with past monitoring the deeper irrigation bore BH12A contained less suspended sediment than the shallow bore BH12B. BH12A is typically slightly more alkaline than BH12B, with a pH ranging from 6.5-7.0 whereas BH12B ranges from 6.5-5.7. TDS in BH12A have remained consistent over the monitoring period and have increased in BH12B to exceed the maximum in June 2022 with 2,280 mg/L. Redox potential dropped in BH12A since the previous sample round to -76 mV.

6.2.5 C-Cell Groundwater Bores

C-Cell bores include BH14A, BH15A, BH15B and BH18A which were installed in 2017. Bores BH15B and BH18A often do not contain sufficient water to sample. Both bores were sampled in the June monitoring round, however BH18A was unable to be purged prior to sampling due to insufficient water.

Field parameters in BH14A were within historical ranges, however redox reduced from 74 mV in March to -107 mV, which is close to the historical minimum of -110 mV in 2016. Total nitrogen dropped from 0.67

mg/L in March 2022 to a historical low of 0.12 mg/L in June and orthophosphate increased to a historical maximum of 0.015 mg/L over the same period.

Consistent with previous sampling landfill gas was present in the bore casing while sampling BH15A and BH15B. This was observed as a visible stream of gas exiting the bore when the casing cap was removed. A pH of 6.1 was recorded in BH15B, which is more acidic than historical data. The pH appears to be decreasing since 2016, however data points are limited because a sample is often not able to be collected due to insufficient water.

TDS in BH15A increased to a historical maximum of 4,900 mg/L. Total nitrogen in in BH15B increased from 1 mg/L in March to 2.44 mg/L in June 2022. Total phosphorous increased in BH15B from below the LOR to 0.499 mg/L which represents a significant increase compared to the historical data. Orthophosphate increased above the historical maximum in BH15A from 0.011 mg/L in March to 0.035 mg/L in June 2022. Further assessment of the notable changes in BH15A and BH15B are discussed further in **Section 6.5.**

Most parameters tested in BH1 remained within historical ranges. TDS of 5,510 mg/L was recorded which was slightly more than 5,500 mg/L reported in March 2022.

The shallow bore BH19 (8.9 m) is located in a topographic low on the western side of the CDS, down hydraulic gradient of BH21. Although monitoring data of the bore is limited being installed in 2019, field parameters are consistent, display little variability and were within historical data ranges. Slight variability in chemistry is likely to be related climatic variability and recharge into the aquifer.

6.2.6 Wetland bores & leachate treatment bores

The wetland treatment bores include BH24A, BH24B, BH25A and BH25B and were installed in 2019. Leachate is reported to have first been introduced into the wetland for treatment in November 2020. Field parameters and physicochemistry remained within historical ranges for most analytes. Total phosphorous increased in both wells to historical highs of 0.049 mg/L (BH24A) and 0.035 mg/L (BH24B). An increase in phosphorus and orthophosphate was also evident in the other wetland bores over the same period.

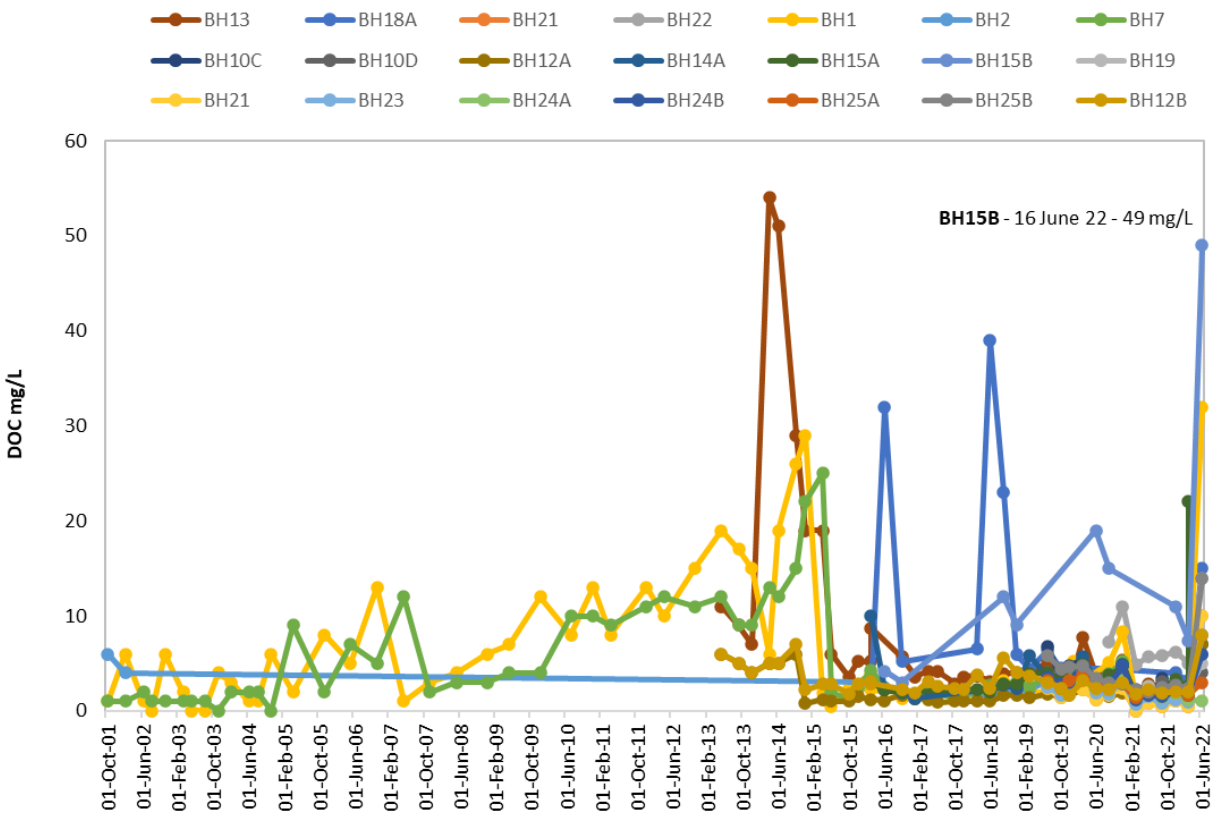
6.3 Potential leachate indicators – Groundwater

Leachate at the CDS is characterised by elevated concentrations of COD, nutrients, PFAS and soluble potassium, arsenic and chromium above levels expected in background groundwater and surface waters. A consistent increase in the concentrations of these analytes in groundwater at a specific sample site above natural variability may therefore be indicative of leachate.

The leachate indicators in groundwater are detailed in the following sections and temporal concentrations are graphically displayed with key observations listed.

6 DISCUSSION OF RESULTS

Soluble organic carbon (DOC) - groundwater

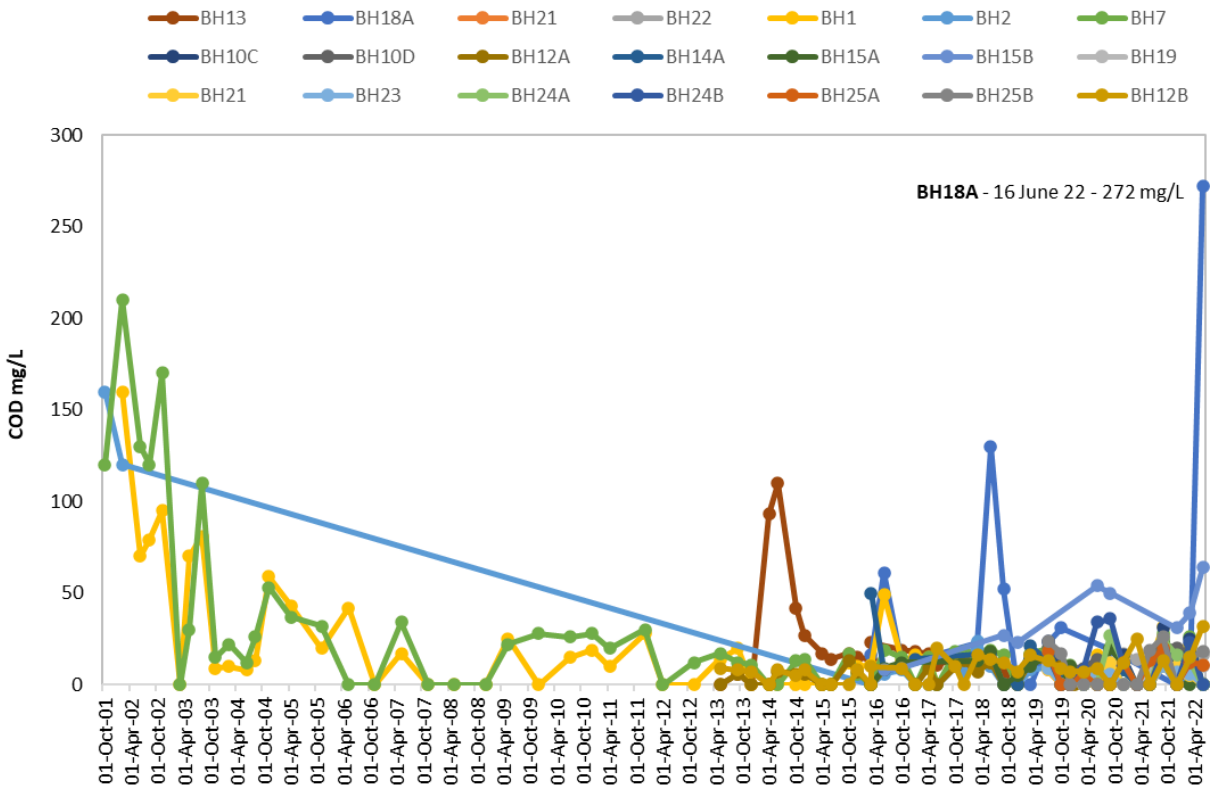


Soluble organic carbon (DOC) trend summary

- DOC in bore BH15B increased from 7.4 to 49 mg/L between March and June 2022. Prior to June 2022 the next highest concentration was 19 mg/L in June 2020. The bore commonly has insufficient water to collect a sample and sometimes purging prior to sampling has not possible.
- DOC also increase to a historical maximum on the deeper bore BH15A which is installed at a depth of 29.7 m in the same aquifer. DOC increased from 2.6 in Match 22 to 22 mg/L in June 2022.
- DOC was also reported above the past maximum in BH1 located down hydraulic gradient of the C-cell leachate pond. DOC increased from 1.9 mg/L in March to 32 mg/L in June 2022. Prior to June the previous DOC maximum was 29 mg/L in April 2015.
- Less pronounced increases in DOC occurred across the remaining bores between March and June 2022, suggesting that some DOC increase may, in part be due to natural variability in groundwater chemistry.

6 DISCUSSION OF RESULTS

Chemical oxygen demand – groundwater

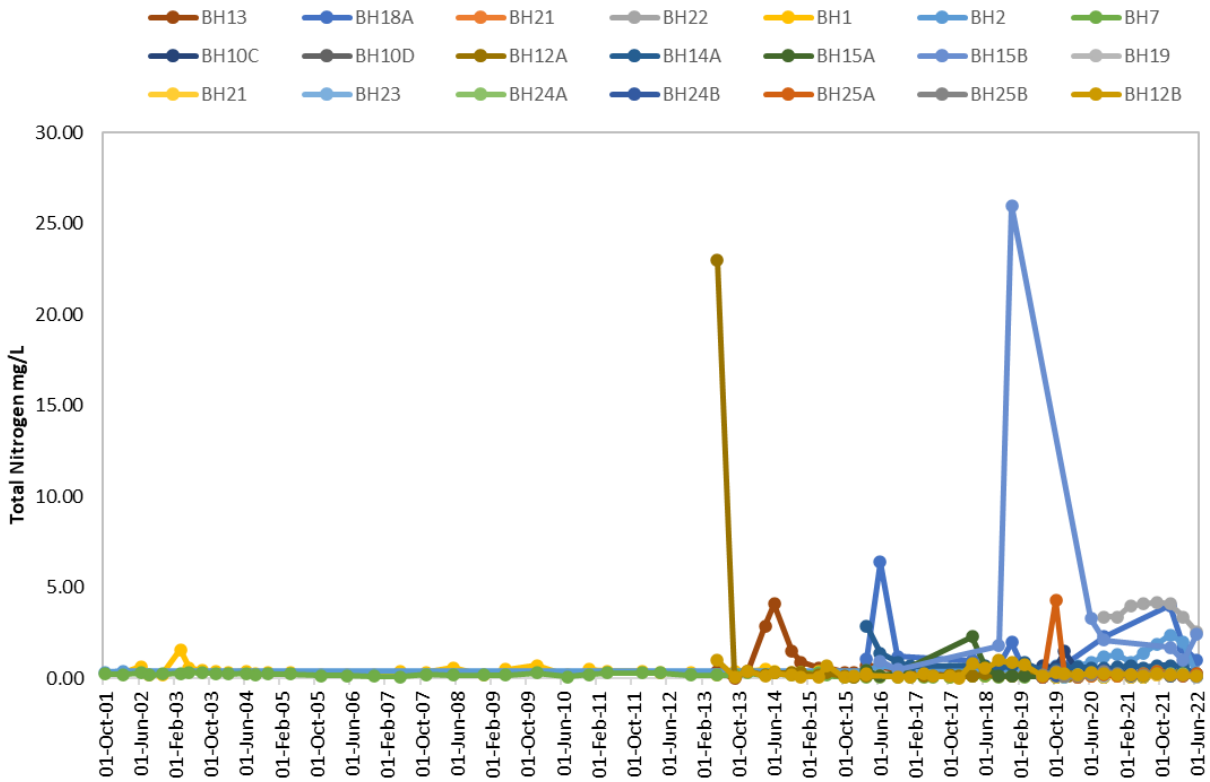


Chemical oxygen demand (COD) trend summary

- COD in bore BH18A (a bore of low yield situated up hydraulic gradient of the C-cell) increased from 6 to 272 mg/L between March and June 2022.
- Prior to June 2022 the next highest concentration was 130 mg/L in June 2018. Bore BH18A is 19.3 m deep and the shallowest of two bores. The bore commonly has insufficient water or recharge to collect a sample and sometimes purging prior to sampling has not possible. The water volume in bore BH18A has historically not been sufficient for the collection of organics samples and this lack of past monitoring data should be taken into account when reviewing chronological trends.

6 DISCUSSION OF RESULTS

Total nitrogen – groundwater

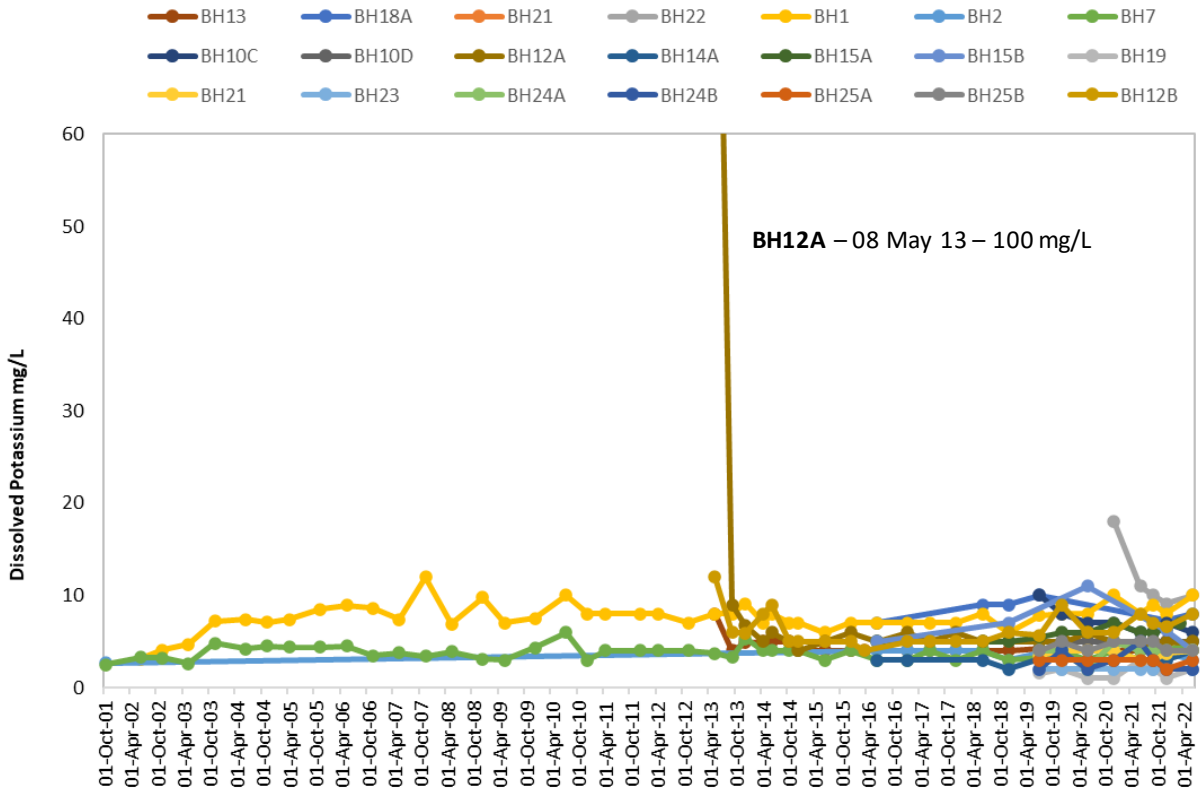


Total nitrogen trend summary

- Total nitrogen in the upgradient reference bore BH22 has continued to reduce from elevated concentrations reported in 2021
- Isolated elevated concentrations in bores BH2, BH12A, BH13 and BH25A since 2013 appear to be isolated and do not represent an increasing long-term trends indicative of leachate.

6 DISCUSSION OF RESULTS

Soluble potassium - groundwater

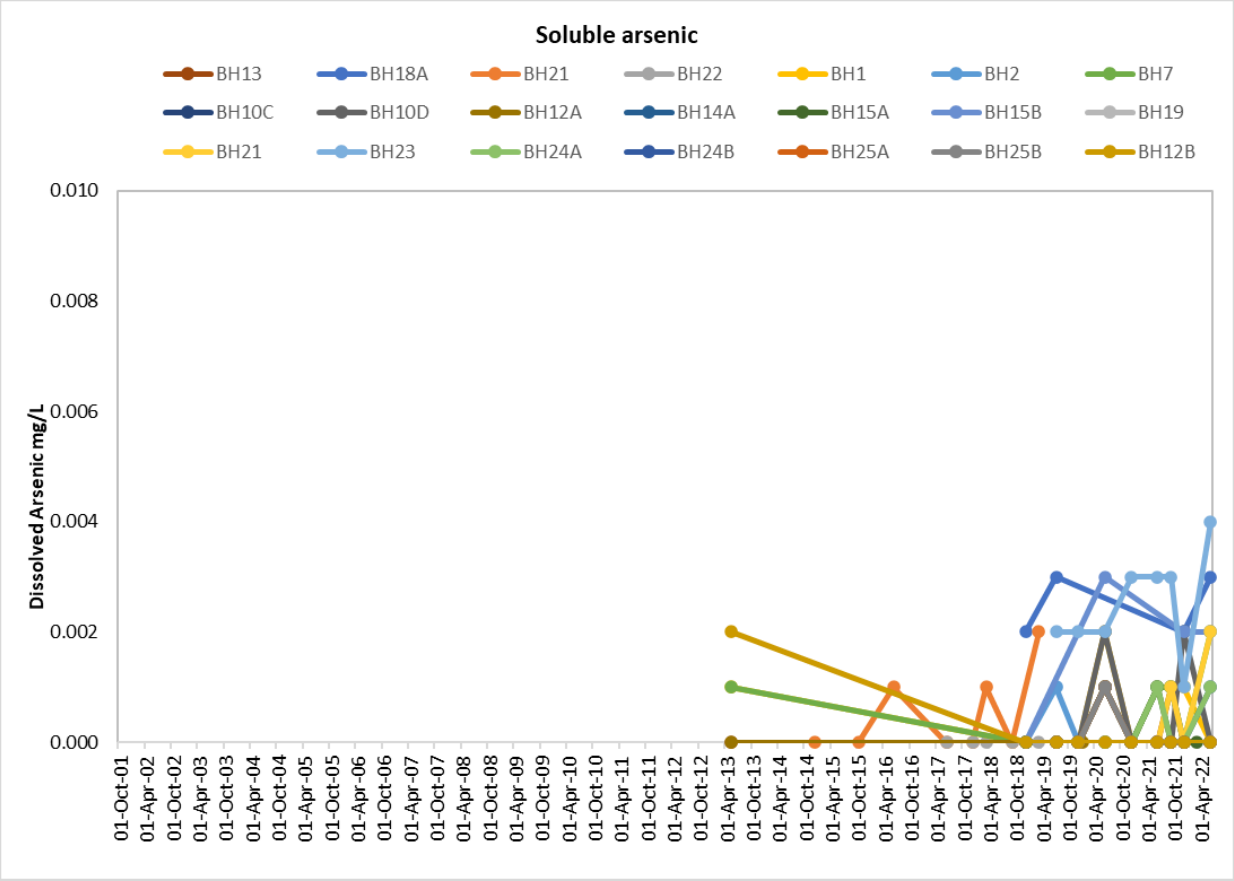


Soluble potassium (SP) trend summary

- Soluble potassium concentrations are variable but generally remain within historical ranges below 10 mg/L.
- For comparison soluble potassium concentrations in B-cell leachate (SS1) are a maximum of 130 mg/L and a long term average of 34 mg/L.
- High concentrations of soluble potassium were detected in Irrigation Area Bore BH12A in 2013, which was an order of magnitude above the subsequent data range suggesting it was an anomalous result.

6 DISCUSSION OF RESULTS

Soluble arsenic - groundwater

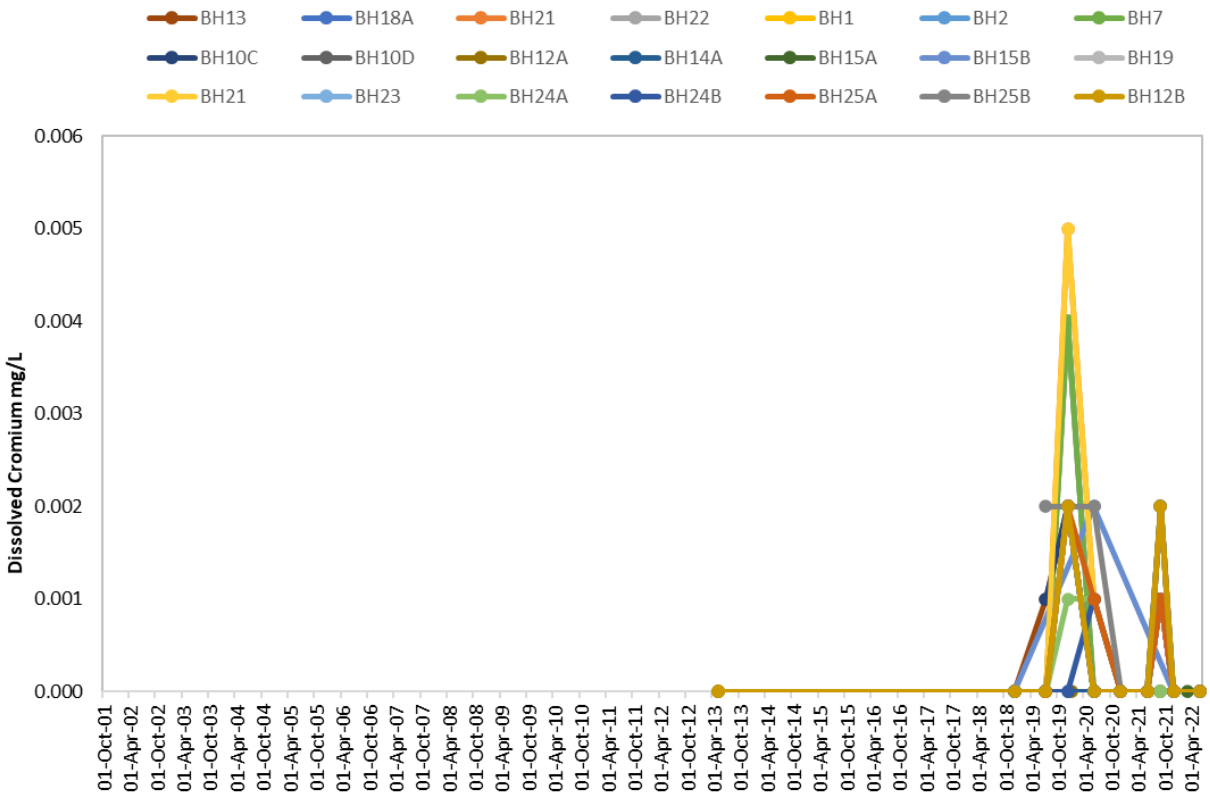


Soluble arsenic trend summary

- As concentrations in the bores have been slightly variable, but have remained largely below 0.003 mg/L
- For comparison maximum soluble As concentrations in the B-cell leachate (SS1) is 0.320 mg/L and the long term average is 0.049 mg/L.
- For C-cell leachate (SS10), soluble As has reported maximum concentration of 0.1 mg/L, with a long term average 0.01 mg/L.

