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Annual Report on Water and Gas Monitoring 2021-2022

Kempsey Landfill Water and Gas Monitoring
638 Crescent Head Road, Kempsey

Prepared for
Kempsey Shire Council

Project 89781.00
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Douglas Partners
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Reviewer	pp	7 September 2022

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1. Introduction

1.1 Overview

This annual report presents the results of groundwater, surface water and gas monitoring for the period October 2021 to July 2022 at the Kempsey Landfill Site located at 638 Crescent Head Road, South Kempsey New South Wales (NSW). Monitoring was commissioned by Kempsey Shire Council (KSC).

The Kempsey landfill site is located at 638 Crescent Head Road, South Kempsey (Part Lot 7008 DP96356).

The site is licensed by the Environment Protection Authority under Environmental Protection Licence (EPL) 6269. The EPL notice specifies requirements for surface water, groundwater, leachate and gas monitoring including test locations, analytes and threshold concentrations. Monitoring was conducted with reference to EPL 6269 requirements.

The site is located within undeveloped land adjacent to the Maria National Park approximately 10 km southwest of Kempsey.

1.2 Background & Objectives

The KSC Environmental Protection Licence (EPL 6269) authorises the scheduled activity of Waste Disposal (application to land) at the Kempsey Landfill site on Crescent Head Road South Kempsey. KSC is required to undertake compliance monitoring as part of the licence conditions that allow the site to operate.

Conditions M2.2 and M2.3 of the EPL outline air emissions monitoring and water/ leachate monitoring requirements. Conditions M2.4, M2.5 and M2.6 of the EPL outline the groundwater, surface water and leachate reporting requirements.

The objective of this report is to meet the ELP requirements related to groundwater, surface water and gas monitoring for the 2021-2022 reporting period, specifically conditions M2.2, M2.3, M2.4, M2.5 and M2.6.

1.3 Scope of Work

This report presents the results of the groundwater, surface water / leachate and gas monitoring program undertaken from October 2021 to July 2022. The following work tasks were undertaken:

- Q1 - First quarterly monitoring event, October 2021;

  - Manual water level gauging, purging and sampling of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q2 - Second quarterly monitoring event, February 2022;
  - Manual water level gauging of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q3 – Third quarterly monitoring event, April 2022;
  - Manual water level gauging, purging and sampling of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Q4 - Fourth quarterly monitoring event, July 2022;
  - Manual water level gauging of five groundwater monitoring wells;
  - Sampling of three surface water locations, one leachate location and one effluent location;
  - Methane gas monitoring within the five groundwater bores, landfill surface and enclosed spaces within the site.
- Assessment of the results of monitoring against the EPL 6269;
- Preparation of this report.

Following the identification of some localised elevated surface methane monitoring results in the previous July 2021 monitoring event (ie Q4 of the 2020-2021 annual monitoring), an additional surface methane monitoring event was conducted on 25 August 2021 and is reported herein.

Due to significant rainfall in July 2022, KSC requested additional sampling and analysis on surface waters from locations S4 and L8 which was conducted on 13 July 2022, approximately 7 days after Q4 sampling.

The locations of the groundwater / gas monitoring wells, surface water and gas monitoring area are shown on Drawing 1 in Appendix A.

2. Site Identification

Site Address	638 Crescent Head Road, Kempsey NSW 2440
Legal Description	Part Lot 7008 DP96356
Area	Approx. 12 Ha
Zoning	1(a1) Rural “A1” Zone
Elevation	Approx. 16 to 50 mAHD
Local Council Area	Kempsey Shire Council
Current Use	Landfill and waste management facility
Surrounding Uses	Crown Reserve

3. Environmental Setting (ERM 2020)

3.1 Topography

The original topography of the site has been disrupted by the former quarry operation and by the landfill operation. Despite this, the original landform is evident to some degree. The site is located on the slope of a ridge with southwest aspect. The highest natural elevation at the site is on the ridge in the northern portion of the site at approximately 49 m Australian Height Datum.

3.2 Hydrology

The landform of the site slopes to the southwest providing natural drainage to the lower end of the site, in the vicinity of the sediment retention dam (S7). A small, unnamed ephemeral watercourse is located adjacent to the western portion of the site, upon which the surface water monitoring location S4, S5 and S6 are located (see Drawing 1 in Appendix A). The unnamed ephemeral watercourse adjacent to the west of the site drainage only has flow during and immediately following high rainfall events. Another first order ephemeral watercourse meets with the unnamed ephemeral watercourse adjacent to the western portion of the site and this watercourse is sourced from within the rural residential area west of the site. The site catchment drains to Reedy Creek approximately two kilometres to the southwest of the site. Reedy Creek flows directly into the Maria River approximately five kilometres south of the landfill.

Surface water flow from capped areas of the site is directed into a perimeter spoon drain into the sediment retention dam (S7) sediment retention dam prior to being reused at the site (irrigation or dust suppression), evaporated or flowing on from the site to the unnamed ephemeral watercourse during overflow events or via active discharge.

Leachate from the landfill cells is managed within the leachate dam (L8) for on-site irrigation and evaporation.

3.3 Hydrogeology

Previous drilling activities conducted by RCA (2000) encountered the groundwater between 12 and 17 metres below the existing ground surface. RCA (2000) indicated that the groundwater beneath the site is confined by clay and weathered mudstone layers above the groundwater and bedrock below, particularly beneath the southern portion of the site. The groundwater is present in the less weathered mudstone, siltstone and sandstone layers.

Regional groundwater flow direction in the vicinity of the site is generally to the south / south-west, which is the same as the catchment area draining and existing landforms. This is consistent with field observations of the five groundwater monitoring wells (BH1, BH1/02, BH2, BH3 and BH4) at the site conducted over previous reporting periods.

3.4 Geology

Reference to the NSW Seamless Geology dataset, made available by the NSW Government Department of Regional New South Wales the site is underlain by Kempsey Beds which typically comprises sandstone, mudstone, siltstone, and conglomerate.

Reference to the Kempsey 1:100,000 scale Soil Landscape Sheet indicates the site is mapped as comprising residual soils of the Kundabung landscape.

The Kundabung landscape is characterised by “undulating rises with broad crests, extensive foot slopes and drainage plains on Permian mudstones of the Kempsey and Beechwood beds”. The soils within this landscape are characterised as “water erosion hazard, foundation hazards, shallow soils, erodible, sodic, acidic soils with low wet bearing strength and low permeability”.

Reference to the NSW Acid Sulfate Soil Risk Map indicates the site is not mapped within an acid sulfate soils area.

4. Site History and Use

The Site was originally a clay quarry, in 1985 it was granted Development Consent to become a landfill and occupy approximately four hectares. Further Development Consents were granted in August of 2002 for an additional 0.5 hectares and December of 2003 for up to a total of 12 hectares.

The existing Kempsey landfill site is located within Lot 7008 DP96356, 638 Crescent Head Road, South Kempsey. The landfill area is generally positioned centrally within the lot and is surrounded by undeveloped rural land and mature trees as can be seen in Figure 1 below.

The Site consists of an operational landfill area, a completed landfill area and an area designated for future use. The current on-site buildings consist of a machinery shed, a pump shed, a heavy vehicle weighbridge and office, truck wheel wash, a waste transfer station and an area for recyclables materials and off-site processing materials.

5. Site Specific Trigger Levels

The site specific trigger levels applied for the ground and surface water monitoring are provided in the EPL 6269 and are shown in Table 1 below.

Table 1: EPL 6269 Site Specific Trigger Levels

Pollutant	Units of measure	Groundwater Trigger Level	Surface Water Trigger Level
Ammonia	mg/L	0.9	0.9
Conductivity	µS/cm	1065	1065
Magnesium	mg/L	10.05	10.05
Nitrate	mg/L	0.7	0.7
pH	pH	6.5-8.0	6.5-8.0
Calcium	mg/L	NA	2.05
Chloride	mg/L	NA	54.49
Iron	mg/L	NA	1.84
Manganese	mg/L	NA	1.9
Sodium	mg/L	NA	34
Sulfate	mg/L	NA	3.1
TOC	mg/L	NA	33.1
Total Phenolics	mg/L	NA	0.32
Alkalinity (as CaCo3)	mg/L	NA	12.283
Potassium	mg/L	NA	2.282
TSS	mg/L	NA	33.415
DO	mg/L	NA	12.057

The criteria for the surface and ground gas monitoring are in reference to the Environmental Guidelines for Solid waste landfills (NSW EPA, 2016) as follows:

- Subsurface methane criteria – 1 % (v/v); and
- Surface methane – 500 ppm.

6. Field Work Methods

6.1 Overview and Schedule

Groundwater, surface water and gas monitoring was conducted with reference to the EPL as presented in Table 2 below.

Table 2: Quarterly Monitoring Tasks

Quarterly Round	Sampling Date	Description	Comment
Additional Gas Monitoring Event	25 August 2021	Methane gas monitoring (surface)	Additional round of surface gas monitoring due to localised elevated results in July 2021. No rainfall on the day of monitoring. Approximately 2 mm of rainfall in the preceding week.
Q1 1st Quarter monitoring event	26 October 2021	Surface water sampling and laboratory analysis	No rainfall on the day of monitoring. Approximately 12 mm of rainfall in the preceding week.
	25/26 October 2021	Groundwater gauging	
	25/26 October 2021	Groundwater sampling and laboratory analysis	
	25/26 October 2021	Methane gas monitoring (building, bores and surface)	Note that gas monitoring for buildings and surface was not conducted due to malfunction of monitoring equipment.
Q2 2nd Quarter monitoring event	1 February 2022	Surface water sampling and laboratory analysis	No rainfall on the day of monitoring. Approximately 8 mm of rainfall in the preceding week.
	2 February 2022	Groundwater gauging	Approximately 3.6 mm of rainfall on the day of monitoring. Approximately 8 mm of rainfall in the preceding week.
	1 February 2022	Methane gas monitoring (building, bores and surface)	No rainfall on the day of monitoring. Approximately 8 mm of rainfall in the preceding week. Note that gas monitoring for bores was not conducted due to malfunction of monitoring equipment.
Q3 3rd Quarter monitoring event	12 April 2022	Surface water sampling and laboratory analysis	Approximately 0.2 mm of rainfall on the day of monitoring. Approximately 40 mm of rainfall in the preceding week.
	12 April 2022	Groundwater gauging	
	12 April 2022	Groundwater sampling and laboratory analysis	
	4 May 2022	Methane gas monitoring (building, bores and surface)	No rainfall on the day of monitoring. Approximately 13 mm of rainfall in the preceding week.
Q4 4th Quarter monitoring event	6 &7 July 2022	Surface water sampling and laboratory analysis	Approximately 132.8 mm of rainfall on the day of monitoring. Approximately 120 mm of rainfall in the preceding week.
	7 July 2022	Groundwater gauging	Not conducted due to malfunction of monitoring equipment.
	25 July 2022	Methane gas monitoring (building, bores and surface)	No rainfall on the day of monitoring. Approximately 8 mm of rainfall in the preceding week. Note that gas monitoring for bores was not conducted due to malfunction of monitoring equipment.
Additional Sampling	13 July 2022	Surface water sampling and laboratory analysis (S4 & L8)	No rainfall on the day of monitoring. Approximately 218 mm of rainfall in the preceding week.

6.2 Groundwater

6.2.1 Groundwater Monitoring Locations

A summary of groundwater bore/well monitoring locations is presented below:

- BH1 (EPL Point 1):
  - Located up-hydraulic gradient of the site and is intended to be representative of background groundwater conditions.
- BH2 (EPL Point 2):
  - Located down gradient and to the south of the landfill, near the sediment retention dam.
- BH3 (EPL Point 3):
  - Located on the western side of the site within the landfill fence-line, near an existing storm water spoon drain.
- BH4 (EPL Point 12):
  - The western-most monitoring well outside the landfill fence-line, located between the sediment retention pond and leachate dam.
- BH1-02 (EPL Point 14):
  - Located to the south of the landfill boundary.

Refer to Drawing 1 in Appendix A for approximate well locations.

6.2.2 Groundwater Well Gauging, Purging and Sampling

Prior to purging and sampling of wells (BH1, BH1/02, BH2, BH3 and BH4), an oil-water interface meter was used to measure the depth to groundwater and assess the possible presence of a floating product within each well. Refer to Drawing 1 in Appendix A for approximate well locations.

Prior to sampling, the wells were purged using a MP10 MicroPurge low-flow water sampler or Clearview disposal single-check valve bailers until steady pH, EC, turbidity and temperature readings were achieved. Field parameters were measured using a calibrated portable meter.

The groundwater level was allowed to recover from the effects of purging prior to sampling. Groundwater samples were collected under strict QA / QC protocols and placed directly into laboratory prepared containers for analysis. The samples were delivered to the laboratory within the recommended holding times for analysis.

The headspace at the top of each well was also screened for the presence of volatile organic compounds (VOCs) using a calibrated Photo-ionisation detector (PID).

The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard Chain-of-Custody (COC) form. Copies of completed forms are contained in Appendix F.

Gauging, groundwater purging and sampling were undertaken by a geo-environmental engineer from DP.

6.2.3 Groundwater Analysis

Laboratory testing for groundwater samples was undertaken by Envirolab Services Pty Ltd (Envirolab), a National Association of Testing Authorities, Australia (NATA) registered laboratory. The analytical methods used are shown on the laboratory sheets in Appendix E.

Groundwater analysis was undertaken bi-annually (Q1 and Q3) at locations BH1, BH2, BH3, BH4, BH01-2 for the following parameters as per the EPL:

- Ammonia, Electrical Conductivity, Magnesium, Nitrate, pH, Standing water level, Temperature;
- Monitoring for dissolved oxygen (DO) was also conducted, together with screening of groundwater headspace for volatile organic compounds using a Photo-ionisation detector (PID).

6.3 Surface Water

6.3.1 Surface Water Monitoring Locations

A summary of surface water sampling locations is presented below:

- S4 (EPL Point 4):
  - Located upstream from the site and is considered to be representative of background surface water conditions.
- S5 (EPL Point 5):
  - Located directly downstream from the site and sediment retention dam overflow. S5 is also located downstream from input from the first order stream that meets with the unnamed ephemeral watercourse located adjacent to the western portion of the site.
- S6 (EPL Point 6):
  - Located further downstream of the site than S5.
- S7 (EPL Point 7):
  - Located at the outlet of the site sediment retention pond.
- L8 (EPL Point 8):
  - Located within the leachate dam and utilised to monitor the composition of leachate and allow comparisons with the other surface water locations on and offsite, to assess potential impacts associated with the operation of the landfill.

Refer to Drawing 1 in Appendix A for approximate sampling locations.

6.3.2 Surface Water Sampling

Surface water samples (S4, S5, S6, S7 and S8) were collected using a long-handled ‘swing sampler’, directly into new laboratory prepared sampling bottles for each sampling event. Sampling was undertaken to minimise the disturbance of surface water sediments. Refer to Drawing 1 in Appendix A for approximate surface water sample locations.

In-situ measurements of pH, electrical conductivity (EC), oxidation-reduction potential (ORP), dissolved oxygen (DO), turbidity and temperature were taken using a calibrated multi-parameter meter following collection of each surface water sample. The headspace of surface water collected was also screened for the presence of VOCs using a calibrated PID.

Samples were collected under strict QA/QC protocols and delivered to the laboratory within the recommended holding times for analysis. The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard Chain-of-Custody (COC) form. Copies of completed forms are contained in Appendix C.

6.3.3 Surface Water Analysis

Laboratory testing for groundwater and surface water samples was undertaken by Envirolab Services Pty Ltd (Envirolab), a National Association of Testing Authorities, Australia (NATA) registered laboratory. The analytical methods used are shown on the laboratory sheets in Appendix E.

Surface water analysis was undertaken quarterly (Q1, Q2, Q3 and Q4) at locations S4, S5, S6, S7, L8 for the following parameters as per the EPL:

- Alkalinity, Ammonia, Calcium, Chloride, Electrical Conductivity, Dissolved Oxygen, Fluoride, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Sodium, Sulfate, Temperature, Total organic carbon, Total Phenolics, Total suspended solids.

6.4 Gas Monitoring

6.4.1 Monitoring Wells

Landfill gas monitoring was carried out in wells BH1, BH1/02, BH2, BH3 and BH4, with reference to DP standard operating procedures and NSW EPA (2020). The monitoring method is described as follows:

- Record the barometric pressure;
- Connect the tube on the calibrated landfill gas analyser (GA5000) to the quick connect gas fitting on the well cap; and
- Set the analyser pump on and record concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide, generally at 30 second intervals, until concentrations have generally stabilised.

The general weather conditions and atmospheric pressure were recorded during the monitoring event.

6.4.2 Landfill Surface and Enclosed Spaces (Buildings)

Surface gas monitoring comprised traversing the southern portion of the landfill surface on foot, taking measurements of methane concentrations close to the ground surface and client nominated buildings.

Methane measurements were made within buildings (i.e. Office, Shed 1, Shed 2 and Shed 3) as instructed by the client (i.e. generally each corner, centre, sinks, drains etc as described in Table D5 in Appendix D). Refer to Drawing 1 in Appendix A for approximate building locations.

Surface landfill gas monitoring was carried out in accordance with DP standard operating procedures and (NSW EPA, 2020). The monitoring method is described as follows:

- Methane was measured in the atmosphere approximately 5 cm above the landfill surface;

- Transects were generally conducted at 25 m spacings where accessible and methane was measured at approximately 25 m intervals along each transect;
- Further monitoring was undertaken at client nominated enclosed structures / buildings, as shown in Drawing 1;
- The monitoring was performed on a calm day (where possible) during a period of relatively low and stable atmospheric pressure and where wind speed was estimated less than 10 km/h;
- Measurements were taken using a TDL-500 Laser Methane Detector capable of detecting concentrations of methane between 0 and 10,000 ppm;
- The methane detector was calibrated prior to use (undertaken by equipment supplier).

6.5 Quality Assurance / Quality Control

6.5.1 Field QA / QC

Quality assurance and quality control (QA/QC) procedures were adopted throughout the field sampling programme and comprised the following:

- Following standard operating procedures;
- Storage of samples under secure, temperature-controlled conditions;
- Use of chain of custody documentation for the handling, transport and delivery of samples to the selected laboratory.

The overall assessment of QA/QC presented in Appendix C.

6.5.2 Laboratory QA/QC

The NATA accredited chemical laboratory undertook in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks;
- Statistical analysis of QC data.

An assessment of the laboratory QA/QC data quality is presented in Appendix C.

7. Field Work Results

7.1 Groundwater Level Monitoring

The results of water level gauging for each monitoring round are shown in Table D1 Appendix D. Historic groundwater levels are also presented in Figure D1 in Appendix D. Groundwater levels for the last two years of monitoring are also plotted against rainfall (Kempsey Airport) in Figure D1A in Appendix D. It is noted that there was significant rainfall in the 2020-2021 and 2021/2022 monitoring periods (ie 2023.4 mm and 1575.8 mm respectfully for a 12 month period), compared to the 2019-2020 monitoring period (ie 301.4 mm).

Prior to 2019 there was a general trend of slowly dropping water levels with the exception of BH1 as shown in Figure D1. Gauging in BH1 indicated sporadic levels with significant response to rainfall suggesting that the well is compromised and is not providing accurate water levels within the formation (refer to Figure D1 and D1A).

Groundwater levels have generally increased over the 2021-2022 reporting period by up to about 0.5m. Groundwater levels in BH1 continue to be sporadic and are not believed to provide accurate groundwater levels at this location.

Groundwater flow is inferred to be flowing to the southwest which is consistent with the southwest orientated land formation.

7.2 Groundwater Quality Monitoring - Field

The groundwater field parameters measured during purging and sampling for Q1 and Q3 monitoring events are shown in Table D2 Appendix D.

The field parameters indicated the following:

- pH ranging from 4.3 – 7.1 pH indicating generally neutral to acidic conditions;
- Electrical Conductivity ranging from 1.44 to 1.93 mS/cm indicating generally fresh to brackish conditions;
- Both oxidative and reductive water conditions; and
- Generally minimal to slight turbidity, clear, grey and brown groundwater. Turbid conditions were observed in BH2 and BH4 in Q2.

The results of PID screening on headspace at the top of each well also suggested the absence of gross volatile organic compounds (ie <1 ppm) as indicated in Tables F1 and F4 in Appendix F.

Observations made during purging and sampling generally indicated the absence of visual or olfactory evidence of gross contamination to groundwater at the locations sampled (i.e. general absence of staining, odours, free product etc). A minor hydrogen sulfide odour was noted in BH1 during the Q2 monitoring period.

Graphed representation of historical field observations (EC and pH) is presented Appendix G.

7.3 Surface Water Quality Monitoring - Field

The surface water field parameters measured during sampling for each monitoring round are shown in Table D2 Appendix D. Additional sampling and testing of location S4 (upgradient surface water) and L8 (leachate dam) was conducted approximately 7 days after Q4 monitoring at the request of KSC due to the significant preceding rainfall.

The field parameters indicated the following for surface waters (excluding L8 leachate dam):

- pH ranging from 7.1 – 10.8 pH indicating generally acidic to alkaline conditions;
- Electrical Conductivity ranging from 0.08 to 2.58 mS/cm indicating generally fresh to brackish conditions;
- Generally oxidative water conditions with high dissolved oxygen; and
- A range of slight to moderate turbidity, clear, green, brown, grey and black surface water.

The field parameters for L8 (Leachate Dam) indicated the following:

- pH ranging from 7.7 – 9.2 pH indicating generally acidic to alkaline conditions;
- Electrical Conductivity ranging from 0.72 to 3.06 mS/cm indicating generally fresh to brackish conditions;
- Generally oxidative water conditions with high dissolved oxygen; and
- A slight turbidity, green, brown, grey, brown water.

Observations made during surface water sampling generally indicated the absence of visual or olfactory evidence of gross contamination to the surface water bodies at the locations sampled (i.e. general absence of staining, odours, free product etc).

Slight hydrogen sulfide odour was noted in surface waters as follows:

- S5 and L8 (Leachate Dam) – Q1;
- S5 and S6 – Q2;
- S7 and L8 (Leachate Dam) – Q3.

Graphed representation of historical field observations (EC and pH) is presented Appendix G.

7.4 Gas Monitoring

7.4.1 Monitoring Wells

The results of gas monitoring within the monitoring wells are shown in Table D3, Appendix D. It is noted that gas monitoring within wells for events Q2 and Q4 was not conducted due to equipment malfunction. The results of monitoring in Q1 (25 & 26 Oct 2021) and Q3 (4 May 2022) indicated the general absence of methane concentrations within groundwater wells (ie <1ppm), which is consistent with gas monitoring in the previous year.

7.4.2 Landfill Surface

The results of methane monitoring across the landfill surface are shown in Table D4, Appendix D.

A total of six exceedances of the monitoring criteria (500 ppm) were found in Q4 in the previous annual monitoring period (2020-2021) 6 July 2021. The approximate locations of the exceedances are shown in Figure 1 below (E1 to E6). An additional round of surface gas monitoring was conducted on 25 August 2021 to further assess the possible presence, extent and implications (if any) of the elevated methane results. An equipment malfunction in October 2021 (Q1) precluded surface gas monitoring so the results of surface gas monitoring on 25 August 2021 were reported as Q1 in Table D4, Appendix D.

It is noted that a large soil stockpile (estimated to be up to 15 m high) was present over approximately 50% of the methane walkover area on 25 Aug 2021 (see brown hatched area in Figure 1 below). The stockpile generally precluding surface methane monitoring over this area. Previous locations E1, E4, E5 and E6 were not accessible for monitoring on 25 Aug 2021. Monitoring was conducted over the accessible northern portion of the stockpile where fill was generally less than 2m thick.

The results of methane monitoring for July 2021 and August 2021 are summarised in Table 3 below:

Table 3: Surface Methane Monitoring Exceedances – July and August 2021 Events

Location	Methane (ppm)		Comments
	6 July 2021	25 Aug 2021	
E1	1123	N/A	No access due to stockpile
E2	936	224	Additional monitoring <500 ppm criteria
E3	2948	10,100	Localised area of elevated methane (approx. 1 m x 1m)
E4	848	N/A	No access due to stockpile
E5	3478	N/A	No access due to stockpile
E6	2098	N/A	No access due to stockpile
Red Dots (Figure 1)	N/A	100 to 430	<500 ppm criteria

Methane detections for the remainder of the assessed area (grey transects on Figure 1 below) were below 100 ppm.

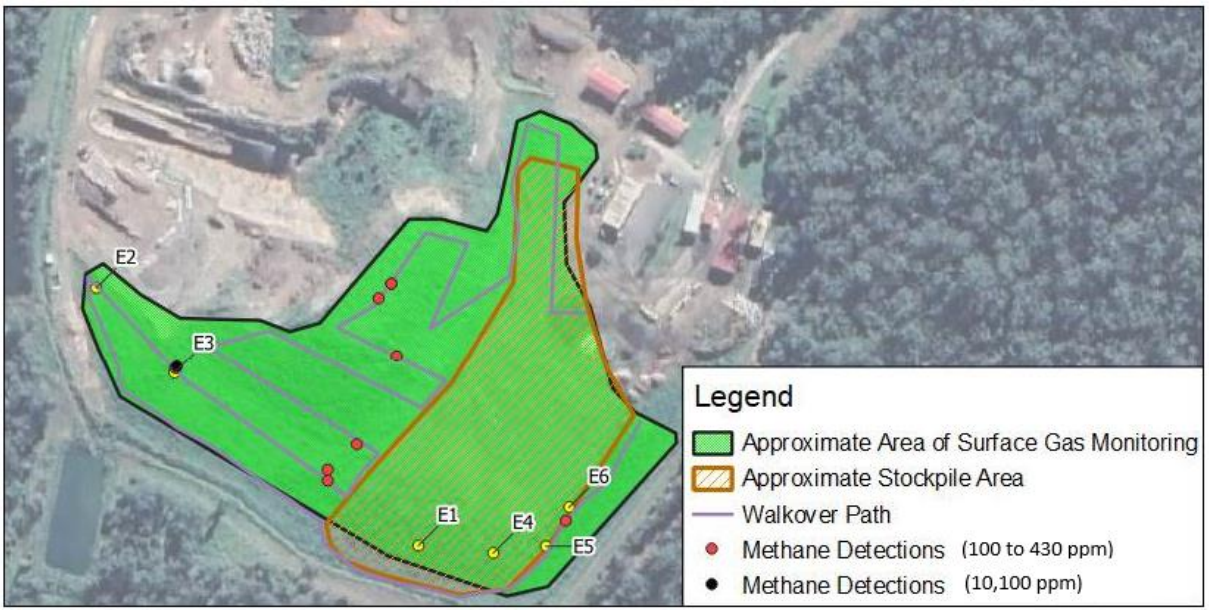

Figure 1: Surface Methane Monitoring - 25 August 2021
(reported as Q1 in Table D4, Appendix D) (E1 to E6 – previous exceedances)

The results of surface methane monitoring indicated the presence of localised elevated methane at location E3 (within a 1 m by 1 m area). Vegetation was not present at the surface at this location which may have been associated with the elevated methane concentration. Elsewhere, surface vegetation generally comprised grasses with some localised bare areas. Additional targeted monitoring of surface methane was conducted within selected bare areas. Monitoring generally suggested that there was no direct correlation between bare vegetation areas and elevated methane concentrations.

There were no exceedances of the criteria (500 ppm) for surface methane monitoring conducted for Q2 (February 2022) as shown in Figure 2 below.

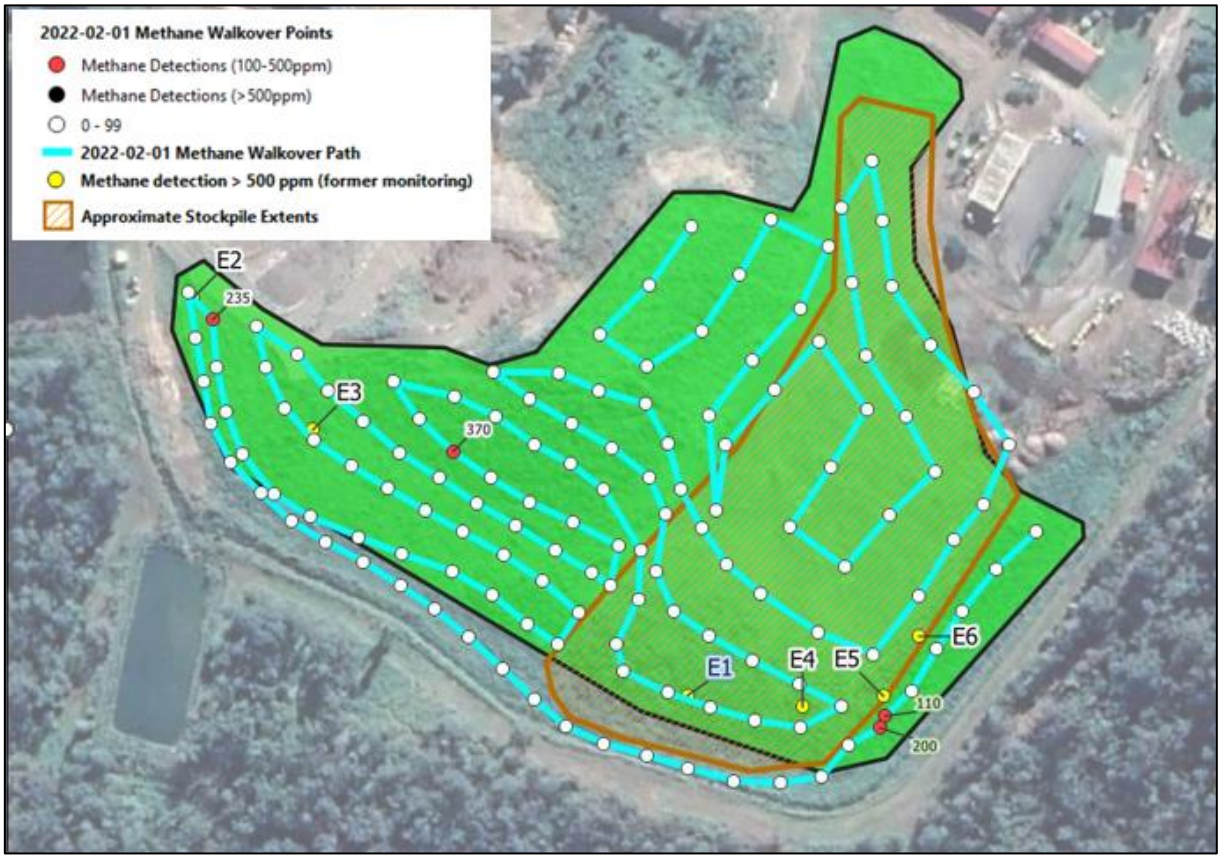

Figure 2: Surface Methane Monitoring - 1 Feb 2022 (Q2)
(E1 to E6 – previous exceedances)

Stockpiled fill was also present over a significant portion of the area in Feb 2022 which precluded methane monitoring over areas previously found to contain elevated methane concentrations (ie locations E1, E4, E5 and E6).

There was one exceedances of the criteria (500 ppm) for surface methane monitoring conducted for Q3 (May 2022) as shown in Figures 3, 4 and 5 below.

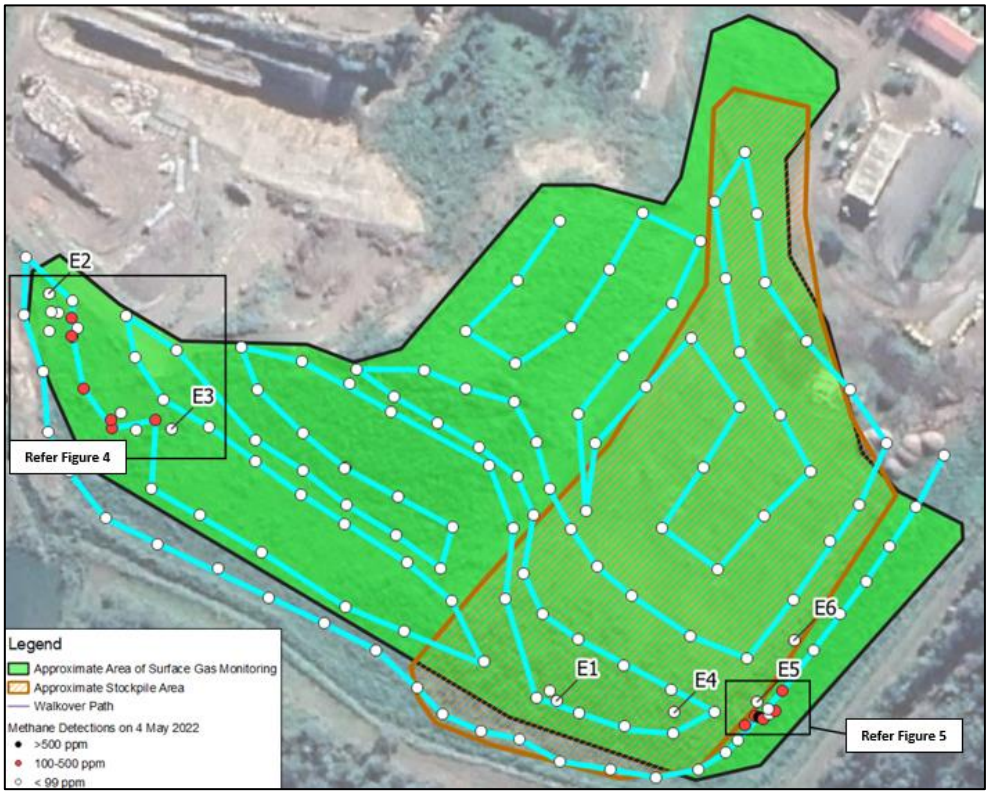

Figure 3: Surface Methane Monitoring – 4 May 2022 (Q3)
(E1 to E6 – previous exceedances)

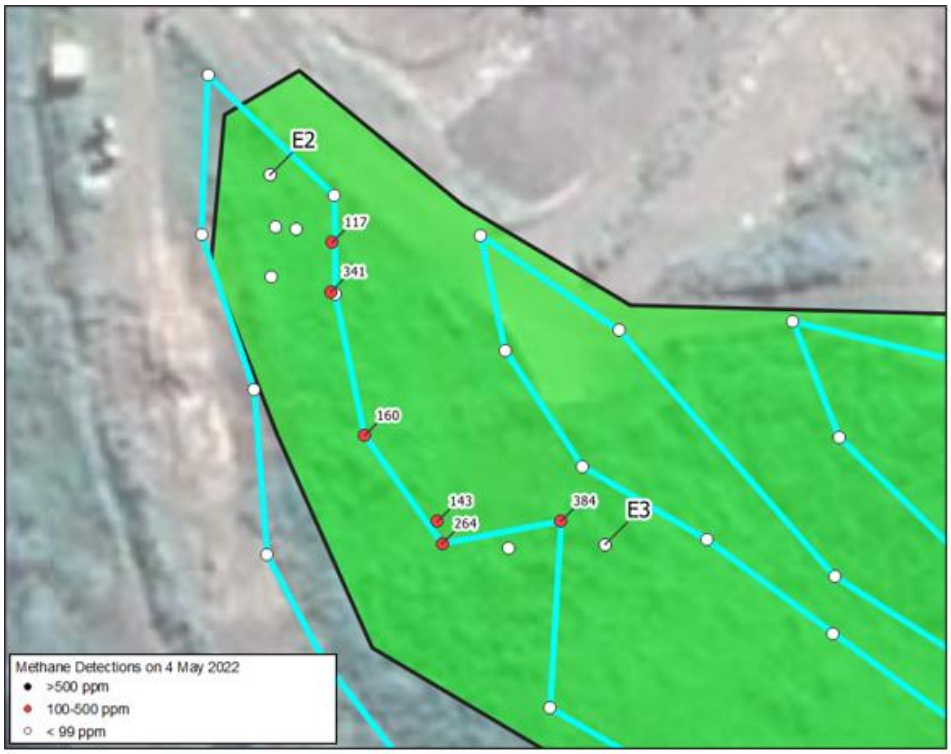

Figure 4: Surface Methane Monitoring – 4 May 2022 (Q3) – North West Portion
(E2 and E3 – previous exceedances)

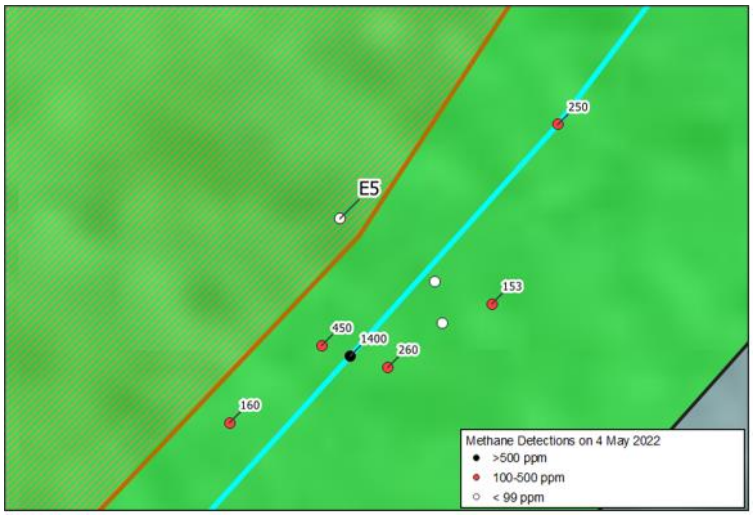

Figure 5: Surface Methane Monitoring – 4 May 2022 (Q3) – South East Portion (E5 – previous exceedance)

There were three exceedances of the criteria (500 ppm) for surface methane monitoring conducted for Q4 (July 2022) as shown in Figure 6 below.

Figure 6: Surface Methane Monitoring – 25 July 2022 (Q4) (E1 to E6 – previous exceedances)

In summary, a total of five exceedances of the surface methane monitoring criteria were observed (One in Q1, one in Q3 and three in Q4).

A number of previous locations containing elevated surface methane concentration were not accessible due to the placement of fill (ie locations E1, E4, E5 and E6). We understand that the stockpile is temporary and contains natural soils that will be progressively used as day cover for future landfill activities. The stockpile may therefore be present over this area for an extended period.

The results of monitoring generally suggests the presence of elevated methane concentrations within the western portion of the monitoring area (in the vicinity of former location E3), and the south eastern portion of the monitoring area (in the vicinity of former location E5).

7.4.3 Buildings (Enclosed Spaces)

The results of methane monitoring within nominated buildings for each event are shown in Table D5, Appendix D. The results indicated the general absence of significant methane concentrations within buildings (ie <5ppm). Minor methane concentrations (<17 ppm) were observed in the office in Q4 (25 July 2022) which may be attributed to site personnel cooking food during this event.

8. Discussion

8.1 Groundwater

8.1.1 Field Observations

The groundwater field parameters measured during purging and sampling for Q2 and Q4 monitoring events are shown in Table D2 Appendix D and were discussed in Section 7.2 above.

Observations made during purging and sampling generally indicated the absence of visual or olfactory evidence of gross contamination to groundwater at the locations sampled (i.e. general absence of staining, odours, free product etc). A minor hydrogen sulfide odour was noted in BH1 during the Q2 monitoring period.

During the Q4 visit of April 2022, BH1 was blocked by obstruction and sampling was not able to be completed.

8.1.2 Groundwater Analytical Results

The results of analytical testing of groundwater are included in the laboratory report sheets in Appendix E. The results of testing are summarised in Tables F2 and F5 against the adopted site criteria in Appendix F. Graphical representation of historical analytical results for selected parameters are presented in Appendix G. Laboratory analytical reports are in Appendix E.

A summary of the analytical results, together with comments on EPL criteria exceedances and historical trends are provided in Annual Reporting Tables H1, H2, H3, H12 and H13 in Appendix H.

Exceedances of EPL trigger levels for each bore and quarterly monitoring round are summarised below:

Table 4: Exceedances of the EPL 6269 Tigger Levels - Groundwater

Groundwater Well I.D	Analytes Exceeding the EPL Groundwater Trigger Levels	
	Q1 - October 2021	Q3 - April 2022
BH01-2	EC, pH, Mg	EC, Mg
BH1	pH	-
BH2	EC, pH, Mg	EC, Mg
BH3	EC, pH, Mg	EC, Mg, Nitrate
BH4	EC, Mg	EC, Mg

Groundwater monitoring concentrations were generally within the range of historical data. An elevated nitrate concentration was found in BH3 during the Q4 monitoring round. It is noted that sporadic elevated nitrate concentrations have been observed historically for a number of bores, however, the elevated results were not in subsequent monitoring events (refer to Figure G2 in Appendix G). The elevated sporadic nitrate concentrations may therefore be spurious.

8.2 Surface Water

8.2.1 Field Observations

The surface water field parameters measured during sampling for Q1, Q2, Q3 and Q4 monitoring events are shown in Table D2 Appendix D and were discussed in Section 7.3 above.

Observations made during surface water sampling generally indicated the absence of visual or olfactory evidence of gross contamination to the surface water bodies at the locations sampled (i.e. general absence of staining, odours, free product etc). Slight hydrogen sulfide odour was noted in surface waters at S5 and S6, and within the Leachate dam at L8.

8.2.2 Surface Water Analytical Results

The results of analytical testing of surface water are included in the laboratory report sheets in Appendix E. The results of testing are summarised in Tables F1, F3, F4 and F6 against the adopted site criteria in Appendix F. Graphical representation of historical analytical results for selected parameters are presented in Appendix G. Laboratory analytical reports are in Appendix E.

A summary of the analytical results, together with comments on EPL criteria exceedances and historical trends are provided in Annual Reporting Tables H4, H5, H6, H7 and H8 in Appendix H.