6 DISCUSSION OF RESULTS

Soluble chromium – groundwater

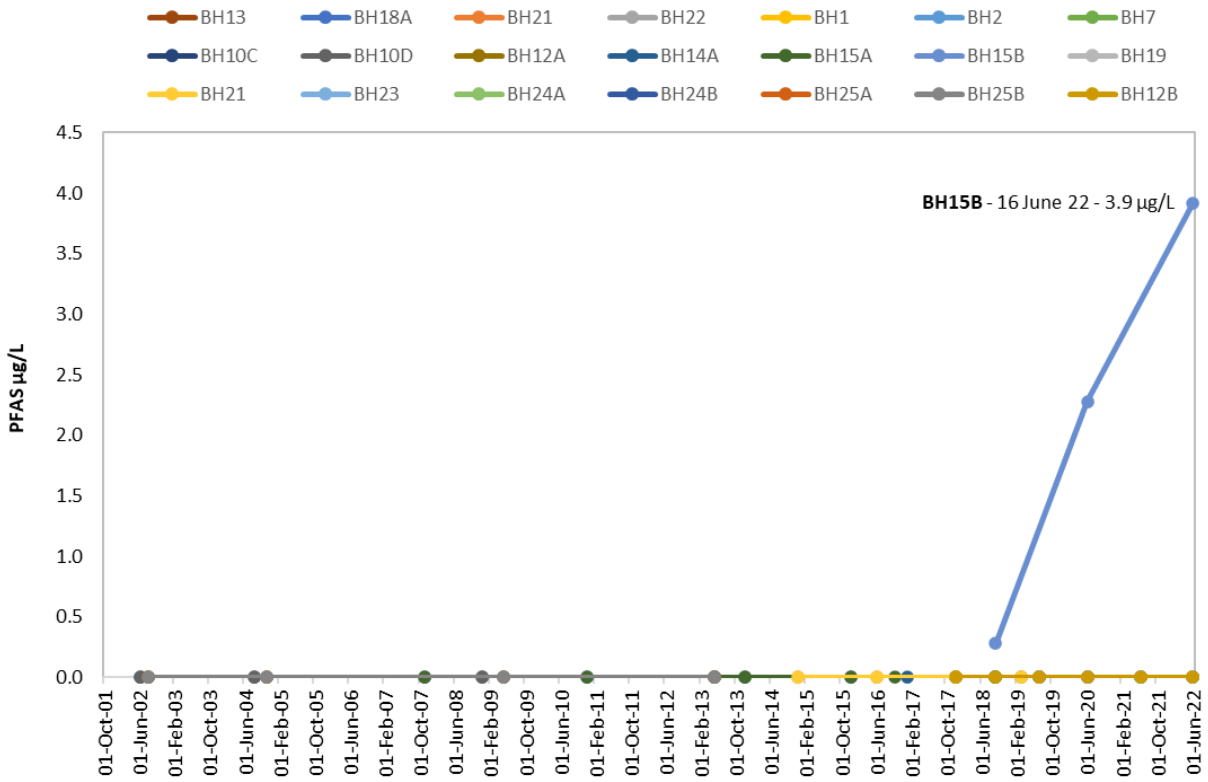


Soluble chromium – trend summary

- Soluble chromium concentrations increased to maximum concentrations before reducing in the following sampling event between 2019 and 2020 in bores BH1 and BH24A and 2021 in bores BH12A and BH25A.
- For comparison soluble chromium: B-cell leachate (SS1) max – 0.017 mg/L, average 0.007 mg/L, C-cell leachate (SS10) maximum – 0.011 mg/L, average 0.0036 mg/L.
- No groundwater Cr concentration display an increasing long term trend.
- No Cr was reported above the historical maximum in the June monitoring round.

6 DISCUSSION OF RESULTS

Perfluoroalkyl and polyfluoroalkyl substances (sum PFAS) – groundwater



Sum PFAS – trend summary

- With the exception of BH15B, PFAS has not been detected in any bore since testing commenced in 2019.
- In relation to BH15B, three samples have been tested for PFAS from 2018 and on all occasions PFAS was detected above the LOR.
- Total PFAS has increased over the last four years since 2018 from 0.3 µg/L in September 2018, 2.3 µg/L in June 2020 and 3.9 µg/L in the current June 2022 sampling round
- PFAS detected in BH15B in 2018 and 2020 was inferred by AquaSci to be related to runoff from Cell 4 nearby. It is unclear what evidence supported this inference.
- The maximum PFAS concentrations reported in the B-cell leachate (SS1) is 0.70 µg/L, and in the C-cell leachate (SS10) 0.20 µg/L;
- PFAS in bore BH15B in 2018 and 2020 is therefore above the maximum concentrations reported in the B-Cell and C-Cell leachate. Leachate is the most likely source of PFAS reported in BH15B, and indicates it is more concentrated in proximity to BH15B or there are concentration effects in either bore resulting in the higher concentrations reported.

6 DISCUSSION OF RESULTS

6.4 Groundwater leachate impact in bore BH15B

The recent changes in water chemistry in bore BH15B are considered to be significant, and indicative of leachate based on the lines of evidence:

BH15B Shallow (13.6 m)

- Groundwater has become progressively more acidic
- Total nitrogen - increased from 1 mg/L to 2.44 mg/L over a 3-month period
- Total phosphorous - increased from the LOR to 0.499 mg/L over the same period
- DOC - increased from 7.4 to a historical maximum of 49 mg/L.
- PFAS has been detected and increased in concentration since 2018.
- Presence of landfill gas in the bore casing.

As noted below, water chemistry and levels measured in BH15B indicate that the water sampled in the bore is unlikely to be dolerite groundwater, but instead either a perched water infiltrating from the surface, or a leachate from adjacent waste mass.

For deeper bore BH15A, changes in groundwater chemistry were also noted, however based on the available data they are not considered to represent a clear indication of leachate impact:

BH15A Deep (29.7 m)

- DOC increased from 2.6 mg/L in March 2022 to a historical maximum of 22 mg/L in June 2022
- TDS increased to a historical maximum of 4,900 mg/L.

It is acknowledged that the L/N ratio of 0.017 and 0.054 in BH15A and BH15B respectively is below the threshold of 0.1 indicative of leachate, however, other multiple lines of evidence indicate that the water in BH15B is impacted by leachate whilst the groundwater in BH15B is not.

A review of historical reports was undertaken in order to obtain more detailed background information on the history of bores BH15A and BH15B. The pertinent points from the review are summarised below:

- Bores BH15A and BH15B are about 1 m apart and installed in 2018. The bores were positioned to monitor potential westerly migration of leachate from the C-cell; however, they are located very close to the B-cell, which now rises more than 2 m above the ground level less than 2 m away.
- Bore BH15B is the shallowest of the pair and is 13.6 m deep with a 0.5 m screen (12.5-13.0m). This very short screen has resulted in very poor recharge in the bore and it is unable to be purged prior to sampling.
- Bore BH15A is 29.7 m deep with a 1 m screen from (29-30 m). The bores are reported to be installed into Jurassic dolerite described as locally fractured with abundant joints.
- It is reported that both bores were buried by tip operations between 2017 and 2018 and sampling was interrupted over this period.
- Both bores were extended 5.7 m as the ground level was raised. No information is provided on how the bores were extended or who undertook the work.
- Prior to burial, BH15B was reported to have contained little or no water, however, it contained some low EC water which was believed to represent infiltrated surface water following rainfall. After the construction of the nearby B-Cell, and the extension of both bores it was reported that BH15A contained adequate water for sampling in 2018.

6 DISCUSSION OF RESULTS

- In September 2018 surface water was reported to have surrounded the wells which included runoff from the recently constructed and active Cell 4 within the B-cell. This corresponded with an increase in EC, TN, TAN, nitrate and DOC above levels in 2016.
- The increase in nutrients and degradation of water quality was attributed by AquaSci to surface runoff from the active landfill B-cell 4 with bird faeces and was not investigated further by AquaSci as they did not see a corresponding increase in the modified Mulvey Ratio.
- Results from December 2018 were inferred to be anomalous due to low rechange which prevented recharge of the bore. It was concluded by AquaSci that BH15B appeared to contain temporary perched water that enters the bore only after rainfall.

7 CONCLUSIONS AND RECOMMENDATIONS

The June 2022 6-monthly sampling event involved the collection of 10 surface water and 19 groundwater samples on the 14 and 15th June 2022. Samples were subject to Groups 1, 2, 3 and PFAS analysis in accordance with the Landfill Sustainability Guide (DPIWE, 2004) and EPN 690/1, PCE 8700 (EPA, 2012) and PCE 9931 (2019).

Physicochemical parameters were recorded prior to sampling and at specific surface water locations downstream of the primary discharge point on the CRT. Surface water sample locations SS8 and SS11 were not sampled as they were dry, and it was not possible to gauge or sample borehole BH13 because the access road was inaccessible due to the wet conditions.

Bureau of Meteorology data indicated that prior up to the sampling event rainfall was above the long-term monthly average in May (103.6 mm), but below the average in June (28.2 mm) and Jul 2022 (26 mm).

Based on the results of the sampling event are the following conclusions and recommendations:

- Standing groundwater levels across the monitoring network dropped from an average of 5.77 m BGL in March 2022 to 5.97 m BGL in June 2022. Reduced groundwater levels reported the highest levels in the southeast corner of the CDS and an inferred groundwater flow direction to the northwest. Insufficient groundwater was present to purge bore BH15B and BH18A prior to sampling.
- Consistent with previous sampling, landfill gas was present in the casing of bores BH15A and BH15B following the removal of the well covers. This has been noted as a health and safety issue for sampling these bores and further controls for purging and sampling are required, including venting and measuring landfill gas prior to sampling. SWS has advised that nearby gas extraction wells have since been connected to the gas extraction system, which may reduce future gas emissions from these bores.
- The analytes tested in surface waters and groundwater were generally within historical ranges, except for BH15B which shows impacts of leachate as summarised below.
- Changes in water chemistry and the presence of landfill gas in bore BH15B are noticeable and indicative of the presence of leachate based on multiple lines of evidence as follows:
    - Groundwater has become more acidic.
    - Total nitrogen and phosphorous concentrations have increased since the previous monitoring round.
    - DOC has increased to a historical maximum of 49 mg/L.
    - PFAS has increased since added to the analysis in 2018 (three samples analysed for PFAS in this period).
    - The presence of landfill gas in the bore casing.

  It is possible that an effective seal was not achieved when bores BH15A and BH15B were incrementally extended due to infilling of the nearby B-cell. Or that the standpipes have subsequently become displaced and/or cracked and are allowing perched water or leachate to enter the bores. If this is the case surface and subsurface water or leachate migrating through unsaturated material may be entering the bores above the screen and collecting at the bottom of the bore.

The above scenario is supported by the observation that landfill gas has been reported in both bores since Elgin commenced sampling last year, and AquaSci has indicated that landfill gas has become progressively more noticeable over recent years. In addition, bore BH15B has previously contained insufficient water to allow sampling or only contained sufficient water after periods of heavy rainfall.

- If leachate is migrating into BH15B from shallow surface and subsurface unsaturated horizons, and not entering the well from the slotted standpipe in the aquifer, the analytical results would not be representative of groundwater chemistry in the aquifer.
    - **Recommendation 1** – Based on the presence of landfill gas in bores BH15A and BH15B and to ensure the bores don't provide a potential migration pathway into the aquifer both bores be grouted and decommissioned as soon as possible.
    - **Recommendation 2** – Prior to decommissioning it should be explored if a downhole camera can be employed to inspect the bores and establish if displacement of the standpipes has occurred.
    - **Recommendation 3** – BH15A and BH15B should be reinstalled at similar depths in a suitable alternative location to facilitate future sample and characterization of groundwater conditions down gradient of the C-cell and in close proximity to the B-cell.
    - **Recommendation 4** – Consideration should be given to reinstalling BH18A which is upgradient of the C-Cell. This bore doesn't produce enough water to purge before sampling which is compromising sample quality and the ability to assess upgradient background the aquifer conditions.
- The review of potential leachate indicators did not indicate that leachate reaches the CRT downstream of the discharge point from the Primary Stormwater Pond.
- The CRT represents the primary receiving surface water body for the CDS and has previously been designated as *'slightly to moderately disturbed'* with a 95% protection level. The 95% protection level have previously been applied, however talking into account the WQG framework and PFAS bio-accumulative properties 99% species protection should be adopted.
    - **Recommendation 5** – Seek approval to lower the PFAS reporting limit in future annual sampling, which should allow comparison to the 99% Species Protection Level and enable earlier detection of PFAS, which is a useful leachate indicator.
- Sampling bore BH13 has not been possible during the last two sampling events because the access road has been impassable due to the wet conditions.
    - **Recommendation 6** – Vehicle access should be improved prior to the September 2022 sampling round to ensure sampling can continue from the bore and it does not represent a long-term data gap.
- The field QA/QC sampling results are considered acceptable for the reliability and accuracy of the analytical data for the purpose of the report.

8 REFERENCES

8 REFERENCES

AquaSci (2020). Copping RDS Surface and Groundwater Monitoring Program, Annual Sampling Event Report, December 2020.

Australian and New Zealand Environment Conservation Council (ANZECC) (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Australian and New Zealand Governments (ANZG) (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian State and tertiary governments, Canberra ACT, Australia.

Cromer, W.C (2018). *Review of Groundwater Monitoring and Conceptual Groundwater Model*.

DPIPWE (1997). State Policy on Water Quality Management 1997.

DPIWE (2004). *Landfill Sustainability Guide – Tasmania.* September 2004.

Environment Protection Notice 690/1 (EPN 690/1).

HEPA (2020). Heads of EPA Aust. and NZ. PFAS National Environmental Management Plan v 2.0. January 2020.

Landfill Sustainability Guide, Department of Primary Industries, Water and Environment (DPIWE, 2004)

NEPC (1999, amended 2013). *National Environment Protection Measure – Site Contamination.* National Environment Protection Council.

NEMP (2020). PFAS National Environmental Management Plan Version 2.0. The Heads of EPAs Australia and New Zealand (HEPA). January 2020.

NHMRC (2019). *Australian Drinking Water Guidelines.* National Health and Medical Research Council.

9 LIMITATIONS

Elgin Associates Pty Ltd has prepared this report for the sole use of Southern Waste Solutions in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal issued to SWS dated 7 September 2021.

The methodology adopted and sources of information used by Elgin Associates are outlined in this report. Elgin Associates has made no independent verification of this information beyond the agreed scope of works and Elgin Associates assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to Elgin Associates was false.

This sampling event report was prepared between July and August 2022 and is based on the conditions encountered and information reviewed during that period up to the time of preparation. Elgin Associates disclaims responsibility for any changes that may have occurred after this time. Opinions and recommendations contained in this report are based upon information gained during desktop study and fieldwork and information provided from government authorities' records and other third parties. The information in this report is considered to be accurate at the date of issue and reflects at the site at the dates sampled. This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the fieldwork unless otherwise explicitly stated in a preceding section of this report.

This report should be read in full together with all other reports referenced by this report. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

FIGURES

562000 562500 563000 563500

5257000

5256500

Confl. Pool
SS7
SS6
Marsh Ck
SS5
BH2
BH22
BH23
BH7
SS4
SS3
SS1
BH10C
BH10D
BH24A
SS2
BH24B
SS14
C-Cell
BH18A
BH18B
BH15A
B-Cell
BH15B
BH25A
BH25B
BH14A
BH14B
BH12A
BH12B
SS8
BH1
SS11
BH19
SS9
SS10
Clay Quarry
BH21
BH13

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Surface water sample
- Groundwater sample
- Waterway
- Water discharge
- Flow direction

Scale = 1:4,750

N

0 150 300 Meters

Site: Copping Refuse Disposal Site, Arthur Highway, Copping, TAS	Client: Southern Waste Solutions	Title: Site Layout - Sampling Monitoring Sites	**Figure AF1**
Date: 21 December 2021 Size: A3 Version: 2	Drawn: MU Approbed: DL/LF	elgin associates	Coordinate System: GDA2020 MGA Zone 55Projection: Transverse Mercator Datum: GDA 2020 Scale Factor: 0.9996 Units: Meter

Document Path: C:\Users\Owner\Elgin Associates Dropbox\Elgin_GIS\Tasmania\JN21332 Copping EMP\1. Project mxd\Fig1 Copping EMP Site Layout v2 21-12-21.mxd

562500 563000

5257000 5257000

BH2
RL =43.80mAHD

BH22

BH23

BH7
RL =40.23mAHD

40

BH10C
BH10D

BH24B BH24A

BH25A
BH25B

BH18A
RL =54.03mAHD

BH18B
RL =74.92mAHD

70

BH15A
RL =46.12mAHD

BH15B
RL =47.86mAHD

45

50

5256500 5256500

BH14B
RL =61.54mAHD

BH14A
RL =58.41mAHD

55

60

65

BH12B
RL =44.00mAHD

BH12A
RL =44.09mAHD

BH1
RL =51.45mAHD

BH19

BH13
RL =51.213mAHD

BH21

the LIST State of Tasmania, DPIPWE, Esri, HERE, Garmin, FAO, NOAA, USGS,

Legend

- Surveyed Groundwater Bore
- Not Surveyed Groundwater Bore
- Inferred Contour 5m
- Inferred Flow Direction
- **RL =** Reduced Level

*Contours are limited on number of data points.

0 25 50 100 Meters

Scale: 1:2,500

N

Site:
Copping Refuse Disposal Site, Arthur Highway, Copping, TAS

Client:
Southern Waste Solutions

Title:
Groundwater Reduced Levels, Inferred Contours and Flow June 2022

Date: 8 August 2022
Size: A3 Version: A
Job Number: 21332

Drawn: MU
Approved: DL

elgin associates

Figure AF2

CS: GDA2020 MGA Zone 55Datum: GDA2020 Projection: Transverse MercatorScale Factor: 0.9996Map Units: Meter

C:\Users\Owner\Elgin Associates Dropbox\Elgin_GIS\Tasmania\JN21332 Copping EMP\1.1 Project aprx\Fig2 Copping EMP RL Contours June 2022\Fig2 Copping EMP RL Contours June 2022.aprx

APPENDIX A – SUMMARY OF ANALYTICAL RESULTS – SURFACE AND GROUNDWATER

Table AT1 - Surface Water Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Field Parameters								Physico-Chemical					Alkalinity				Nutrients								Bacteriol.
				Temp	DO (%)	DO (ppm)	Electrical Conductivity (SPC)	pH	Redox Potential (Calomel)	Turbidity	Observations	Total Dissolved Solids (TDS)	Suspended Solids (SS)	Dissolved Organic Carbon	Chemical Oxygen Demand	Total Cyanide	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Ammonia as N	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorous as P	Reactive Phosphorus as P	Escherichia coli
			Units	°C	% sat	mg/L	µS/cm	pH Unit	mV	NTU		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	orgs/100mL
			LOR	0.1			1	0.01	0.1	0.1		10	5	1	10	0.004	1	1	1	1	0.005	0.002	0.002	0.002	0.01	0.01	0.005	0.001	1
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)				7.4-16.7			1910	7.1-7.8					6.8	22	68	0.007 (Free CN)				130	0.035	0.005	0.022		-	1.2	0.032	0.004	-
CRT - SS6, AquaSci (2019) - (max)				**5.2-24.6**			**3530**	**6.6-9.0**					**24**	**37**	**160**					**180**	**0.72**	**0.034**	**5**		-	**4.3**	**0.085**	**0.032**	-
Primary leachate pond	**Six-monthly**	**SS1**	14-Jun-22	9.8	23	2.5	**14949**	7.6	-62	30	rown, slightly turbid, no odour/sheen. Leachate inlet from sit	7810	15	**484**	**1870**	0.018	<1	<1	4170	**4170**	**680**	<0.200	<0.200	<0.200	685	**685**	**4.3**	**3.46**	290
	Six-monthly	**SS2**	14-Jun-22	3.2	91	12.2	367	8.0	46	31	y, slightly green, no odour/sheen. Ice on surface. Water level	162	18	6	15	<0.004	<1	<1	32	32	0.136	0.002	0.017	0.019	0.74	1	0.017	0.001	26
Primary stormwater pond	**Six-monthly**	**SS3**	14-Jun-22	5.6	90	11.3	638	8.0	-69	246	ht brown, cloudy, no odour/sheen. Water coming form chan	448	**95**	16	95	<0.004	<1	<1	73	73	0.212	<0.020	0.467	0.467	0.43	0.9	<0.050	0.025	350
Primary leachate pond seepage pit	**Six-monthly**	**SS4**	14-Jun-22	9.1	63	7.1	**6670**	7.2	-76	14	Slightly cloudy, no odour/sheen. Flocculent	3910	**34**	12	<50	<0.004	<1	<1	707	**707**	**1.12**	**0.048**	0.925	0.973	1.32	**2.29**	<0.005	0.012	0
Pond drain to Marsh Creek	**Six-monthly**	**SS5**	14-Jun-22	5.6	105	13.1	712	7.7	-5	243	Slightly brown, cloudy, no odour/sheen	629	**160**	16	93	<0.004	<1	<1	71	71	0.232	<0.020	0.239	0.239	0.85	1.09	<0.050	0.019	240
CRT upstream sample	**Six-monthly**	**SS6**	14-Jun-22	4.8	98	12.5	432	7.7	5	30	Slightly brown, no odour/sheen, foam, high flow	316	9	22	76	<0.004	<1	<1	30	30	<0.050	<0.020	<0.020	<0.020	0.67	0.67	<0.050	<0.010	170
CRT downstream site	**Six-monthly**	**SS7**	14-Jun-22	5.2	94	12.0	522	7.8	4	48	Slightly brown, no odour/sheen, high flow on creek	373	21	21	73	<0.004	<1	<1	39	39	<0.050	<0.020	0.044	0.044	0.51	0.55	<0.050	<0.010	160
	Six-monthly	**SS8**	14-Jun-22	Dry - Not sampled																									
C-Cell leachate balancing pond	**Six-monthly**	**SS9**	14-Jun-22	5.1	92	11.6	3263	7.6	91	20	Slighlty cloudy, green, no odour/sheen. Algae	2730	**72**	**43**	**178**	<0.004	<1	9	164	173	<0.005	<0.002	<0.002	<0.002	4.18	4.18	<0.010	0.003	30
	Six-monthly	**SS10**	14-Jun-22	4.5	97	12.2	**7264**	7.6	88	8.3	Slighlty green, clear, no odour/sheen	7970	**69**	28	116	<0.004	<1	<1	39	39	**0.98**	0.028	0.969	0.997	3.53	**4.53**	0.039	<0.001	20
Secondary stormwater pond seepage pit	**Six-monthly**	**SS14**	14-Jun-22	10.4	84	9.3	3171	7.4	68	0.3	Clear, no odour/sheen	1750	6	8	27	<0.004	<1	<1	68	68	<0.005	<0.002	2.27	2.27	0.43	2.7	0.009	**0.057**	4
March Creek	**Six-monthly**	**SS15**	14-Jun-22	2.6	96	13.0	1308	7.5	16	290	Cloudy , no odour/sheen. High flow																			
Confluence Pool	**Six-monthly**	**SS16**	14-Jun-22	4.7	96	12.3	486	7.8	10	49	Slighlty brown, clear, no odour/sheen																			

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shaded based on SS6 - Range maximum value

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - SSGV (Aq Eco)

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - Range (min-max)

Redox converted from $ag/AgCl_2$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been notified to analyse sulphur in future rounds

Table AT1 - Surface Water Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Anions and Cations							Dissolved Metals												Total Metals											
				Sulphur as SO4 =	Sulfate as SO4-	Chloride as Cl-	Dissolved Calcium as Ca	Dissolved Magnesium as Mg	Dissolved Sodium as Na	Dissolved Potassium as K	Aluminium as Al	Arsenic as As	Cadmium as Cd	Chromium as Cr	Copper as Cu	Iron as Fe	Lead as Pb	Manganese as Mn	Mercury as Hg	Nickel as Ni	Selenium as Se	Vanadium as V	Zinc as Zn	Aluminium as Al	Arsenic as As	Cadmium as Cd	Chromium as Cr	Copper as Cu	Iron as Fe	Lead as Pb	Manganese as Mn	Mercury as Hg	Nickel as Ni	Selenium as Se	Vanadium as V	Zinc as Zn
			Units	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	mg/L	mg/L	mg/L
			LOR	1	1	1	1	1	1	1	0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01	0.01	0.005	0.01	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01	0.01	0.005
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)											0.055	0.024	0.0002	0.001	0.0014		0.0034	1.9	0.00006	0.011	0.005	0.006L	0.008	0.055	0.024	0.0002	0.001	0.0014		0.0034	1.9	0.00006	0.011	0.005	0.006L	0.008
CRT - SS6, AquaSci (2019) - (max)																																				
Primary leachate pond	Six-monthly	SS1	14-Jun-22		<1	3130	97	263	1640	185	0.1	0.074	<0.0002	0.107	0.002	1.05	0.002	0.458	<0.0010	0.137	<0.02	0.08	0.045	0.14	0.098	<0.0002	0.148	0.007	1.51	0.002	0.595	<0.0001	0.169	<0.02	0.11	0.106
	Six-monthly	SS2	14-Jun-22		51	17	12	12	14	2	0.16	<0.001	<0.0001	<0.001	<0.001	0.08	<0.001	0.004	<0.0001	0.001	<0.01	<0.01	<0.005	1.41	0.002	<0.0001	0.001	0.002	1.1	<0.001	0.022	<0.0001	0.002	<0.01	<0.01	0.008
Primary stormwater pond	Six-monthly	SS3	14-Jun-22		36	55	8	9	60	2	0.06	<0.001	0.0003	<0.001	0.003	0.43	<0.001	0.015	<0.0001	0.003	<0.01	<0.01	0.01	9.72	0.001	0.0018	0.01	0.012	10.2	0.006	0.097	<0.0001	0.009	<0.01	0.02	0.101
Primary leachate pond seepage pit	Six-monthly	SS4	14-Jun-22		180	1670	209	291	814	4	0.01	<0.001	<0.0001	<0.001	<0.001	0.38	<0.001	0.368	<0.0001	0.004	<0.01	<0.01	<0.005	0.08	0.005	<0.0001	<0.001	<0.001	6.73	<0.001	0.385	<0.0001	0.003	<0.01	<0.01	<0.005
Pond drain to Marsh Creek	Six-monthly	SS5	14-Jun-22		39	159	19	22	91	2	0.11	<0.001	0.0002	<0.001	0.003	0.83	<0.001	0.018	<0.0001	0.003	<0.01	<0.01	0.012	11.7	0.001	0.0013	0.011	0.011	11.3	0.006	0.091	<0.0001	0.008	<0.01	0.02	0.092
CRT upstream sample	Six-monthly	SS6	14-Jun-22		19	100	11	13	56	3	1.2	<0.001	<0.0001	0.002	0.003	1.08	<0.001	0.008	<0.0001	0.002	<0.01	<0.01	0.005	2.06	<0.001	<0.0001	0.003	0.004	2.06	<0.001	0.013	<0.0001	0.002	<0.01	<0.01	0.023
CRT downstream site	Six-monthly	SS7	14-Jun-22		20	124	13	16	64	3	1.11	<0.001	<0.0001	0.001	0.003	1.12	<0.001	0.008	<0.0001	0.002	<0.01	<0.01	0.009	2.68	<0.001	<0.0001	0.003	0.004	2.65	0.001	0.016	<0.0001	0.003	<0.01	<0.01	0.008
	Six-monthly	SS8	14-Jun-22																																	
C-Cell leachate balancing pond	Six-monthly	SS9	14-Jun-22		1660	146	127	339	252	16	0.02	0.112	0.0013	<0.001	0.001	<0.05	<0.001	0.111	<0.0001	0.039	<0.01	<0.01	0.056	0.8	0.138	0.0034	<0.001	0.002	0.59	<0.001	0.455	<0.0001	0.046	<0.01	<0.01	0.177
	Six-monthly	SS10	14-Jun-22		5290	183	368	996	484	26	0.35	0.008	0.163	<0.001	0.015	<0.05	<0.001	9.61	0.0004	0.95	0.02	<0.01	8.39	1.32	0.01	0.176	<0.001	0.026	0.17	0.004	9.67	0.002	1.04	0.02	<0.01	9.19
Secondary stormwater pond seepage pit	Six-monthly	SS14	14-Jun-22		124	855	31	60	475	10	<0.01	0.003	0.0003	<0.001	0.004	<0.05	<0.001	0.004	<0.0001	0.006	<0.01	<0.01	0.011	0.01	0.003	0.0002	<0.001	0.004	<0.05	<0.001	0.005	<0.0001	0.006	<0.01	<0.01	0.01
March Creek	Six-monthly	SS15	14-Jun-22																																	
Confluence Pool	Six-monthly	SS16	14-Jun-22																																	

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shaded based on SS6 - Range maximum value

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - SSGV (Aq Eco)

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - Range (min-max)

Redox converted from ag/$AgCl_2$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been notified to analyse sulphur in future rou

Table AT1 - Surface Water Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Per &Poly-Fluoroalkyl Substances (PFAS)																																		
				Perfluorobutane sulphonic acid (PFBS)	Perfluoropentane sulphonic acid (PFPeS)	Perfluorohexane sulphonic acid (PFHxS)	Perfluoroheptane sulphonic acid (PFHpS)	Perfluorooctane sulphonic acid (PFOS)	Perfluorodecane sulphonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (NMeFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (NEtFOSE)	N-Methyl perfluorooctane sulphonamide (NMeFOSAA)	N-Ethyl perfluorooctane sulphonamidoacetic acid (NEtFOSAA)	4:2 Fluorotelomer sulphonic acid (4:2 FTS)	6:2 Fluorotelomer sulphonic acid (6:2 FTS)	8:2 Fluorotelomer sulphonic acid (8:2 FTS)	10:2 Fluorotelomer sulphonic acid (10:2 FTS)	Sum of PFAS	Sum of PFHxS and PFOS	Sum of PFAS (WA DER List)
			Units	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	µg/L	µg/L	µg/L	µg/L	µg/L
			LOR	0.02	0.02	0.01	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.05	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.01		
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)								0.13						220																								
CRT - SS6, AquaSci (2019) - (max)																																						
Primary leachate pond	Six-monthly	SS1	14-Jun-22	4.04	<0.02	0.94	<0.02	0.5	<0.02	<0.1	0.75	1.95	0.36	0.81	0.07	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	0.17	<0.02	<0.05	0.32	<0.05	<0.05	9.91	1.44	9.67
	Six-monthly	SS2	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01		
Primary stormwater pond	Six-monthly	SS3	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01		
Primary leachate pond seepage pit	Six-monthly	SS4	14-Jun-22	0.04	<0.02	0.02	<0.02	<0.01	<0.02	<0.1	0.03	0.03	<0.02	0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	0.13	0.02	0.13		
Pond drain to Marsh Creek	Six-monthly	SS5	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01		
CRT upstream sample	Six-monthly	SS6	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01		
CRT downstream site	Six-monthly	SS7	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01		
	Six-monthly	SS8	14-Jun-22																																			
C-Cell leachate balancing pond	Six-monthly	SS9	14-Jun-22	0.04	<0.02	0.09	<0.02	0.06	<0.02	<0.1	0.12	0.12	0.09	0.23	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	0.75	0.15	0.75		
	Six-monthly	SS10	14-Jun-22	0.02	<0.02	0.04	<0.02	0.02	<0.02	<0.1	0.1	0.12	0.1	0.27	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	0.67	0.1	0.67		
Secondary stormwater pond seepage pit	Six-monthly	SS14	14-Jun-22	0.21	0.02	0.11	<0.02	0.02	<0.02	0.2	0.22	0.2	0.06	0.09	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	1.13	0.13	1.11		
March Creek	Six-monthly	SS15	14-Jun-22																																			
Confluence Pool	Six-monthly	SS16	14-Jun-22																																			

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shaded based on SS6 - Range maximum value

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - SSGV (Aq Eco)

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - Range (min-max)

Redox converted from ag/$AgCl_4$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been notified to analyse sulphur in future rou

Table AT2 - Groundwater Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Field Parameters											Physico-Chemical				Nutrients							
				Bore depth	Groundwater depth	Static hydraulic head	Vol Purged	Temp	DO (ppm)	Electrical Conductivity (SPC)	pH	Redox Potential (Calomel)	Turbidity	Observations	Total Dissolved Solids (TDS)	Dissolved Organic Carbon	Chemical Oxygen Demand	Total Cyanide	Ammonia as N	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorous as P	Reactive Phosphorus as P
			Units	m bgl	m bgl	m	L	°C	mg/L	µS/cm	pH Unit	mV	NTU		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			LOR	0.01	0.01	0.01	1	0.1		1	0.01	0.1	0.1		10	1	10	0.004	0.005	0.002	0.002	0.002	0.01	0.01	0.005	0.001
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)								7.4-16.7		1910	7.1-7.8					22	68	0.007 (Free CN)	0.035	0.005	0.022			1.2	0.032	0.004
CRT - SS6, AquaSci (2019) - Range (min-max)								**5.2-24.6**		**3530**	**6.6-9.0**					**37**	**160**		**0.72**	**0.034**	**5**			**4.3**	**0.085**	**0.032**
C-Cell Bores	**Six-monthly**	**BH1**	16-Jun-22	22.93	5.46	17.48	3	13.9	1.4	**7663**	6.1	-92	3.3	Clear, no odour/sheen	5510	32	<50	<0.004	0.09	<0.002	0.01	0.01	0.25	0.26	0.047	0.01
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH2**	15-Jun-22	11.49	0.00	11.49	3.5	13.0	0.6	3094	6.9	4	5.0	Clear, no odour/sheen	1880	8	<10	<0.004	<0.005	0.006	0.082	0.088	<0.02	0.08	0.036	0.021
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH7**	15-Jun-22	10.16	0.78	9.39	3.5	13.2	6.1	**8424**	6.7	-45.0	7.6	Clear, no odour/sheen	5240	7	<50	<0.004	0.022	<0.002	0.004	0.004	0.12	0.12	**0.126**	0.025
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH10C**	15-Jun-22	12.39	1.40	10.99	2.5	12.8	6.9	**8762**	6.7	-113	23	Clear, no odour/sheen	5370	7	<50	<0.004	0.091	<0.002	0.006	0.006	0.26	0.27	0.041	0.013
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH10D**	15-Jun-22	7.03	0.94	6.09	2	13.4	2.0	**8792**	6.7	-19	28	Clear, no odour/sheen	5440	4	<50	<0.004	0.026	<0.002	0.032	0.032	0.12	0.15	0.03	0.017
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH12A**	16-Jun-22	21.58	3.01	18.57	3.5	13.5	0.7	**4064**	6.9	-76	19	Slightly cloudy, clear, no odour/sheen	2770	7	<10	<0.004	0.051	<0.002	0.046	0.046	0.09	0.14	<0.005	0.004
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH12B**	16-Jun-22	5.36	3.21	2.16	3.5	14.1	3.8	**3654**	5.9	66	258	Cloudy, light brown/orange, no odour/sheen	2280	8	32	<0.004	<0.005	<0.002	0.018	0.018	0.09	0.11	0.014	0.014
		BH13	15-Jun-22	13.49	6.29	7.20								Not sampled - Unable to access												
C-Cell Bore	**Six-monthly**	**BH14A**	14-Jun-22	24.35	7.19	17.16	5	14.3	0.6	**4039**	6.7	-107	85	Slightly cloudy, no odour/sheen	2650	6	<10	<0.004	0.056	<0.002	0.148	0.148	<0.01	0.12	<0.005	0.015
C-Cell Bore	**Six-monthly**	**BH14B**	14-Jun-22	11.61	4.07	7.55								Gauged only												
C-Cell Bore	**Six-monthly**	**BH15A**	16-Jun-22	29.67	14.18	15.49	3	18.1	0.7	**6134**	6.8	-150	76	Slightly cloudy, no odour/sheen, High landfill gas levels	4900	22	<50	<0.004	0.008	<0.002	<0.002	<0.002	0.18	0.18	<0.050	0.035
C-Cell Bore	**Six-monthly**	**BH15B**	16-Jun-22	13.62	12.44	1.18	--	18.8	1.8	518	6.1	-126	54	Cloudy, grey, landfill gas odour, no sheen. Insufficient water to purge.	560	49	64	<0.004	0.717	<0.002	0.017	0.017	2.42	2.44	**0.499**	0.001
Perimeter / Reference Bores	**Six-monthly**	**BH18A**	16-Jun-22	34.91	34.47	0.44	--	11.4	4.5	**4652**	7.4	52	2204	Cloudy, light grey, sediment. Sampled with bailer insufficient water to purge	3220	15	**272**	<0.004	0.011	<0.002	0.513	0.513	0.47	0.98	**1.44**	0.007
Perimeter / Reference Bores	**Six-monthly**	**BH18B**	16-Jun-22	19.30	13.58	5.72								Gauged only												
C-Cell Bores	**Six-monthly**	**BH19**	14-Jun-22	8.96	3.49	5.48	3	14.2	1.7	**4356**	5.9	48	107	Slightly cloudy-becoming clear when sampling, no odour/sheen	2860	5	10	<0.004	0.071	<0.002	<0.002	<0.002	0.08	0.08	<0.005	0.021
Perimeter / Reference Bores	**Six-monthly**	**BH21**	16-Jun-22	31.13	10.70	20.43	2.5	13.1	1.3	2393	7.2	-157	11	Clear, no odour, no sheen	1460	10	<10	<0.004	0.038	<0.002	<0.002	<0.002	0.14	0.14	<0.010	0.008
Perimeter / Reference Bores	**Six-monthly**	**BH22**	15-Jun-22	19.95	0.51	19.45	3	13.4	3.8	1772	7.0	33	40	Clear, no odour, no sheen	1060	14	16	<0.004	<0.005	0.005	2.76	2.76	<0.10	2.56	0.077	0.028
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH23**	15-Jun-22	15.37	2.77	12.60	3	13.6	3.9	2558	6.9	26	7.8		1490	8	<10	<0.004	<0.005	0.006	0.117	0.123	0.02	0.14	0.039	0.018
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH24A**	15-Jun-22	12.43	1.28	11.16	4	13.4	5.3	**7084**	6.6	-51	4.6	Clear, no odour, no sheen	4260	1	<50	<0.004	0.087	<0.002	<0.002	<0.002	0.2	0.2	0.049	0.016
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH24B**	15-Jun-22	3.03	1.28	1.76	3	13.6	1.5	**6620**	6.6	25	252	Cloudy, slightly brown, no odour/sheen	3890	6	<50	<0.004	<0.005	<0.002	0.007	0.007	0.11	0.12	**0.13**	0.021
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH25A**	15-Jun-22	10.07	2.10	7.97	3	12.7	0.6	**5106**	6.3	-20	42	Slightly cloudy, no odour/sheen	2880	3	11	<0.004	0.011	<0.002	0.13	0.13	0.14	0.27	0.074	0.017
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH25B**	15-Jun-22	3.55	2.14	1.41	3	12.6	4.2	**6995**	6.2	40	10	Slightly cloudy, no odour/sheen	4210	14	18	<0.004	<0.005	<0.002	0.016	0.016	0.13	0.15	0.019	0.017

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shaded based on SS6 - Range maximum value

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - SSGV (Aq Eco)

Represents the primary guideline values derived using long-term monitoring data from the upstream reference site (SS6) - Range (min-max)

Draft ANZECC GL - PFOA: Slightly-Moderately Disturbed (95% sp. protection) = 220 µg/L GL (99% sp. Protection) PFOA 19 µg/L

Draft ANZECC GL - PFOS: Slightly-Moderately Disturbed (95% sp. protection) = 0.13 µg/L GL (99% sp. Protection) PFOS 0.00023 µg/L

Rodox converted form ag/$AgCl_2$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been notified to analyse sulphur in future rounds

Table AT2 - Groundwater Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Anions and Cations							Dissolved Metals											
				Sulphur as SO4=	Sulfate as SO4 -	Chloride as Cl-	Dissolved Calcium as Ca	Dissolved Magnesium as Mg	Dissolved Sodium as Na	Dissolved Potassium as K	Arsenic as As	Cadmium as Cd	Chromium as Cr	Copper as Cu	Iron as Fe	Lead as Pb	Manganese as Mn	Mercury as Hg	Nickel as Ni	Selenium as Se	Vanadium as V	Zinc as Zn
			Units	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
			LOR	1	1	1	1	1	1	1	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01	0.01	0.005
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)											0.024	0.0002	0.001	0.0014		0.0034	1.9	0.00006	0.011	0.005	0.006L	0.008
CRT - SS6, AquaSci (2019) - Range (min-max)																						
C-Cell Bores	**Six-monthly**	**BH1**	16-Jun-22		153	2420	443	478	482	10	<0.001	<0.0001	<0.001	<0.001	0.54	<0.001	0.712	<0.0001	0.005	<0.01	<0.01	0.008
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH2**	15-Jun-22		60	779	160	157	228	3	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.181	<0.0001	0.002	<0.01	<0.01	0.006
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH7**	15-Jun-22		205	2760	369	403	818	5	0.002	0.0001	<0.001	0.003	0.61	<0.001	1.08	<0.0001	0.005	<0.01	<0.01	0.011
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH10C**	15-Jun-22		201	2910	388	440	829	6	0.007	<0.0001	<0.001	<0.001	1.02	<0.001	1.64	<0.0001	0.003	<0.01	<0.01	0.012
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH10D**	15-Jun-22		188	2940	315	478	867	5	<0.001	<0.0001	<0.001	0.004	<0.05	<0.001	0.393	<0.0001	0.004	<0.01	<0.01	0.027
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH12A**	16-Jun-22		56	1140	186	90	458	5	<0.001	<0.0001	<0.001	<0.001	0.11	<0.001	1.56	<0.0001	0.016	<0.01	<0.01	0.005
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH12B**	16-Jun-22		86	1060	34	80	525	8	<0.001	<0.0001	<0.001	0.005	<0.05	<0.001	0.031	<0.0001	0.01	<0.01	<0.01	0.034
		BH13	15-Jun-22																			
C-Cell Bore	**Six-monthly**	**BH14A**	14-Jun-22		72	992	205	234	294	4	0.001	<0.0001	<0.001	<0.001	0.63	<0.001	0.329	<0.0001	0.001	<0.01	<0.01	0.013
C-Cell Bore	**Six-monthly**	**BH14B**	14-Jun-22																			
C-Cell Bore	**Six-monthly**	**BH15A**	16-Jun-22		148	1730	264	377	416	7	<0.001	<0.0001	<0.001	<0.001	3.15	<0.001	0.158	<0.0001	0.013	<0.01	<0.01	0.008
C-Cell Bore	**Six-monthly**	**BH15B**	16-Jun-22		11	18	65	32	88	4	0.002	<0.0001	<0.001	<0.001	11.9	<0.001	3.07	<0.0001	0.001	<0.01	<0.01	<0.005
Perimeter / Reference Bores	**Six-monthly**	**BH18A**	16-Jun-22		87	1340	173	101	617	8	0.003	0.0001	<0.001	0.002	<0.05	<0.001	0.142	<0.0001	0.002	<0.01	<0.01	0.007
Perimeter / Reference Bores	**Six-monthly**	**BH18B**	16-Jun-22																			
C-Cell Bores	**Six-monthly**	**BH19**	14-Jun-22		107	1260	121	178	509	2	<0.001	0.0001	<0.001	<0.001	<0.05	<0.001	0.056	<0.0001	0.021	<0.01	<0.01	0.024
Perimeter / Reference Bores	**Six-monthly**	**BH21**	16-Jun-22		55	601	114	48	286	4	0.002	<0.0001	<0.001	<0.001	0.62	<0.001	0.536	<0.0001	0.012	<0.01	<0.01	<0.005
Perimeter / Reference Bores	**Six-monthly**	**BH22**	15-Jun-22		30	291	96	64	187	10	<0.001	<0.0001	<0.001	0.004	<0.05	<0.001	<0.001	<0.0001	0.001	<0.01	0.03	0.006
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH23**	15-Jun-22		37	611	140	124	198	2	0.004	<0.0001	<0.001	0.001	<0.05	<0.001	0.115	<0.0001	0.003	<0.01	<0.01	0.007
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH24A**	15-Jun-22		205	2290	264	207	925	4	0.001	<0.0001	<0.001	<0.001	0.85	<0.001	1.38	<0.0001	0.004	<0.01	<0.01	0.008
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH24B**	15-Jun-22		218	1870	148	194	976	2	<0.001	<0.0001	<0.001	0.002	<0.05	<0.001	0.112	<0.0001	0.018	<0.01	<0.01	0.009
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH25A**	15-Jun-22		167	1490	99	130	798	3	<0.001	<0.0001	<0.001	<0.001	0.13	<0.001	0.122	<0.0001	0.01	<0.01	<0.01	0.019
C-Cell / Irrigation Wetland Bore	**Six-monthly**	**BH25B**	15-Jun-22		217	2320	106	177	1080	4	<0.001	<0.0001	<0.001	0.003	<0.05	<0.001	0.028	<0.0001	0.02	<0.01	<0.01	0.022

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shade

Represents the primary guideline values derived using long-term monitoring data from the upstream ref

Represents the primary guideline values derived using long-term monitoring data from the upstream ref

Draft ANZECC GL - PFOA: Slightly-Moderately Disturbed (95% sp. protection) = 220 µg/L

Draft ANZECC GL - PFOS: Slightly-Moderately Disturbed (95% sp. protection) = 0.13 µg/L

Rodox converted form ag/$AgCl_2$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been

Table AT2 - Groundwater Quality Results
Copping Environmental Monitoring Program

Site Type	Sampling Round	Site ID	Sampling Date	Per &Poly-Fluoroalkyl Substances (PFAS)																																	
				Perfluorobutane sulphonic acid (PFBS)	Perfluoropentane sulphonic acid (PFPeS)	Perfluorohexane sulphonic acid (PFHxS)	Perfluoroheptane sulphonic acid (PFHpS)	Perfluorooctane sulphonic acid (PFOS)	Perfluorodecane sulphonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulphonamide (FOSA)	N-MeFOSA)	N-EtFOSA)	perfluorooctane sulphonamidoethanol (N-MeFOSE)	perfluorooctane sulphonamidoethanol (N-EtFOSE)	perfluorooctane sulphonamidoacetic acid (FOSAA)	N-MeFOSAA	N-EtFOSAA	4:2 Fluorotelomer sulphonic acid (4:2 FTS)	6:2 Fluorotelomer sulphonic acid (6:2 FTS)	8:2 Fluorotelomer sulphonic acid (8:2 FTS)	10:2 Fluorotelomer sulphonic acid (10:2 FTS)	Sum of PFAS	Sum of PFHxS and PFOS	Sum of PFAS (WA DER List)
			Units	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	µg/L	µg/L	µg/L	µg/L
			LOR	0.02	0.02	0.01	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.05	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.01	0.01	0.01
CRT - SS6, AquaSci (2019) - SSGV (Aq Eco)								0.13						220																							
CRT - SS6, AquaSci (2019) - Range (min-max)																																					
C-Cell Bores	Six-monthly	BH1	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH2	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH7	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH10C	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH10D	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH12A	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH12B	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
		BH13	15-Jun-22																																		
C-Cell Bore	Six-monthly	BH14A	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell Bore	Six-monthly	BH14B	14-Jun-22																																		
C-Cell Bore	Six-monthly	BH15A	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell Bore	Six-monthly	BH15B	16-Jun-22	<0.02	<0.02	<0.01	<0.02	0.01	<0.02	1.1	0.39	1.52	0.13	0.45	0.03	0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	0.16	<0.05	0.04	<0.02	<0.05	0.07	<0.05	<0.05	3.92	0.01	3.67
Perimeter / Reference Bores	Six-monthly	BH18A	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Perimeter / Reference Bores	Six-monthly	BH18B	16-Jun-22																																		
C-Cell Bores	Six-monthly	BH19	14-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Perimeter / Reference Bores	Six-monthly	BH21	16-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Perimeter / Reference Bores	Six-monthly	BH22	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH23	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH24A	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH24B	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH25A	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
C-Cell / Irrigation Wetland Bore	Six-monthly	BH25B	15-Jun-22	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01

Notes

Site specific guidelines values developed by AquaSci

Shaded based on SS6 - SSGV (Aq Eco) for water temperature and pH range. For other parameters shade

Represents the primary guideline values derived using long-term monitoring data from the upstream ref

Represents the primary guideline values derived using long-term monitoring data from the upstream ref

Draft ANZECC GL - PFOA: Slightly-Moderately Disturbed (95% sp. protection) = 220 µg/L

Draft ANZECC GL - PFOS: Slightly-Moderately Disturbed (95% sp. protection) = 0.13 µg/L

Rodox converted form ag/$AgCl_2$ to calomel by subtracting 45

Sulfate was incorrectly analysed instead of sulphur in the June 2022 monitoring round. The lab has been

APPENDIX B – L/N RATIO

Table AT3
COPPING SURFACE WATER MODIFED MULVEY L/N RATIO
Modified Mulvey L/N Ratio (K^++NH_4^++NO_x/Na^+)