Exceedances of EPL trigger levels for each location and quarterly monitoring round are summarised below:

Table 5: Exceedances of the EPL 6269 Tigger Levels – Surface Water

Sampling Location	Analytes Exceeding the Surface Water Trigger Levels			
	Q1 - October 2021	**Q2 - February 2022**	**Q3 - April 2022**	**Q4 – July 2022**
L8 (Leachate Dam)	EC, pH, Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulfate, Ammonia, TOC, TSS	DO, EC, Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulfate, Ammonia, TOC	Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulfate, Ammonia, Nitrate, TOC, TSS	DO, EC, Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulfate, Ammonia, Nitrate, TOC, TSS
S4	pH, Fe, Alkalinity (total), K, TOC, TSS	DO	DO, pH, Fe	DO
S5	Fe, Alkalinity (total), Ca, Cl, Mg, K, Na, Sulfate, TSS	No exceedances	Fe, Alkalinity (total), Ca, Cl, K, Na, Sulfate, Ammonia, TSS	DO, Fe, Alkalinity (total), Ca, K, Sulfate, Ammonia, TSS
S6	Fe, Alkalinity (total), Ca, Cl, K, Na, Sulfate, TSS	Alkalinity (total)	Fe, Alkalinity (total), Ca, Cl, K, Na, Sulfate, Ammonia	pH, Fe, K, TSS
S7	pH, Alkalinity (total), Ca, Cl, K, Na, Sulfate, TSS	DO, Alkalinity (total), Ca, Cl, K, Na, Sulfate, TSS	DO, EC, pH, Alkalinity (total), Ca, Cl, K, Na, Sulfate, Ammonia, TOC, TSS	DO, Fe, pH, Alkalinity (total), Ca, Cl, K, Sulfate, Ammonia, TOC, TSS

Various exceedances of the EPL trigger levels have been found for surface waters as presented in the table above. As expected, the leachate dam (L8) exceeded the EPL trigger levels consistently during the annual monitoring period. Surface water monitoring concentrations were generally within the range of historical data (refer to Appendix G (graphs) and Appendix H (Annual Return). Some elevated results were found for some parameters as shown on the graphs in Appendix G. For example, an elevated EC was found at S7 in the Q3 monitoring event (ie commensurate with the EC for leachate water - L8) and waters within the sediment dam at S7 were observed to be turbid. The increased turbidity could account for the elevated EC at S7 during this event.

As requested by KSC, additional monitoring was conducted at S4 (ie background surface water) and L8 (leachate dam) on 13 July 2022, approximately 7 days after Q4 sampling due to significant rainfall in July 2022. The results of monitoring of S4 and L8 on 13 July 2022 were commensurate with Q4 monitoring on 7 July 2022

We understand that KSC conduct monitoring of surface waters during any discharge events from the sediment retention dam (ie S7) of leachate dam (L8). There were no discharge monitoring results provided by KSC for the current monitoring period.

Recorded rainfall (Kempsey Airport) for the last two years of monitoring are presented in Figure D1A in Appendix D. It is noted that there was significant rainfall in the 2020-2021 and 2021/2022 monitoring periods (ie 2023.4 mm and 1575.8 mm respectfully for a 12 month period), compared to the 2019-2020 monitoring period (ie 301.4 mm). The months which recorded elevated rainfall during the current 2021/2022 monitoring period are presented below:

- October 2021 – 115 mm;
- November 2021 – 185.4 mm;
- December 2021 – 111 mm;
- January 2022 – 132.8 mm;
- February 2022 - 286.6 mm;
- March 2022 – 526.4 mm;
- July 2022 – 296.4 mm.

8.3 Gas Monitoring

The results of gas monitoring are summarised below:

- Monitoring Wells:
  - The results of monitoring indicated the general absence of methane concentrations within groundwater wells (ie <1ppm). All results were below the acceptance criteria.
- Landfill Surface:
  - In summary, a total of five exceedances of the surface methane monitoring criteria were observed (One in Q1, one in Q3 and three in Q4);

- Exceedances were generally found to be localised and not associated with areas with sparse vegetation;
- Based on a number of quarterly monitoring events, elevated methane concentrations were observed within the western portion of the monitoring area (in the vicinity of former location E3), and the south eastern portion of the monitoring area (in the vicinity of former location E5).
- A number of previous locations containing elevated surface methane concentrations (ie locations E1, E4, E5 and E6) were not accessible due to the presence of a temporary fill stockpile.

- Buildings (Enclosed Spaces):
  - The results indicated the general absence of significant methane concentrations within buildings. All results were below the acceptance criteria.

9. Conclusion

9.1 Groundwater

Groundwater monitoring data from the current 2021-2022 reporting period is generally consistent with historical monitoring data, although various parameters continue to be reported outside the EPL defined trigger levels.

Previous assessment by ERM indicated that BH1 is not well connected to the same regional water bearing zone as the other groundwater monitoring locations. This is supported by the observed fluctuating groundwater levels at BH1 in current and previous monitoring events. On this basis ERM indicated that groundwater quality at BH1 should not be compared to the results of other groundwater monitoring locations. In addition to this, an obstruction in BH1 precluded sampling and testing of groundwater at this location in Q3. The obstruction may also preclude groundwater sampling at his location in future monitoring events.

Based on the results of historic and current monitoring, landfill operations are unlikely to represent a significant risk to human health or ecological receptors during the current reporting period.

9.2 Surface Water

Surface water monitoring data from the current 2021-2022 reporting period is generally consistent with historical monitoring data, although various parameters continue to be reported outside the EPL defined trigger levels. It is noted that the watercourses adjacent to the site are ephemeral. As a consequence, water quality will vary depending on climatic conditions, the presence of waters and the magnitude of flow within the watercourses. Sampling of surface waters has been conducted from both flowing and stagnant waters within watercourses as indicated in Table D2 in Appendix D. Variable water quality is likely to be present as a result of climatic conditions (ie flushing of watercourses and sampling from stagnant ponds within watercourses).

A number of outliers were observed as indicated on the graphs in Appendix G and the Annual Reporting tables in Appendix H. Some results may be spurious or influenced by elevated turbidity as discussed in Section 8.2.2 above. Continual monitoring and interpretation of future results will confirm possible trends and potential impacts where present.

The presence of analytes in downstream surface waters suggest that stormwater runoff from the landfill site is potentially influencing surface water quality when compared to upstream water quality, which is consistent with previous monitoring at the landfill.

The results of historic and current surface water monitoring generally suggest the absence of significant impacts to human health or ecological receptors as a result of landfill operations.

9.3 Gas Monitoring

The results of gas monitoring continue to indicate the general absence of elevated methane concentration within groundwater wells and Buildings (enclosed spaces) monitored within the site.

Surface methane monitoring has indicated some elevated results and localised exceedances. Continued surface methane monitoring is recommended in accordance with the EPL. Where possible, areas/locations found to contain previous elevated results should be targeted.

It is noted that stockpiled fill is present over a significant portion of the monitored area. Surface methane monitoring should also be conducted at the perimeter of the stockpile and at the surface where accessible during future quarterly monitoring events. Monitoring should also be conducted following the removal of stockpiled materials from this area.

Due to the elevated surface methane concentrations observed over a number of monitoring events, additional investigation is recommended to confirm subsurface conditions and capping within the western portion of the surface monitoring area (in the vicinity of former location E3) and within the south eastern portion of the monitoring area (in the vicinity of former location E5).

If additional surface methane monitoring and investigation identifies elevated reproducible results, remediation measures may be required to ensure that capping is performing as required.

10. Recommendations

The following recommendations are made based on the findings of this report:

- Replace BH1 monitoring well in order to allow a more representative assessment of baseline (upgradient) groundwater conditions;
- KSC conduct a review of current site and surface water management strategies to identify potential areas for improvement to minimise the risk of migration and impacts to receiving waters (including capacity of dams, irrigation and reuse procedures, discharge procedures and catchment/containment design);

- KSC consider a review and amendment of the trigger levels for monitoring based on the historic data set;
- Surface gas monitoring:
    - Continue surface methane monitoring in accordance with the EPL;
    - Also target areas/locations found to contain localised elevated results (ie in the vicinity of former locations E3 and E5);
    - Conduct targeted investigation to assess the presence and condition of capping within areas observed to contain elevated methane concentrations (ie the western portion of the monitoring area in the vicinity of former location E3, and the south eastern portion of the monitoring area in the vicinity of former location E5);
    - Also conduct gas monitoring at the perimeter and surface of the of the stockpile located over the monitored area (during future quarterly monitoring events);
    - Also conduct gas monitoring following the removal of the stockpiled materials from the monitored area.
- Continue monitoring surface water, groundwater and gas in accordance with the EPL.

11. References

NSW EPA. (2020). *Assessment and Management of Hazardous Ground Gases.* NSW Environment Protection Authority.

ERM (2020). Annual Water and Leachate Monitoring Report 2019-2022, Environmental Resources Management Australia Pty Ltd

12. Limitations

Douglas Partners (DP) has prepared this report for this project at 638 Crescent Head Road, Kempsey with reference to DP's proposal PMQ200062.P.001.Rev0 dated 20 August 2020 and acceptance received from Gavin Hughes dated 18 September 2020. The work was carried out under an AS4122 contract dated 13 October 2020. This report is provided for the exclusive use of Kempsey Shire Council for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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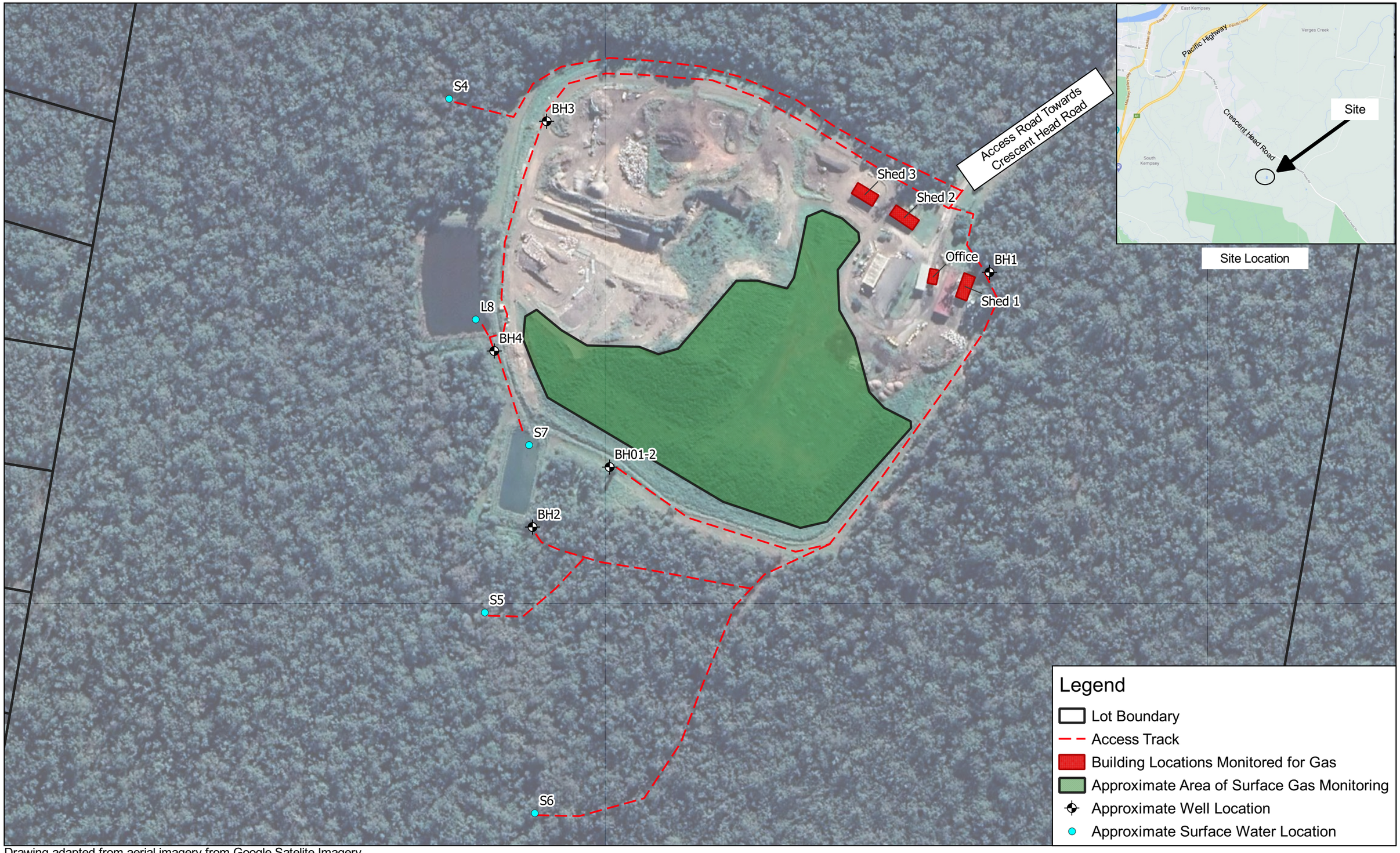
Appendix A

Test Location Plan



Drawing adapted from aerial imagery from Google Satelite Imagery.

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Kempsey Shire Council		
OFFICE: Port Macquarie	DRAWN BY: JCL	
SCALE: 1:3000 @A3	DATE: 24.August.2021	

TITLE: **Test Location Plan**
Proposed Kempsey Landfill Water and Gas Monitoring
638 Crescent Head Road, Kempsey

N

Project:	89781.00
DRAWING No:	1
REVISION:	0

DP.QGIS.A3LandscapeDrawingLayout.DftA

Appendix B

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix C

Quality Assurance / Quality Control Report
Chain of Custody Sheets (Field and Despatch)
Laboratory Sample Receipts

Appendix C
Quality Assurance Quality Control Report
638 Crescent Head Road, Kempsey

C1.0 Field and Laboratory Data Quality Assurance and Quality Control

The field and laboratory data quality assurance and quality control (QA/QC) procedures and results are summarised in the following Table 1. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details.

Table 1: Field and Laboratory Quality Control

Item	Evaluation / Acceptance Criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	C
Intra-laboratory replicates	5% 10% of primary samples; <30% RPD	PC
Laboratory / Reagent Blanks	1 per batch; <PQL	C
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Standard Operating Procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes to Table 1:
C = compliance PC = partial compliance NC = non-compliance

The RPD results were all within the acceptable range, with the exception of those indicated in Table QA1. The exceedances are not, however, considered to be of concern given that:

- The typically low actual differences in the concentrations of the replicate pairs where some RPD exceedances occurred, particularly for groundwater;
- Most of the recorded concentrations being relatively close to the PQL;
- The majority of RPDs within a replicate pair being within the acceptable limits; and
- All other QA/QC parameters generally met the DQIs.

In summary, the QC data is determined to be of sufficient quality to be considered acceptable for the assessment.

Table QA1: Results of RPD

Analyte		Units	Lab Report Number	287839	287839	RPD	293430	293430	RPD	293430	293430	RPD
			Field ID	S5	D1		BH2	D2		S6	D1	
			Sampled Date	1/02/2022	1/02/2022		12/04/2022	12/04/2022		12/04/2022	12/04/2022	
			EQL									
Ion Balance	Alkalinity (Hydroxide) as CaCO3	mg/l	5	<5.0	<5.0	0				<5.0	<5.0	0
	Alkalinity (total) as CaCO3	mg/l	5	11.0	10.0	10				63.0	61.0	3
	Alkalinity (Bicarbonate as CaCO3)	mg/l	5	11.0	10.0	10				63.0	61.0	3
	Chloride	mg/l	1	34.0	34.0	0				71.0	70.0	1
	Ionic Balance	%		-5.0	3.0	200				0.0	0.0	0
	Sodium (Filtered)	mg/l	0.5	19.0	21.0	10				49.0	49.0	0
	Sulphate	mg/l	1	3.0	2.0	40				10.0	10.0	0
Miscellaneous Inorganics	Ammonia as N	mg/l	0.005	<0.005	0.007	33	<0.005	<0.005	0	4.0	4.1	2
	Fluoride	mg/l	0.1	<0.1	<0.1	0				<0.1	<0.1	0
	Nitrate (as N)	mg/l	0.005	<0.005	0.01	67	0.22	0.26	17	<0.005	<0.005	0
	TOC	mg/l	1	19.0	18.0	5				20.0	18.0	11
	TSS	mg/l	5	11.0	22.0	67				33.0	43.0	26
Ion Balance	Alkalinity (Carbonate)	mg/l	5	<5.0	<5.0	0				<5.0	<5.0	0
HM in water - dissolved	Iron (Filtered)	mg/l	0.01	0.78	0.59	28				**0.5**	**0.9**	**57**
	Manganese (Filtered)	mg/l	0.005	0.02	0.025	22				**<0.005**	**0.54**	**196**
HM in water - total	Iron	mg/l	0.01	1.4	1.4	0				1.9	1.7	11
	Manganese	mg/l	0.005	0.041	0.044	7				0.6	0.5	18
Ion Balance	Calcium (Filtered)	mg/l	0.5	2.0	3.0	40				13.0	13.0	0
	Magnesium (Filtered)	mg/l	0.5	2.0	2.0	0	17.0	17.0	0	5.2	5.2	0
	Potassium (Filtered)	mg/l	0.5	2.0	2.0	0				7.8	7.7	1
Total Phenolics in Water	Phenolics Total	mg/l	0.05	<0.05	<0.05	0				<0.05	<0.05	0

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

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))

C2.0 Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs) as outlined in NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013):

- Completeness: a measure of the amount of usable data from a data collection activity;
- Comparability: the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness: the confidence (qualitative) of data representativeness of media present on-site;
- Precision: a measure of variability or reproducibility of data; and
- Accuracy: a measure of closeness of the data to the 'true' value.

Table 2: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Systematic and selected target locations sampled.
	Preparation of chain of custody records.
	Preparation of field groundwater sampling sheets.
	Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody.
	Samples analysed for contaminants of potential concern based on the EPL
	Completion of chain of custody (COC) documentation.
	NATA accredited laboratory results certificates provided by the laboratory.
	Satisfactory frequency and results for field and laboratory quality control (QC) samples as discussed in Section 1.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project.
	Experienced sampler(s) used.
	Use of NATA registered laboratories, with test methods the same or similar between laboratories.
	Satisfactory results for laboratory QC samples.
Representativeness	Target media sampled.
	Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs.
	Samples were extracted and analysed within holding times.
	Samples were analysed in accordance with the COC.
Precision	Field staff followed standard operating procedures.
	Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures.
	Satisfactory results for all laboratory QC samples.

Based on the above, it is considered that the DQIs have been generally complied with.

C3.0 Conclusion

Based on the results of the field QA and field and laboratory QC, and evaluation against the DQIs it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

C4.0 Reference

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

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CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.00	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received**	By: Date:

Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
~~BH01-2~~	-		~~W~~	~~P~~	-							
~~BH1~~	-		~~W~~	~~P~~	-							
~~BH2~~	-		~~W~~	~~P~~	-							
~~BH3~~	-		~~W~~	~~P~~	-							
~~BH4~~	-		~~W~~	~~P~~	-							
S4	-		W	P	-							
S5	-	D1	W	P	-							
S6	-		W	P	-							
S7	-		W	P	-							
L8	-		W	P	-							
D1	-		W	P	-							

*** Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

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Old COC

CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.00	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received** By:	Date:

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

	Field								For Despatch to			Notes
	Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
1	BH01-2	-		W	P	-	SVK	12/04/22		12/04/22			
2	~~BH1~~	-		W	P	-							
3	BH2	-	D2	W	P	-							
4	BH3	-		W	P	-							
5	BH4	-		W	P	-							
6	S4	-		W	P	-							
7	S5	-		W	P	-							
8	S6	-	D1	W	P	-							
9	S7	-		W	P	-							
10	L8	-		W	P	-							
	8												

TS

* **Default storage:** **glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge**

#293430
TS

Douglas Partners
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CHAIN OF CUSTODY FIELD SHEET

Project No:	89781.00	**Client Project Name:**	Kempsey Landfill Water and Gas Monitoring
Client:	Kempsey Shire Council	**Location:**	638 Crescent Head Road, Kempsey
Project Manager:	Cowan, Joel	**DP Lab Received**	By: Date:

Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S - soil W - water	Container Type G - glass P - plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Lab 1 [A] Date	Lab 2 [B] Date	Lab 3 [C] Date	
BH01-2	-		W	P	-	JCL	26.10.21	0800	26.10.21			
BH1	-		W	P	-		25.10.21	1600				
BH2	-		W	P	-		26.10.21	0615				
BH3	-		W	P	-							
BH4	-		W	P	-							
S4	-		W	P	-							
S5	-		W	P	-							
S6	-		W	P	-			0700				
S7	-		W	P	-							
L8	-		W	P	-			1300				

* **Default storage:** **glass containers in fridge,** **plastic containers shelved,** **ASS in freezer,** **water samples in fridge**

A Provide name of Lab 1 Envirolab B Provide name of Lab 2 C Provide name of Lab 3

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitorin	**Order Number**	NC230019		12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Jason Lambert	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, james.cudmore@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard x			**Email:**	
Prior Storage:	x Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐	No x	(If YES, then handle, transport and store in accordance with FPM HAZID)

	DP ID	Lab ID	Date Sampled	Sample Type (S - soil W - water)	Container Type (G - glass P - plastic)	Ammonia	Magnesium (dissolved)	Nitrate	Ionic Balance	Metals (2) (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
1	BH01-2		26.10.21	W	P	●	●	●							Envirolab Quote:
2	BH1		25.10.21	W	P	●	●	●							20SYD319
3	BH2		26.10.21	W	P	●	●	●							
4	BH3			W	P	●	●	●							
5	BH4			W	P	●	●	●							
6	S4			W	P	●		●	●	●	●	●	●	●	
7	S5			W	P	●		●	●	●	●	●	●	●	
8	S6			W	P	●		●	●	●	●	●	●	●	
9	S7			W	P	●		●	●	●	●	●	●	●	
10	L8 (extra)														
	PQL (S) mg/kg													ANZECC PQLs req'd for all water analytes ☐	

ENVIROLAB GROUP
12 Ashley St
Chatswood NSW 2
Ph: (02) 9910

Job No: 281278
Date Received: 27/10/21
Time Received: 1040
Received By: TR
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Lab Report/Reference No:

Metals to Analyse: 8HM unless specified here: Fe, Mn

Total number of samples in container: **Relinquished by:** **Transported to laboratory by:**

Send Results to: James Cudmore **Address** James.Cudmore@douglaspartners.com.au **Phone:** 0413 810 422 **Fax:**

Signed: **Received by:** ELSyd TRoberts **Date & Time:** 27/10/21 1040

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitorin	**Order Number**			12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Jason Lambert	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, james.cudmore@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard x			**Email:**	
Prior Storage:	x Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)		

DP ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Ammonia	Magnesium	Nitrate	Ionic Balance	Metals (2) (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
~~BH01-2~~			~~W~~	~~P~~	●	●	●							~~Envirolab~~ Quote:
~~BH1~~			~~W~~	~~P~~	●	●	●							20SYD319
~~BH2~~			W	P	●	●	●							
~~BH3~~			W	P	●	●	●							ENVIROLAB Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200
~~BH4~~			W	P	●	●	●							~~Job No:~~ 287839
S4	1		W	P	●		●	●	●	●	●	●	●	~~Date Received:~~ 2-2-22
S5	2		W	P	●		●	●	●	●	●	●	●	~~Time Received:~~ 10 am
S6	3		W	P	●		●	●	●	●	●	●	●	~~Received by:~~
S7	4		W	P	●		●	●	●	●	●	●	●	~~Temp: Cool/Ambient~~ Cooling: ~~Ice/Icepack~~ Security: ~~Intact/Broken~~/None
D1	5		W	P	●		●	●	●	●	●	●	●	
extra	LS x 6													
PQL (S) mg/kg														**ANZECC PQLs req'd for all water analytes** ☐

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here: Fe, Mn

Lab Report/Reference No:

Total number of samples in container: **Relinquished by:** **Transported to laboratory by:**

Send Results to: James Cudmore **Address** James.Cudmore@douglaspartners.com.au **Phone:** 0413 810 422 **Fax:**

Signed: **Received by:** **Date & Time:**

Douglas Partners
Geotechnics / Environment / Groundwater

Shaun.vantal@douglaspartners.com.a

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitorin	**Order Number**			12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Jason Lambert	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, ~~james.cudmore@douglaspartners.com.au~~			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard x			**Email:**	
Prior Storage:	x Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No x (If YES, then handle, transport and store in accordance with FPM HAZID)		

DP ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Ammonia	Magnesium	Nitrate	Ionic Balance	Metals (2) (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
1 BH01-2		12/04/2022	W	P&G	•	•	•							Envirolab Quote:
~~BH1~~			~~W~~	~~P~~	~~•~~	~~•~~	~~•~~							20SYD319
2 BH2		12/04/22	W	P	•	•	•							
3 BH3			W	P	•	•	•							
4 BH4			W	P	•	•	•							
5 S4			W	P	•		•	•	•	•	•	•	•	
6 S5			W	P	•		•	•	•	•	•	•	•	
7 S6 A			W	P	•		•	•	•	•	•	•	•	Envir... Chatswood NSW ... Ph: (02) 9910 6...
8 S7			W	P	•		•	•	•	•	•	•	•	
9 D1			W	P&G	•		•	•	•	•	•	•	•	... 213430
10 D2			W	P&G	•	•	•							... received: 14.4.22 ... 1030
11 L8														Time Received: ... By: TSHAN
12 S6B														... Ambient / Cooled 18
PQL (S) mg/kg														**ANZECC PQLs req'd for all water analytes** ☐

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here: Fe, Mn

Lab Report/Reference No:

Total number of samples in container:

Relinquished by: SVK

Transported to laboratory by:

Send Results to: James Cudmore

Address ~~James.Cudmore@douglaspartners.com.au~~

Phone: 0413 810 422 **Fax:**

Signed:

Received by: TSHAN

Date & Time: 19.4.22 1330

Shaun.vantal@douglaspartners.com.au

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitorin	**Order Number**			.12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Shaun van Kal	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, shaun.vankal@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☑ 48 hours ☐ 72 hours ☐ Standard ☐			**Email:**	
Prior Storage:	☑ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

	DP ID	Lab ID	Date Sampled	Sample Type (S - soil W - water)	Container Type (G - glass P - plastic)	Ammonia	Magnesium	Nitrate	Ionic Balance	Heavy Metals (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
1	S4		07/07/22	W	P	●		●	●	●	●	●	●	●	Envirolab Quote:
	~~S5~~			~~W~~	~~P~~	●		●	●	●	●	●	●	●	20SYD319
	~~S6~~			~~W~~	~~P~~	●		●	●	●	●	●	●	●	
	~~S7~~			~~W~~	~~P~~	●		●	●	●	●	●	●	●	
2	L8		07/07/22	W	P	●		●	●	●	●	●	●	●	
	PQL (S) mg/kg														ANZECC PQLs req'd for all water analytes ☐

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 299930
Date Received: 08/07/22
Time Received: 0930
Received By: GC
Temp: Cool/Ambient
Cooling: Ice/Icepack 08 C
Security: Intact/Broken

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Lab Report/Reference No:

Metals to Analyse: 8HM unless specified here: Iron, manganese

Total number of samples in container: **Relinquished by:** **Transported to laboratory by:**

Send Results to: James Cudmore **Address** James.Cudmore@douglaspartners.com.au **Phone:** 0413 810 422 **Fax:**

Signed: **Received by:** courier, ALS Sydney **Date & Time:** 08/07/22 0930

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitorin	**Order Number**			12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Shaun van Kal	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, shaun.vankal@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑			**Email:**	
Prior Storage:	☑ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

DP ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Ammonia	Magnesium	Nitrate	Ionic Balance	Heavy Metals (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
~~S4~~			~~W~~	~~P~~	●		●	●	●	●	●	●	●	Envirolab Quote:
S5		07/07/22	W	P	●		●	●	●	●	●	●	●	20SYD319
S6		"	W	P	●		●	●	●	●	●	●	●	
S7		"	W	P	●		●	●	●	●	●	●	●	
~~L8~~			~~W~~	~~P~~	●		●	●	●	●	●	●	●	
PQL (S) mg/kg													**ANZECC PQLs req'd for all water analytes** ☐	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 299998
Date Received: 08/07/22
Time Received: 0930
Received By: CR
Temp: Cool/Ambient
Cooling: Ice/Icepack 08 C
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here: Iron, manganese

Lab Report/Reference No:

Total number of samples in container: | **Relinquished by:** | **Transported to laboratory by:**

Send Results to: James Cudmore | **Address** James.Cudmore@douglaspartners.com.au | **Phone:** 0413 810 422 **Fax:**

Signed: | **Received by:** | **Date & Time:**

COC 14/7 10:07

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	89781.00	**Suburb:**	Kempsey	**To:**	Envirolab Services Pty Ltd
Project Name:	Kempsey Landfill Water & Gas Monitoring	**Order Number**			12 Ashley Street, Chatswood, NSW 2067
Project Manager:	Cowan, Joel	**Sampler:**	Nicole Murfitt	**Attn:**	Jacinta / Aileen
Emails:	Joel.Cowan@douglaspartners.com.au, shaun.vankal@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☐			**Email:**	
Prior Storage:	☐ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐	No ☐	(If YES, then handle, transport and store in accordance with FPM HAZID)

DP ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Ammonia	Magnesium	Nitrate	Ionic Balance	Heavy Metals (dissolved and total)	Flouride	Total Organic Carbon	Total Phenolics	Total Suspended Solids	Notes/preservation
S4	1	13/07/22	W	P	⊙		⊙	⊙	⊙	⊙	⊙	⊙	⊙	Envirolab Quote:
L8	2	13/07/22	W	P	⊙		⊙	⊙	⊙	⊙	⊙	⊙	⊙	20SYD319
PQL (S) mg/kg													ANZECC PQLs req'd for all water analytes ☐	

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Lab Report/Reference No: 300448

Metals to Analyse: 8HM unless specified here: Iron, manganese

Total number of samples in container: **Relinquished by:** **Transported to laboratory by:**

Send Results to: James Cudmore **Address** James.Cudmore@douglaspartners.com.au **Phone:** 0413 810 422 **Fax:**

Signed: **Received by:** CMcClemens by Sydney **Date & Time:** 14/7/22 1045

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan

Sample Login Details

Your reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Envirolab Reference	281278
Date Sample Received	27/10/2021
Date Instructions Received	27/10/2021
Date Results Expected to be Reported	03/11/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	10 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	2
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Extra sample received: L8

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Total Phenolicsin Water	Ammonia as N in water	Nitrate as N in water	Fluoride, F	Total Organic Carbon	Total Suspended Solids	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	HM in water - dissolved	HM in water - total	On Hold
BH01-2		✓	✓							✓										
BH01		✓	✓							✓										
BH02		✓	✓							✓										
BH03		✓	✓							✓										
BH04		✓	✓							✓										
S4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
S5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
S6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
S7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
L8																				✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan

Sample Login Details

Your reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Envirolab Reference	287839
Date Sample Received	27/10/2021
Date Instructions Received	27/10/2021
Date Results Expected to be Reported	09/02/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	2
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Extra sample L8

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Total Phenolicsin Water	Ammonia as N in water	Nitrate as N in water	Fluoride, F	Total Organic Carbon	Total Suspended Solids	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	HM in water - dissolved	HM in water - total
S4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
S5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
S6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
S7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan, Shaun VanKal

Sample Login Details

Your reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Envirolab Reference	299930
Date Sample Received	08/07/2022
Date Instructions Received	08/07/2022
Date Results Expected to be Reported	11/07/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 Water
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Total Phenolicsin Water	Ammonia as N in water	Nitrate as N in water	Fluoride, F	Total Organic Carbon	Total Suspended Solids	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	HM in water - dissolved	HM in water - total
S4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan

Sample Login Details

Your reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Envirolab Reference	299998
Date Sample Received	08/07/2022
Date Instructions Received	08/07/2022
Date Results Expected to be Reported	15/07/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	3 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8
Cooling Method	Ice
Sampling Date Provided	Not Provided on the COC

Comments

Nil

Please direct any queries to:

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Fax: 02 9910 6201	**Fax: 02 9910 6201**
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Sample ID	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Ammonia as N in water	Nitrate as N in water	Fluoride, F	Total Organic Carbon	Total Suspended Solids	Total Phenolicsin Water	HM in water - dissolved	HM in water - total
S5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
S6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
S7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

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Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

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SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan

Sample Login Details

Your reference	89781.00, Kempsey Landfill Water & Gas Monitoring
Envirolab Reference	300448
Date Sample Received	14/07/2022
Date Instructions Received	14/07/2022
Date Results Expected to be Reported	21/07/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
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Sample ID	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	Ammonia as N in water	Nitrate as N in water	Fluoride, F	Total Organic Carbon	Total Suspended Solids	Total Phenolicsin Water	HM in water - dissolved	HM in water - total
S4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Appendix D

Tabulated Field Work Results:

Table D1: Groundwater Levels During Monitoring Period (2021-2022)

Figure D1A – Rainfall Data and Groundwater levels 2020-2022

Table D2: Groundwater and Surface Water Field Parameters During Monitoring Period (2021-2022)

Table D3: Gas Monitoring - Groundwater Wells (2021-2022)

Table D4: Methane Monitoring - Surface (2021-2022)

Table D5: Methane Monitoring - Buildings (2021-2022)

Table D1: Groundwater Levels During Monitoring Period (2021-2022)

Well ID	Quarterly Round	Sampling Date	TOC Elevation (mAHD)	Depth to Water (mTOC)	Reduced Water Elevation (mAHD)
BH1	Q1	25/10/2021	50.17	20.82	29.35
BH01-2		26/10/2021	29.64	5.62	24.02
BH2		26/10/2021	25.72	1.95	23.77
BH3		26/10/2021	29.78	6.42	23.36
BH4		26/10/2021	26.35	3.02	23.33
BH1	Q2	2/02/2022	50.17	20.59	29.58
BH01-2		2/02/2022	29.64	4.98	24.66
BH2		2/02/2022	25.72	1.50	24.22
BH3		2/02/2022	29.78	5.88	23.90
BH4		2/02/2022	26.35	2.41	23.94
BH1	Q3	12/04/2022	50.17	13.15	37.02
BH01-2		12/04/2022	29.64	4.84	24.80
BH2		12/04/2022	25.72	1.15	24.57
BH3		12/04/2022	29.78	5.32	24.46
BH4		12/04/2022	26.35	2.41	23.94
BH1	Q4	-	50.17	-	-
BH01-2		-	29.64	-	-
BH2		-	25.72	-	-
BH3		-	29.78	-	-
BH4		-	26.35	-	-

Notes

- TOC - Top of Casing
- AHD - Australian Hieght Datum

Figure D1A - Rainfall and Groundwater Levels 2020 - 2022

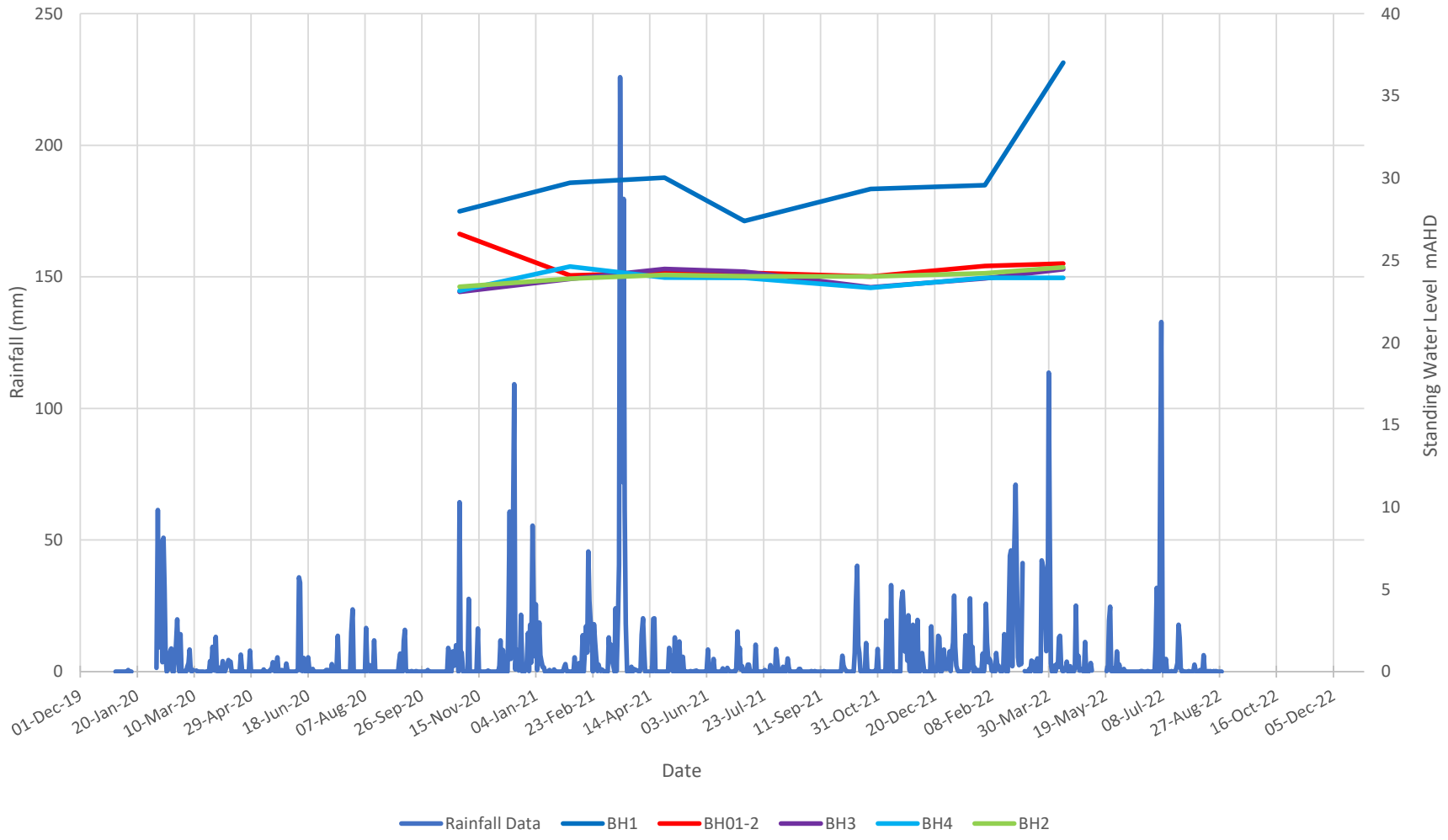

Table D2: Groundwater and Surface Water Field Parameters During Monitoring Period (2021-2022)

Test Location	Quarterly Round	Sampling Date	Temp (°C)	pH	Eh (ORPmV)	EC (mS/cm)	EC (µS/cm)	Turbidity (NTU)	DO (ppm)	Comments			
										Turbidity	Colour	Odour	Flow
BH01-2	Q1	26/10/2021	18.60	5.4	79	1440.00	1440000	60	4.9	Slight	Clear	Nil	-
BH1	Q1	25/10/2021	21.00	4.3	3	186.00	186000	19	0.1	Minimal	Pale Brown	Minor H2S	-
BH2	Q1	26/10/2021	18.10	5.9	59	1500.00	1500000	500	1.9	High	Brown	Nil	-
BH3	Q1	26/10/2021	20.10	6.1	1	1940.00	1940000	71	0.9	Slight	Grey	Nil	-
BH4	Q1	26/10/2021	20.70	6.6	-1	1780.00	1780000	770	0.9	High	Brown	Nil	-
L8	Q1	26/10/2021	22.60	9.2	-104	3060.00	3060000	70	7.4	Slight	Brown/green	Slight H2S	No Flow
S4	Q1	26/10/2021	23.30	8.7	18	126.00	126000	24	7.7	Minimal	Black	Nil	No Flow
S5	Q1	26/10/2021	17.30	7.4	-15	742.00	742000	160	7.0	Slight	Brown	Slight H2S	No Flow
S6	Q1	26/10/2021	16.60	7.1	70	389.00	389000	430	8.6	Moderate	Brown	Nil	No Flow
S7	Q1	26/10/2021	24.30	10.8	-65	328.00	328000	6	8.1	Minimal	Grey	Nil	No Flow
S4	Q2	1/02/2022	27.22	7.8	54	0.12	119	16	12.7	Minimal	Brown	Nil	No flow
S5	Q2	1/02/2022	27.30	7.1	108	0.14	138	26	8.1	Minimal	Brown	Nil	No flow
S6	Q2	1/02/2022	29.70	7.2	105	0.10	97	148	8.0	Slight	Brown	Nil	No flow
S7	Q2	1/02/2022	32.30	7.8	93	0.55	551	188	17.1	Minimal	Brown	Nil	No flow
L8	Q2	1/02/2022	34.28	7.7	91	2.58	2580	73	14.2	Slight	Brown	Nil	No flow
BH01-2	Q3	12/04/2022	19.80	7.0	-13	1.55	1550	10	18.2	Minimal	colourless	Nil	-
BH1	Q3	12/04/2022	Well blocked by obstruction, No Measurements Taken										
BH2	Q3	12/04/2022	20.00	7.1	-18	1.61	1610	21	10.9	Minimal	pale brown	Nil	-
BH3	Q3	12/04/2022	20.54	7.0	-12	1.48	1481	10	17.0	Minimal	colourless	Nil	-
BH4	Q3	12/04/2022	20.68	7.1	-17	1.93	1930	11	16.6	Minimal	colourless	Nil	-
L8	Q3	12/04/2022	27.50	7.7	-92	0.72	723	61	2.5	Slight	Grey	Slight H2S	No flow
S4	Q3	12/04/2022	21.70	8.5	-95	0.08	79	18	14.0	Minimal	Brown	Nil	Flowing
S5	Q3	12/04/2022	20.70	7.6	-42	0.83	834	4	6.1	Minimal	Brown	Nil	No flow
S6	Q3	12/04/2022	20.20	7.6	-42	0.40	404	87	4.0	Slight	Brown	Nil	Flowing
S7	Q3	12/04/2022	25.30	8.3	-82	2.58	2580	137	17.7	Slight	Black	Slight H2S	No flow
S4	Q4	7/07/2022	16.10	7.8	177	0.04	41	50	14.8	Slight	pale brown	Nil	Flowing
S5	Q4	6/07/2022	16.20	7.3	194	0.32	319	0	17.5	Minimal	pale brown	Nil	Flowing
S6	Q4	6/07/2022	16.70	8.8	160	0.09	89	0	11.7	Minimal	pale brown	Nil	Flowing
S7	Q4	7/07/2022	17.00	7.7	171	0.49	493	762	17.8	HIgh	pale brown	Nil	No Flow
L8	Q4	7/07/2022	15.90	8.0	184	1.84	1840	414	14.7	Moderate	Dark green	Nil	No Flow
S4A	Q4	13/07/2022	14.10	6.7	203	0.07	73	42	10.8	Minimal	pale brown	Nil	Flowing
L8A	Q4	13/07/2022	16.40	8.9	115	2.78	2780	128	18.1	Slight	green brown	Nil	No Flow

Notes:

Turdidty descriptor - 0 to 50 - minimal, 50 to 200 - slight, 200 to 500 - moderate, 500+ high

BH - Borehole - Groundwater Well

S - Surface Water Testing Locations

L - Leachate Testing Location

EC - Electrical conductivity

DO - Dissolved oxygen

ORP - Oxidation reduction potential

Table D3: Gas Monitoring - Groundwater Wells (2021-2022)