		Leachate Ponds and Seepage Pits					Stormwaters/Receiving waters					
		SS 1	**SS 4**	**SS 8**	**SS 9**	**SS10**	**SS 2**	**SS 3**	**SS5**	**SS6**	**SS7**	**SS14**
2007	**May**	***0.201***	0.012				0.053	0.050	0.022	0.012	0.010	
	Nov	***0.232***	0.012				0.097	0.010	NS-Dry	0.020	NS-Dry	
2008	**May**	***0.247***	0.026				0.082	0.044	NS-Dry	0.014	NS-Dry	
	Dec	***0.211***	0.023				0.096	0.053	0.034	0.014	NS-Dry	
2009	**May**	***0.295***	0.016				***0.111***	0.044	0.020	0.010	NS-Dry	
	Dec	***0.350***	0.033				***0.197***	0.064	0.081	0.074	0.072	
2010	**Jul**	***0.456***	0.067				***0.120***	***0.247***	NS-Dry	***0.293***	NS-Dry	
	Dec	***0.148***	0.035				***0.101***	0.082	0.041	0.020	0.020	
2011	**Apr**	***0.333***	0.032				***0.106***	0.075	0.024	0.029	0.026	
	Dec	***0.300***	0.026				***0.117***	***0.120***	0.093	0.032	0.022	
2012	**Apr**	***0.372***	0.023				***0.133***	0.088	NS-Dry	0.050	NS-Dry	
	Nov	***0.314***	0.030				***0.114***	0.058	0.011	0.021	0.018	
2013	**May**	***0.260***	0.016	0.091	***0.129***		***0.149***	0.098	0.012	0.033	0.030	
	Sep	***0.356***	0.041	0.023	***0.132***		***0.156***	0.081	0.005	0.025	0.023	
	Dec	***0.322***	0.033	0.093	***0.112***		***0.109***	0.038	0.007	0.028	0.028	
2014	**Apr**	***0.219***	0.019	0.083	***0.116***		0.064	0.042	NS-Dry	0.026	NS-Dry	
	Jun	***0.272***	0.091	***0.256***	***0.124***		0.093	0.051	0.038	0.019	0.013	
	Oct	***0.300***	0.091	***0.415***	***0.121***		0.082	0.061	0.022	0.020	0.018	
	Dec	***0.322***	0.048	***0.367***	***0.112***		0.049	0.051	NS-Dry	0.021	0.021	
2015	**Jun**	***0.358***	0.020	NS-Dry	***0.153***	*0.089*	NS-Drained	0.075	0.053	0.020	0.014	
	Dec	***0.248***	0.021	NS-Dry	***0.101***	*0.095*	NS-Drained	0.045	NS-Dry	0.019	NS-Dry	
2016	**Jun**	***0.387***	0.019	NS-Dry	*0.085*	*0.085*	NS-Drained	0.070	0.019	0.043	0.038	
2017	**Jan**	***0.332***	0.009	NS-Dry	*0.089*	*0.088*	NS-Drained	0.048	0.007	0.029	0.016	
	Jun	***0.355***	0.010	NS-Dry	*0.095*	*0.086*	NS-Drained	0.098	0.007	0.028	0.010	
	Dec	***0.306***	NS	NS-Dry	*0.082*	NS-Drained	NS-Drained	0.079	0.011	0.033	0.011	SS2 Drained
2018	**Jun**	***0.382***	0.005	NS-Dry	*0.087*	NS-Drained	NS-Drained	0.093	0.054	0.026	0.010	SS2 Drained
	Dec	***0.241***	0.003	NS-Dry	*0.085*	***0.220***	***0.114***	0.052	0.019	0.025	0.009	0.030
2019	**Jul**	***0.355***	0.003	NS-Dry	NS-Drained	0.060	***0.122***	0.058	0.044	0.023	0.012	0.036
	Dec	***0.260***	0.003	NS-Dry	*0.083*	0.034	***0.133***	0.028	0.006	0.028	NS-Dry	0.036
2020	**Jan**	***0.392***	0.003	NS-Dry	0.076	0.050	S-Insuff Wate	0.061	0.041	0.044	0.035	0.045
	Nov	***0.506***	0.010	NS-Dry	0.064	0.042	0.081	0.049	NS-Dry	0.037	0.013	0.051
2021	**Jun**	***0.424***	0.009	NS-Dry	0.063	0.047	NS-Drained	0.049	0.006	0.030	0.017	0.049
	Dec	***0.363***	0.014	NS-Dry	0.057	0.048	0.057	0.045	0.075	0.041	0.034	0.075
2022	**Jun**	***0.528***	0.007	NS-Dry	0.064	0.058	***0.154***	0.045	0.027	0.054	0.048	0.026
	Dec											

*Value Indicative of Leachate in Groundwaters - 0.1 or greater

Table AT4
Annual and Six-monthly Report Table - Groundwater Bores

COPPING GROUNDWATER MODIFED MULVEY L/N RATIO
Modified Mulvey L/N Ratio (K^++NH_4^++NO_x/Na^+)

		B-Cells					Irrigation Area		Leachate Treatment Wetlands			
		BH 2	BH 7	BH10C	BH10D	BH 23	BH12A	BH12B	BH 24A	BH24B	BH25A	BH25B
2007	May		0.004									
	Nov		0.004									
2008	May		0.005									
	Dec		0.003									
2009	May		0.004									
	Dec		0.005									
2010	Jul		0.007									
	Dec		0.004									
2011	Apr		0.005									
	Dec		0.005									
2012	Apr		0.005									
	Nov		0.005									
2013	May		0.004				***0.190***	0.023				
	Sep		0.004				0.020	0.012				
	Dec		0.006				0.014	0.012				
2014	Apr		0.004				0.010	0.015				
	Jun		0.005				0.013	0.018				
	Oct		0.005				0.010	0.010				
	Dec		0.005				0.008	0.011				
2015	Jun		0.004				0.009	0.010				
	Dec		0.005				0.010	0.009				
2016	Jun	0.014	0.003				0.008	0.010				
2017	Jan	0.015	0.004				0.011	0.010				
	Jun	0.016	0.005				0.010	0.011				
	Dec	0.016	0.004				0.011	0.010				
2018	Jun	0.016	0.005				0.009	0.011				
	Dec	0.013	0.004				0.008	0.012				
2019	Jul	0.016	0.004	0.012	0.006	0.011	0.009	0.013				
	Dec	0.016	0.004	0.009	0.006	0.009	0.009	0.014	0.004	0.004	0.003	0.004
2020	Jun	0.017	0.004	0.009	0.006	0.010	0.010	0.011	0.002	0.002	0.003	0.004
	Dec	0.015	0.005	0.009	0.006	0.010	0.010	0.011	0.005	0.003	0.003	0.005
2021	Jun	0.017	0.004	0.008	0.006	0.012	0.009	0.016	0.005	0.006	0.004	0.005
	Sep	0.017	0.004	0.007	0.007	0.009	0.011	0.014	0.004	0.003	0.004	0.005
	Dec	0.022	0.005	0.008	0.005	0.010	0.015	0.011	0.004	0.002	0.003	0.004
2022	Jun	0.014	0.006	0.007	0.006	0.011	0.011	0.015	0.004	0.002	0.004	0.004
	Sep											

*Value Indicative of Leachate in Groundwaters - 0.1 or greater

COPPING RDS SURFACE AND GROUNDWATER MONITORING PROGRAM
Modified Mulvey L/N Ratio (K^++NH_4^++NO_x/Na^+) - Groundwater Bores

		Reference				C-Cell				
		BH13	BH18A	BH21	BH22	BH 1	BH14A	BH15A	BH15B	BH19
2007	May					0.019				
	Nov					0.032				
2008	May					0.026				
	Dec					0.026				
2009	May					0.022				
	Dec					0.021				
2010	Jul					0.031				
	Dec					0.019				
2011	Apr					0.024				
	Dec					0.023				
2012	Apr					0.024				
	Nov					0.021				
2013	May	0.024				0.021				
	Sep	0.014				0.006				
	Dec	0.014				0.027				
2014	Apr	0.011				0.020				
	Jun	0.011				0.022				
	Oct	0.011				0.020				
	Dec	0.010				0.020				
2015	Jun	0.010				0.017				
	Dec	0.015				0.019				
2016	Jun	0.011	0.017			0.021	0.014	0.014	0.075	
2017	Jan	0.011	ns-insuff water			0.020	0.012	ns	ns	
	Jun	0.011	ns-insuff water			0.019	ns	ns	ns	
	Dec	0.011	ns-insuff water			0.021	ns	ns	ns	
2018	Jun	0.012	0.021			0.023	0.013	0.016	NS	
	Dec	0.011	0.019			0.018	0.009	0.013	0.019	
2019	Jul	0.012	0.017	0.013	ns	0.023	0.012	0.016	ns-dry	0.004
	Dec	0.011	ns-insuff water	0.012	ns	0.021	0.011	0.014	ns-dry	0.004
2020	Jun	0.011	ns-insuff water	0.014	ns	0.023	0.012	0.014	0.060	0.002
	Dec	0.011	ns-insuff water	0.013	0.055	0.022	0.012	0.016	ns-insuff water	0.002
2021	Jun	0.011	ns-insuff water	0.011	0.060	0.020	0.012	0.015	ns-insuff water	0.007
	Sep	0.014	ns-insuff water	0.011	0.059	0.021	0.012	0.015	ns-insuff water	0.004
	Dec	0.012	0.021	0.013	0.069	0.018	0.011	0.015	0.058	0.002
2022	Jun	NS	0.014	0.014	0.068	0.021	0.014	0.017	0.054	0.004
	Sep									

*Value Indicative of Leachate in Groundwaters - 0.1 or greater

APPENDIX C – QA/QC FIELD SAMPLE RESULTS

Table AT5- Surface Water and Groundwater QA/QC Results (Field Duplicates)
Copping Environmental Monitoring Program

			Batch	EM2211232							EM2211291								EM2211413							
			Round	Six-monthly							Six-monthly								Six-monthly							
			Sample ID	SS1	QA1 (FD01)	Relative Percentile Difference %	P pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR	BH10C	QA3 (FD02)	Relative Percentile Difference %	P pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR	BH15A	QA4 (FD03)	Relative Percentile Difference %	P pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR
			Sample Date	14-Jun-22	14-Jun-22						15-Jun-22	15-Jun-22						16-Jun-22	16-Jun-22							
			Sample Type	Primary	Duplicate						Primary	Duplicate						Primary	Duplicate							
Analyte Group	**Analyte**	**Units**	**LOR**																							
Physico-chemical	Total Dissolved Solids (TDS)	mg/L	10	7810	7500	4%	1				----	----						4900	4570	7%	1				
	Suspended Solids (SS)	mg/L	5	15	10	**40%**	1	1			----	----						----	----						
	Dissolved Organic Carbon	mg/L	1	484	205	**81%**	1		1	1	----	----						22	21	5%	1				
	Chemical Oxygen Demand	mg/L	10	1870	1840	2%	1				----	----						<50	<50	0%	1				
	Total Cyanide	mg/L	0.004	0.018	0.015	18%	1				----	----						<0.004	<0.004	0%	1				
Alkalinity	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	0%	1				----	----						----	----						
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	0%	1				----	----						----	----						
	Bicarbonate Alkalinity as CaCO3	mg/L	1	4170	4150	0%	1				----	----						----	----						
	Total Alkalinity as CaCO3	mg/L	1	4170	4150	0%	1				----	----						----	----						
Nutrients	Ammonia as N	mg/L	0.005	680	711	4%	1				----	----						0.008	0.007	13%	1				
	Nitrite as N	mg/L	0.002	<0.200	<0.200	0%	1				----	----						<0.002	<0.002	0%	1				
	Nitrate as N	mg/L	0.002	<0.200	<0.200	0%	1				----	----						<0.002	0.007	**150%**	1	1			
	Nitrite + Nitrate as N	mg/L	0.002	<0.200	<0.200	0%	1				----	----						<0.002	0.007	**150%**	1	1			
	Total Kjeldahl Nitrogen as N	mg/L	0.01	685	692	1%	1				----	----						0.18	0.12	**40%**	1	1			
	Total Nitrogen as N	mg/L	0.01	685	692	1%	1				----	----						0.18	0.13	**32%**	1	1			
	Total Phosphorous as P	mg/L	0.005	4.29	4.46	4%	1				----	----						<0.050	<0.050	0%	1				
	Reactive Phosphorus as P	mg/L	0.001	3.46	4.02	15%	1				----	----						0.035	0.037	6%	1				
Bacteriological	Escherichia coli	orgs/100mL	1	290	170	**52%**	1	1		1	----	----						----	----						
Anions and Cations	Sulfate as SO4-	mg/L	1	<1	<1	0%	1				----	----						148	149	0%	1				
	Chloride as Cl-	mg/L	1	3130	3160	1%	1				----	----						1730	1710	1%	1				
	Calcium as Ca	mg/L	1	97	120	21%	1				----	----						264	265	0%	1				
	Magnesium as Mg	mg/L	1	263	327	22%	1				----	----						377	376	0%	1				
	Sodium as Na	mg/L	1	1640	2000	20%	1				----	----						416	416	0%	1				
	Potassium as K	mg/L	1	185	227	20%	1				----	----						7	7	0%	1				
Dissolved Metals	Aluminium as Al	mg/L	0.01	0.1	0.1	0%	1				----	----						----	----						
	Arsenic as As	mg/L	0.001	0.074	0.074	0%	1				----	----						<0.001	<0.001	0%	1				
	Cadmium as Cd	mg/L	0.0001	<0.0002	<0.0002	0%	1				----	----						<0.0001	<0.0001	0%	1				
	Chromium as Cr	mg/L	0.001	0.107	0.108	1%	1				----	----						<0.001	<0.001	0%	1				
	Copper as Cu	mg/L	0.001	0.002	0.002	0%	1				----	----						<0.001	<0.001	0%	1				
	Iron as Fe	mg/L	0.05	1.05	1.04	1%	1				----	----						3.15	3.13	1%	1				

Table AT5- Surface Water and Groundwater QA/QC Results (Field Duplicates)
Copping Environmental Monitoring Program

			Batch	EM2211232							EM2211291								EM2211413							
			Round	Six-monthly							Six-monthly								Six-monthly							
			Sample ID	SS1	QA1 (FD01)	Relative Percentile Difference %	# pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR	BH10C	QA3 (FD02)	Relative Percentile Difference %	# pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR	BH15A	QA4 (FD03)	Relative Percentile Difference %	# pairs	Over 30% (Inorganics)	Over 50% (Organics)	Over 30% or 50% & >10 x LOR
			Sample Date	14-Jun-22	14-Jun-22						15-Jun-22	15-Jun-22						16-Jun-22	16-Jun-22							
			Sample Type	Primary	Duplicate						Primary	Duplicate						Primary	Duplicate							
Analyte Group	**Analyte**	**Units**	**LOR**																							
	Lead as Pb	mg/L	0.001	0.002	0.002	0%	1				----	----						<0.001	<0.001	0%	1					
	Manganese as Mn	mg/L	0.001	0.458	0.454	1%	1				----	----						0.158	0.157	1%	1					
	Mercury as Hg	mg/L	0.0001	<0.0010	<0.0010	0%	1				----	----						<0.0001	<0.0001	0%	1					
	Nickel as Ni	mg/L	0.001	0.137	0.137	0%	1				----	----						0.013	0.013	0%	1					
	Selenium as Se	mg/L	0.01	<0.02	<0.02	0%	1				----	----						<0.01	<0.01	0%	1					
	Vanadium as V	mg/L	0.01	0.08	0.08	0%	1				----	----						<0.01	<0.01	0%	1					
	Zinc as Zn	mg/L	0.005	0.045	0.044	2%	1				----	----						0.008	0.008	0%	1					
Total Metals	Aluminium as	mg/L	0.01	0.14	0.14	0%	1				----	----						----	----							
	Arsenic as As	mg/L	0.001	0.098	0.097	1%	1				----	----						----	----							
	Cadmium as Cd	mg/L	0.0001	<0.0002	<0.0002	0%	1				----	----						----	----							
	Chromium as Cr	mg/L	0.001	0.148	0.154	4%	1				----	----						----	----							
	Copper as Cu	mg/L	0.001	0.007	0.007	0%	1				----	----						----	----							
	Iron as Fe	mg/L	0.05	1.51	1.52	1%	1				----	----						----	----							
	Lead as Pb	mg/L	0.001	0.002	0.002	0%	1				----	----						----	----							
	Manganese as Mn	mg/L	0.001	0.595	0.604	2%	1				----	----						----	----							
	Mercury as Hg	mg/L	0.0001	<0.0001	<0.0001	0%	1				----	----						----	----							
	Nickel as Ni	mg/L	0.001	0.169	0.177	5%	1				----	----						----	----							
	Selenium as Se	mg/L	0.01	<0.02	<0.02	0%	1				----	----						----	----							
	Vanadium as V	mg/L	0.01	0.11	0.11	0%	1				----	----						----	----							
	Zinc as Zn	mg/L	0.005	0.106	0.108	2%	1				----	----						----	----							
Per &Poly-Fluoroalkyl Substances (PFAS)	Perfluorobutane sulphonic acid (PFBS)	µg/L	0.02	4.04	3.93	3%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluoropentane sulphonic acid (PFPeS)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorohexane sulphonic acid (PFHxS)	µg/L	0.01	0.94	0.96	2%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					
	Perfluoroheptane sulphonic acid (PFHpS)	µg/L	0.02	<0.02	0.02	**67%**	1		1		<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorooctane sulphonic acid (PFOS)	µg/L	0.01	0.5	0.6	18%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					
	Perfluorodecane sulphonic acid (PFDS)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1	0%	1				<0.1	<0.1	0%	1				<0.1	<0.1	0%	1					
	Perfluoropentanoic acid (PFPeA)	µg/L	0.02	0.75	0.82	9%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorohexanoic acid (PFHxA)	µg/L	0.02	1.95	2.16	10%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	0.36	0.52	36%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.81	0.87	7%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					
	Perfluorononanoic acid (PFNA)	µg/L	0.02	0.07	0.08	13%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorodecanoic acid (PFDA)	µg/L	0.02	<0.02	0.02	**67%**	1		1		<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	Perfluorooctane sulphonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	N-Methyl perfluorooctane sulphonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	N-Ethly perfluorooctane sulphonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	N-Methyl perfluorooctane sulphonamidoethanol	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	N-Ethyl perfluorooctane sulphonamidoethanol	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	N-Methyl perfluorooctane sulphonamidoacetic acid	µg/L	0.02	0.17	0.18	6%	1				<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	N-Ethyl perfluorooctane sulphonamidoacetic acid	µg/L	0.02	<0.02	0.03	**100%**	1		1		<0.02	<0.02	0%	1				<0.02	<0.02	0%	1					
	4:2 Fluorotelomer sulphonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	6:2 Fluorotelomer sulphonic acid (6:2 FTS)	µg/L	0.05	0.32	0.29	10%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	8:2 Fluorotelomer sulphonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	10:2 Fluorotelomer sulphonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05	0%	1				<0.05	<0.05	0%	1				<0.05	<0.05	0%	1					
	Sum of PFAS	µg/L	0.01	9.91	10.5	6%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					
	Sum of PFHxS and PFOS	µg/L	0.01	1.44	1.56	8%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					
	Sum of PFAS (WA DER List)	µg/L	0.01	9.67	10.2	5%	1				<0.01	<0.01	0%	1				<0.01	<0.01	0%	1					

Table AT6 - Surface Water and Groundwater QA/QC Results (Rinsate and Field Blanks)
Copping Environmental Monitoring Program

Rinsate Blanks

				SW Gloves		GW Pump	GW Deep Meter	
			Batch	EM2211232	EM2211232	EM2211291	EM2211413	EM2211413
			Round	**Six-monthly**	**Six-monthly**	**Six-monthly**	**Six-monthly**	**Six-monthly**
			Sample ID	**RB_14.6.22**	**FB_14.6.22**	**RB_15.6.22**	**RB_16.6.22**	**FB_16.6.22**
			Sample Date	14-Jun-22	14-Jun-22	15-Jun-22	16-Jun-22	16-Jun-22
			Sample Type	Water	Water	Water	Water	Water
Analyte Group	**Analyte**	**Units**	**LOR**					
Physico-Chemical	Total Cyanide	mg/L	0.004	<0.004	-	<0.004	<0.004	<0.01
Total Metals	Aluminium	mg/L	0.01	**0.02**	<0.01	<0.01	**0.3**	-
	Arsenic	mg/L	0.001	<0.001	-	<0.001	<0.001	-
	Cadmium	mg/L	0.0001	<0.0001	-	<0.0001	<0.0001	-
	Chromium	mg/L	0.001	<0.001	-	<0.001	**0.007**	<0.001
	Copper	mg/L	0.001	<0.001	-	<0.001	<0.001	-
	Iron	mg/L	0.05	<0.05	-	<0.05	**0.22**	-
	Lead	mg/L	0.001	<0.001	-	<0.001	<0.001	<0.05
	Manganese	mg/L	0.001	<0.001	-	<0.001	<0.001	-
	Mercury	mg/L	0.0001	<0.0001	-	<0.0001	<0.0001	-
	Nickel	mg/L	0.001	<0.001	-	<0.001	<0.001	-
	Selenium	mg/L	0.01	<0.01	-	<0.01	<0.01	-
	Vanadium	mg/L	0.01	<0.01	-	<0.01	<0.01	-
	Zinc	mg/L	0.005	<0.005	-	<0.005	**0.01**	<0.005
PFAS	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	-	<0.01	<0.01	-
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	-	<0.01	<0.01	-
	Perfluorodecane sulfonic acid (PFDS)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	-	<0.1	<0.1	-
	Perfluoropentanoic acid (PFPeA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	-	<0.01	<0.01	-
	Perfluorononanoic acid (PFNA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorodecanoic acid (PFDA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	N-Methyl perfluorooctane sulfonamide (MeFOSA	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	N-Methyl perfluorooctane sulfonamidoethanol (	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	N-Ethyl perfluorooctane sulfonamidoethanol (Et	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	N-Methyl perfluorooctane sulfonamidoacetic aci	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02	<0.02	-	<0.02	<0.02	-
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	-	<0.05	<0.05	-
	Sum of PFAS	µg/L	0.01	<0.01	-	<0.01	<0.01	-
	Sum of PFHxS and PFOS	µg/L	0.01	<0.01	-	<0.01	<0.01	-
	Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	-	<0.01	<0.01	-

Field Blanks

			Batch	EM2211232		EM2211291	EM2211413	
			Round	**Six-monthly**		**Six-monthly**	**Six-monthly**	
			Sample ID	**FB_14.6.22**		**FB_15.6.22**	**FB_16.6.22**	
			Sample Date	14-Jun-22		15-Jun-22	16-Jun-22	
			Sample Type	Water		Water	Water	
Analyte Group	**Analyte**	**Units**	**LOR**					
Total Metals	Aluminium	mg/L	0.01	Not Analysed		Not Analysed	Not Analysed	
	Arsenic	mg/L	0.001					
	Cadmium	mg/L	0.0001					
	Chromium	mg/L	0.001					
	Copper	mg/L	0.001					
	Iron	mg/L	0.05					
	Lead	mg/L	0.001					
	Manganese	mg/L	0.001					
	Mercury	mg/L	0.0001					
	Nickel	mg/L	0.001					
	Selenium	mg/L	0.01					
	Vanadium	mg/L	0.01					
	Zinc	mg/L	0.005					

Table AT7 - Surface Water and Groundwater QA/QC Results - RPD Summary
Copping Environmental Monitoring Program

Pairs Summary - By Round

	Six-monthly	Six-monthly	Six-monthly	
	14-Jun-22	**15-Jun-22**	**16-Jun-22**	
Number of Pairs	81	31	61	
>30% RPD (Inorganics)	2	0	4	
as % of total	***2%***	***0%***	***7%***	
>50% RPD (Organics)	4	***0%***	***0%***	
as % of total	***5%***	***0%***	***0%***	
>30% or 50% RPD & >10 x LOR	2	0	0	
as % of total	***2%***	***0%***	***0%***	
Total Number of Pairs	81			
Total Number of Pairs (>30% (inorganics) and/or >50% RPD (organics))	6	**7%**		
Total Number of Pairs (>30% (inorganics) and/or >50% RPD (organics) and 10 x LOR)	2	**2%**		

APPENDIX D – GROUNDWATER GAUGING RESULTS

Table D1. Groundwater Reduced Levels (mAHD) - June 2022
Copping Environmental Monitoring Program

Well ID	Round Measured	Bore Depth (m)	(A) Depth to Groundwater (mbgl)	(B) Well surveyed (mAHD)	RL mAHD (B - A)
BH1	June 2022	22.93	5.46	56.90	51.45
BH2	June 2022	11.49	0.0	43.80	43.80
BH7	June 2022	10.16	0.78	41.00	40.23
BH10C	June 2022	12.39	1.40	-	-
BH10D	June 2022	7.03	0.94	-	-
BH12A	June 2022	21.58	3.01	47.10	44.09
BH12B	June 2022	5.36	3.21	47.20	44.00
BH13	June 2022	13.49	6.29	57.50	51.21
BH14A	June 2022	24.35	7.19	65.60	58.41
BH14B	June 2022	11.61	4.07	65.60	61.54
BH15A	June 2022	29.67	14.18	60.30	46.12
BH15B	June 2022	13.62	12.44	60.30	47.86
BH18A	June 2022	34.91	34.47	88.50	54.03
BH18B	June 2022	19.30	13.58	88.50	74.92
BH19	June 2022	8.96	3.49	-	-
BH21	June 2022	31.13	10.70	-	-
BH22	June 2022	19.95	0.51	-	-
BH23	June 2022	15.37	2.77	-	-
BH24A	June 2022	12.43	1.28	-	-
BH24B	June 2022	3.03	1.28	-	-
BH25A	June 2022	10.07	2.10	-	-
BH25B	June 2022	3.55	2.14	-	-

m: meters
gl: ground level
mbgl: meters below ground level
mAHD: meters Australian Height Datum

Table D2. 2022 Groundwater Level Gauging Results
Copping Environmental Monitoring Program

Position	Bore Name	Stated Bore Installation Depth (mbTOC)	Stated Screen Depth (mbtoc)	Date Gauged	Easting (GDA94)	Northing (GDA94)	Casing Diameter (mm)	Casing Height (mm)	SWL (mbTOC)	SWL (mbgl)	TWD (mbTOC)	TWD (mbgl)	Water Column (m)	Elevation (mAHD)	RL (mAHD)
C-Cell Bores	BH1			15/03/2022	562785	5256339	100	0.0	--	5.35	--	22.93	17.59	56.90	51.56
C-Cell Bores	BH1	22.90	1.0-23.5	16/06/2022	562785	5256339	100	0.0	--	5.46	--	22.93	17.48	56.90	51.45
	BH1														
C-Cell / Irrigation Wetland Bore	BH2			15/03/2022	562610	5256950	100	0.0	--	0.0	--	11.49	11.49	43.80	43.80
C-Cell / Irrigation Wetland Bore	BH2	11.50	1.0-11.3	15/06/2022	562610	5256950	100	0.0	--	0.0	--	11.49	11.49	43.80	43.80
	BH2														
C-Cell / Irrigation Wetland Bore	BH7			16/03/2022	562368	5256827	50	0.49	1.51	1.02	10.64	10.15	9.13	41.00	39.98
C-Cell / Irrigation Wetland Bore	BH7	10.10	4.0-10.0	15/06/2022	562368	5256827	50	0.49	1.27	0.78	10.65	10.16	9.39	41.00	40.23
	BH7														
C-Cell / Irrigation Wetland Bore	BH10C			15/03/2022	562530	5256748	50	0.66	2.14	1.48	13.05	12.39	10.91	-	-
C-Cell / Irrigation Wetland Bore	BH10C	12.40	11.5-12.4	15/06/2022	562530	5256748	50	0.66	2.06	1.40	13.05	12.39	10.99	-	-
	BH10C														
C-Cell / Irrigation Wetland Bore	BH10D			15/03/2022	562527	5256746	50	0.64	1.57	0.93	7.67	7.03	6.11	-	-
C-Cell / Irrigation Wetland Bore	BH10D	7.00	6.0-7.0	15/06/2022	562527	5256746	50	0.64	1.58	0.94	7.67	7.03	6.09	-	-
	BH10D														
C-Cell / Irrigation Wetland Bore	BH12A			15/03/2022	562440	5256362	50	0.62	3.63	3.01	22.20	21.58	18.57	47.10	44.09
C-Cell / Irrigation Wetland Bore	BH12A	12.60	18.6-21.6	16/06/2022	562440	5256362	50	0.62	3.63	3.01	22.20	21.58	18.57	47.10	44.09
	BH12A														
C-Cell / Irrigation Wetland Bore	BH12B			15/03/2022	562440	5256362	50	0.64	3.84	3.20	5.80	5.16	1.96	47.20	44.00
C-Cell / Irrigation Wetland Bore	BH12B	5.50	4.0-5.5	16/06/2022	562440	5256362	50	0.64	3.85	3.21	6.00	5.36	2.16	47.20	44.00
	BH12B														
Perimeter / Reference Bore	BH13			15/03/2022	562771	5256209	50	0.68	--	--	--	--	--	57.50	--
Perimeter / Reference Bore	BH13	13.50	10.5-13.5	15/06/2022	562771	5256209	50	0.68	6.97	6.29	14.17	13.49	7.20	57.50	51.21
	BH13														
C-Cell Bore	BH14A			15/03/2022	562909	5256461	50	0.83	8.66	7.83	25.18	24.35	16.52	65.60	57.77
C-Cell Bore	BH14A	24.30	23.5-24.0	14/06/2022	562909	5256461	50	0.83	8.02	7.19	25.18	24.35	17.16	65.60	58.41
	BH14A														
C-Cell Bore	BH14B			15/03/2022	562909	5256461	25	0.83	6.18	5.35	12.44	11.61	6.27	65.60	60.26
C-Cell Bore	BH14B	11.60	10.5-11.0	14/06/2022	562909	5256461	25	0.83	4.90	4.07	12.44	11.61	7.55	65.60	61.54
	BH14B														
C-Cell Bore	BH15A			15/03/2022	562830	5256570	50	0.65	15.06	14.41	30.32	29.67	15.26	60.30	45.89
C-Cell Bore	BH15A	29.70	29-29.7	16/06/2022	562830	5256570	50	0.65	14.83	14.18	30.32	29.67	15.49	60.30	46.12
	BH15A														
C-Cell Bore	BH15B			15/03/2022	562830	5256570	50	0.65	13.40	12.75	14.27	13.62	0.87	60.30	47.55
C-Cell Bore	BH15B	13.60	12.5-13.0	16/06/2022	562830	5256570	50	0.65	13.09	12.44	14.27	13.62	1.18	60.30	47.86
	BH15B														
Perimeter / Reference Bores	BH18A			15/03/2022	563011	5256605	50	0.72	34.29	33.57	35.63	34.91	1.34	88.50	54.93
Perimeter / Reference Bores	BH18A	34.90	34.5-35.0	16/06/2022	563011	5256605	50	0.72	35.19	34.47	35.63	34.91	0.44	88.50	54.03
	BH18A														
Perimeter / Reference Bores	BH18B			15/03/2022	563011	5256605	25	0.69	14.26	13.57	19.99	19.30	5.74	88.50	74.94
Perimeter / Reference Bores	BH18B	19.30	19.0-19.5	16/06/2022	563011	5256605	25	0.69	14.27	13.58	19.99	19.30	5.72	88.50	74.92
	BH18B														
C-Cell Bores	BH19			15/03/2022	562653	5256272	50	0.0	--	3.37	--	8.91	5.55	-	-
C-Cell Bores	BH19	9.00	6.3-8.9	14/06/2022	562653	5256272	50	0.0	--	3.49	--	8.96	5.48	-	-
	BH19														
Perimeter / Reference Bores	BH21			16/03/2022	562626	5256155	50	0.0	--	10.68	--	31.13	20.45	-	-
Perimeter / Reference Bores	BH21	31.10	25.1-31.1	16/06/2022	562626	5256155	50	0.0	--	10.70	--	31.13	20.43	-	-
	BH21														
Perimeter / Reference Bores	BH22			15/03/2022	562900	5256902	50	0.62	2.31	1.69	20.57	19.95	18.27	-	-
Perimeter / Reference Bores	BH22	20.00	14.0-20.0	15/06/2022	562900	5256902	50	0.62	1.13	0.51	20.57	19.95	19.45	-	-
	BH22														
C-Cell / Irrigation Wetland Bore	BH23			15/03/2022	562684	5256876	50	0.58	3.95	3.37	15.95	15.37	12.00	-	-
C-Cell / Irrigation Wetland Bore	BH23	15.40	9.4-15.4	15/06/2022	562684	5256876	50	0.58	3.35	2.77	15.95	15.37	12.60	-	-
	BH23														
Leachate Treatment Wetland Bore	BH24A			15/03/2022	562387	5256679	50	0.64	1.99	1.35	13.07	12.43	11.08	-	-
Leachate Treatment Wetland Bore	BH24A	12.40	8.4-12.4	15/06/2022	562387	5256679	50	0.64	1.92	1.28	13.07	12.43	11.16	-	-
	BH24A														
Leachate Treatment Wetland Bore	BH24B			15/03/2022	562387	5256678	50	0.61	1.97	1.36	3.64	3.03	1.68	-	-
Leachate Treatment Wetland Bore	BH24B	3.00	1.0-3.0	15/06/2022	562387	5256678	50	0.61	1.89	1.28	3.64	3.03	1.76	-	-
	BH24B														
Leachate Treatment Wetland Bore	BH25A			15/03/2022	562426	5256563	50	0.0	--	2.16	--	10.07	7.91	-	-
Leachate Treatment Wetland Bore	BH25A	10.10	7.1-10.1	15/06/2022	562426	5256563	50	0.0	--	2.10	--	10.07	7.97	-	-
	BH25A														
Leachate Treatment Wetland Bore	BH25B			15/03/2022	562425	5256561	50	0.0	--	2.20	--	3.55	1.36	-	-
Leachate Treatment Wetland Bore	BH25B	3.60	2.6-3.5	15/06/2022	562425	5256561	50	0.0	--	2.14	--	3.55	1.41	-	-
	BH25B														

APPENDIX E –SITE PHOTOGRAPHS

APPENDIX E – PHOTOGARPHS JUNE 2022

C-Cell Main Leachate Pond (SS10)

C-Cell Leachate Balancing Pond (SS9)

APPENDIX E – PHOTOGARPHS JUNE 2022

C-Cell Main Leachate BP Seepage Pit (SS8)

C-Cell Main Leachate BP Seepage Pit (SS8)

APPENDIX E – PHOTOGARPHS JUNE 2022

B-Cell Secondary Stormwater Pond (SS2)

B-Cell Primary Leachate Pond (SS1)

APPENDIX E – PHOTOGARPHS JUNE 2022

(B-Cell Primary Stormwater Pond SS3)

Primary Stormwater Pond Drain Towards (SS5)

APPENDIX E – PHOTOGARPHS JUNE 2022

CRT downstream of discharge from stormwater pond and marsh (SS7)

CRT Upstream of discharge from stormwater pond and marsh (SS6)

APPENDIX E – PHOTOGARPHS JUNE 2022

Impassable Vehicle Access Road to BH13

North-western downgradient bore showing water level at ground level (BH2)

APPENDIX F – LABORATORY ANALYTICAL CERTIFICATES

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2211232**	Page	: 1 of 25
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 15-Jun-2022 12:50
Order number	: JN21332	Date Analysis Commenced	: 15-Jun-2022
C-O-C number	: 38737	Issue Date	: 05-Aug-2022 16:08
Sampler	: DANIEL LAVER		
Site	: Copping Landfill - June 6 monthly sampling round		
Quote number	: ME/088/22 V2		
No. of samples received	: 15		
No. of samples analysed	: 15		

ilac-MRA NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Samantha Smith	Assistant Laboratory Manager	WRG Subcontracting, Springvale, VIC
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- EG020-F&T: Metals for EM2211232 #1 and #13 has been diluted prior to analysis due to sample matrix. LORs have been raised accordingly.
- EK026SF: EM2210983 #1. Particular samples required dilution prior to analysis for Cyanide due to matrix interferences. LOR values have been adjusted accordingly.
- EG020-T: Metals for EM2211232 #14 has been confirmed by re-preparation and re-analysis.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.
- It is recognised that TKN is less than Ammonia as N for sample 13. However, the difference is within experimental variation of the methods.
- It is recognised that total metals are less than dissolved metals for EM2211232. However, the difference is within experimental variation of the methods.
- EG035T: EM2211232#9 samople results for total mercury confirmed by re-extraction and re-analysis.
- EK267, EK271, EK255, EK259, EK257: LOR raised for TP, RP, Ammonia, NOx and Nitrite on a few samples due to sample matrix.
- EA015H: EM2211232 #3, #5, #8-9: TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EG035F: Samples EM2210232-001 and 013 required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly.
- EP026SP: Samples EM2211232 #1, #4 & #13 required dilution prior to extraction due to matrix interferences. LOR values have been adjusted accordingly.
- Amendment (3/8/22):This report has been amended to report total Aluminium - EG020T on sample 15
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- E.coli & Total Coliforms by MPN (MM514) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- 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.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH14A PFAS lab QC sample	BH19	----	----	----
				Sampling date / time	14-Jun-2022 14:18	14-Jun-2022 15:16	----	----	----
Compound	CAS Number	LOR	Unit		EM2211232-011	EM2211232-012	--------	--------	--------
					Result	Result	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**2650**	**2860**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**72**	**107**	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**992**	**1260**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**205**	**121**	----	----	----
Magnesium	7439-95-4	1	mg/L		**234**	**178**	----	----	----
Sodium	7440-23-5	1	mg/L		**294**	**509**	----	----	----
Potassium	7440-09-7	1	mg/L		**4**	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.001**	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0001**	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.329**	**0.056**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.001**	**0.021**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.013**	**0.024**	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.63**	<0.05	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		**0.056**	**0.071**	----	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	<0.002	----	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.148**	<0.002	----	----	----
EK259A: Nitrite and Nitrate (NOx)									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH14A PFAS lab QC sample	BH19	----	----	----
				Sampling date / time	14-Jun-2022 14:18	14-Jun-2022 15:16	----	----	----
Compound	CAS Number	LOR	Unit		EM2211232-011	EM2211232-012	--------	--------	--------
					Result	Result	----	----	----
EK259A: Nitrite and Nitrate (NOx) - Continued									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.148**	<0.002	----	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		<0.01	**0.08**	----	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.12**	**0.08**	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		<0.005	<0.005	----	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.015**	**0.021**	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**6**	**5**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	**10**	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH14A PFAS lab QC sample	BH19	----	----	----
				Sampling date / time	14-Jun-2022 14:18	14-Jun-2022 15:16	----	----	----
Compound	CAS Number	LOR	Unit		EM2211232-011	EM2211232-012	--------	--------	--------
					Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH14A PFAS lab QC sample	BH19	----	----	----
				Sampling date / time	14-Jun-2022 14:18	14-Jun-2022 15:16	----	----	----
Compound	CAS Number	LOR	Unit		EM2211232-011	EM2211232-012	--------	--------	--------
					Result	Result	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**96.9**	**107**	----	----	----
13C8-PFOA	----	0.02	%		**98.0**	**99.5**	----	----	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)			Sample ID	**RB_14.6.22 Rinsate Blank**	----	----	----	----
			Sampling date / time	14-Jun-2022 12:49	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2211232-014**	--------	--------	--------	--------
				Result	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	RB_14.6.22 Rinsate Blank	----	----	----	----
				Sampling date / time	14-Jun-2022 12:49	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211232-014	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)			Sample ID	**RB_14.6.22 Rinsate Blank**	**----**	**----**	**----**	**----**
			Sampling date / time	14-Jun-2022 12:49	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2211232-014**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	**----**	**----**	**----**	**----**
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	**----**	**----**	**----**	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	**----**	**----**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	**----**	**----**	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**101**	**----**	**----**	**----**	**----**
13C8-PFOA	----	0.02	%	**102**	**----**	**----**	**----**	**----**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS1 Primary leachate pond	SS2	SS3 Primary stormwater pond	SS5 Pond drain to Marsh Creek	SS6 CRT upstream sample
				Sampling date / time	14-Jun-2022 09:23	14-Jun-2022 09:01	14-Jun-2022 10:43	14-Jun-2022 11:12	14-Jun-2022 12:21
					EM2211232-001	EM2211232-002	EM2211232-003	EM2211232-005	EM2211232-006
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**7810**	**162**	**448**	**629**	**316**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**15**	**18**	**95**	**160**	**9**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**4170**	**32**	**73**	**71**	**30**
Total Alkalinity as CaCO3	----	1	mg/L		**4170**	**32**	**73**	**71**	**30**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<1	**51**	**36**	**39**	**19**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**3130**	**17**	**55**	**159**	**100**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**97**	**12**	**8**	**19**	**11**
Magnesium	7439-95-4	1	mg/L		**263**	**12**	**9**	**22**	**13**
Sodium	7440-23-5	1	mg/L		**1640**	**14**	**60**	**91**	**56**
Potassium	7440-09-7	1	mg/L		**185**	**2**	**2**	**2**	**3**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.10**	**0.16**	**0.06**	**0.11**	**1.20**
Arsenic	7440-38-2	0.001	mg/L		**0.074**	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0002	<0.0001	**0.0003**	**0.0002**	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.107**	<0.001	<0.001	<0.001	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	**0.003**	**0.003**	**0.003**
Lead	7439-92-1	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.458**	**0.004**	**0.015**	**0.018**	**0.008**
Nickel	7440-02-0	0.001	mg/L		**0.137**	**0.001**	**0.003**	**0.003**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.02	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		**0.08**	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.045**	<0.005	**0.010**	**0.012**	**0.005**
Iron	7439-89-6	0.05	mg/L		**1.05**	**0.08**	**0.43**	**0.83**	**1.08**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.14**	**1.41**	**9.72**	**11.7**	**2.06**
Arsenic	7440-38-2	0.001	mg/L		**0.098**	**0.002**	**0.001**	**0.001**	<0.001

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS1 Primary leachate pond	SS2	SS3 Primary stormwater pond	SS5 Pond drain to Marsh Creek	SS6 CRT upstream sample
				Sampling date / time	14-Jun-2022 09:23	14-Jun-2022 09:01	14-Jun-2022 10:43	14-Jun-2022 11:12	14-Jun-2022 12:21
					EM2211232-001	EM2211232-002	EM2211232-003	EM2211232-005	EM2211232-006
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0002	<0.0001	**0.0018**	**0.0013**	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.148**	**0.001**	**0.010**	**0.011**	**0.003**
Copper	7440-50-8	0.001	mg/L		**0.007**	**0.002**	**0.012**	**0.011**	**0.004**
Lead	7439-92-1	0.001	mg/L		**0.002**	<0.001	**0.006**	**0.006**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.595**	**0.022**	**0.097**	**0.091**	**0.013**
Nickel	7440-02-0	0.001	mg/L		**0.169**	**0.002**	**0.009**	**0.008**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.02	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		**0.11**	<0.01	**0.02**	**0.02**	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.106**	**0.008**	**0.101**	**0.092**	**0.023**
Iron	7439-89-6	0.05	mg/L		**1.51**	**1.10**	**10.2**	**11.3**	**2.06**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		**0.018**	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**680**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**685**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		**685**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**4.29**	----	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		----	**0.136**	**0.212**	**0.232**	<0.050
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.200	**0.002**	<0.020	<0.020	<0.020
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		<0.200	**0.017**	**0.467**	**0.239**	<0.020

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS1 Primary leachate pond	SS2	SS3 Primary stormwater pond	SS5 Pond drain to Marsh Creek	SS6 CRT upstream sample
				Sampling date / time	14-Jun-2022 09:23	14-Jun-2022 09:01	14-Jun-2022 10:43	14-Jun-2022 11:12	14-Jun-2022 12:21
					EM2211232-001	EM2211232-002	EM2211232-003	EM2211232-005	EM2211232-006
					Result	Result	Result	Result	Result
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		<0.200	**0.019**	**0.467**	**0.239**	<0.020
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**----**	**0.74**	**0.43**	**0.85**	**0.67**
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**----**	**0.76**	**0.90**	**1.09**	**0.67**
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		**----**	**0.017**	<0.050	<0.050	<0.050
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**3.46**	**0.001**	**0.025**	**0.019**	<0.010
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**484**	**6**	**16**	**16**	**22**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**1870**	**15**	**95**	**93**	**76**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**4.04**	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		**0.94**	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.50**	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.75**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**1.95**	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.36**	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.81**	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.07**	<0.02	<0.02	<0.02	<0.02

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS1 Primary leachate pond	SS2	SS3 Primary stormwater pond	SS5 Pond drain to Marsh Creek	SS6 CRT upstream sample
				Sampling date / time	14-Jun-2022 09:23	14-Jun-2022 09:01	14-Jun-2022 10:43	14-Jun-2022 11:12	14-Jun-2022 12:21
					EM2211232-001	EM2211232-002	EM2211232-003	EM2211232-005	EM2211232-006
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		**0.17**	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.32**	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS1 Primary leachate pond	SS2	SS3 Primary stormwater pond	SS5 Pond drain to Marsh Creek	SS6 CRT upstream sample
				Sampling date / time	14-Jun-2022 09:23	14-Jun-2022 09:01	14-Jun-2022 10:43	14-Jun-2022 11:12	14-Jun-2022 12:21
					EM2211232-001	EM2211232-002	EM2211232-003	EM2211232-005	EM2211232-006
					Result	Result	Result	Result	Result
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**9.91**	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.44**	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**9.67**	<0.01	<0.01	<0.01	<0.01
MM514: E.coli & Total Coliforms MPN by Colilert									
Escherichia coli (Colilert)	----	1	orgs/100mL		**290**	**26**	**350**	**240**	**170**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**106**	**107**	**101**	**106**	**111**
13C8-PFOA	----	0.02	%		**104**	**99.7**	**101**	**99.9**	**98.8**

Analytical Results

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

				Sample ID	SS7 CRT downstream site	SS9 C-Cell leachate balancing pond	SS10	SS14 secondary stormwater pond seepage pit	----
				Sampling date / time	14-Jun-2022 12:01	14-Jun-2022 08:31	14-Jun-2022 08:25	14-Jun-2022 08:47	----
Compound	CAS Number	LOR	Unit		EM2211232-007	EM2211232-008	EM2211232-009	EM2211232-010	--------
					Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**373**	**2730**	**7970**	**1750**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**21**	**72**	**69**	**6**	**----**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	**----**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	**9**	<1	<1	**----**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**39**	**164**	**39**	**68**	**----**
Total Alkalinity as CaCO3	----	1	mg/L		**39**	**173**	**39**	**68**	**----**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**20**	**1660**	**5290**	**124**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**124**	**146**	**183**	**855**	**----**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**13**	**127**	**368**	**31**	**----**
Magnesium	7439-95-4	1	mg/L		**16**	**339**	**996**	**60**	**----**
Sodium	7440-23-5	1	mg/L		**64**	**252**	**484**	**475**	**----**
Potassium	7440-09-7	1	mg/L		**3**	**16**	**26**	**10**	**----**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**1.11**	**0.02**	**0.35**	<0.01	**----**
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.112**	**0.008**	**0.003**	**----**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0013**	**0.163**	**0.0003**	**----**
Chromium	7440-47-3	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	**----**
Copper	7440-50-8	0.001	mg/L		**0.003**	**0.001**	**0.015**	**0.004**	**----**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**----**
Manganese	7439-96-5	0.001	mg/L		**0.008**	**0.111**	**9.61**	**0.004**	**----**
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.039**	**0.950**	**0.006**	**----**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	**----**
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**----**
Zinc	7440-66-6	0.005	mg/L		**0.009**	**0.056**	**8.39**	**0.011**	**----**
Iron	7439-89-6	0.05	mg/L		**1.12**	<0.05	<0.05	<0.05	**----**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**2.68**	**0.80**	**1.32**	**0.01**	**----**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS7 CRT downstream site	SS9 C-Cell leachate balancing pond	SS10	SS14 secondary stormwater pond seepage pit	----
				Sampling date / time	14-Jun-2022 12:01	14-Jun-2022 08:31	14-Jun-2022 08:25	14-Jun-2022 08:47	----
					EM2211232-007	EM2211232-008	EM2211232-009	EM2211232-010	--------
					Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.138**	**0.010**	**0.003**	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0034**	**0.176**	**0.0002**	----
Chromium	7440-47-3	0.001	mg/L		**0.003**	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		**0.004**	**0.002**	**0.026**	**0.004**	----
Lead	7439-92-1	0.001	mg/L		**0.001**	<0.001	**0.004**	<0.001	----
Manganese	7439-96-5	0.001	mg/L		**0.016**	**0.455**	**9.67**	**0.005**	----
Nickel	7440-02-0	0.001	mg/L		**0.003**	**0.046**	**1.04**	**0.006**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	**0.02**	<0.01	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		**0.008**	**0.177**	**9.19**	**0.010**	----
Iron	7439-89-6	0.05	mg/L		**2.65**	**0.59**	**0.17**	<0.05	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	**0.0004**	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	**0.0020**	<0.0001	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.050	<0.005	**0.976**	<0.005	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.020	<0.002	**0.028**	<0.002	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.044**	<0.002	**0.969**	**2.27**	----
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.044**	<0.002	**0.997**	**2.27**	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**0.51**	**4.18**	**3.53**	**0.43**	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.55**	**4.18**	**4.53**	**2.70**	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		<0.050	<0.010	**0.039**	**0.009**	----