Well ID	Quarterly Round	Sampling Date	Max Methane (ppm)	Max Carbon Dioxide (%)	Oxygen (%)	Max Hydrogen Sulfide (ppm)	Max Carbon Monoxide (ppm)	Comments	
								Weather Conditions	Atmospheric Pressure (Mb)
BH1	Q1	25/10/2021	0.00	0.50	19.40	0.00	0.00	Clear	1008
BH01-2	Q1	26/10/2021	0.00	0.60	19.40	0.00	0.00	Clear	1008
BH2	Q1	26/10/2021	0.00	0.60	19.30	0.00	0.00	Clear	1018
BH3	Q1	26/10/2021	0.00	0.10	20.20	0.00	0.00	Clear	1018
BH4	Q1	26/10/2021	0.00	0.20	20.50	0.00	0.00	Clear	1018
BH1	Q2	-	-	-	-	-	-	-	-
BH01-2	Q2	-	-	-	-	-	-	-	-
BH2	Q2	-	-	-	-	-	-	-	-
BH3	Q2	-	-	-	-	-	-	-	-
BH4	Q2	-	-	-	-	-	-	-	-
BH1	Q3	4/05/2022	0.30	0.10	20.90	0.00	0.00	Clear	1012
BH01-2	Q3	4/05/2022	0.20	0.20	20.60	0.00	0.00	Clear	1015
BH2	Q3	4/05/2022	0.20	0.10	20.50	0.00	0.00	Clear	1015
BH3	Q3	4/05/2022	0.00	0.10	19.40	0.00	0.00	Clear	1014
BH4	Q3	4/05/2022	0.20	0.10	20.60	0.00	0.00	Clear	1014
BH1	Q4	-	-	-	-	-	-	-	-
BH01-2	Q4	-	-	-	-	-	-	-	-
BH2	Q4	-	-	-	-	-	-	-	-
BH3	Q4	-	-	-	-	-	-	-	-
BH4	Q4	-	-	-	-	-	-	-	-
Crieria (EPL 6269)			10000	NC	NC	NC	NC	NA	NA

Notes:

- ppm - parts per million
- Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

Table D4: Methane Monitoring - Surface (2021-2022)									
Quarter	Date	Easting	Northing	Methane (ppm)	Quarter	Date	Easting	Northing	Methane (ppm)
Q1	25/08/2021	488517	6555865	2.2	Q1	25/08/2021	488380	6555942	109.2
Q1	25/08/2021	488486	6555822	32.2	Q1	25/08/2021	488377	6555936	29.2
Q1	25/08/2021	488476	6555811	224.2	Q1	25/08/2021	488375	6555929	9.2
Q1	25/08/2021	488470	6555801	23.2	Q1	25/08/2021	488370	6555923	9.2
Q1	25/08/2021	488463	6555791	75.2	Q1	25/08/2021	488385	6555949	20.2
Q1	25/08/2021	488446	6555774	15.2	Q1	25/08/2021	488399	6555970	18.2
Q1	25/08/2021	488281	6555852	1.2	Q1	25/08/2021	488409	6555968	14.2
Q1	25/08/2021	488235	6555929	2.7	Q1	25/08/2021	488422	6555964	14.2
Q1	25/08/2021	488258	6555900	4.2	Q1	25/08/2021	488417	6555956	4.2
Q1	25/08/2021	488259	6555895	4.2	Q1	25/08/2021	488413	6555945	4.2
Q1	25/08/2021	488254	6555901	1.2	Q1	25/08/2021	488406	6555931	4.2
Q1	25/08/2021	488261	6555896	4.2	Q1	25/08/2021	488396	6555920	4.2
Q1	25/08/2021	488261	6555896	2.2	Q1	25/08/2021	488391	6555926	4.2
Q1	25/08/2021	488265	6555900	2.2	Q1	25/08/2021	488401	6555917	509.2
Q1	25/08/2021	488265	6555904	2.2	Q1	25/08/2021	488406	6555920	9.2
Q1	25/08/2021	488262	6555901	9.2	Q1	25/08/2021	488421	6555928	9.2
Q1	25/08/2021	488261	6555895	111.2	Q1	25/08/2021	488432	6555940	9.2
Q1	25/08/2021	488262	6555896	10099.2	Q1	25/08/2021	488442	6555946	9.2
Q1	25/08/2021	488266	6555889	7.2	Q1	25/08/2021	488445	6555946	7.2
Q1	25/08/2021	488345	6555833	279.2	Q1	25/08/2021	488449	6555956	4.2
Q1	25/08/2021	488345	6555839	359.2	Q1	25/08/2021	488450	6555973	4.2
Q1	25/08/2021	488358	6555854	49.2	Q1	25/08/2021	488448	6555986	4.2
Q1	25/08/2021	488361	6555853	144.2	Q1	25/08/2021	488446	6555995	7.2
Q1	25/08/2021	488358	6555854	4.2	Q1	25/08/2021	488455	6556030	4.2
Q1	25/08/2021	488360	6555852	4.2	Q1	25/08/2021	488465	6556027	4.2
Q1	25/08/2021	488279	6555907	4.2	Q1	25/08/2021	488472	6556023	9.2
Q1	25/08/2021	488293	6555911	5.2	Q1	25/08/2021	488463	6555988	6.2
Q1	25/08/2021	488313	6555916	2.2	Q1	25/08/2021	488466	6555968	2.2
Q1	25/08/2021	488318	6555911	3.2	Q2	1/02/2022	377482	6680629	2.3
Q1	25/08/2021	488327	6555909	9.2	Q2	1/02/2022	488520	6555856	2.3
Q1	25/08/2021	488342	6555900	26.2	Q2	1/02/2022	488505	6555843	2.4
Q1	25/08/2021	488347	6555900	24.2	Q2	1/02/2022	488493	6555828	2.2
Q1	25/08/2021	488356	6555894	21.2	Q2	1/02/2022	488484	6555814	2.6
Q1	25/08/2021	488355	6555891	4.2	Q2	1/02/2022	488475	6555799	3.1
Q1	25/08/2021	488408	6555885	6.2	Q2	1/02/2022	488466	6555790	110.0
Q1	25/08/2021	488383	6555899	21.2	Q2	1/02/2022	488464	6555786	200.0
Q1	25/08/2021	488383	6555902	429.2	Q2	1/02/2022	488452	6555779	3.5
Q1	25/08/2021	488385	6555906	4.2	Q2	1/02/2022	488443	6555768	5.6
Q1	25/08/2021	488376	6555901	4.2	Q2	1/02/2022	488428	6555766	7.6
Q1	25/08/2021	488378	6555907	4.2	Q2	1/02/2022	488411	6555767	10.6
Q1	25/08/2021	488366	6555910	4.2	Q2	1/02/2022	488395	6555771	3.1
Q1	25/08/2021	488362	6555911	4.2	Q2	1/02/2022	488380	6555776	3.3
Q1	25/08/2021	488350	6555918	4.2	Q2	1/02/2022	488365	6555780	2.4
Q1	25/08/2021	488361	6555922	4.2	Q2	1/02/2022	488351	6555786	6.7
Q1	25/08/2021	488371	6555930	9.2	Q2	1/02/2022	488340	6555796	2.4
Q1	25/08/2021	488373	6555934	99.2	Q2	1/02/2022	488329	6555807	3.2
Q1	25/08/2021	488376	6555937	19.2	Q2	1/02/2022	488316	6555818	2.7
Q1	25/08/2021	488377	6555938	4.2	Q2	1/02/2022	488304	6555828	2.6
Q1	25/08/2021	488380	6555942	179.2	Q2	1/02/2022	488292	6555837	3.1

Notes:

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL 6269)

Monitoring equipment malfunction precluded Oct 2021 monitoring (Q2)

Additional monitoring on 25/08/2021 is reported above as the Q1 event

Table D4: Methane Monitoring - Surface (2021-2022)									
Quarter	Date	Easting	Northing	Methane (ppm)	Quarter	Date	Easting	Northing	Methane (ppm)
Q2	1/02/2022	488279	6555845	2.6	Q2	1/02/2022	488311	6555904	9.6
Q2	1/02/2022	488265	6555852	8.5	Q2	1/02/2022	488326	6555897	2.4
Q2	1/02/2022	488253	6555860	4.1	Q2	1/02/2022	488340	6555887	2.3
Q2	1/02/2022	488242	6555870	5.3	Q2	1/02/2022	488353	6555880	2.3
Q2	1/02/2022	488231	6555881	11.1	Q2	1/02/2022	488365	6555871	2.4
Q2	1/02/2022	488224	6555895	5.7	Q2	1/02/2022	488378	6555849	2.3
Q2	1/02/2022	488222	6555910	3.4	Q2	1/02/2022	488377	6555832	2.2
Q2	1/02/2022	488219	6555925	3.1	Q2	1/02/2022	488369	6555816	2.2
Q2	1/02/2022	488216	6555942	8.5	Q2	1/02/2022	488372	6555806	2.2
Q2	1/02/2022	488225	6555932	236.0	Q2	1/02/2022	488388	6555798	2.2
Q2	1/02/2022	488226	6555915	12.6	Q2	1/02/2022	488403	6555793	2.5
Q2	1/02/2022	488230	6555899	11.3	Q2	1/02/2022	488419	6555788	5.3
Q2	1/02/2022	488235	6555884	5.3	Q2	1/02/2022	488435	6555786	5.6
Q2	1/02/2022	488247	6555870	8.8	Q2	1/02/2022	488450	6555794	14.3
Q2	1/02/2022	488260	6555861	3.7	Q2	1/02/2022	488435	6555801	8.1
Q2	1/02/2022	488277	6555854	3.0	Q2	1/02/2022	488418	6555810	2.2
Q2	1/02/2022	488293	6555848	3.3	Q2	1/02/2022	488402	6555819	2.2
Q2	1/02/2022	488310	6555842	2.7	Q2	1/02/2022	488390	6555828	2.2
Q2	1/02/2022	488325	6555833	2.9	Q2	1/02/2022	488383	6555842	2.3
Q2	1/02/2022	488338	6555823	3.3	Q2	1/02/2022	488387	6555862	2.6
Q2	1/02/2022	488348	6555816	4.0	Q2	1/02/2022	488381	6555875	3.4
Q2	1/02/2022	488356	6555827	5.2	Q2	1/02/2022	488368	6555886	3.0
Q2	1/02/2022	488343	6555838	3.4	Q2	1/02/2022	488353	6555895	2.5
Q2	1/02/2022	488329	6555848	4.0	Q2	1/02/2022	488338	6555904	10.4
Q2	1/02/2022	488314	6555856	7.6	Q2	1/02/2022	488325	6555913	68.1
Q2	1/02/2022	488301	6555864	5.1	Q2	1/02/2022	488349	6555913	6.1
Q2	1/02/2022	488288	6555872	6.1	Q2	1/02/2022	488363	6555906	2.2
Q2	1/02/2022	488274	6555879	5.7	Q2	1/02/2022	488380	6555902	2.3
Q2	1/02/2022	488261	6555889	6.6	Q2	1/02/2022	488388	6555888	2.4
Q2	1/02/2022	488251	6555900	7.8	Q2	1/02/2022	488392	6555871	2.2
Q2	1/02/2022	488244	6555915	12.3	Q2	1/02/2022	488400	6555857	2.2
Q2	1/02/2022	488240	6555929	26.5	Q2	1/02/2022	488409	6555844	2.3
Q2	1/02/2022	488255	6555920	15.4	Q2	1/02/2022	488421	6555834	2.2
Q2	1/02/2022	488266	6555906	7.4	Q2	1/02/2022	488442	6555820	2.4
Q2	1/02/2022	488279	6555896	5.5	Q2	1/02/2022	488462	6555812	2.4
Q2	1/02/2022	488292	6555884	7.3	Q2	1/02/2022	488478	6555833	2.4
Q2	1/02/2022	488306	6555875	3.4	Q2	1/02/2022	488490	6555853	2.3
Q2	1/02/2022	488319	6555866	3.1	Q2	1/02/2022	488501	6555866	2.2
Q2	1/02/2022	488333	6555858	2.5	Q2	1/02/2022	488510	6555887	2.2
Q2	1/02/2022	488347	6555849	2.5	Q2	1/02/2022	488497	6555906	2.2
Q2	1/02/2022	488360	6555841	54.7	Q2	1/02/2022	488482	6555923	2.2
Q2	1/02/2022	488367	6555837	2.7	Q2	1/02/2022	488468	6555944	3.3
Q2	1/02/2022	488370	6555851	3.2	Q2	1/02/2022	488465	6555967	6.4
Q2	1/02/2022	488354	6555859	3.0	Q2	1/02/2022	488461	6555989	2.2
Q2	1/02/2022	488338	6555867	10.4	Q2	1/02/2022	488450	6555972	2.4
Q2	1/02/2022	488324	6555875	6.1	Q2	1/02/2022	488454	6555945	2.3
Q2	1/02/2022	488311	6555885	371.0	Q2	1/02/2022	488459	6555919	2.2
Q2	1/02/2022	488299	6555896	7.5	Q2	1/02/2022	488473	6555897	2.2
Q2	1/02/2022	488289	6555910	7.1	Q2	1/02/2022	488484	6555878	2.2

Notes:

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL 6269)

Monitoring equipment malfunction precluded Oct 2021 monitoring (Q2)

Additional monitoring on 25/08/2021 is reported above as the Q1 event

Table D4: Methane Monitoring - Surface (2021-2022)									
Quarter	Date	Easting	Northing	Methane (ppm)	Quarter	Date	Easting	Northing	Methane (ppm)
Q2	1/02/2022	488467	6555862	2.6	Q3	4/05/2022	488501	6555866	11.6
Q2	1/02/2022	488451	6555843	2.2	Q3	4/05/2022	488510	6555887	1.5
Q2	1/02/2022	488432	6555858	2.3	Q3	4/05/2022	488497	6555906	8.5
Q2	1/02/2022	488446	6555879	2.2	Q3	4/05/2022	488482	6555923	1.9
Q2	1/02/2022	488459	6555900	2.4	Q3	4/05/2022	488468	6555944	3.5
Q2	1/02/2022	488442	6555924	2.3	Q3	4/05/2022	488465	6555967	6.8
Q2	1/02/2022	488426	6555907	2.3	Q3	4/05/2022	488461	6555989	5.8
Q2	1/02/2022	488409	6555887	2.2	Q3	4/05/2022	488450	6555972	2.1
Q2	1/02/2022	488405	6555864	2.2	Q3	4/05/2022	488454	6555945	8.6
Q2	1/02/2022	488403	6555898	2.2	Q3	4/05/2022	488459	6555919	11.9
Q2	1/02/2022	488418	6555918	2.6	Q3	4/05/2022	488473	6555897	2.9
Q2	1/02/2022	488435	6555936	2.2	Q3	4/05/2022	488484	6555878	7.9
Q2	1/02/2022	488445	6555958	2.3	Q3	4/05/2022	488467	6555862	11.7
Q2	1/02/2022	488425	6555968	2.6	Q3	4/05/2022	488451	6555843	2.3
Q2	1/02/2022	488413	6555948	2.4	Q3	4/05/2022	488432	6555858	10.9
Q2	1/02/2022	488400	6555928	2.4	Q3	4/05/2022	488446	6555879	9.1
Q2	1/02/2022	488380	6555915	2.3	Q3	4/05/2022	488459	6555900	10.3
Q2	1/02/2022	488363	6555927	2.3	Q3	4/05/2022	488442	6555924	5.7
Q2	1/02/2022	488381	6555944	2.5	Q3	4/05/2022	488426	6555907	1.3
Q2	1/02/2022	488396	6555965	2.8	Q3	4/05/2022	488409	6555887	4.7
Q3	4/05/2022	488388	6555798	1.7	Q3	4/05/2022	488405	6555864	5.7
Q3	4/05/2022	488403	6555793	1.6	Q3	4/05/2022	488403	6555898	6.2
Q3	4/05/2022	488419	6555788	2.1	Q3	4/05/2022	488418	6555918	2.9
Q3	4/05/2022	488435	6555786	1.9	Q3	4/05/2022	488435	6555936	10.6
Q3	4/05/2022	488450	6555794	2.0	Q3	4/05/2022	488445	6555958	9.4
Q3	4/05/2022	488435	6555801	1.8	Q3	4/05/2022	488425	6555968	10.4
Q3	4/05/2022	488418	6555810	3.2	Q3	4/05/2022	488413	6555948	10.6
Q3	4/05/2022	488402	6555819	2.2	Q3	4/05/2022	488400	6555928	10.7
Q3	4/05/2022	488390	6555828	2.1	Q3	4/05/2022	488380	6555915	1.9
Q3	4/05/2022	488383	6555842	2.0	Q3	4/05/2022	488363	6555927	8.1
Q3	4/05/2022	488387	6555862	6.5	Q3	4/05/2022	488381	6555944	7.5
Q3	4/05/2022	488381	6555875	3.5	Q3	4/05/2022	488396	6555965	2.7
Q3	4/05/2022	488368	6555886	2.0	Q3	4/05/2022	488530	6555883	1.7
Q3	4/05/2022	488353	6555895	3.1	Q3	4/05/2022	488520	6555865	1.6
Q3	4/05/2022	488338	6555904	7.7	Q3	4/05/2022	488511	6555851	3.0
Q3	4/05/2022	488325	6555913	13.2	Q3	4/05/2022	488503	6555839	3.2
Q3	4/05/2022	488349	6555913	12.7	Q3	4/05/2022	488494	6555828	2.7
Q3	4/05/2022	488363	6555906	6.7	Q3	4/05/2022	488485	6555815	3.9
Q3	4/05/2022	488380	6555902	2.1	Q3	4/05/2022	488474	6555801	250.0
Q3	4/05/2022	377482	6680629	36.5	Q3	4/05/2022	488464	6555792	450.0
Q3	4/05/2022	488388	6555888	2.3	Q3	4/05/2022	488466	6555791	1400.0
Q3	4/05/2022	488392	6555871	4.6	Q3	4/05/2022	488467	6555791	260.0
Q3	4/05/2022	488400	6555857	3.4	Q3	4/05/2022	488469	6555793	36.0
Q3	4/05/2022	488409	6555844	6.1	Q3	4/05/2022	488471	6555794	153.0
Q3	4/05/2022	488421	6555834	3.5	Q3	4/05/2022	488469	6555794	21.0
Q3	4/05/2022	488442	6555820	1.8	Q3	4/05/2022	488461	6555789	160.0
Q3	4/05/2022	488462	6555812	9.4	Q3	4/05/2022	488458	6555784	49.0
Q3	4/05/2022	488478	6555833	11.7	Q3	4/05/2022	488454	6555779	22.0
Q3	4/05/2022	488490	6555853	2.1	Q3	4/05/2022	488444	6555773	77.0

Notes:

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL 6269)

Monitoring equipment malfunction precluded Oct 2021 monitoring (Q2)

Additional monitoring on 25/08/2021 is reported above as the Q1 event

Table D4: Methane Monitoring - Surface (2021-2022)									
Quarter	Date	Easting	Northing	Methane (ppm)	Quarter	Date	Easting	Northing	Methane (ppm)
Q3	4/05/2022	488429	6555771	15.4	Q3	4/05/2022	488321	6555879	13.1
Q3	4/05/2022	488414	6555773	6.8	Q3	4/05/2022	488321	6555879	10.4
Q3	4/05/2022	488396	6555776	27.6	Q3	4/05/2022	488306	6555891	25.6
Q3	4/05/2022	488382	6555784	93.0	Q3	4/05/2022	488291	6555906	27.8
Q3	4/05/2022	488368	6555787	11.9	Q3	4/05/2022	488285	6555921	15.3
Q3	4/05/2022	488355	6555793	13.4	Q3	4/05/2022	488306	6555916	10.3
Q3	4/05/2022	488346	6555802	6.8	Q3	4/05/2022	488323	6555908	2.6
Q3	4/05/2022	488332	6555815	5.1	Q3	4/05/2022	488337	6555898	2.0
Q3	4/05/2022	488314	6555824	6.1	Q3	4/05/2022	488371	6555880	1.8
Q3	4/05/2022	488295	6555833	10.1	Q3	4/05/2022	488380	6555858	1.7
Q3	4/05/2022	488277	6555844	14.9	Q3	4/05/2022	488377	6555833	1.6
Q3	4/05/2022	488256	6555852	8.4	Q3	4/05/2022	488369	6555811	1.7
Q3	4/05/2022	488237	6555861	15.7	Q3	4/05/2022	488393	6555801	72.4
Q3	4/05/2022	488225	6555877	14.3	Q3	4/05/2022	488221	6555933	54.3
Q3	4/05/2022	488217	6555891	11.2	Q3	4/05/2022	488226	6555931	117.0
Q3	4/05/2022	488216	6555912	12.5	Q3	4/05/2022	488228	6555928	56.8
Q3	4/05/2022	488209	6555932	14.1	Q3	4/05/2022	488225	6555925	341.0
Q3	4/05/2022	488210	6555952	27.3	Q3	4/05/2022	488218	6555927	21.1
Q3	4/05/2022	488226	6555937	68.1	Q3	4/05/2022	488218	6555933	83.2
Q3	4/05/2022	488226	6555924	15.0	Q3	4/05/2022	488395	6555797	1.8
Q3	4/05/2022	488230	6555906	160.0	Q3	4/05/2022	488218	6555940	30.9
Q3	4/05/2022	488240	6555893	264.0	Q3	4/05/2022	488261	6555892	12.9
Q3	4/05/2022	488239	6555895	143.0	Q3	4/05/2022	488436	6555793	1.9
Q3	4/05/2022	488243	6555898	54.0	Q3	4/05/2022	488465	6555797	2.8
Q3	4/05/2022	488255	6555895	384.0	Q3	4/05/2022	488478	6555818	2.9
Q3	4/05/2022	488248	6555892	62.0	Q4	25/07/2022	488515	6555873	1.3
Q3	4/05/2022	488254	6555871	12.8	Q4	25/07/2022	488502	6555854	1.1
Q3	4/05/2022	488270	6555862	6.3	Q4	25/07/2022	488488	6555836	1.0
Q3	4/05/2022	488292	6555849	5.2	Q4	25/07/2022	488475	6555817	1.2
Q3	4/05/2022	488321	6555830	5.8	Q4	25/07/2022	488461	6555802	1.3
Q3	4/05/2022	488342	6555822	8.1	Q4	25/07/2022	488445	6555784	5.3
Q3	4/05/2022	488358	6555832	4.6	Q4	25/07/2022	488460	6555795	275.0
Q3	4/05/2022	488343	6555846	4.9	Q4	25/07/2022	488424	6555795	2.5
Q3	4/05/2022	488321	6555859	5.7	Q4	25/07/2022	488400	6555801	2.9
Q3	4/05/2022	488306	6555869	7.0	Q4	25/07/2022	488376	6555811	2.1
Q3	4/05/2022	488290	6555881	6.0	Q4	25/07/2022	488357	6555824	3.7
Q3	4/05/2022	488274	6555893	29.2	Q4	25/07/2022	488344	6555831	50.1
Q3	4/05/2022	488258	6555902	32.1	Q4	25/07/2022	488355	6555844	9.7
Q3	4/05/2022	488248	6555917	17.1	Q4	25/07/2022	488335	6555858	10.9
Q3	4/05/2022	488245	6555932	9.2	Q4	25/07/2022	488316	6555872	5.1
Q3	4/05/2022	488262	6555920	10.7	Q4	25/07/2022	488296	6555885	2.4
Q3	4/05/2022	488290	6555888	6.7	Q4	25/07/2022	488282	6555871	1.4
Q3	4/05/2022	488306	6555878	5.8	Q4	25/07/2022	488261	6555883	1.5
Q3	4/05/2022	488321	6555866	3.3	Q4	25/07/2022	488250	6555895	734.0
Q3	4/05/2022	488339	6555855	2.1	Q4	25/07/2022	488245	6555890	1124.0
Q3	4/05/2022	375884	6687174	19.2	Q4	25/07/2022	488238	6555895	221.0
Q3	4/05/2022	488355	6555844	6.2	Q4	25/07/2022	488237	6555892	42.3
Q3	4/05/2022	488359	6555858	6.3	Q4	25/07/2022	488236	6555899	21.5
Q3	4/05/2022	488339	6555868	10.3	Q4	25/07/2022	488243	6555904	182.0

Notes:

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL 6269)

Monitoring equipment malfunction precluded Oct 2021 monitoring (Q2)

Additional monitoring on 25/08/2021 is reported above as the Q1 event

Table D4: Methane Monitoring - Surface (2021-2022)									
Quarter	Date	Easting	Northing	Methane (ppm)	Quarter	Date	Easting	Northing	Methane (ppm)
Q4	25/07/2022	488239	6555911	365.0	Q4	25/07/2022	488437	6555989	28.2
Q4	25/07/2022	488227	6555922	33.9	Q4	25/07/2022	488435	6555970	0.8
Q4	25/07/2022	488216	6555936	44.9	Q4	25/07/2022	488421	6555933	0.7
Q4	25/07/2022	488236	6555926	58.1	Q4	25/07/2022	488414	6555911	0.9
Q4	25/07/2022	488251	6555911	17.1	Q4	25/07/2022	488407	6555888	0.9
Q4	25/07/2022	488270	6555899	3.8	Q4	25/07/2022	488384	6555903	31.2
Q4	25/07/2022	488290	6555891	3.5	Q4	25/07/2022	488365	6555913	4.2
Q4	25/07/2022	488311	6555880	6.0	Q4	25/07/2022	488344	6555919	3202.0
Q4	25/07/2022	488331	6555869	4.6	Q4	25/07/2022	488364	6555930	41.7
Q4	25/07/2022	488352	6555856	3.5	Q4	25/07/2022	488384	6555917	6.8
Q4	25/07/2022	488372	6555844	8.3	Q4	25/07/2022	488373	6555936	21.8
Q4	25/07/2022	488387	6555831	2.3	Q4	25/07/2022	488386	6555955	28.9
Q4	25/07/2022	488405	6555819	1.5	Q4	25/07/2022	488404	6555972	11.5
Q4	25/07/2022	488426	6555807	0.8	Q4	25/07/2022	488415	6555958	81.5
Q4	25/07/2022	488444	6555797	1.4	Q4	25/07/2022	488400	6555939	3.2
Q4	25/07/2022	488456	6555813	0.6	Q4	25/07/2022	488395	6555797	2.8
Q4	25/07/2022	488472	6555832	0.5	Q4	25/07/2022	488218	6555940	46.3
Q4	25/07/2022	488485	6555852	0.7	Q4	25/07/2022	488261	6555892	246.0
Q4	25/07/2022	488501	6555870	0.7	Q4	25/07/2022	488436	6555793	2.3
Q4	25/07/2022	488508	6555890	0.6	Q4	25/07/2022	488465	6555797	473.0
Q4	25/07/2022	488489	6555881	1.3	Q4	25/07/2022	488478	6555818	1.3
Q4	25/07/2022	488473	6555862	5.6					
Q4	25/07/2022	488461	6555844	2.5					
Q4	25/07/2022	488449	6555825	2.1					
Q4	25/07/2022	488432	6555836	1.0					
Q4	25/07/2022	488412	6555848	1.1					
Q4	25/07/2022	488387	6555864	7.2					
Q4	25/07/2022	488369	6555875	6.8					
Q4	25/07/2022	488350	6555881	5.6					
Q4	25/07/2022	488332	6555892	11.4					
Q4	25/07/2022	488309	6555905	16.8					
Q4	25/07/2022	488289	6555915	3.9					
Q4	25/07/2022	488312	6555915	16.1					
Q4	25/07/2022	488333	6555905	13.6					
Q4	25/07/2022	488352	6555893	2.1					
Q4	25/07/2022	488372	6555881	1.3					
Q4	25/07/2022	488392	6555865	2.6					
Q4	25/07/2022	488410	6555849	1.1					
Q4	25/07/2022	488429	6555835	0.6					
Q4	25/07/2022	488426	6555860	0.8					
Q4	25/07/2022	488440	6555879	1.0					
Q4	25/07/2022	488450	6555901	1.2					
Q4	25/07/2022	488460	6555926	0.6					
Q4	25/07/2022	488437	6555953	2.0					
Q4	25/07/2022	488442	6555976	0.8					
Q4	25/07/2022	488456	6555997	1.7					
Q4	25/07/2022	488468	6556023	1.3					
Q4	25/07/2022	488446	6556037	4.4					
Q4	25/07/2022	488439	6556013	3.2					

Notes:

Methane (CH4) surface gas reading above 500 ppm (NSW EPA, 2016 and the EPL 6269)

Monitoring equipment malfunction precluded Oct 2021 monitoring (Q2)

Additional monitoring on 25/08/2021 is reported above as the Q1 event

Table D5: Methane Monitoring - Buildings (2021-2022)

Quarterly Round	Location		Date	Methane (ppm)	Quarterly Round	Location		Date	Methane (ppm)
Q1	Shed 1	North cnr	25/10/2021	1.6	Q2	Shed 1	North cnr	1/02/2022	2.4
Q1	Shed 1	South cnr	25/10/2021	1.5	Q2	Shed 1	South cnr	1/02/2022	2.4
Q1	Shed 1	East cnr	25/10/2021	1.4	Q2	Shed 1	East cnr	1/02/2022	2.3
Q1	Shed 1	West cnr	25/10/2021	1.4	Q2	Shed 1	West cnr	1/02/2022	2.4
Q1	Shed 1	Drain	25/10/2021	1.4	Q2	Shed 1	Drain	1/02/2022	2.4
Q1	Shed 1	Sink	25/10/2021	1.3	Q2	Shed 1	Sink	1/02/2022	2.4
Q1	Shed 1	Outside	25/10/2021	1.3	Q2	Shed 1	Outside	1/02/2022	2.2
Q1	Shed 2	North cnr	25/10/2021	1.4	Q2	Shed 2	North cnr	1/02/2022	2.4
Q1	Shed 2	South cnr	25/10/2021	1.4	Q2	Shed 2	South cnr	1/02/2022	2.4
Q1	Shed 2	East cnr	25/10/2021	1.3	Q2	Shed 2	East cnr	1/02/2022	2.4
Q1	Shed 2	West cnr	25/10/2021	1.3	Q2	Shed 2	West cnr	1/02/2022	2.4
Q1	Shed 2	Middle	25/10/2021	1.4	Q2	Shed 2	Middle	1/02/2022	2.4
Q1	Shed 2	Entrance	25/10/2021	1.4	Q2	Shed 2	Entrance	1/02/2022	2.4
Q1	Shed 3	North cnr	25/10/2021	1.2	Q2	Shed 3	North cnr	1/02/2022	2.3
Q1	Shed 3	South cnr	25/10/2021	1.2	Q2	Shed 3	South cnr	1/02/2022	2.4
Q1	Shed 3	East cnr	25/10/2021	1.2	Q2	Shed 3	East cnr	1/02/2022	2.4
Q1	Shed 3	West cnr	25/10/2021	1.2	Q2	Shed 3	West cnr	1/02/2022	2.4
Q1	Office	North end	25/10/2021	2.1	Q2	Office	North end	1/02/2022	2.6
Q1	Office	South end	25/10/2021	2.1	Q2	Office	South end	1/02/2022	2.6
Q1	Office	West end	25/10/2021	2.3	Q2	Office	West end	1/02/2022	2.6
Q1	Office	East end	25/10/2021	2.5	Q2	Office	East end	1/02/2022	2.6
Q1	Office	Kitchen Sink	25/10/2021	2.5	Q2	Office	Kitchen Sink	1/02/2022	2.7
Q1	Office	Drain	25/10/2021	2.5	Q2	Office	Drain	1/02/2022	2.8
Q1	Office	Bathroom Sink	25/10/2021	2.6	Q2	Office	Bathroom Sink	1/02/2022	2.8
Q1	Office	Entrance	25/10/2021	2.5	Q2	Office	Entrance	1/02/2022	2.5

Notes:

- ppm - parts per million
- Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

Table D5: Methane Monitoring - Buildings (2021-2022)

Quarterly Round	Location		Date	Methane (ppm)	Quarterly Round	Location		Date	Methane (ppm)
Q3	Shed 1	North cnr	4/05/2022	1.1	Q4	Shed 1	North cnr	25/07/2022	2.8
Q3	Shed 1	South cnr	4/05/2022	1.1	Q4	Shed 1	South cnr	25/07/2022	2.3
Q3	Shed 1	East cnr	4/05/2022	1.4	Q4	Shed 1	East cnr	25/07/2022	2.4
Q3	Shed 1	West cnr	4/05/2022	1.1	Q4	Shed 1	West cnr	25/07/2022	2.8
Q3	Shed 1	Drain	4/05/2022	1.2	Q4	Shed 1	Drain	25/07/2022	2.5
Q3	Shed 1	Sink	4/05/2022	1.1	Q4	Shed 1	Sink	25/07/2022	2.0
Q3	Shed 1	Outside	4/05/2022	1.7	Q4	Shed 1	Outside	25/07/2022	1.8
Q3	Shed 2	North cnr	4/05/2022	1.8	Q4	Shed 2	North cnr	25/07/2022	1.1
Q3	Shed 2	South cnr	4/05/2022	2.1	Q4	Shed 2	South cnr	25/07/2022	1.1
Q3	Shed 2	East cnr	4/05/2022	1.9	Q4	Shed 2	East cnr	25/07/2022	1.0
Q3	Shed 2	West cnr	4/05/2022	1.8	Q4	Shed 2	West cnr	25/07/2022	1.3
Q3	Shed 2	Middle	4/05/2022	1.9	Q4	Shed 2	Middle	25/07/2022	0.8
Q3	Shed 2	Entrance	4/05/2022	2.0	Q4	Shed 2	Entrance	25/07/2022	0.9
Q3	Shed 3	North cnr	4/05/2022	1.9	Q4	Shed 3	North cnr	25/07/2022	1.1
Q3	Shed 3	South cnr	4/05/2022	1.8	Q4	Shed 3	South cnr	25/07/2022	1.0
Q3	Shed 3	East cnr	4/05/2022	1.6	Q4	Shed 3	East cnr	25/07/2022	1.1
Q3	Shed 3	West cnr	4/05/2022	5.3	Q4	Shed 3	West cnr	25/07/2022	1.0
Q3	Office	North end	4/05/2022	4.1	Q4	Office	North end	25/07/2022	5.0
Q3	Office	South end	4/05/2022	4.2	Q4	Office	South end	25/07/2022	6.6*
Q3	Office	West end	4/05/2022	4.0	Q4	Office	West end	25/07/2022	5.7*
Q3	Office	East end	4/05/2022	4.0	Q4	Office	East end	25/07/2022	5.8*
Q3	Office	Kitchen Sink	4/05/2022	4.0	Q4	Office	Kitchen Sink	25/07/2022	7.8*
Q3	Office	Drain	4/05/2022	4.9	Q4	Office	Drain	25/07/2022	16.6*
Q3	Office	Bathroom Sink	4/05/2022	3.9	Q4	Office	Bathroom Sink	25/07/2022	8.3*
Q3	Office	Entrance	4/05/2022	3.8	Q4	Office	Entrance	25/07/2022	6.2*

Notes:

- ppm - parts per million
- Criteria of Subsurface methane 10000 ppm / 1 % (v/v) (NSW EPA, 2016 and the EPL 6269)

* Site personnel cooking food during measurements

Appendix E

Laboratory Report Sheets

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CERTIFICATE OF ANALYSIS 281278

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	10 Water
Date samples received	27/10/2021
Date completed instructions received	27/10/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	03/11/2021
Date of Issue	03/11/2021

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Greta Petzold, Senior Report Coordinator
Hannah Nguyen, Metals Supervisor
Jenny He, Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		281278-6	281278-7	281278-8	281278-9	281278-10
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Date analysed	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Miscellaneous Inorganics						
Our Reference		281278-1	281278-2	281278-3	281278-4	281278-5
Your Reference	UNITS	BH01-2	BH01	BH02	BH03	BH04
Date Sampled		26/10/2021	25/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Date analysed	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Ammonia as N in water	mg/L	0.047	0.35	0.092	0.095	0.13
Nitrate as N in water	mg/L	0.008	<0.005	<0.005	0.05	0.02

Miscellaneous Inorganics						
Our Reference		281278-6	281278-7	281278-8	281278-9	281278-10
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Date analysed	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Ammonia as N in water	mg/L	<0.005	0.10	0.12	0.017	93
Nitrate as N in water	mg/L	<0.02	0.12	<0.005	0.007	0.45
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	mg/L	44	17	18	18	110
Total Suspended Solids	mg/L	300	130	290	34	78

Ion Balance						
Our Reference		281278-1	281278-2	281278-3	281278-4	281278-5
Your Reference	UNITS	BH01-2	BH01	BH02	BH03	BH04
Date Sampled		26/10/2021	25/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Date analysed	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Magnesium - Dissolved	mg/L	18	1	18	40	32

Ion Balance						
Our Reference		281278-6	281278-7	281278-8	281278-9	281278-10
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Date analysed	-	27/10/2021	27/10/2021	27/10/2021	27/10/2021	27/10/2021
Calcium - Dissolved	mg/L	2	22	11	33	62
Potassium - Dissolved	mg/L	3	13	7.8	12	89
Sodium - Dissolved	mg/L	18	92	65	47	470
Magnesium - Dissolved	mg/L	2	14	8.8	8.0	31
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	22	31	33	51	720
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	32	65
Total Alkalinity as $CaCO_3$	mg/L	22	31	33	83	790
Sulphate, SO4	mg/L	2	120	61	58	19
Chloride, Cl	mg/L	24	150	93	100	620
Ionic Balance	%	-2.0	-5.0	-3.0	-11	-9.0

HM in water - dissolved						
Our Reference		281278-6	281278-7	281278-8	281278-9	281278-10
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Date analysed	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Iron-Dissolved	µg/L	4,500	350	1,100	10	320
Manganese-Dissolved	µg/L	47	110	210	<5	410

HM in water - total						
Our Reference		281278-6	281278-7	281278-8	281278-9	281278-10
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Date analysed	-	28/10/2021	28/10/2021	28/10/2021	28/10/2021	28/10/2021
Iron-Total	µg/L	7,400	2,300	3,500	580	2,000
Manganese-Total	µg/L	71	140	780	36	470

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			28/10/2021	6	28/10/2021	28/10/2021		28/10/2021	[NT]
Date analysed	-			28/10/2021	6	28/10/2021	28/10/2021		28/10/2021	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	6	<0.05	<0.05	0	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	281278-2
Date prepared	-			27/10/2021	1	27/10/2021	27/10/2021		27/10/2021	27/10/2021
Date analysed	-			27/10/2021	1	27/10/2021	27/10/2021		27/10/2021	27/10/2021
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.047	0.054	14	112	88
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.008	0.006	29	109	103
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	6	<0.1	[NT]		104	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	6	44	44	0	91	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	6	300	320	6	86	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	281278-7
Date prepared	-			[NT]	6	27/10/2021	27/10/2021		[NT]	27/10/2021
Date analysed	-			[NT]	6	27/10/2021	27/10/2021		[NT]	27/10/2021
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	6	<0.005	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	6	<0.02	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	97

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	281278-2
Date prepared	-			27/10/2021	1	27/10/2021	27/10/2021		27/10/2021	27/10/2021
Date analysed	-			27/10/2021	1	27/10/2021	27/10/2021		27/10/2021	27/10/2021
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	89
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	92	88
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	100	85
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	18	18	0	99	92
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			29/10/2021	[NT]	[NT]	[NT]	[NT]	28/10/2021	[NT]
Date analysed	-			29/10/2021	[NT]	[NT]	[NT]	[NT]	28/10/2021	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	93	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	90	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			28/10/2021	6	28/10/2021	28/10/2021		28/10/2021	[NT]
Date analysed	-			28/10/2021	6	28/10/2021	28/10/2021		28/10/2021	[NT]
Iron-Total	µg/L	10	Metals-022	<10	6	7400	6900	7	101	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	6	71	65	9	93	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

MISC_INORG: Nitrate as N PQL has been raised due to matrix interferences from analytes (other than those being tested) in the sample/s. Samples were diluted and reanalysed however same results were achieved.