Analytical Results

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

				Sample ID	SS7 CRT downstream site	SS9 C-Cell leachate balancing pond	SS10	SS14 secondary stormwater pond seepage pit	----
				Sampling date / time	14-Jun-2022 12:01	14-Jun-2022 08:31	14-Jun-2022 08:25	14-Jun-2022 08:47	----
Compound	CAS Number	LOR	Unit		EM2211232-007	EM2211232-008	EM2211232-009	EM2211232-010	--------
					Result	Result	Result	Result	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		<0.010	**0.003**	<0.001	**0.057**	**----**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**21**	**43**	**28**	**8**	**----**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**73**	**178**	**116**	**27**	**----**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	**0.04**	**0.02**	**0.21**	**----**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	**0.02**	**----**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	**0.09**	**0.04**	**0.11**	**----**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.06**	**0.02**	**0.02**	**----**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	**0.2**	**----**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**0.12**	**0.10**	**0.22**	**----**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**0.12**	**0.12**	**0.20**	**----**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.09**	**0.10**	**0.06**	**----**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.23**	**0.27**	**0.09**	**----**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**----**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS7 CRT downstream site	SS9 C-Cell leachate balancing pond	SS10	SS14 secondary stormwater pond seepage pit	----
				Sampling date / time	14-Jun-2022 12:01	14-Jun-2022 08:31	14-Jun-2022 08:25	14-Jun-2022 08:47	----
					EM2211232-007	EM2211232-008	EM2211232-009	EM2211232-010	--------
					Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**0.75**	**0.67**	**1.13**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.15**	**0.06**	**0.13**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.75**	**0.67**	**1.11**	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS7 CRT downstream site	SS9 C-Cell leachate balancing pond	SS10	SS14 secondary stormwater pond seepage pit	----
				Sampling date / time	14-Jun-2022 12:01	14-Jun-2022 08:31	14-Jun-2022 08:25	14-Jun-2022 08:47	----
					EM2211232-007	EM2211232-008	EM2211232-009	EM2211232-010	--------
					Result	Result	Result	Result	----
MM514: E.coli & Total Coliforms MPN by Colilert									
Escherichia coli (Colilert)	----	1	orgs/100mL		**160**	**30**	**20**	**4**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**108**	**96.1**	**96.9**	**----**
13C8-PFOA	----	0.02	%		**100**	**98.8**	**100**	**100**	**----**

Analytical Results

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

				Sample ID	SS4 Primary leachate pond seepage pit	QA1	FB_14.6.22	----	----
				Sampling date / time	14-Jun-2022 10:24	14-Jun-2022 09:47	14-Jun-2022 12:56	----	----
Compound	CAS Number	LOR	Unit		EM2211232-004	EM2211232-013	EM2211232-015	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**3910**	**7500**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**34**	**10**	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**707**	**4150**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**707**	**4150**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**180**	<1	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**1670**	**3160**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**209**	**120**	----	----	----
Magnesium	7439-95-4	1	mg/L		**291**	**327**	----	----	----
Sodium	7440-23-5	1	mg/L		**814**	**2000**	----	----	----
Potassium	7440-09-7	1	mg/L		**4**	**227**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.01**	**0.10**	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.074**	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0002	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.108**	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	**0.002**	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	**0.002**	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.368**	**0.454**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.004**	**0.137**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.02	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	**0.08**	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.044**	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.38**	**1.04**	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.08**	**0.14**	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L		**0.005**	**0.097**	----	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS4 Primary leachate pond seepage pit	QA1	FB_14.6.22	----	----
				Sampling date / time	14-Jun-2022 10:24	14-Jun-2022 09:47	14-Jun-2022 12:56	----	----
					EM2211232-004	EM2211232-013	EM2211232-015	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0002	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.154**	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	**0.007**	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	**0.002**	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.385**	**0.604**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.003**	**0.177**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.02	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	**0.11**	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.108**	----	----	----
Iron	7439-89-6	0.05	mg/L		**6.73**	**1.52**	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0010	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	**0.015**	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	**711**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	**692**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	**692**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	**4.46**	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		**1.12**	----	----	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		**0.048**	<0.200	----	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.925**	<0.200	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SS4 Primary leachate pond seepage pit	QA1	FB_14.6.22	----	----
				Sampling date / time	14-Jun-2022 10:24	14-Jun-2022 09:47	14-Jun-2022 12:56	----	----
Compound	CAS Number	LOR	Unit		EM2211232-004	EM2211232-013	EM2211232-015	--------	--------
					Result	Result	Result	----	----
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.973**	<0.200	----	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**1.32**	----	----	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**2.29**	----	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		<0.005	----	----	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.012**	**4.02**	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**12**	**205**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<50	**1840**	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.04**	**3.93**	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		**0.02**	**0.96**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	**0.02**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.60**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.03**	**0.82**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.03**	**2.16**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.52**	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.01**	**0.87**	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.08**	----	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SS4 Primary leachate pond seepage pit	QA1	FB_14.6.22	----	----
				Sampling date / time	14-Jun-2022 10:24	14-Jun-2022 09:47	14-Jun-2022 12:56	----	----
					EM2211232-004	EM2211232-013	EM2211232-015	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	**0.02**	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	**0.18**	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	**0.03**	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	**0.29**	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----

Analytical Results

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

				Sample ID	SS4 Primary leachate pond seepage pit	QA1	FB_14.6.22	----	----
				Sampling date / time	14-Jun-2022 10:24	14-Jun-2022 09:47	14-Jun-2022 12:56	----	----
Compound	CAS Number	LOR	Unit		EM2211232-004	EM2211232-013	EM2211232-015	--------	--------
					Result	Result	Result	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.13**	**10.5**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.02**	**1.56**	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.13**	**10.2**	----	----	----
MM514: E.coli & Total Coliforms MPN by Colilert									
Escherichia coli (Colilert)	----	1	orgs/100mL		**0**	**170**	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**114**	**114**	----	----	----
13C8-PFOA	----	0.02	%		**97.7**	**98.8**	----	----	----

Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Sub-Matrix: RINSATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK257A: Nitrite

(WATER) EK258A: Nitrate

(WATER) EK271A: Reactive Phosphorus

(WATER) EK259A: Nitrite and Nitrate (NOx)

(WATER) EK255A: Ammonia

(WATER) EK261A: Total Kjeldahl Nitrogen

(WATER) EK262A: Total Nitrogen

(WATER) EK267A: Total Phosphorus (Persulfate Digestion)

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2211232**	Page	: 1 of 16
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 15-Jun-2022
Order number	: JN21332	Date Analysis Commenced	: 15-Jun-2022
C-O-C number	: 38737	Issue Date	: 05-Aug-2022
Sampler	: DANIEL LAVER		
Site	: Copping Landfill - June 6 monthly sampling round		
Quote number	: ME/088/22 V2		
No. of samples received	: 15		
No. of samples analysed	: 15		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Samantha Smith	Assistant Laboratory Manager	WRG Subcontracting, Springvale, VIC
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4401688)									
EM2211196-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	452	451	0.0	0% - 20%
EM2211232-012	BH19	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2860	2810	1.8	0% - 20%
EM2211254-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	545	494	9.8	0% - 20%
EM2211232-002	SS2	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	162	154	5.1	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4401687)									
EM2211171-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EM2211236-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EM2211275-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EM2211232-002	SS2	EA025H: Suspended Solids (SS)	----	5	mg/L	18	18	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4401743)									
EM2211224-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	71	71	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	71	71	0.0	0% - 20%
EM2211226-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	189	188	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	189	188	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4401745)									
EM2211232-006	SS6 CRT upstream sample	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	30	30	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	30	30	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 4401745) - continued									
EM2211254-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	475	477	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	475	477	0.4	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4401943)									
EM2211232-010	SS14 secondary stormwater pond seepage pit	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	124	110	12.2	0% - 20%
EM2211232-001	SS1 Primary leachate pond	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 4401944)									
EM2211232-009	SS10	ED045G: Chloride	16887-00-6	1	mg/L	183	182	0.0	0% - 20%
EM2211232-001	SS1 Primary leachate pond	ED045G: Chloride	16887-00-6	1	mg/L	3130	3130	0.2	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4405180)									
EM2211232-002	SS2	ED093F: Calcium	7440-70-2	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
EM2211232-010	SS14 secondary stormwater pond seepage pit	ED093F: Calcium	7440-70-2	1	mg/L	31	31	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	60	60	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	475	472	0.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4405179)									
EM2211232-001	SS1 Primary leachate pond	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0002	<0.0002	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.074	0.074	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.107	0.108	0.0	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.458	0.458	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.137	0.136	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.045	0.044	2.5	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.10	0.10	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.02	<0.02	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	0.08	0.08	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.05	1.07	2.4	0% - 20%
EM2211232-010	SS14 secondary stormwater pond seepage pit	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0003	0.0003	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4405179) - continued									
EM2211232-010	SS14 secondary stormwater pond seepage pit	EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.004	0.002	37.1	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.010	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4404903)									
EM2211215-010	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.027	0.024	10.6	0% - 20%
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.049	0.048	3.3	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.008	0.008	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.130	0.125	3.6	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.034	0.029	14.0	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.310	0.312	0.7	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	9.99	9.52	4.8	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	17.3	15.4	11.3	0% - 20%
EM2211232-009	SS10	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.176	0.172	2.6	0% - 20%
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.010	0.010	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.026	0.026	0.0	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	9.67	9.92	2.6	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	1.04	1.04	0.1	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	9.19	9.18	0.0	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	1.32	1.33	0.8	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.17	0.17	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4496161)									
EM2211232-015	FB_14.6.22	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 4496161) - continued									
EM2211232-015	FB_14.6.22	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EM2214507-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.916	0.885	3.5	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.013	0.013	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.04	0.04	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.10	0.10	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4405178)									
EM2211232-001	SS1 Primary leachate pond	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0010	<0.0010	0.0	No Limit
EM2211232-010	SS14 secondary stormwater pond seepage pit	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4401311)									
EM2211223-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2211232-008	SS9 C-Cell leachate balancing pond	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4403167)									
EM2210962-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.004	<0.004	0.0	No Limit
EM2211232-002	SS2	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4403168)									
EM2211285-003	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EM2211246-003	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4416028)									
EM2211232-001	SS1 Primary leachate pond	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	680	830	19.8	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4416027)									
EM2211232-001	SS1 Primary leachate pond	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4415926)									
EM2211232-001	SS1 Primary leachate pond	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	685	728	6.1	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4415927)									
EM2211232-001	SS1 Primary leachate pond	EK067G: Total Phosphorus as P	----	0.01	mg/L	4.29	4.61	7.2	0% - 20%
EK255A: Ammonia (QC Lot: 4406503)									
EM2211232-001	SS1 Primary leachate pond	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	298	297	0.4	0% - 20%
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK257A: Nitrite (QC Lot: 4406501)									
EM2211232-001	SS1 Primary leachate pond	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.200	<0.200	0.0	No Limit
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 4406500)									
EM2211232-001	SS1 Primary leachate pond	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.200	<0.200	0.0	No Limit
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	2.27	2.24	1.5	0% - 20%
EK262A: Total Nitrogen (QC Lot: 4405935)									
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	2.70	2.74	1.7	0% - 20%
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 4405934)									
EM2211232-001	SS1 Primary leachate pond	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	3.32	3.40	2.3	0% - 20%
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.009	0.043	129	No Limit
EK271A: Reactive Phosphorus (QC Lot: 4406502)									
EM2211232-001	SS1 Primary leachate pond	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	3.46	3.68	6.1	0% - 20%
EM2211232-010	SS14 secondary stormwater pond seepage pit	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.057	0.060	5.1	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 4404909)									
EM2211232-001	SS1 Primary leachate pond	EP002: Dissolved Organic Carbon	----	1	mg/L	484	521	7.3	0% - 20%
EM2211232-010	SS14 secondary stormwater pond seepage pit	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 4402463)									
EM2211232-002	SS2	EP026SP: Chemical Oxygen Demand	----	10	mg/L	15	23	38.5	No Limit
EM2211232-009	SS10	EP026SP: Chemical Oxygen Demand	----	10	mg/L	116	111	4.4	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4401490)									
EM2211232-001	SS1 Primary leachate pond	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.94	0.91	3.6	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.50	0.58	15.5	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	4.04	4.11	1.8	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4401490)									
EM2211232-001	SS1 Primary leachate pond	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.81	0.85	3.8	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.75	0.79	4.8	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.95	2.19	11.5	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.36	0.33	7.6	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.07	0.08	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 4401490)									
EM2211232-001	SS1 Primary leachate pond	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	0.17	0.20	17.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.04	56.7	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4401490)									
EM2211232-001	SS1 Primary leachate pond	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.32	0.30	7.9	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4401490) - continued									
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4401490)									
EM2211232-001	SS1 Primary leachate pond	EP231X: Sum of PFAS	----	0.01	µg/L	9.91	10.4	4.6	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.44	1.49	3.4	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	9.67	10.1	4.0	0% - 20%
EM2211232-005	SS5 Pond drain to Marsh Creek	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4401688)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	102	91.0	110
				<10	2460 mg/L	100	81.7	118
				<10	293 mg/L	101	91.0	110
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4401687)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	98.0	91.0	109
				<5	812 mg/L	97.7	87.1	115
				<5	1000 mg/L	96.1	90.3	109
ED037P: Alkalinity by PC Titrator (QCLot: 4401743)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	99.3	85.0	116
ED037P: Alkalinity by PC Titrator (QCLot: 4401745)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.1	85.0	116
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4401943)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	85.8	117
				<1	500 mg/L	102	80.0	120
ED045G: Chloride by Discrete Analyser (QCLot: 4401944)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	106	85.0	115
				<1	1000 mg/L	98.7	85.0	122
ED093F: Dissolved Major Cations (QCLot: 4405180)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	106	80.0	120
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	113	80.0	120
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	80.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	104	80.0	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 4405179)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	108	90.4	111
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	89.0	111
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	83.5	111
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	83.2	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	105	83.1	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	106	84.6	108
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	103	84.8	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	105	84.3	110
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	108	82.3	113
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	103	83.7	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	104	86.3	112

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4405179) - continued								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	108	91.8	112
EG020T: Total Metals by ICP-MS (QCLot: 4404903)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	110	90.8	115
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	110	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	104	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	108	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	107	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	105	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	106	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	113	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	105	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	86.7	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	108	92.8	118
EG020T: Total Metals by ICP-MS (QCLot: 4496161)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	108	90.8	115
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	114	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.9	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.0	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	108	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.5	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.3	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	112	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	111	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	98.3	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	116	86.7	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	101	92.8	118
EG035F: Dissolved Mercury by FIMS (QCLot: 4405178)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.3	71.6	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4401311)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.0	73.4	119
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4403167)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	96.7	77.7	116
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4403168)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	81.1	77.7	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4416028)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	103	84.1	116
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4416027)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4416027) - continued								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	116	90.0	117
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4415926)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	103	70.0	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4415927)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	104	71.9	114
EK255A: Ammonia (QCLot: 4406503)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	92.6	80.0	122
EK257A: Nitrite (QCLot: 4406501)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	96.2	87.0	129
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406500)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	94.4	89.0	123
EK262A: Total Nitrogen (QCLot: 4405935)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	104	78.0	112
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405934)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	99.0	88.0	114
EK271A: Reactive Phosphorus (QCLot: 4406502)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	96.0	78.0	120
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404909)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	100	83.0	115
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4402463)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	500 mg/L	100	89.7	111
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4401490)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.235 µg/L	95.3	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.228 µg/L	111	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	106	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.241 µg/L	105	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4401490)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	117	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	108	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	108	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.8	69.0	133

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4401490) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	99.9	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	110	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4401490)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	118	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	100	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	102	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	107	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	108	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	104	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4401490)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	115	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	114	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	94.1	70.0	130
EP231P: PFAS Sums (QCLot: 4401490)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4401943)							
EM2211232-002	SS2	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	90.9	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4401944)							
EM2211232-002	SS2	ED045G: Chloride	16887-00-6	400 mg/L	103	70.0	142
EG020F: Dissolved Metals by ICP-MS (QCLot: 4405179)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4405179) - continued							
EM2211232-001	SS1 Primary leachate pond	EG020A-F: Arsenic	7440-38-2	0.4 mg/L	108	76.6	124
		EG020A-F: Cadmium	7440-43-9	0.1 mg/L	96.4	74.6	118
		EG020A-F: Chromium	7440-47-3	0.4 mg/L	89.4	71.0	135
		EG020A-F: Copper	7440-50-8	0.4 mg/L	96.6	76.0	130
		EG020A-F: Lead	7439-92-1	0.4 mg/L	96.4	75.0	133
		EG020A-F: Manganese	7439-96-5	0.4 mg/L	89.4	64.0	134
		EG020A-F: Nickel	7440-02-0	0.4 mg/L	94.4	73.0	131
		EG020A-F: Vanadium	7440-62-2	0.4 mg/L	94.7	73.0	131
		EG020A-F: Zinc	7440-66-6	0.4 mg/L	99.8	75.0	131
EG020T: Total Metals by ICP-MS (QCLot: 4404903)							
EM2211215-010	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	107	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	106	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	97.5	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	107	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	112	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	108	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	106	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	100	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	109	74.0	120
EG020T: Total Metals by ICP-MS (QCLot: 4496161)							
EM2211232-015	FB_14.6.22	EG020A-T: Arsenic	7440-38-2	1 mg/L	106	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	99.3	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	95.2	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	102	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	105	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	104	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	104	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	95.2	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	104	74.0	120
EG035F: Dissolved Mercury by FIMS (QCLot: 4405178)							
EM2211232-002	SS2	EG035F: Mercury	7439-97-6	0.01 mg/L	96.1	70.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4401311)							
EM2211223-002	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	82.3	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4403167)							
EM2210983-001	Anonymous	EK026SF: Total Cyanide	57-12-5	1 mg/L	117	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4403168)							
EM2211232-014	RB_14.6.22 Rinsate Blank	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	101	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4416028)							
EM2211232-013	QA1	EK055G: Ammonia as N	7664-41-7	1 mg/L	# Not Determined	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4416027)							
EM2211232-013	QA1	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	103	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4415926)							
EM2211232-013	QA1	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	# Not Determined	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4415927)							
EM2211232-013	QA1	EK067G: Total Phosphorus as P	----	1 mg/L	114	70.0	130
EK255A: Ammonia (QCLot: 4406503)							
EM2211232-001	SS1 Primary leachate pond	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	# Not Determined	70.0	130
EK257A: Nitrite (QCLot: 4406501)							
EM2211232-001	SS1 Primary leachate pond	EK257A-CM: Nitrite as N	14797-65-0	10 mg/L	101	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406500)							
EM2211232-001	SS1 Primary leachate pond	EK259A-CM: Nitrite + Nitrate as N	----	10 mg/L	92.7	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405934)							
EM2211232-001	SS1 Primary leachate pond	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	# Not Determined	70.0	130
EK271A: Reactive Phosphorus (QCLot: 4406502)							
EM2211232-001	SS1 Primary leachate pond	EK271A-CM: Reactive Phosphorus as P	14265-44-2	2 mg/L	98.4	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404909)							
EM2211232-002	SS2	EP002: Dissolved Organic Carbon	----	100 mg/L	105	75.0	117
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4402463)							
EM2211232-003	SS3 Primary stormwater pond	EP026SP: Chemical Oxygen Demand	----	2500 mg/L	93.2	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4401490)							
EM2211232-003	SS3 Primary stormwater pond	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.222 µg/L	108	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.235 µg/L	94.4	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.228 µg/L	100	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.238 µg/L	108	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.232 µg/L	104	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.241 µg/L	85.9	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4401490)							
EM2211232-003	SS3 Primary stormwater pond	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	102	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	105	72.0	129

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4401490) - continued							
EM2211232-003	SS3 Primary stormwater pond	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	98.3	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	96.9	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	97.4	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	108	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	108	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	95.5	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	99.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	93.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	104	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4401490)							
EM2211232-003	SS3 Primary stormwater pond	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	106	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	100	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	98.6	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	104	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	103	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	98.3	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	95.5	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4401490)							
EM2211232-003	SS3 Primary stormwater pond	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.234 µg/L	102	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.238 µg/L	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.24 µg/L	132	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.242 µg/L	88.4	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2211232**	Page	: 1 of 15
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 15-Jun-2022
Site	: Copping Landfill - June 6 monthly sampling round	Issue Date	: 05-Aug-2022
Sampler	: DANIEL LAVER	No. of samples received	: 15
Order number	: JN21332	No. of samples analysed	: 15

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK055G: Ammonia as N by Discrete Analyser	EM2211232--013	QA1	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser	EM2211232--013	QA1	**Total Kjeldahl Nitrogen as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK255A: Ammonia	EM2211232--001	SS1 Primary leachate pond	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK267A: Total Phosphorus (Persulfate Digestion)	EM2211232--001	SS1 Primary leachate pond	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	1	19	5.26	9.52	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	0	19	0.00	4.76	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	21-Jun-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, QA1, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	21-Jun-2022	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, QA1, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	28-Jun-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	12-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	12-Jul-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)							
SS1 - Primary leachate pond, SS2, SS4 - Primary leachate pond seepage pit, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, BH19	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
Clear Plastic Bottle - Natural (ED093F)							
SS3 - Primary stormwater pond, SS5 - Pond drain to Marsh Creek, QA1	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	21-Jun-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
SS1 - Primary leachate pond, SS2, SS4 - Primary leachate pond seepage pit, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, BH19	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	11-Dec-2022	✓
Clear Plastic Bottle - Natural (EG020A-F)							
SS3 - Primary stormwater pond, SS5 - Pond drain to Marsh Creek, QA1	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	11-Dec-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
FB_14.6.22	**14-Jun-2022**	**03-Aug-2022**	11-Dec-2022	✓	**03-Aug-2022**	11-Dec-2022	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, QA1, SS14 - secondary stormwater pond seepage pit, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**17-Jun-2022**	11-Dec-2022	✓	**17-Jun-2022**	11-Dec-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
SS1 - Primary leachate pond, SS2, SS4 - Primary leachate pond seepage pit, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, BH19	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
Clear Plastic Bottle - Natural (EG035F)							
SS3 - Primary stormwater pond, SS5 - Pond drain to Marsh Creek, QA1	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, QA1, SS14 - secondary stormwater pond seepage pit, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	12-Jul-2022	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	28-Jun-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SS1 - Primary leachate pond, QA1	**14-Jun-2022**	**----**	----	----	**23-Jun-2022**	12-Jul-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SS1 - Primary leachate pond, QA1	**14-Jun-2022**	**----**	----	----	**23-Jun-2022**	12-Jul-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
SS1 - Primary leachate pond, QA1	**14-Jun-2022**	**24-Jun-2022**	12-Jul-2022	✓	**24-Jun-2022**	12-Jul-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
SS1 - Primary leachate pond, QA1	**14-Jun-2022**	**24-Jun-2022**	12-Jul-2022	✓	**24-Jun-2022**	12-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK255A: Ammonia							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK255A-CM)							
SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH14A - PFAS lab QC sample, BH19, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
EK257A: Nitrite							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK257A-CM)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	18-Jun-2022	✓
EK259A: Nitrite and Nitrate (NOx)							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK259A-CM)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
EK262A: Total Nitrogen							
Clear Plastic Bottle - Frozen (AS) (EK262PA-CM)							
SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH14A - PFAS lab QC sample, BH19, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**17-Jun-2022**	12-Jul-2022	✓	**17-Jun-2022**	12-Jul-2022	✓
EK267A: Total Phosphorus (Persulfate Digestion)							
Clear Plastic Bottle - Frozen (AS) (EK267PA-CM)							
SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH14A - PFAS lab QC sample, BH19, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**17-Jun-2022**	12-Jul-2022	✓	**17-Jun-2022**	12-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK271A: Reactive Phosphorus							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK271A-CM)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**17-Jun-2022**	12-Jul-2022	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample	**14-Jun-2022**	**----**	----	----	**16-Jun-2022**	12-Jul-2022	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**16-Jun-2022**	11-Dec-2022	✓	**16-Jun-2022**	11-Dec-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**16-Jun-2022**	11-Dec-2022	✓	**16-Jun-2022**	11-Dec-2022	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**16-Jun-2022**	11-Dec-2022	✓	**16-Jun-2022**	11-Dec-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**16-Jun-2022**	11-Dec-2022	✓	**16-Jun-2022**	11-Dec-2022	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, BH19, QA1, SS14 - secondary stormwater pond seepage pit, BH14A - PFAS lab QC sample, RB_14.6.22 - Rinsate Blank	**14-Jun-2022**	**16-Jun-2022**	11-Dec-2022	✓	**16-Jun-2022**	11-Dec-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
MM514: E.coli & Total Coliforms MPN by Colilert							
Sterile Plastic Bottle - Sodium Thiosulfate (MM514)							
SS1 - Primary leachate pond, SS2, SS3 - Primary stormwater pond, SS4 - Primary leachate pond seepage pit, SS5 - Pond drain to Marsh Creek, SS6 - CRT upstream sample, SS7 - CRT downstream site, SS9 - C-Cell leachate balancing pond, SS10, QA1, SS14 - secondary stormwater pond seepage pit	**14-Jun-2022**	**----**	----	----	**15-Jun-2022**	15-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	20	**10.00**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	21	**9.52**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	21	**9.52**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	4	33	**12.12**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	19	**5.26**	**9.52**	×	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	**5.00**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	40	**7.50**	**7.50**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	37	**8.11**	**7.50**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	19	**5.26**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	**5.00**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	19	**5.26**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	**5.00**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	0	19	**0.00**	**4.76**	×	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	In house: Referenced to APHA 4500-NH3 H. Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM Schedule B(3)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	In house: Referenced to APHA 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	In house: Referenced to APHA 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	In house: Referenced to APHA 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	In house: Referenced to APHA 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloured and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
E.coli & Total Coliforms by MPN Colilert	MM514	WATER	Microbiological analysis subcontracted to ALS Scoresby (NATA Accredited Laboratory No. 992).