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CERTIFICATE OF ANALYSIS 287839

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	6 Water
Date samples received	27/10/2021
Date completed instructions received	27/10/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	09/02/2022
Date of Issue	09/02/2022

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		287839-1	287839-2	287839-3	287839-4	287839-5
Your Reference	UNITS	S4	S5	S6	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Date analysed	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Total Phenolics in Water		
Our Reference		287839-6
Your Reference	UNITS	L8
Type of sample		Water
Date extracted	-	03/02/2022
Date analysed	-	03/02/2022
Total Phenolics (as Phenol)	mg/L	<0.05

Miscellaneous Inorganics						
Our Reference		287839-1	287839-2	287839-3	287839-4	287839-5
Your Reference	UNITS	S4	S5	S6	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/02/2022	02/02/2022	02/02/2022	02/02/2022	02/02/2022
Date analysed	-	02/02/2022	02/02/2022	02/02/2022	02/02/2022	02/02/2022
Ammonia as N in water	mg/L	<0.005	<0.005	<0.005	0.045	0.007
Nitrate as N in water	mg/L	0.11	<0.005	<0.005	0.34	0.01
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	mg/L	17	19	20	14	18
Total Suspended Solids	mg/L	<10	11	15	100	22

Miscellaneous Inorganics		
Our Reference		287839-6
Your Reference	UNITS	L8
Type of sample		Water
Date prepared	-	02/02/2022
Date analysed	-	02/02/2022
Ammonia as N in water	mg/L	46
Nitrate as N in water	mg/L	0.29
Fluoride, F	mg/L	0.1
Total Organic Carbon	mg/L	91
Total Suspended Solids	mg/L	21

Ion Balance						
Our Reference		287839-1	287839-2	287839-3	287839-4	287839-5
Your Reference	UNITS	S4	S5	S6	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/02/2022	02/02/2022	02/02/2022	02/02/2022	02/02/2022
Date analysed	-	02/02/2022	02/02/2022	02/02/2022	02/02/2022	02/02/2022
Calcium - Dissolved	mg/L	1	2	1	21	3
Potassium - Dissolved	mg/L	1	2	2	15	2
Sodium - Dissolved	mg/L	16	19	20	63	21
Magnesium - Dissolved	mg/L	2	2	1	6.4	2
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	9	11	17	73	10
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	9	11	17	73	10
Sulphate, SO4	mg/L	3	3	3	33	2
Chloride, Cl	mg/L	31	34	38	110	34
Ionic Balance	%	-7.0	-5.0	-15	-5.0	3.0

Ion Balance		
Our Reference		287839-6
Your Reference	UNITS	L8
Type of sample		Water
Date prepared	-	02/02/2022
Date analysed	-	02/02/2022
Calcium - Dissolved	mg/L	41
Potassium - Dissolved	mg/L	69
Sodium - Dissolved	mg/L	370
Magnesium - Dissolved	mg/L	23
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	470
Carbonate Alkalinity as $CaCO_3$	mg/L	40
Total Alkalinity as $CaCO_3$	mg/L	510
Sulphate, SO4	mg/L	17
Chloride, Cl	mg/L	550
Ionic Balance	%	-9.0

HM in water - dissolved						
Our Reference		287839-1	287839-2	287839-3	287839-4	287839-5
Your Reference	UNITS	S4	S5	S6	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Date analysed	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Iron-Dissolved	µg/L	650	780	820	130	590
Manganese-Dissolved	µg/L	11	20	15	6	25

HM in water - dissolved		
Our Reference		287839-6
Your Reference	UNITS	L8
Type of sample		Water
Date prepared	-	03/02/2022
Date analysed	-	03/02/2022
Iron-Dissolved	µg/L	3,200
Manganese-Dissolved	µg/L	280

HM in water - total						
Our Reference		287839-1	287839-2	287839-3	287839-4	287839-5
Your Reference	UNITS	S4	S5	S6	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Date analysed	-	03/02/2022	03/02/2022	03/02/2022	03/02/2022	03/02/2022
Iron-Total	µg/L	930	1,400	1,500	1,000	1,400
Manganese-Total	µg/L	11	41	29	95	44

HM in water - total		
Our Reference		287839-6
Your Reference	UNITS	L8
Type of sample		Water
Date prepared	-	03/02/2022
Date analysed	-	03/02/2022
Iron-Total	µg/L	4,300
Manganese-Total	µg/L	340

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	287839-2
Date extracted	-			03/02/2022	1	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Date analysed	-			03/02/2022	1	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	106	92

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			02/02/2022	1	02/02/2022	02/02/2022		02/02/2022	[NT]
Date analysed	-			02/02/2022	1	02/02/2022	02/02/2022		02/02/2022	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	<0.005	[NT]		102	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.11	[NT]		101	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	<0.1	<0.1	0	107	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	17	17	0	96	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<10	[NT]		105	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	287839-3
Date prepared	-			02/02/2022	2	02/02/2022	02/02/2022		02/02/2022	02/02/2022
Date analysed	-			02/02/2022	2	02/02/2022	02/02/2022		02/02/2022	02/02/2022
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	2	2	0	85	86
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	2	2	0	88	86
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	19	18	5	100	86
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	2	2	0	90	91
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	2	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	11	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	11	[NT]		104	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	2	3	[NT]		107	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	2	34	[NT]		105	[NT]
Ionic Balance	%		Inorg-040	[NT]	2	-5.0	[NT]		[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	287839-2
Date prepared	-			03/02/2022	4	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Date analysed	-			03/02/2022	4	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Iron-Dissolved	µg/L	10	Metals-022	<10	4	130	130	0	98	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	4	6	6	0	97	100

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	287839-2
Date prepared	-			03/02/2022	1	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Date analysed	-			03/02/2022	1	03/02/2022	03/02/2022		03/02/2022	03/02/2022
Iron-Total	µg/L	10	Metals-022	<10	1	930	910	2	107	#
Manganese-Total	µg/L	5	Metals-022	<5	1	11	11	0	105	99

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Dissolved Metals: For the determination of dissolved metals, the unpreserved sample for #1 was filtered through 0.45um filter at the lab due to the appearance
of colloids and/or sediment in the supplied HNO3 bottle (it appears the sample has not been field filtered).
Note: there is a possibility some elements may be underestimated.

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Total suspended solid PQL has been raised due to the small volume of sample supplied.

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CERTIFICATE OF ANALYSIS 293430

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	12 Water
Date samples received	14/04/2022
Date completed instructions received	21/04/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	26/04/2022
Date of Issue	26/04/2022

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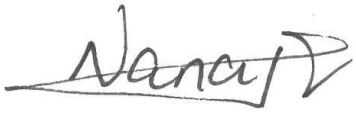
Results Approved By
Diego Bigolin, Inorganics Supervisor
Giovanni Agosti, Group Technical Manager
Hannah Nguyen, Metals Supervisor
Jenny He, Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date extracted	-	20/04/2022	20/04/2022	20/04/2022	20/04/2022	20/04/2022
Date analysed	-	20/04/2022	20/04/2022	20/04/2022	20/04/2022	20/04/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Miscellaneous Inorganics						
Our Reference		293430-1	293430-2	293430-3	293430-4	293430-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Ammonia as N in water	mg/L	<0.005	<0.005	0.13	<0.005	0.012
Nitrate as N in water	mg/L	0.23	0.22	3.6	0.18	0.02
Fluoride, F	mg/L	[NA]	[NA]	[NA]	[NA]	<0.1
Total Organic Carbon	mg/L	[NA]	[NA]	[NA]	[NA]	13
Total Suspended Solids	mg/L	[NA]	[NA]	[NA]	[NA]	12

Miscellaneous Inorganics						
Our Reference		293430-6	293430-7	293430-8	293430-9	293430-10
Your Reference	UNITS	S5	S6 (A)	S7	D1	D2
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Ammonia as N in water	mg/L	4.7	4.0	8.6	4.1	<0.005
Nitrate as N in water	mg/L	<0.005	<0.005	<0.005	<0.005	0.26
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	[NA]
Total Organic Carbon	mg/L	20	20	39	18	[NA]
Total Suspended Solids	mg/L	79	33	990	43	[NA]

Ion Balance						
Our Reference		293430-1	293430-2	293430-3	293430-4	293430-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	S4
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	<0.5
Potassium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	1
Sodium - Dissolved	mg/L	[NA]	[NA]	[NA]	[NA]	12
Magnesium - Dissolved	mg/L	18	17	27	31	0.6
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Carbonate Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Total Alkalinity as $CaCO_3$	mg/L	[NA]	[NA]	[NA]	[NA]	<5
Sulphate, SO4	mg/L	[NA]	[NA]	[NA]	[NA]	3
Chloride, Cl	mg/L	[NA]	[NA]	[NA]	[NA]	15
Ionic Balance	%	[NA]	[NA]	[NA]	[NA]	12

Ion Balance						
Our Reference		293430-6	293430-7	293430-8	293430-9	293430-10
Your Reference	UNITS	S5	S6 (A)	S7	D1	D2
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date analysed	-	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	14	13	31	13	[NA]
Potassium - Dissolved	mg/L	7.9	7.8	13	7.7	[NA]
Sodium - Dissolved	mg/L	53	49	85	49	[NA]
Magnesium - Dissolved	mg/L	5	5.2	8.9	5.2	17
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	[NA]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	73	63	120	61	[NA]
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	[NA]
Total Alkalinity as $CaCO_3$	mg/L	73	63	120	61	[NA]
Sulphate, SO4	mg/L	9	10	19	10	[NA]
Chloride, Cl	mg/L	74	71	120	70	[NA]
Ionic Balance	%	-2.0	0	0	0	[NA]

HM in water - dissolved						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Date analysed	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Iron-Dissolved	µg/L	1,900	1,300	500	1,600	900
Manganese-Dissolved	µg/L	5	160	<5	240	540

HM in water - total						
Our Reference		293430-5	293430-6	293430-7	293430-8	293430-9
Your Reference	UNITS	S4	S5	S6 (A)	S7	D1
Type of sample		Water	Water	Water	Water	Water
Date Sampled		12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Date prepared	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Date analysed	-	26/04/2022	26/04/2022	26/04/2022	26/04/2022	26/04/2022
Iron-Total	µg/L	800	2,600	1,900	1,600	1,700
Manganese-Total	µg/L	10	200	600	300	500

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			20/04/2022	5	20/04/2022	20/04/2022		20/04/2022	[NT]
Date analysed	-			20/04/2022	5	20/04/2022	20/04/2022		20/04/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	5	<0.05	<0.05	0	98	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-2
Date prepared	-			19/04/2022	5	14/04/2022	14/04/2022		19/04/2022	19/04/2022
Date analysed	-			19/04/2022	5	14/04/2022	14/04/2022		19/04/2022	19/04/2022
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	5	0.012	[NT]		106	93
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	5	0.02	[NT]		101	100
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	5	<0.1	[NT]		94	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	5	13	13	0	97	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	5	12	[NT]		101	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	293430-6
Date prepared	-			[NT]	8	14/04/2022	14/04/2022		[NT]	19/04/2022
Date analysed	-			[NT]	8	14/04/2022	14/04/2022		[NT]	19/04/2022
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	8	8.6	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	8	<0.005	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	8	<0.1	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	8	39	[NT]		[NT]	99
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	8	990	1000	1	[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			14/04/2022	5	14/04/2022	14/04/2022		14/04/2022	14/04/2022
Date analysed	-			14/04/2022	5	14/04/2022	14/04/2022		14/04/2022	14/04/2022
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	<0.5	<0.5	0	100	102
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	1	1	0	92	84
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	12	12	0	120	102
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	5	0.6	0.6	0	97	99
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	5	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	5	<5	[NT]		101	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	5	3	[NT]		94	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	5	15	[NT]		106	[NT]
Ionic Balance	%		Inorg-040	[NT]	5	12	[NT]		[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Date analysed	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Iron-Dissolved	µg/L	10	Metals-022	<10	5	1900	2000	5	96	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	5	5	5	0	96	98

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-6
Date prepared	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Date analysed	-			26/04/2022	5	26/04/2022	26/04/2022		26/04/2022	26/04/2022
Iron-Total	µg/L	10	Metals-022	<10	5	800	1000	22	96	#
Manganese-Total	µg/L	5	Metals-022	<5	5	10	10	0	94	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

TRACE METALS: In theory the total metal content should be higher than the dissolved metal content. However, in some samples this is not the case. The sample has been re-analysed for both Total and Dissolved metals and results have been confirmed.

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CERTIFICATE OF ANALYSIS 293430-A

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Lanfill Water & Gas Monitoring**
Number of Samples	additional analysis
Date samples received	14/04/2022
Date completed instructions received	21/04/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	29/04/2022
Date of Issue	29/04/2022

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Results Approved By
Alexander Mitchell Maclean, Senior Chemist
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Hannah Nguyen, Metals Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	28/04/2022
Date analysed	-	29/04/2022
TRH C_6 - C_9	µg/L	<100
TRH C_6 - C_{10}	µg/L	<100
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<100
Benzene	µg/L	<10
Toluene	µg/L	<10
Ethylbenzene	µg/L	<10
m+p-xylene	µg/L	<20
o-xylene	µg/L	<10
Naphthalene	µg/L	<10
Surrogate Dibromofluoromethane	%	95
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	101

svTRH (C10-C40) in Water		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
TRH C_{10} - C_{14}	µg/L	150
TRH C_{15} - C_{28}	µg/L	300
TRH C_{29} - C_{36}	µg/L	<100
TRH >C_{10} - C_{16}	µg/L	200
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	200
TRH >C_{16} - C_{34}	µg/L	250
TRH >C_{34} - C_{40}	µg/L	<100
Surrogate o-Terphenyl	%	81

PAHs in Water		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	85

Organochlorine Pesticides in Water		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
alpha-BHC	µg/L	<0.2
HCB	µg/L	<0.2
beta-BHC	µg/L	<0.2
gamma-BHC	µg/L	<0.2
Heptachlor	µg/L	<0.2
delta-BHC	µg/L	<0.2
Aldrin	µg/L	<0.2
Heptachlor Epoxide	µg/L	<0.2
gamma-Chlordane	µg/L	<0.2
alpha-Chlordane	µg/L	<0.2
Endosulfan I	µg/L	<0.2
pp-DDE	µg/L	<0.2
Dieldrin	µg/L	<0.2
Endrin	µg/L	<0.2
Endosulfan II	µg/L	<0.2
pp-DDD	µg/L	<0.2
Endrin Aldehyde	µg/L	<0.2
pp-DDT	µg/L	<0.2
Endosulfan Sulphate	µg/L	<0.2
Methoxychlor	µg/L	<0.2
Surrogate TCMX	%	73

OP Pesticides in Water		
Our Reference	UNITS	293430-A-11
Your Reference		L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
Dichlorvos	µg/L	<0.2
Dimethoate	µg/L	<0.2
Diazinon	µg/L	<0.2
Chlorpyriphos-methyl	µg/L	<0.2
Ronnel	µg/L	<0.2
Fenitrothion	µg/L	<0.2
Malathion	µg/L	<0.2
Chlorpyriphos	µg/L	<0.2
Parathion	µg/L	<0.2
Bromophos ethyl	µg/L	<0.2
Ethion	µg/L	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2
Surrogate TCMX	%	73

PCBs in Water		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
Aroclor 1016	µg/L	<2
Aroclor 1221	µg/L	<2
Aroclor 1232	µg/L	<2
Aroclor 1242	µg/L	<2
Aroclor 1248	µg/L	<2
Aroclor 1254	µg/L	<2
Aroclor 1260	µg/L	<2
Surrogate TCMX	%	73

Speciated Phenols in water		
Our Reference	UNITS	293430-A-11
Your Reference		L8
Date Sampled		12/04/2022
Type of sample		Water
Date extracted	-	26/04/2022
Date analysed	-	26/04/2022
Phenol	µg/L	<1
2-Chlorophenol	µg/L	<1
4-Chloro-3-Methylphenol	µg/L	<5
2-Methylphenol (0-Cresol)	µg/L	<1
3/4-Methylphenol (m/p-Cresol)	µg/L	<2
2-Nitrophenol	µg/L	<1
2,4-Dimethylphenol	µg/L	<1
2,4-Dichlorophenol	µg/L	<1
2,6-Dichlorophenol	µg/L	<1
2,4,5-Trichlorophenol	µg/L	<1
2,4,6-Trichlorophenol	µg/L	<1
2,4-Dinitrophenol	µg/L	<20
4-Nitrophenol	µg/L	<20
2346-Tetrachlorophenol	µg/L	<1
2-methyl-4,6-Dinitrophenol	µg/L	<10
Pentachlorophenol	µg/L	<5
Surrogate 2-fluorophenol	%	53
Surrogate Phenol-d_6	%	35
Surrogate 2,4,6-Tribromophenol	%	82
Surrogate *p*-Terphenyl-d_{14}	%	63

HM in water - dissolved		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
Aluminium-Dissolved	µg/L	240
Boron-Dissolved	µg/L	470
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	61
Cobalt-Dissolved	µg/L	5
Copper-Dissolved	µg/L	2
Iron-Dissolved	µg/L	3,700
Manganese-Dissolved	µg/L	240
Molybdenum-Dissolved	µg/L	1
Lead-Dissolved	µg/L	<1
Nickel-Dissolved	µg/L	13
Zinc-Dissolved	µg/L	10

HM in water - total		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
Arsenic-Total	µg/L	16
Mercury-Total	µg/L	<0.05
Selenium-Total	µg/L	<1
Iron-Total	µg/L	4,100
Manganese-Total	µg/L	300

Miscellaneous Inorganics		
Our Reference	UNITS	293430-A-11
Your Reference		L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
COD	mg O_2 /L	320
pH	pH Units	7.4
Total Dissolved Solids (grav)	mg/L	1,300
Total Suspended Solids	mg/L	65
Total Nitrogen in water	mg/L	120
TKN in water	mg/L	120
Nitrate as N in water	mg/L	3.1
Nitrite as N in water	mg/L	3.7
NOx as N in water	mg/L	6.8
Ammonia as N in water	mg/L	110
Organic Nitrogen as N	mg/L	10
Phosphate as P in water	mg/L	0.38
Total Cyanide	mg/L	<0.004
Fluoride, F	mg/L	0.1
Formaldehyde in waters	mg/L	9.2
Total Organic Carbon	mg/L	93

Metals in Waters - Total		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
Phosphorus - Total	mg/L	0.8

PFAS in Waters Extended		
Our Reference	UNITS	293430-A-11
Your Reference		L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
Perfluorobutanesulfonic acid	µg/L	0.23
Perfluoropentanesulfonic acid	µg/L	0.02
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.34
Perfluoroheptanesulfonic acid	µg/L	0.03
Perfluorooctanesulfonic acid PFOS	µg/L	0.53
Perfluorodecanesulfonic acid	µg/L	<0.02
Perfluorobutanoic acid	µg/L	0.06
Perfluoropentanoic acid	µg/L	0.30
Perfluorohexanoic acid	µg/L	0.58
Perfluoroheptanoic acid	µg/L	0.19
Perfluorooctanoic acid PFOA	µg/L	0.81
Perfluorononanoic acid	µg/L	0.02
Perfluorodecanoic acid	µg/L	<0.02
Perfluoroundecanoic acid	µg/L	<0.02
Perfluorododecanoic acid	µg/L	<0.05
Perfluorotridecanoic acid	µg/L	<0.1
Perfluorotetradecanoic acid	µg/L	<0.5
4:2 FTS	µg/L	<0.01
6:2 FTS	µg/L	0.04
8:2 FTS	µg/L	<0.02
10:2 FTS	µg/L	<0.02
Perfluorooctane sulfonamide	µg/L	<0.1
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05
N-Ethyl perfluorooctanesulfon amide	µg/L	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.03
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	103
Surrogate $^{13}C_2$ *PFOA*	%	103
Extracted ISTD $^{13}C_3$ *PFBS*	%	100
Extracted ISTD $^{18}O_2$ *PFHxS*	%	106
Extracted ISTD $^{13}C_4$ *PFOS*	%	109
Extracted ISTD $^{13}C_4$ *PFBA*	%	51

PFAS in Waters Extended		
Our Reference	UNITS	293430-A-11
Your Reference		L8
Date Sampled		12/04/2022
Type of sample		Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	92
Extracted ISTD $^{13}C_2$ *PFHxA*	%	101
Extracted ISTD $^{13}C_4$ *PFHpA*	%	113
Extracted ISTD $^{13}C_4$ *PFOA*	%	118
Extracted ISTD $^{13}C_5$ *PFNA*	%	129
Extracted ISTD $^{13}C_2$ *PFDA*	%	138
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	114
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	123
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	94
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	144
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	171
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	152
Extracted ISTD $^{13}C_8$ *FOSA*	%	114
Extracted ISTD d_3 *N MeFOSA*	%	116
Extracted ISTD d_5 *N EtFOSA*	%	113
Extracted ISTD d_7 *N MeFOSE*	%	98
Extracted ISTD d_9 *N EtFOSE*	%	109
Extracted ISTD d_3 *N MeFOSAA*	%	134
Extracted ISTD d_5 *N EtFOSAA*	%	138
Total Positive PFHxS & PFOS	µg/L	0.86
Total Positive PFOA & PFOS	µg/L	1.3
Total Positive PFAS	µg/L	3.2

Ion Balance		
Our Reference		293430-A-11
Your Reference	UNITS	L8
Date Sampled		12/04/2022
Type of sample		Water
Date prepared	-	22/04/2022
Date analysed	-	22/04/2022
Calcium - Dissolved	mg/L	29
Potassium - Dissolved	mg/L	55
Sodium - Dissolved	mg/L	310
Magnesium - Dissolved	mg/L	16
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	630
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	630
Sulphate, SO4	mg/L	28
Chloride, Cl	mg/L	410
Ionic Balance	%	-17

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-067	Samples are digested in acid with a known excess of potassium dichromate then titrated against ammonium ferrous sulphate in accordance with APHA latest edition 5220 C.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Inorg-113	Formaldehyde in waters and solids (1:5 extract) using colourimetric analysis and/or LC-DAD.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			28/04/2022	[NT]	[NT]	[NT]	[NT]	28/04/2022	[NT]
Date analysed	-			29/04/2022	[NT]	[NT]	[NT]	[NT]	29/04/2022	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	101	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate toluene-d8	%		Org-023	99	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-023	102	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	11	150	160	6	81	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	11	300	350	15	89	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	11	<100	<100	0	125	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	11	200	220	10	81	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	11	250	300	18	89	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	11	<100	<100	0	125	[NT]
Surrogate o-Terphenyl	%		Org-020	85	11	81	82	1	76	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	11	<1	<1	0	82	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	11	<1	<1	0	83	[NT]
Fluorene	µg/L	1	Org-022/025	<1	11	<1	<1	0	92	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	11	<1	<1	0	90	[NT]
Anthracene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	11	<1	<1	0	88	[NT]
Pyrene	µg/L	1	Org-022/025	<1	11	<1	<1	0	95	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	11	<1	<1	0	97	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	11	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	11	<1	<1	0	100	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	92	11	85	80	6	90	[NT]

QUALITY CONTROL: Organochlorine Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	84	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	85	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	97	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	91	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	92	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	84	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	90	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	68	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	90	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	90	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	87	11	73	74	1	87	[NT]

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	110	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	83	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	121	[NT]
Malathion	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	118	[NT]
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	94	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	136	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	86	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	11	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	87	11	73	74	1	87	[NT]

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Aroclor 1016	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021	<2	11	<2	<2	0	90	[NT]
Aroclor 1260	µg/L	2	Org-021	<2	11	<2	<2	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	87	11	73	74	1	87	[NT]