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Persulfate Digestion for UT TN and TP for FIA finish.	EK262/267-PA Prep	WATER	In house: Referenced to APHA 4500 P - J. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2211291**	Page	: 1 of 18
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 16-Jun-2022 13:10
Order number	: JN21332	Date Analysis Commenced	: 17-Jun-2022
C-O-C number	: 38923	Issue Date	: 24-Jun-2022 19:18
Sampler	: DANIEL LAVER, MIGUEL URREA		
Site	: Copping Landfill 6 monthly round June 2022 - day 2		
Quote number	: ME/088/22		
No. of samples received	: 13		
No. of samples analysed	: 12		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.
- EK267: Poor spike recovery for Total Phosphorus due to matrix interferences(confirmed by re-analysis).
- EK259, EK262: It has been noted that NOx is greater than TN for sample nos: 1 and 5, however this difference is within the limits of experimental variation.
- EP026SP: Samples EM2211291-002, 003, 004, 007, and 008 required dilution prior to COD analysis due to matrix interferences. LOR values have been adjusted accordingly.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised 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.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH2	BH7	BH10C	BH10D	BH22
				Sampling date / time	15-Jun-2022 13:54	15-Jun-2022 12:28	15-Jun-2022 08:23	15-Jun-2022 08:45	15-Jun-2022 14:59
Compound	CAS Number	LOR	Unit		EM2211291-001	EM2211291-002	EM2211291-003	EM2211291-004	EM2211291-005
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**1880**	**5240**	**5370**	**5440**	**1060**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**60**	**205**	**201**	**188**	**30**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**779**	**2760**	**2910**	**2940**	**291**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**160**	**369**	**388**	**315**	**96**
Magnesium	7439-95-4	1	mg/L		**157**	**403**	**440**	**478**	**64**
Sodium	7440-23-5	1	mg/L		**228**	**818**	**829**	**867**	**187**
Potassium	7440-09-7	1	mg/L		**3**	**5**	**6**	**5**	**10**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.002**	**0.007**	<0.001	<0.001
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
Copper	7440-50-8	0.001	mg/L		<0.001	**0.003**	<0.001	**0.004**	**0.004**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.181**	**1.08**	**1.64**	**0.393**	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.005**	**0.003**	**0.004**	**0.001**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.03**
Zinc	7440-66-6	0.005	mg/L		**0.006**	**0.011**	**0.012**	**0.027**	**0.006**
Iron	7439-89-6	0.05	mg/L		<0.05	**0.61**	**1.02**	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.005	**0.022**	**0.091**	**0.026**	<0.005
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		**0.006**	<0.002	<0.002	<0.002	**0.005**
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.082**	**0.004**	**0.006**	**0.032**	**2.76**
EK259A: Nitrite and Nitrate (NOx)									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH2	BH7	BH10C	BH10D	BH22
				Sampling date / time	15-Jun-2022 13:54	15-Jun-2022 12:28	15-Jun-2022 08:23	15-Jun-2022 08:45	15-Jun-2022 14:59
Compound	CAS Number	LOR	Unit		EM2211291-001	EM2211291-002	EM2211291-003	EM2211291-004	EM2211291-005
					Result	Result	Result	Result	Result
EK259A: Nitrite and Nitrate (NOx) - Continued									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.088**	**0.004**	**0.006**	**0.032**	**2.76**
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		<0.02	**0.12**	**0.26**	**0.12**	<0.10
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.08**	**0.12**	**0.27**	**0.15**	**2.56**
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		**0.036**	**0.126**	**0.041**	**0.030**	**0.077**
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.021**	**0.025**	**0.013**	**0.017**	**0.028**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**8**	**7**	**7**	**4**	**14**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	<50	<50	<50	**16**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH2	BH7	BH10C	BH10D	BH22
				Sampling date / time	15-Jun-2022 13:54	15-Jun-2022 12:28	15-Jun-2022 08:23	15-Jun-2022 08:45	15-Jun-2022 14:59
Compound	CAS Number	LOR	Unit		EM2211291-001	EM2211291-002	EM2211291-003	EM2211291-004	EM2211291-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH2	BH7	BH10C	BH10D	BH22
				Sampling date / time	15-Jun-2022 13:54	15-Jun-2022 12:28	15-Jun-2022 08:23	15-Jun-2022 08:45	15-Jun-2022 14:59
Compound	CAS Number	LOR	Unit		EM2211291-001	EM2211291-002	EM2211291-003	EM2211291-004	EM2211291-005
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**112**	**104**	**107**	**105**	**108**
13C8-PFOA	----	0.02	%		**102**	**101**	**104**	**101**	**100**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH23	BH24A	BH24B	BH25A	QA3 duplicate sample
				Sampling date / time	15-Jun-2022 14:21	15-Jun-2022 11:50	15-Jun-2022 10:00	15-Jun-2022 09:43	15-Jun-2022 08:26
Compound	CAS Number	LOR	Unit		EM2211291-006	EM2211291-007	EM2211291-008	EM2211291-009	EM2211291-010
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		1490	4260	3890	2880	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		37	205	218	167	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		611	2290	1870	1490	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		140	264	148	99	----
Magnesium	7439-95-4	1	mg/L		124	207	194	130	----
Sodium	7440-23-5	1	mg/L		198	925	976	798	----
Potassium	7440-09-7	1	mg/L		2	4	2	3	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		0.004	0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		0.001	<0.001	0.002	<0.001	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L		0.115	1.38	0.112	0.122	----
Nickel	7440-02-0	0.001	mg/L		0.003	0.004	0.018	0.010	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		0.007	0.008	0.009	0.019	----
Iron	7439-89-6	0.05	mg/L		<0.05	0.85	<0.05	0.13	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.005	0.087	<0.005	0.011	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		0.006	<0.002	<0.002	<0.002	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		0.117	<0.002	0.007	0.130	----
EK259A: Nitrite and Nitrate (NOx)									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	BH23	BH24A	BH24B	BH25A	QA3 duplicate sample
			Sampling date / time	15-Jun-2022 14:21	15-Jun-2022 11:50	15-Jun-2022 10:00	15-Jun-2022 09:43	15-Jun-2022 08:26
Compound	CAS Number	LOR	Unit	EM2211291-006	EM2211291-007	EM2211291-008	EM2211291-009	EM2211291-010
				Result	Result	Result	Result	Result
EK259A: Nitrite and Nitrate (NOx) - Continued								
Nitrite + Nitrate as N	----	0.002	mg/L	**0.123**	<0.002	**0.007**	**0.130**	----
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	**0.02**	**0.20**	**0.11**	**0.14**	----
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	**0.14**	**0.20**	**0.12**	**0.27**	----
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	**0.039**	**0.049**	**0.130**	**0.074**	----
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	**0.018**	**0.016**	**0.021**	**0.017**	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**8**	**1**	**6**	**3**	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	<50	<50	**11**	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH23	BH24A	BH24B	BH25A	QA3 duplicate sample
				Sampling date / time	15-Jun-2022 14:21	15-Jun-2022 11:50	15-Jun-2022 10:00	15-Jun-2022 09:43	15-Jun-2022 08:26
Compound	CAS Number	LOR	Unit		EM2211291-006	EM2211291-007	EM2211291-008	EM2211291-009	EM2211291-010
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	BH23	BH24A	BH24B	BH25A	QA3 duplicate sample
			Sampling date / time	15-Jun-2022 14:21	15-Jun-2022 11:50	15-Jun-2022 10:00	15-Jun-2022 09:43	15-Jun-2022 08:26
Compound	CAS Number	LOR	Unit	EM2211291-006	EM2211291-007	EM2211291-008	EM2211291-009	EM2211291-010
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**105**	**99.9**	**108**	**99.5**	**102**
13C8-PFOA	----	0.02	%	**104**	**102**	**103**	**99.6**	**100**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH25B	----	----	----	----
				Sampling date / time	[15-Jun-2022]	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-013	--------	--------	--------	--------
					Result	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**4210**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**217**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**2320**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**106**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**177**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**1080**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**4**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.003**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.028**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.020**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.022**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.005	----	----	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	----	----	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.016**	----	----	----	----
EK259A: Nitrite and Nitrate (NOx)									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH25B	----	----	----	----
				Sampling date / time	[15-Jun-2022]	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-013	--------	--------	--------	--------
					Result	----	----	----	----
EK259A: Nitrite and Nitrate (NOx) - Continued									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.016**	----	----	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**0.13**	----	----	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.15**	----	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		**0.019**	----	----	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.017**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**14**	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**18**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH25B	----	----	----	----
				Sampling date / time	[15-Jun-2022]	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-013	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH25B	----	----	----	----
				Sampling date / time	[15-Jun-2022]	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-013	--------	--------	--------	--------
					Result	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**101**	----	----	----	----
13C8-PFOA	----	0.02	%		**99.9**	----	----	----	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	RB_15.6.22 Rinsate blank	----	----	----	----
				Sampling date / time	15-Jun-2022 13:03	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-012	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	RB_15.6.22 Rinsate blank	----	----	----	----
				Sampling date / time	15-Jun-2022 13:03	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2211291-012	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)			Sample ID	**RB_15.6.22 Rinsate blank**	----	----	----	----
			Sampling date / time	15-Jun-2022 13:03	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2211291-012**	--------	--------	--------	--------
				Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**106**	----	----	----	----
13C8-PFOA	----	0.02	%	**106**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Sub-Matrix: **RINSATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK255A: Ammonia

(WATER) EK257A: Nitrite

(WATER) EK258A: Nitrate

(WATER) EK261A: Total Kjeldahl Nitrogen

(WATER) EK262A: Total Nitrogen

(WATER) EK267A: Total Phosphorus (Persulfate Digestion)

(WATER) EK271A: Reactive Phosphorus

(WATER) EK259A: Nitrite and Nitrate (NOx)

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2211291**	Page	: 1 of 14
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 16-Jun-2022
Order number	: JN21332	Date Analysis Commenced	: 17-Jun-2022
C-O-C number	: 38923	Issue Date	: 24-Jun-2022
Sampler	: DANIEL LAVER, MIGUEL URREA		
Site	: Copping Landfill 6 monthly round June 2022 - day 2		
Quote number	: ME/088/22		
No. of samples received	: 13		
No. of samples analysed	: 12		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4404752)									
EM2211245-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	7230	7220	0.1	0% - 20%
EM2211287-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	676	657	2.8	0% - 20%
EM2211291-002	BH7	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5240	5020	4.3	0% - 20%
EM2211343-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6330	6600	4.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4408869)									
EM2211392-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6050	6210	2.7	0% - 20%
EM2211402-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	724	726	0.1	0% - 20%
EM2211402-018	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2380	2300	3.3	0% - 20%
EM2211324-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4100	3960	3.5	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4404962)									
EM2211343-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1160	1180	2.0	0% - 20%
EM2211291-001	BH2	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	60	60	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4405258)									
EM2211239-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	278	283	1.6	0% - 20%
EM2211239-016	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3100	3180	2.6	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4404963)									
EM2211291-009	BH25A	ED045G: Chloride	16887-00-6	1	mg/L	1490	1460	2.0	0% - 20%
EM2211291-001	BH2	ED045G: Chloride	16887-00-6	1	mg/L	779	782	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4405259)									
EM2211239-009	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	581	582	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4406835)									
EM2211291-002	BH7	ED093F: Calcium	7440-70-2	1	mg/L	369	372	0.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	403	407	0.9	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 4406835) - continued									
EM2211291-002	BH7	ED093F: Sodium	7440-23-5	1	mg/L	818	824	0.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.0	No Limit
EM2211291-013	BH25B	ED093F: Calcium	7440-70-2	1	mg/L	106	105	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	177	177	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1080	1080	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4406834)									
EM2211291-001	BH2	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.181	0.183	0.8	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EM2211291-013	BH25B	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.028	0.028	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.020	0.019	5.6	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.022	0.018	18.3	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4405142)									
EM2211239-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.019	0.018	0.0	0% - 50%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.023	0.022	0.0	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.041	0.042	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.95	0.95	0.0	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 4405142) - continued									
EM2211239-001	Anonymous	EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.74	1.75	0.0	0% - 20%
EM2211239-010	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.124	0.124	0.0	0% - 20%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.036	0.038	4.6	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.014	0.013	9.2	0% - 50%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.010	0.016	44.4	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.38	0.41	8.4	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	0.01	0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	3.14	3.20	2.0	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 4406833)									
EM2211291-001	BH2	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2211291-013	BH25B	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4410908)									
EM2211182-012	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2211371-008	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4405944)									
EM2211239-003	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EM2211239-017	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4405945)									
EM2211291-013	BH25B	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK255A: Ammonia (QC Lot: 4406503)									
EM2211232-001	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	298	297	0.4	0% - 20%
EM2211232-010	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK255A: Ammonia (QC Lot: 4406507)									
EM2211291-013	BH25B	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK257A: Nitrite (QC Lot: 4406501)									
EM2211232-001	Anonymous	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.200	<0.200	0.0	No Limit
EM2211232-010	Anonymous	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK257A: Nitrite (QC Lot: 4406506)									
EM2211291-013	BH25B	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 4406500)									
EM2211232-001	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.200	<0.200	0.0	No Limit
EM2211232-010	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	2.27	2.24	1.5	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 4406505)									
EM2211291-013	BH25B	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.016	0.016	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 4405935)									
EM2211232-010	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	2.70	2.74	1.7	0% - 20%
EK262A: Total Nitrogen (QC Lot: 4405937)									
EM2211291-009	BH25A	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.27	0.30	10.2	0% - 20%
ES2221118-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.93	0.87	7.0	0% - 20%
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 4405934)									
EM2211232-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	3.32	3.40	2.3	0% - 20%
EM2211232-010	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.009	0.043	129	No Limit
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 4405936)									
EM2211291-009	BH25A	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.074	0.073	0.0	0% - 50%
ES2221118-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.018	0.012	40.8	No Limit
EK271A: Reactive Phosphorus (QC Lot: 4406502)									
EM2211232-001	Anonymous	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	3.46	3.68	6.1	0% - 20%
EM2211232-010	Anonymous	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.057	0.060	5.1	No Limit
EK271A: Reactive Phosphorus (QC Lot: 4406504)									
EM2211291-013	BH25B	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.017	0.017	0.0	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 4404909)									
EM2211232-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	484	521	7.3	0% - 20%
EM2211232-010	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 4404910)									
EM2211291-008	BH24B	EP002: Dissolved Organic Carbon	----	1	mg/L	6	3	72.5	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 4408212)									
EM2211239-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	18	17	0.0	0% - 50%
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 4405273)									
EM2211239-003	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	16	19	13.1	No Limit
EM2211239-016	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	39	43	9.8	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4407812)									
EM2211291-001	BH2	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EM2211291-006	BH23	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4407812) - continued									
EM2211291-006	BH23	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4407812)									
EM2211291-001	BH2	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EM2211291-006	BH23	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 4407812)									
EM2211291-001	BH2	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EM2211291-006	BH23	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 4407812) - continued									
EM2211291-006	BH23	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4407812)									
EM2211291-001	BH2	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EM2211291-006	BH23	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4407812)									
EM2211291-001	BH2	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
EM2211291-006	BH23	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4404752)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	97.5	91.0	110
				<10	2460 mg/L	99.7	81.7	118
				<10	293 mg/L	108	91.0	110
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4408869)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	98.0	91.0	110
				<10	2460 mg/L	93.7	81.7	118
				<10	293 mg/L	103	91.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4404962)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	85.8	117
				<1	500 mg/L	99.3	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4405258)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	85.8	117
				<1	500 mg/L	102	80.0	120
ED045G: Chloride by Discrete Analyser (QCLot: 4404963)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	85.0	115
				<1	1000 mg/L	101	85.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4405259)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.7	85.0	115
				<1	1000 mg/L	101	85.0	122
ED093F: Dissolved Major Cations (QCLot: 4406835)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	80.0	120
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	80.0	120
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.3	80.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.9	80.0	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 4406834)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	111	89.0	111
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	111	83.5	111
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	83.2	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	100	83.1	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	108	84.6	108
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	110	84.8	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	107	84.3	110
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	106	82.3	113
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	110	83.7	110

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4406834) - continued								
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	112	86.3	112
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	110	91.8	112
EG020T: Total Metals by ICP-MS (QCLot: 4405142)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	106	90.8	115
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.9	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	104	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	105	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	106	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	106	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	109	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	108	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	86.7	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	114	92.8	118
EG035F: Dissolved Mercury by FIMS (QCLot: 4406833)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.9	71.6	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4410908)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	103	73.4	119
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4405944)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	94.5	77.7	116
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4405945)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	93.0	77.7	116
EK255A: Ammonia (QCLot: 4406503)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	92.6	80.0	122
EK255A: Ammonia (QCLot: 4406507)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	95.8	80.0	122
EK257A: Nitrite (QCLot: 4406501)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	96.2	87.0	129
EK257A: Nitrite (QCLot: 4406506)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	98.4	87.0	129
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406500)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	94.4	89.0	123
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406505)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	97.6	89.0	123
EK262A: Total Nitrogen (QCLot: 4405935)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	104	78.0	112

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EK262A: Total Nitrogen (QCLot: 4405937)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	106	78.0	112
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405934)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	99.0	88.0	114
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405936)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	99.3	88.0	114
EK271A: Reactive Phosphorus (QCLot: 4406502)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	96.0	78.0	120
EK271A: Reactive Phosphorus (QCLot: 4406504)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	85.9	78.0	120
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404909)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	100	83.0	115
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404910)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	100	83.0	115
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4408212)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	96.0	83.0	115
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4405273)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	500 mg/L	101	89.7	111
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4407812)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	109	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.235 µg/L	99.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.228 µg/L	105	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	98.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.241 µg/L	90.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4407812)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	102	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	103	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.5	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	93.5	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	83.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	109	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4407812)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4407812) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	102	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	119	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	104	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	106	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	108	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	94.7	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	99.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4407812)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	106	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	117	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	79.4	70.0	130
EP231P: PFAS Sums (QCLot: 4407812)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4404962)							
EM2211291-002	BH7	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	90.5	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4405258)							
EM2211239-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	91.1	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4404963)							
EM2211291-002	BH7	ED045G: Chloride	16887-00-6	400 mg/L	# Not Determined	70.0	142
ED045G: Chloride by Discrete Analyser (QCLot: 4405259)							
EM2211239-011	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	98.1	70.0	142

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4406834)							
EM2211291-001	BH2	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	104	76.6	124
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	105	74.6	118
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	101	71.0	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	101	76.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	97.1	75.0	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	98.7	64.0	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	99.0	73.0	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	104	73.0	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	101	75.0	131
EG020T: Total Metals by ICP-MS (QCLot: 4405142)							
EM2211239-001	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	105	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	98.8	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	100	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	107	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	104	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	106	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	105	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	104	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	105	74.0	120
EG035F: Dissolved Mercury by FIMS (QCLot: 4406833)							
EM2211291-002	BH7	EG035F: Mercury	7439-97-6	0.01 mg/L	100	70.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4410908)							
EM2211291-012	RB_15.6.22 Rinsate blank	EG035T: Mercury	7439-97-6	0.01 mg/L	85.4	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4405944)							
EM2211239-005	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	94.2	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4405945)							
EM2211404-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	73.8	70.0	130
EK255A: Ammonia (QCLot: 4406503)							
EM2211232-001	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	# Not Determined	70.0	130
EK255A: Ammonia (QCLot: 4406507)							
EM2211291-013	BH25B	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	97.2	70.0	130
EK257A: Nitrite (QCLot: 4406501)							
EM2211232-001	Anonymous	EK257A-CM: Nitrite as N	14797-65-0	10 mg/L	101	70.0	130
EK257A: Nitrite (QCLot: 4406506)							
EM2211291-009	BH25A	EK257A-CM: Nitrite as N	14797-65-0	0.1 mg/L	96.2	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406500)							
EM2211232-001	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	10 mg/L	92.7	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4406505)							
EM2211291-013	BH25B	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	98.6	70.0	130
EK262A: Total Nitrogen (QCLot: 4405937)							
EM2211291-009	BH25A	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	119	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405934)							
EM2211232-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	# Not Determined	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4405936)							
EM2211291-009	BH25A	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	# 6.2	70.0	130
EK271A: Reactive Phosphorus (QCLot: 4406502)							
EM2211232-001	Anonymous	EK271A-CM: Reactive Phosphorus as P	14265-44-2	2 mg/L	98.4	70.0	130
EK271A: Reactive Phosphorus (QCLot: 4406504)							
EM2211291-013	BH25B	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	91.9	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404909)							
EM2211232-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	105	75.0	117
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4404910)							
EM2211291-009	BH25A	EP002: Dissolved Organic Carbon	----	100 mg/L	116	75.0	117
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4408212)							
EM2211239-009	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	75.0	117
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4405273)							
EM2211239-005	Anonymous	EP026SP: Chemical Oxygen Demand	----	500 mg/L	106	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4407812)							
EM2211378-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.222 µg/L	114	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.235 µg/L	91.9	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.228 µg/L	97.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.238 µg/L	113	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.232 µg/L	91.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.241 µg/L	90.1	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4407812)							
EM2211378-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	106	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	104	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	109	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	114	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	106	71.0	133

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4407812) - continued							
EM2211378-001	Anonymous	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	108	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	108	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	98.5	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	101	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	90.6	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	110	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4407812)							
EM2211378-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	108	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	129	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	106	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	104	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	109	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	94.0	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	99.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4407812)							
EM2211378-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.234 µg/L	110	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.238 µg/L	105	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.24 µg/L	113	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.242 µg/L	# 69.1	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2211291**	Page	: 1 of 12
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 16-Jun-2022
Site	: Copping Landfill 6 monthly round June 2022 - day 2	Issue Date	: 24-Jun-2022
Sampler	: DANIEL LAVER, MIGUEL URREA	No. of samples received	: 13
Order number	: JN21332	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED045G: Chloride by Discrete Analyser	EM2211291--002	BH7	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK255A: Ammonia	EM2211232--001	Anonymous	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK267A: Total Phosphorus (Persulfate Digestion)	EM2211232--001	Anonymous	**Total Phosphorus as P**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK267A: Total Phosphorus (Persulfate Digestion)	EM2211291--009	BH25A	**Total Phosphorus as P**	----	6.2 %	70.0-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2211378--001	Anonymous	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	69.1 %	70.0-130%	**Recovery less than lower data quality objective**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	3	39	7.69	9.52	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	1	39	2.56	4.76	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	22-Jun-2022	✓
Clear Plastic Bottle - Natural (EA015H)							
BH25B	**15-Jun-2022**	**----**	----	----	**20-Jun-2022**	22-Jun-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**21-Jun-2022**	13-Jul-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**18-Jun-2022**	12-Dec-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
RB_15.6.22 - Rinsate blank	**15-Jun-2022**	**17-Jun-2022**	12-Dec-2022	✓	**17-Jun-2022**	12-Dec-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**18-Jun-2022**	13-Jul-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
RB_15.6.22 - Rinsate blank	**15-Jun-2022**	**----**	----	----	**21-Jun-2022**	13-Jul-2022	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	29-Jun-2022	✓
EK255A: Ammonia							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK255A-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓
EK257A: Nitrite							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK257A-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	19-Jun-2022	✓
EK259A: Nitrite and Nitrate (NOx)							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK259A-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK262A: Total Nitrogen							
Clear Plastic Bottle - Frozen (AS) (EK262PA-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**17-Jun-2022**	13-Jul-2022	✓	**17-Jun-2022**	13-Jul-2022	✓
EK267A: Total Phosphorus (Persulfate Digestion)							
Clear Plastic Bottle - Frozen (AS) (EK267PA-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**17-Jun-2022**	13-Jul-2022	✓	**17-Jun-2022**	13-Jul-2022	✓
EK271A: Reactive Phosphorus							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK271A-CM)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓
Amber DOC Filtered- Sulfuric Preserved (EP002)							
BH25B	**15-Jun-2022**	**----**	----	----	**20-Jun-2022**	13-Jul-2022	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, BH25B	**15-Jun-2022**	**----**	----	----	**17-Jun-2022**	13-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, QA3 - duplicate sample, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**20-Jun-2022**	12-Dec-2022	✓	**20-Jun-2022**	12-Dec-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, QA3 - duplicate sample, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**20-Jun-2022**	12-Dec-2022	✓	**20-Jun-2022**	12-Dec-2022	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, QA3 - duplicate sample, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**20-Jun-2022**	12-Dec-2022	✓	**20-Jun-2022**	12-Dec-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, QA3 - duplicate sample, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**20-Jun-2022**	12-Dec-2022	✓	**20-Jun-2022**	12-Dec-2022	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
BH2, BH7, BH10C, BH10D, BH22, BH23, BH24A, BH24B, BH25A, QA3 - duplicate sample, RB_15.6.22 - Rinsate blank, BH25B	**15-Jun-2022**	**20-Jun-2022**	12-Dec-2022	✓	**20-Jun-2022**	12-Dec-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	3	22	**13.64**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	3	24	**12.50**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	3	23	**13.04**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	8	80	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	3	39	**7.69**	**9.52**	×	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	22	**9.09**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	**8.33**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	23	**8.70**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	80	**7.50**	**7.50**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	39	**5.13**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	22	**9.09**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	**8.33**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	23	**8.70**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	80	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	39	**5.13**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	22	**9.09**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	**8.33**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	23	**8.70**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	39	**2.56**	**4.76**	×	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Analytical Methods	Method	Matrix	Method Descriptions
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	In house: Referenced to APHA 4500-NH3 H. Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM Schedule B(3)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	In house: Referenced to APHA 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	In house: Referenced to APHA 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	In house: Referenced to APHA 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	In house: Referenced to APHA 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloured and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Persulfate Digestion for UT TN and TP for FIA finish.	EK262/267-PA Prep	WATER	In house: Referenced to APHA 4500 P - J. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2211413**	Page	: 1 of 14
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 17-Jun-2022 12:52
Order number	: JN21332	Date Analysis Commenced	: 20-Jun-2022
C-O-C number	: 38963	Issue Date	: 03-Aug-2022 17:49
Sampler	: DANIEL LAVER, MIGUEL URREA		
Site	: Copping Landfill, 6 monthly round June 2022 - Day 3		
Quote number	: ME/088/22 V2		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

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

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

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

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

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

- EK267: LOR raised for TP on a few samples due to sample matrix.
- EG020T: EM2211413 #10, the results for Total Metals have been confirmed by re-preparation and re-analysis
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.
- EG020F: EM2211413 #6 Results for Dissolved Metals have been confirmed by re-preparation and re-analysis.
- EP026SP: Samples EM2211413 #1, #4 & #8 required dilution prior to extraction due to matrix interferences. LOR values have been adjusted accordingly.
- Amendment (2/8/22):This report has been amended to report total metals (Al, Cr, Fe, Zn) - EG020T on sample 9
- EA015: EM2211529 #8 Poor duplicate precision for TDS due to sample heterogeneity. Insufficient sample to confirm.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised 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.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	BH1	BH12A	BH12B PFAS lab QA sample	BH15A	BH15B
				Sampling date / time	16-Jun-2022 13:45	16-Jun-2022 12:55	16-Jun-2022 13:29	16-Jun-2022 09:01	16-Jun-2022 09:37
					EM2211413-001	EM2211413-002	EM2211413-003	EM2211413-004	EM2211413-005
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**5510**	**2770**	**2280**	**4900**	**560**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**153**	**56**	**86**	**148**	**11**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**2420**	**1140**	**1060**	**1730**	**18**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**443**	**186**	**34**	**264**	**65**
Magnesium	7439-95-4	1	mg/L		**478**	**90**	**80**	**377**	**32**
Sodium	7440-23-5	1	mg/L		**482**	**458**	**525**	**416**	**88**
Potassium	7440-09-7	1	mg/L		**10**	**5**	**8**	**7**	**4**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.002**
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
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.005**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.712**	**1.56**	**0.031**	**0.158**	**3.07**
Nickel	7440-02-0	0.001	mg/L		**0.005**	**0.016**	**0.010**	**0.013**	**0.001**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.008**	**0.005**	**0.034**	**0.008**	<0.005
Iron	7439-89-6	0.05	mg/L		**0.54**	**0.11**	<0.05	**3.15**	**11.9**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		**0.090**	**0.051**	<0.005	**0.008**	**0.717**
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.010**	**0.046**	**0.018**	<0.002	**0.017**
EK259A: Nitrite and Nitrate (NOx)									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH1	BH12A	BH12B PFAS lab QA sample	BH15A	BH15B
				Sampling date / time	16-Jun-2022 13:45	16-Jun-2022 12:55	16-Jun-2022 13:29	16-Jun-2022 09:01	16-Jun-2022 09:37
Compound	CAS Number	LOR	Unit		EM2211413-001	EM2211413-002	EM2211413-003	EM2211413-004	EM2211413-005
					Result	Result	Result	Result	Result
EK259A: Nitrite and Nitrate (NOx) - Continued									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.010**	**0.046**	**0.018**	<0.002	**0.017**
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**0.25**	**0.09**	**0.09**	**0.18**	**2.42**
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.26**	**0.14**	**0.11**	**0.18**	**2.44**
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		**0.047**	<0.005	**0.014**	<0.050	**0.499**
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.010**	**0.004**	**0.014**	**0.035**	**0.001**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**32**	**7**	**8**	**22**	**49**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<50	<10	**32**	<50	**64**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.01**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	**1.1**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.39**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**1.52**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.13**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.45**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.03**
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.02**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH1	BH12A	BH12B PFAS lab QA sample	BH15A	BH15B
				Sampling date / time	16-Jun-2022 13:45	16-Jun-2022 12:55	16-Jun-2022 13:29	16-Jun-2022 09:01	16-Jun-2022 09:37
Compound	CAS Number	LOR	Unit		EM2211413-001	EM2211413-002	EM2211413-003	EM2211413-004	EM2211413-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.16**
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.04**
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.07**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**3.92**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH1	BH12A	BH12B PFAS lab QA sample	BH15A	BH15B
				Sampling date / time	16-Jun-2022 13:45	16-Jun-2022 12:55	16-Jun-2022 13:29	16-Jun-2022 09:01	16-Jun-2022 09:37
Compound	CAS Number	LOR	Unit		EM2211413-001	EM2211413-002	EM2211413-003	EM2211413-004	EM2211413-005
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.01**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**3.67**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**101**	**105**	**96.7**	**104**	**106**
13C8-PFOA	----	0.02	%		**94.5**	**105**	**102**	**100**	**98.7**

Analytical Results

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

				Sample ID	BH18A	BH21 PFAS lab QC	QA4 duplicate sample - full suite	----	----
				Sampling date / time	16-Jun-2022 08:16	16-Jun-2022 13:41	16-Jun-2022 19:56	----	----
Compound	CAS Number	LOR	Unit		EM2211413-006	EM2211413-007	EM2211413-008	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**3220**	**1460**	**4570**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**87**	**55**	**149**	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**1340**	**601**	**1710**	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**173**	**114**	**265**	----	----
Magnesium	7439-95-4	1	mg/L		**101**	**48**	**376**	----	----
Sodium	7440-23-5	1	mg/L		**617**	**286**	**416**	----	----
Potassium	7440-09-7	1	mg/L		**8**	**4**	**7**	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.003**	**0.002**	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		**0.0001**	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L		**0.142**	**0.536**	**0.157**	----	----
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.012**	**0.013**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L		**0.007**	<0.005	**0.008**	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	**0.62**	**3.13**	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		**0.011**	**0.038**	**0.007**	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	<0.002	<0.002	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		**0.513**	<0.002	**0.007**	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	BH18A	BH21 PFAS lab QC	QA4 duplicate sample - full suite	----	----
				Sampling date / time	16-Jun-2022 08:16	16-Jun-2022 13:41	16-Jun-2022 19:56	----	----
Compound	CAS Number	LOR	Unit		EM2211413-006	EM2211413-007	EM2211413-008	--------	--------
					Result	Result	Result	----	----
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		**0.513**	<0.002	**0.007**	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		**0.47**	**0.14**	**0.12**	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		**0.98**	**0.14**	**0.13**	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		**1.44**	<0.010	<0.050	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		**0.007**	**0.008**	**0.037**	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**15**	**10**	**21**	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**272**	<10	<50	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----

Analytical Results

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

				Sample ID	BH18A	BH21 PFAS lab QC	QA4 duplicate sample - full suite	----	----
				Sampling date / time	16-Jun-2022 08:16	16-Jun-2022 13:41	16-Jun-2022 19:56	----	----
Compound	CAS Number	LOR	Unit		EM2211413-006	EM2211413-007	EM2211413-008	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	BH18A	BH21 PFAS lab QC	QA4 duplicate sample - full suite	----	----
				Sampling date / time	16-Jun-2022 08:16	16-Jun-2022 13:41	16-Jun-2022 19:56	----	----
					EM2211413-006	EM2211413-007	EM2211413-008	--------	--------
					Result	Result	Result	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**111**	**100**	**103**	----	----
13C8-PFOA	----	0.02	%		**106**	**98.9**	**104**	----	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	FB_16.6.22	RB_16.6.22	----	----	----
				Sampling date / time	16-Jun-2022 13:37	16-Jun-2022 14:16	----	----	----
Compound	CAS Number	LOR	Unit		EM2211413-009	EM2211413-010	--------	--------	--------
					Result	Result	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	**0.30**	----	----	----
Arsenic	7440-38-2	0.001	mg/L		----	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		----	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.007**	----	----	----
Copper	7440-50-8	0.001	mg/L		----	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		----	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		----	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		----	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L		----	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L		----	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.010**	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	**0.22**	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	<0.0001	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		----	<0.004	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		----	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		----	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		----	<0.01	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		----	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		----	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		----	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		----	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		----	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		----	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		----	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		----	<0.01	----	----	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)			Sample ID	FB_16.6.22	RB_16.6.22	----	----	----
			Sampling date / time	16-Jun-2022 13:37	16-Jun-2022 14:16	----	----	----
Compound	CAS Number	LOR	Unit	EM2211413-009	EM2211413-010	--------	--------	--------
				Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	----	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	----	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	----	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	----	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	----	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	----	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	----	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	----	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	----	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	----	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	----	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	----	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	----	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	----	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	----	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	----	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	----	<0.05	----	----	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)				Sample ID	**FB_16.6.22**	**RB_16.6.22**	**----**	**----**	**----**
				Sampling date / time	16-Jun-2022 13:37	16-Jun-2022 14:16	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EM2211413-009**	**EM2211413-010**	**--------**	**--------**	**--------**
					Result	Result	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**----**	<0.01	**----**	**----**	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**----**	<0.01	**----**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**----**	<0.01	**----**	**----**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**----**	**104**	**----**	**----**	**----**
13C8-PFOA	----	0.02	%		**----**	**101**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Sub-Matrix: **RINSATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK255A: Ammonia

(WATER) EK257A: Nitrite

(WATER) EK258A: Nitrate

(WATER) EK261A: Total Kjeldahl Nitrogen

(WATER) EK262A: Total Nitrogen

(WATER) EK267A: Total Phosphorus (Persulfate Digestion)

(WATER) EK271A: Reactive Phosphorus

(WATER) EK259A: Nitrite and Nitrate (NOx)

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2211413**	Page	: 1 of 12
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Contact	: Peter Ravlic
Address	: 258 Argyle St NORTH HOBART TAS 7000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 17-Jun-2022
Order number	: JN21332	Date Analysis Commenced	: 20-Jun-2022
C-O-C number	: 38963	Issue Date	: 03-Aug-2022
Sampler	: DANIEL LAVER, MIGUEL URREA		
Site	: Copping Landfill, 6 monthly round June 2022 - Day 3		
Quote number	: ME/088/22 V2		
No. of samples received	: 10		
No. of samples analysed	: 10		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4413912)									
EM2211404-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	3750	3590	4.2	0% - 20%
EM2211413-006	BH18A	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	3220	3150	2.3	0% - 20%
EM2211513-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	894	895	0.2	0% - 20%
EM2211529-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	8500	# 11000	25.8	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4408181)									
EM2211413-001	BH1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	153	152	0.0	0% - 20%
EM2211567-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	107	105	1.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4408182)									
EM2211413-001	BH1	ED045G: Chloride	16887-00-6	1	mg/L	2420	2380	1.5	0% - 20%
EM2211567-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	13	12	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 4417542)									
EM2211413-002	BH12A	ED093F: Calcium	7440-70-2	1	mg/L	186	186	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	90	90	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	458	456	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.0	No Limit
EM2211763-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	12	12	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	53	53	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	168	169	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4417541)									
EM2211413-001	BH1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4417541) - continued									
EM2211413-001	BH1	EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.712	0.711	0.2	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.008	0.007	14.6	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.54	0.53	0.0	0% - 50%
EM2211742-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0275	0.0264	3.8	0% - 20%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.033	0.033	0.0	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	9.48	9.54	0.7	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.165	0.168	1.6	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	13.6	13.8	1.5	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4413143)									
EM2211413-010	RB_16.6.22	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.010	0.010	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.30	0.32	5.3	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.22	0.20	11.1	No Limit
EM2211529-005	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0005	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.429	0.430	0.0	0% - 20%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.268	0.267	0.0	0% - 20%
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.075	0.074	0.0	0% - 50%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.341	0.331	3.0	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.036	0.033	7.8	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 4413143) - continued									
EM2211529-005	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.49	0.54	9.3	0% - 50%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	0.12	0.11	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	3.97	3.97	0.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4495300)									
EM2211413-009	FB_16.6.22	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EM2214698-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4417540)									
EM2211413-001	BH1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2211742-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4420329)									
EM2211413-010	RB_16.6.22	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2211710-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4408290)									
EM2211392-006	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EM2211413-010	RB_16.6.22	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK255A: Ammonia (QC Lot: 4411580)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK255A: Ammonia (QC Lot: 4411580) - continued									
EM2211413-001	BH1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.090	0.093	3.2	0% - 50%
EK257A: Nitrite (QC Lot: 4411578)									
EM2211413-001	BH1	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 4411577)									
EM2211413-001	BH1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.010	0.010	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 4414273)									
ES2221741-004	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2221741-003	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 4414272)									
ES2221741-004	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES2221741-003	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 4419735)									
EM2211413-001	BH1	EP002: Dissolved Organic Carbon	----	1	mg/L	32	38	18.0	0% - 20%
EM2211710-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	10	10	0.0	0% - 50%
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 4416848)									
EM2211413-002	BH12A	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	<10	0.0	No Limit
EM2211662-002	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	51	50	3.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4410091)									
EM2211413-002	BH12A	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4410091)									
EM2211413-002	BH12A	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 4410091)									
EM2211413-002	BH12A	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 4410091) - continued									
EM2211413-002	BH12A	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4410091)									
EM2211413-002	BH12A	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4410091)									
EM2211413-002	BH12A	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4413912)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	104	91.0	110
				<10	2460 mg/L	107	81.7	118
				<10	293 mg/L	100	91.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4408181)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	85.8	117
				<1	500 mg/L	98.6	80.0	120
ED045G: Chloride by Discrete Analyser (QCLot: 4408182)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.6	85.0	115
				<1	1000 mg/L	99.7	85.0	122
ED093F: Dissolved Major Cations (QCLot: 4417542)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.8	80.0	120
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.5	80.0	120
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.2	80.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.9	80.0	120
EG020F: Dissolved Metals by ICP-MS (QCLot: 4417541)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	107	89.0	111
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.5	83.5	111
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	83.2	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	103	83.1	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	102	84.6	108
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	101	84.8	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	101	84.3	110
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	82.3	113
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	102	83.7	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	103	86.3	112
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	97.4	91.8	112
EG020T: Total Metals by ICP-MS (QCLot: 4413143)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	111	90.8	115
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	107	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	106	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	104	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	106	88.7	113

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 4413143) - continued								
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	111	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	103	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	108	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	109	86.7	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	109	92.8	118
EG020T: Total Metals by ICP-MS (QCLot: 4495300)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	106	90.8	115
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	106	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.5	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.7	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	102	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	99.6	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	112	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	105	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	110	86.7	117
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	92.8	118
EG035F: Dissolved Mercury by FIMS (QCLot: 4417540)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	101	71.6	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4420329)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	91.5	73.4	119
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4408290)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	90.0	77.7	116
EK255A: Ammonia (QCLot: 4411580)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	103	80.0	122
EK257A: Nitrite (QCLot: 4411578)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	97.5	87.0	129
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4411577)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	95.1	89.0	123
EK262A: Total Nitrogen (QCLot: 4414273)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	100	78.0	112
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4414272)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	106	88.0	114
EK271A: Reactive Phosphorus (QCLot: 4411579)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	99.1	78.0	120
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4419735)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4419735) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	100 mg/L	96.2	83.0	115
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4416848)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	500 mg/L	99.8	89.7	111
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4410091)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	116	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.235 µg/L	108	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.228 µg/L	106	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	105	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.241 µg/L	101	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4410091)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	106	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	103	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	105	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	93.9	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	91.1	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	115	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4410091)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	106	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	108	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	101	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	106	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	107	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	93.1	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4410091)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	113	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	109	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	134	67.0	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4410091) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	102	70.0	130
EP231P: PFAS Sums (QCLot: 4410091)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4408181)							
EM2211413-002	BH12A	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	92.1	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4408182)							
EM2211413-002	BH12A	ED045G: Chloride	16887-00-6	400 mg/L	75.7	70.0	142
EG020F: Dissolved Metals by ICP-MS (QCLot: 4417541)							
EM2211413-001	BH1	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	108	76.6	124
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	96.0	74.6	118
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	102	71.0	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	103	76.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	98.2	75.0	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	88.9	64.0	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	102	73.0	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	104	73.0	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	101	75.0	131
EG020T: Total Metals by ICP-MS (QCLot: 4413143)							
EM2211413-010	RB_16.6.22	EG020A-T: Arsenic	7440-38-2	1 mg/L	117	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	118	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	107	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	108	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	119	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	121	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	116	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	114	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	112	74.0	120

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 4495300)							
EM2211413-009	FB_16.6.22	EG020A-T: Arsenic	7440-38-2	1 mg/L	101	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	93.9	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	91.7	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	95.6	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	99.3	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	99.5	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	97.9	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	96.8	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	101	74.0	120
EG035F: Dissolved Mercury by FIMS (QCLot: 4417540)							
EM2211413-002	BH12A	EG035F: Mercury	7439-97-6	0.01 mg/L	96.3	70.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4420329)							
EM2211455-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	96.2	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4408290)							
EM2211413-001	BH1	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	75.2	70.0	130
EK255A: Ammonia (QCLot: 4411580)							
EM2211413-001	BH1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	96.6	70.0	130
EK257A: Nitrite (QCLot: 4411578)							
EM2211413-001	BH1	EK257A-CM: Nitrite as N	14797-65-0	0.1 mg/L	103	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 4411577)							
EM2211413-001	BH1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	107	70.0	130
EK262A: Total Nitrogen (QCLot: 4414273)							
ES2221741-004	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	127	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 4414272)							
ES2221741-004	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	110	70.0	130
EK271A: Reactive Phosphorus (QCLot: 4411579)							
EM2211413-001	BH1	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	97.5	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 4419735)							
EM2211413-002	BH12A	EP002: Dissolved Organic Carbon	----	100 mg/L	99.0	75.0	117
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 4416848)							
EM2211413-003	BH12B PFAS lab QA sample	EP026SP: Chemical Oxygen Demand	----	2500 mg/L	101	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4410091)							
EM2211413-003	BH12B PFAS lab QA sample	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.222 µg/L	114	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.235 µg/L	104	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.228 µg/L	105	68.0	131

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4410091) - continued							
EM2211413-003	BH12B PFAS lab QA sample	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.238 µg/L	119	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.232 µg/L	104	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.241 µg/L	99.3	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4410091)							
EM2211413-003	BH12B PFAS lab QA sample	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	114	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	103	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	112	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	103	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	111	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	111	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	105	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	109	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	100	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	120	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4410091)							
EM2211413-003	BH12B PFAS lab QA sample	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	109	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	115	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	120	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	106	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	113	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	109	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4410091)							
EM2211413-003	BH12B PFAS lab QA sample	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.234 µg/L	108	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.238 µg/L	112	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.24 µg/L	131	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.242 µg/L	100	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2211413**	Page	: 1 of 12
Amendment	: **1**		
Client	: **ELGIN ASSOCIATES PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DANIEL LAVER	Telephone	: +6138549 9645
Project	: JN21332 - Copping Landfill 6 monthly June Round	Date Samples Received	: 17-Jun-2022
Site	: Copping Landfill, 6 monthly round June 2022 - Day 3	Issue Date	: 03-Aug-2022
Sampler	: DANIEL LAVER, MIGUEL URREA	No. of samples received	: 10
Order number	: JN21332	No. of samples analysed	: 10

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EA015: Total Dissolved Solids dried at 180 ± 5 °C	EM2211529--008	Anonymous	**Total Dissolved Solids @180°C**	----	25.8 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Due for extraction	Days overdue	Analysis: Date analysed	Due for analysis	Days overdue
EK257A: Nitrite							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu							
BH1,	BH12A,	----	----	----	21-Jun-2022	20-Jun-2022	**1**
BH12B - PFAS lab QA sample,	BH15A,						
BH15B,	BH18A,						
BH21 - PFAS lab QC,	QA4 - duplicate sample - full suite						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Reactive Phosphorus as P - Ultra-Trace for Catchment M	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
BH1,	BH12A,	**16-Jun-2022**	**----**	----	----	**22-Jun-2022**	23-Jun-2022	✓
BH12B - PFAS lab QA sample,	BH15A,							
BH15B,	BH18A,							
BH21 - PFAS lab QC,	QA4 - duplicate sample - full suite							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**23-Jun-2022**	14-Jul-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**23-Jun-2022**	14-Jul-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**24-Jun-2022**	14-Jul-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**23-Jun-2022**	13-Dec-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
FB_16.6.22	**16-Jun-2022**	**02-Aug-2022**	13-Dec-2022	✓	**02-Aug-2022**	13-Dec-2022	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
RB_16.6.22	**16-Jun-2022**	**22-Jun-2022**	13-Dec-2022	✓	**22-Jun-2022**	13-Dec-2022	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**23-Jun-2022**	14-Jul-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
RB_16.6.22	**16-Jun-2022**	**----**	----	----	**25-Jun-2022**	14-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**----**	----	----	**20-Jun-2022**	30-Jun-2022	✓
EK255A: Ammonia							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK255A-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**21-Jun-2022**	14-Jul-2022	✓
EK257A: Nitrite							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK257A-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**21-Jun-2022**	20-Jun-2022	×
EK259A: Nitrite and Nitrate (NOx)							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK259A-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**21-Jun-2022**	14-Jul-2022	✓
EK262A: Total Nitrogen							
Clear Plastic Bottle - Frozen (AS) (EK262PA-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**22-Jun-2022**	14-Jul-2022	✓	**22-Jun-2022**	14-Jul-2022	✓
EK267A: Total Phosphorus (Persulfate Digestion)							
Clear Plastic Bottle - Frozen (AS) (EK267PA-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**22-Jun-2022**	14-Jul-2022	✓	**22-Jun-2022**	14-Jul-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK271A: Reactive Phosphorus							
Clear Plastic - Filtered & Frozen (AS/ISO) - UT Nu (EK271A-CM)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**21-Jun-2022**	14-Jul-2022	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**24-Jun-2022**	14-Jul-2022	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite	**16-Jun-2022**	**----**	----	----	**23-Jun-2022**	14-Jul-2022	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**21-Jun-2022**	13-Dec-2022	✓	**21-Jun-2022**	13-Dec-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**21-Jun-2022**	13-Dec-2022	✓	**21-Jun-2022**	13-Dec-2022	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**21-Jun-2022**	13-Dec-2022	✓	**21-Jun-2022**	13-Dec-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**21-Jun-2022**	13-Dec-2022	✓	**21-Jun-2022**	13-Dec-2022	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
BH1, BH12A, BH12B - PFAS lab QA sample, BH15A, BH15B, BH18A, BH21 - PFAS lab QC, QA4 - duplicate sample - full suite, RB_16.6.22	**16-Jun-2022**	**21-Jun-2022**	13-Dec-2022	✓	**21-Jun-2022**	13-Dec-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	8	**12.50**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	8	**12.50**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	8	**12.50**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	0	8	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	21	**9.52**	**9.52**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	8	**12.50**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	40	**7.50**	**7.50**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	8	**12.50**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	8	**12.50**	**4.55**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	8	**12.50**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Mercury by FIMS	EG035T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	21	**4.76**	**4.76**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Analytical Methods	Method	Matrix	Method Descriptions
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	In house: Referenced to APHA 4500-NH3 H. Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM Schedule B(3)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	In house: Referenced to APHA 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	In house: Referenced to APHA 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	In house: Referenced to APHA 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	In house: Referenced to APHA 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloured and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Persulfate Digestion for UT TN and TP for FIA finish.	EK262/267-PA Prep	WATER	In house: Referenced to APHA 4500 P - J. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.