QUALITY CONTROL: Speciated Phenols in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Date analysed	-			26/04/2022	11	26/04/2022	26/04/2022		26/04/2022	[NT]
Phenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	122	[NT]
2-Chlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	124	[NT]
4-Chloro-3-Methylphenol	µg/L	5	Org-022/025	<5	11	<5	<5	0	[NT]	[NT]
2-Methylphenol (0-Cresol)	µg/L	1	Org-022/025	<1	11	<1	<1	0	120	[NT]
3/4-Methylphenol (m/p-Cresol)	µg/L	2	Org-022/025	<2	11	<2	<2	0	[NT]	[NT]
2-Nitrophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2,4-Dimethylphenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2,4-Dichlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2,6-Dichlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	120	[NT]
2,4,5-Trichlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2,4,6-Trichlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2,4-Dinitrophenol	µg/L	20	Org-022/025	<20	11	<20	<20	0	[NT]	[NT]
4-Nitrophenol	µg/L	20	Org-022/025	<20	11	<20	<20	0	76	[NT]
2346-Tetrachlorophenol	µg/L	1	Org-022/025	<1	11	<1	<1	0	[NT]	[NT]
2-methyl-4,6-Dinitrophenol	µg/L	10	Org-022/025	<10	11	<10	<10	0	[NT]	[NT]
Pentachlorophenol	µg/L	5	Org-022/025	<5	11	<5	<5	0	128	[NT]
Surrogate 2-fluorophenol	%		Org-022/025	56	11	53	55	4	112	[NT]
Surrogate Phenol-d_6	%		Org-022/025	26	11	35	36	3	102	[NT]
Surrogate 2,4,6-Tribromophenol	%		Org-022/025	75	11	82	91	10	128	[NT]
Surrogate p-Terphenyl-d_{14}	%		Org-022/025	68	11	63	62	2	107	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Date analysed	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	93	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	87	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Date analysed	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Arsenic-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Mercury-Total	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	97	[NT]
Selenium-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	118	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Date analysed	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
COD	mg O_2 /L	50	Inorg-067	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	[NT]	[NT]	[NT]	[NT]	110	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	[NT]	[NT]	[NT]	[NT]	112	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	102	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	97	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	102	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	102	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	112	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	[NT]	[NT]	[NT]	[NT]	80	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Formaldehyde in waters	mg/L	0.1	Inorg-113	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]

QUALITY CONTROL: Metals in Waters - Total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Date analysed	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-A-11
Date prepared	-			22/04/2022	11	22/04/2022	22/04/2022		22/04/2022	22/04/2022
Date analysed	-			22/04/2022	11	22/04/2022	22/04/2022		22/04/2022	22/04/2022
Perfluorobutanesulfonic acid	µg/L	0.01	Org-029	<0.01	11	0.23	0.22	4	101	104
Perfluoropentanesulfonic acid	µg/L	0.01	Org-029	<0.01	11	0.02	0.02	0	102	106
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	11	0.34	0.31	9	101	98
Perfluoroheptanesulfonic acid	µg/L	0.01	Org-029	<0.01	11	0.03	0.03	0	103	110
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	11	0.53	0.54	2	97	110
Perfluorodecanesulfonic acid	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	95	88
Perfluorobutanoic acid	µg/L	0.02	Org-029	<0.02	11	0.06	0.07	15	102	107
Perfluoropentanoic acid	µg/L	0.02	Org-029	<0.02	11	0.30	0.31	3	101	104
Perfluorohexanoic acid	µg/L	0.01	Org-029	<0.01	11	0.58	0.60	3	113	105
Perfluoroheptanoic acid	µg/L	0.01	Org-029	<0.01	11	0.19	0.18	5	101	93
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	11	0.81	0.88	8	112	107
Perfluorononanoic acid	µg/L	0.01	Org-029	<0.01	11	0.02	0.02	0	94	111
Perfluorodecanoic acid	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	103	98
Perfluoroundecanoic acid	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	92	102
Perfluorododecanoic acid	µg/L	0.05	Org-029	<0.05	11	<0.05	<0.05	0	120	115
Perfluorotridecanoic acid	µg/L	0.1	Org-029	<0.1	11	<0.1	<0.1	0	109	105
Perfluorotetradecanoic acid	µg/L	0.5	Org-029	<0.5	11	<0.5	<0.5	0	107	104
4:2 FTS	µg/L	0.01	Org-029	<0.01	11	<0.01	<0.01	0	112	107
6:2 FTS	µg/L	0.01	Org-029	<0.01	11	0.04	0.03	29	103	104
8:2 FTS	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	93	92
10:2 FTS	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	102	121
Perfluorooctane sulfonamide	µg/L	0.1	Org-029	<0.1	11	<0.1	<0.1	0	100	102
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	11	<0.05	<0.05	0	100	104
N-Ethyl perfluorooctanesulfon amide	µg/L	0.1	Org-029	<0.1	11	<0.1	<0.1	0	101	104
N-Me perfluorooctanesulfonamid oethanol	µg/L	0.05	Org-029	<0.05	11	<0.05	<0.05	0	121	138
N-Et perfluorooctanesulfonamid oethanol	µg/L	0.5	Org-029	<0.5	11	<0.5	<0.5	0	101	92
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	11	0.03	0.03	0	106	114
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	11	<0.02	<0.02	0	99	117
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	104	11	103	104	1	95	109
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	111	11	103	111	7	111	110

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-A-11
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	99	11	100	105	5	100	101
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	104	11	106	111	5	102	112
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	99	11	109	114	4	106	112
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	104	11	51	49	4	103	50
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	102	11	92	93	1	100	93
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	97	11	101	102	1	98	107
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	105	11	113	115	2	103	112
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	102	11	118	118	0	98	120
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	115	11	129	131	2	108	126
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	116	11	138	146	6	114	154
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	112	11	114	136	18	108	131
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	100	11	123	132	7	99	124
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	79	11	94	93	1	80	94
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	101	11	144	151	5	97	153
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	99	11	171	185	8	101	178
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	99	11	152	151	1	101	162
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	111	11	114	121	6	108	116
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	104	11	116	120	3	108	118
Extracted ISTD d_5 *N EtFOSA*	%		Org-029	104	11	113	117	3	108	113
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	90	11	98	100	2	98	88

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	293430-A-11
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	101	11	109	115	5	98	110
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	103	11	134	136	1	108	133
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	105	11	138	138	0	110	123

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Date analysed	-			22/04/2022	[NT]	[NT]	[NT]	[NT]	22/04/2022	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	93	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	109	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

pH/Nutrients: Samples were out of the recommended holding time for this analysis.

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

vTRH & BTEXN in Water NEPM - The PQL has been raised as sample 293430-11 was foamy and therefore required a dilution.

The mass inbalance may be caused by other ions that have not been measured.

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CERTIFICATE OF ANALYSIS 299930

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan, Shaun VanKal
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	2 Water
Date samples received	08/07/2022
Date completed instructions received	08/07/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	11/07/2022
Date of Issue	11/07/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Metals Supervisor
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Total Phenolics in Water			
Our Reference		299930-1	299930-2
Your Reference	UNITS	S4	L8
Date Sampled		7/07/2022	7/07/2022
Type of sample		Water	Water
Date extracted	-	08/07/2022	08/07/2022
Date analysed	-	08/07/2022	08/07/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05

Miscellaneous Inorganics			
Our Reference		299930-1	299930-2
Your Reference	UNITS	S4	L8
Date Sampled		7/07/2022	7/07/2022
Type of sample		Water	Water
Date prepared	-	08/07/2022	08/07/2022
Date analysed	-	08/07/2022	08/07/2022
Ammonia as N in water	mg/L	0.007	76
Nitrate as N in water	mg/L	0.19	2.9
Fluoride, F	mg/L	<0.1	<0.1
Total Organic Carbon	mg/L	16	67
Total Suspended Solids	mg/L	22	330

Ion Balance			
Our Reference	UNITS	299930-1	299930-2
Your Reference		S4	L8
Date Sampled		7/07/2022	7/07/2022
Type of sample		Water	Water
Date prepared	-	08/07/2022	08/07/2022
Date analysed	-	08/07/2022	08/07/2022
Calcium - Dissolved	mg/L	<0.5	22
Potassium - Dissolved	mg/L	0.9	36
Sodium - Dissolved	mg/L	5.2	190
Magnesium - Dissolved	mg/L	0.8	11
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	<5	460
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	<5	460
Sulphate, SO4	mg/L	2	12
Chloride, Cl	mg/L	5	280
Ionic Balance	%	25	-21

HM in water - dissolved			
Our Reference	UNITS	299930-1	299930-2
Your Reference		S4	L8
Date Sampled		7/07/2022	7/07/2022
Type of sample		Water	Water
Date prepared	-	11/07/2022	11/07/2022
Date analysed	-	11/07/2022	11/07/2022
Iron-Dissolved	µg/L	1,400	5,600
Manganese-Dissolved	µg/L	7	250

HM in water - total			
Our Reference		299930-1	299930-2
Your Reference	UNITS	S4	L8
Date Sampled		7/07/2022	7/07/2022
Type of sample		Water	Water
Date prepared	-	11/07/2022	11/07/2022
Date analysed	-	11/07/2022	11/07/2022
Iron-Total	µg/L	1,400	7,200
Manganese-Total	µg/L	10	270

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Total Phenolics in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Date analysed	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Date analysed	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	106	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	100	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	[NT]	[NT]	[NT]	[NT]	86	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Date analysed	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Date analysed	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Date analysed	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	103	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

The mass inbalance may be caused by other ions that have not been measured.

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CERTIFICATE OF ANALYSIS 299998

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	3 Water
Date samples received	08/07/2022
Date completed instructions received	08/07/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	15/07/2022
Date of Issue	15/07/2022

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Ion Balance				
Our Reference		299998-1	299998-2	299998-3
Your Reference	UNITS	S5	S6	S7
Type of sample		Water	Water	Water
Date prepared	-	08/07/2022	08/07/2022	08/07/2022
Date analysed	-	08/07/2022	08/07/2022	08/07/2022
Calcium - Dissolved	mg/L	12	2	26
Potassium - Dissolved	mg/L	6.9	5.4	13
Sodium - Dissolved	mg/L	23	7.7	33
Magnesium - Dissolved	mg/L	3	0.7	5.3
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	42	<5	90
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	42	<5	90
Sulphate, SO4	mg/L	20	3	33
Chloride, Cl	mg/L	43	12	59
Ionic Balance	%	-8.0	22	-9.0

Miscellaneous Inorganics				
Our Reference		299998-1	299998-2	299998-3
Your Reference	UNITS	S5	S6	S7
Type of sample		Water	Water	Water
Date prepared	-	08/07/2022	08/07/2022	08/07/2022
Date analysed	-	08/07/2022	08/07/2022	08/07/2022
Ammonia as N in water	mg/L	2.5	0.14	8.6
Nitrate as N in water	mg/L	0.21	0.35	0.02
Fluoride, F	mg/L	<0.1	<0.1	<0.1
Total Organic Carbon	mg/L	25	21	62
Total Suspended Solids	mg/L	510	760	400

Total Phenolics in Water				
Our Reference		299998-1	299998-2	299998-3
Your Reference	UNITS	S5	S6	S7
Type of sample		Water	Water	Water
Date extracted	-	11/07/2022	11/07/2022	11/07/2022
Date analysed	-	11/07/2022	11/07/2022	11/07/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	0.08

HM in water - dissolved				
Our Reference		299998-1	299998-2	299998-3
Your Reference	UNITS	S5	S6	S7
Type of sample		Water	Water	Water
Date prepared	-	12/07/2022	12/07/2022	12/07/2022
Date analysed	-	12/07/2022	12/07/2022	12/07/2022
Iron-Dissolved	µg/L	330	1,400	520
Manganese-Dissolved	µg/L	40	<5	<5

HM in water - total				
Our Reference		299998-1	299998-2	299998-3
Your Reference	UNITS	S5	S6	S7
Type of sample		Water	Water	Water
Date prepared	-	12/07/2022	12/07/2022	12/07/2022
Date analysed	-	12/07/2022	12/07/2022	12/07/2022
Iron-Total	µg/L	5,100	3,400	3,500
Manganese-Total	µg/L	72	15	120

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Date analysed	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	93	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Date analysed	-			08/07/2022	[NT]	[NT]	[NT]	[NT]	08/07/2022	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	112	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	115	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	[NT]	[NT]	[NT]	[NT]	112	[NT]

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Date analysed	-			11/07/2022	[NT]	[NT]	[NT]	[NT]	11/07/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			12/07/2022	[NT]	[NT]	[NT]	[NT]	12/07/2022	[NT]
Date analysed	-			12/07/2022	[NT]	[NT]	[NT]	[NT]	12/07/2022	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	98	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			12/07/2022	1	12/07/2022	12/07/2022		12/07/2022	[NT]
Date analysed	-			12/07/2022	1	12/07/2022	12/07/2022		12/07/2022	[NT]
Iron-Total	µg/L	10	Metals-022	<10	1	5100	5200	2	99	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	1	72	77	7	97	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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CERTIFICATE OF ANALYSIS 300448

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.00, Kempsey Landfill Water & Gas Monitoring**
Number of Samples	2 Water
Date samples received	14/07/2022
Date completed instructions received	14/07/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	21/07/2022
Date of Issue	21/07/2022

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Giovanni Agosti, Group Technical Manager
Nick Sarlamis, Assistant Operation Manager

Authorised By

Nancy Zhang, Laboratory Manager

Ion Balance			
Our Reference		300448-1	300448-2
Your Reference	UNITS	S4	L8
Type of sample		Water	Water
Date Sampled		13/07/2022	13/07/2022
Date prepared	-	14/07/2022	14/07/2022
Date analysed	-	14/07/2022	14/07/2022
Calcium - Dissolved	mg/L	1	33
Potassium - Dissolved	mg/L	2	77
Sodium - Dissolved	mg/L	11	270
Magnesium - Dissolved	mg/L	1	17
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	610
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	34
Total Alkalinity as $CaCO_3$	mg/L	5	640
Sulphate, SO4	mg/L	6	19
Chloride, Cl	mg/L	15	450
Ionic Balance	%	0	-21

Miscellaneous Inorganics			
Our Reference	UNITS	300448-1	300448-2
Your Reference		S4	L8
Type of sample		Water	Water
Date Sampled		13/07/2022	13/07/2022
Date prepared	-	14/07/2022	14/07/2022
Date analysed	-	14/07/2022	14/07/2022
Ammonia as N in water	mg/L	0.023	110
Nitrate as N in water	mg/L	0.02	2.7
Fluoride, F	mg/L	<0.1	0.1
Total Organic Carbon	mg/L	12	83
Total Suspended Solids	mg/L	94	160

Total Phenolics in Water			
Our Reference		300448-1	300448-2
Your Reference	UNITS	S4	L8
Type of sample		Water	Water
Date Sampled		13/07/2022	13/07/2022
Date extracted	-	19/07/2022	19/07/2022
Date analysed	-	19/07/2022	19/07/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05

HM in water - dissolved			
Our Reference		300448-1	300448-2
Your Reference	UNITS	S4	L8
Type of sample		Water	Water
Date Sampled		13/07/2022	13/07/2022
Date prepared	-	18/07/2022	18/07/2022
Date analysed	-	18/07/2022	18/07/2022
Iron-Dissolved	µg/L	2,600	8,700
Manganese-Dissolved	µg/L	17	300

HM in water - total			
Our Reference		300448-1	300448-2
Your Reference	UNITS	S4	L8
Type of sample		Water	Water
Date Sampled		13/07/2022	13/07/2022
Date prepared	-	18/07/2022	18/07/2022
Date analysed	-	18/07/2022	18/07/2022
Iron-Total	µg/L	4,100	11,000
Manganese-Total	µg/L	23	390

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			14/07/2022	[NT]	[NT]	[NT]	[NT]	14/07/2022	[NT]
Date analysed	-			14/07/2022	[NT]	[NT]	[NT]	[NT]	14/07/2022	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	94	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	88	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	108	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			14/07/2022	[NT]	[NT]	[NT]	[NT]	14/07/2022	[NT]
Date analysed	-			14/07/2022	[NT]	[NT]	[NT]	[NT]	14/07/2022	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	88	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	95	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			19/07/2022	[NT]	[NT]	[NT]	[NT]	19/07/2022	[NT]
Date analysed	-			19/07/2022	[NT]	[NT]	[NT]	[NT]	19/07/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			18/07/2022	[NT]	[NT]	[NT]	[NT]	18/07/2022	[NT]
Date analysed	-			18/07/2022	[NT]	[NT]	[NT]	[NT]	18/07/2022	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	91	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			18/07/2022	[NT]	[NT]	[NT]	[NT]	18/07/2022	[NT]
Date analysed	-			18/07/2022	[NT]	[NT]	[NT]	[NT]	18/07/2022	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	103	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Appendix F

Tabulated Laboratory Results:

Table F1 - Field and Laboratory Results for Groundwater - October 2021 - Q1

Table F2 - Field and Laboratory Results for Surface water - October 2021 - Q1

Table F3 - Field and Laboratory Results for Surface water - February 2022 - Q2

Table F4 - Field and Laboratory Results for Groundwater - April 2022 - Q3

Table F5 - Field and Laboratory Results for Surface water - April 2022 - Q3

Table F6 - Field and Laboratory Results for Surface water - July 2022 - Q4

Table F1 - Field and Laboratory Results for Groundwater - October 2021 - Q1

Analyte		Units	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	BH1	BH2	BH3	BH4	BH01-2
						LocCode	MP1	MP2	MP3	MP12	MP14
						Sampled Date	25/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Field	Dissolved Oxygen (Filtered)	mg/L					0.11	1.94	0.86	0.91	4.92
	EC (Field)	uS/cm			1065		186	1500	1940	1780	1440
	pH (Field)	pH_Units			6.5 - 8.0		4.3	5.9	6.1	6.6	5.4
	PID (Top of Well)	ppm					<1	<1	<1	<1	<1
	Temp	°C					21.0	18.1	20.1	20.7	18.6
Ion Balance	Magnesium (Filtered)	mg/L	0.5		10.05		1	18	40	32	18
Miscellaneous Inorganics	Ammonia as N	mg/L	0.005	0.9	0.9		0.350	0.092	0.095	0.130	0.047
	Nitrate (as N)	mg/L	0.005	0.7	0.7		<PQL	<PQL	0.050	0.020	0.008

Notes
Only EPL Trigger Levels exceedances highlighted

Table F2 - Field and Laboratory Results for Surface water - October 2021 - Q1

Analytes		Units	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	S4	S5	S6	S7	L8
						LocCode	MP4	MP5	MP6	MP7	MP8
						Sampled Date	26/10/2021	26/10/2021	26/10/2021	26/10/2021	26/10/2021
Field	Dissolved Oxygen (Filtered)	mg/L			12.057		7.69	7.02	8.59	8.1	7.41
	EC (field)	uS/cm			1065		126	742	389	328	3060
	pH (Field)	pH_Units			6.5 - 8.0		8.7	7.4	7.1	10.8	9.2
	Temp	°C					23.3	17.3	16.6	24.3	22.6
HM in water - dissolved	Iron (Filtered)	mg/L	0.01		1.84		4.5	0.35	1.1	0.01	0.32
	Manganese (Filtered)	mg/L	0.005	1.9	1.9		0.047	0.11	0.21	<PQL	0.41
HM in water - total	Iron	mg/L	0.01		1.84		7.4	2.3	3.5	0.58	2
	Manganese	mg/L	0.005	1.9	1.9		0.071	0.14	0.78	0.036	0.47
Ion Balance	Alkalinity (Carbonate)	mg/L	5				<PQL	<PQL	<PQL	32	65
	Alkalinity (Hydroxide) as CaCO3	mg/L	5				<PQL	<PQL	<PQL	<PQL	<PQL
	Alkalinity (total) as CaCO3	mg/L	5		12.283		22	31	33	83	790
	Alkalinity (Bicarbonate as	mg/L	5				22	31	33	51	720
	Calcium (Filtered)	mg/L	0.5		2.05		2	22	11	33	62
	Chloride	mg/L	1		54.49		24	150	93	100	620
	Ionic Balance	%					-2	-5	-3	-11	-9
	Magnesium (Filtered)	mg/L	0.5		10.05		2	14	8.8	8	31
	Potassium (Filtered)	mg/L	0.5		2.282		3	13	7.8	12	89
	Sodium (Filtered)	mg/L	0.5		34		18	92	65	47	470
	Sulphate	mg/L	1		3.1		2	120	61	58	19
Miscellaneous Inorganics	Ammonia as N	mg/L	0.005	0.9	0.9		<PQL	0.1	0.12	0.017	93
	Fluoride	mg/L	0.1				<PQL	<PQL	<PQL	<PQL	<PQL
	Nitrate (as N)	mg/L	0.005	0.7	0.7		<PQL	0.12	<PQL	0.007	0.45
	TOC	mg/L	1		33.1		44	17	18	18	110
	TSS	mg/L	5		33.415		300	130	290	34	78
Total Phenolics	Phenolics Total	mg/L	0.05	0.32	0.32		<PQL	<PQL	<PQL	<PQL	<PQL

Notes
Only EPL Trigger Level Exceedances highlighted

Table F3 - Field and Laboratory Results for Surface water - February 2022 - Q2

Analytes		Units	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	S4	S5	S6	S7	L8
						LocCode	MP4	MP5	MP6	MP7	MP8
						Sampled Date	1/02/2022	1/02/2022	1/02/2022	1/02/2022	1/02/2022
Field	Dissolved Oxygen (Filtered)	mg/L			12.057		12.68	8.09	8.00	17.07	14.18
	EC (field)	uS/cm			1065		119	138	97	551	2580
	pH (Field)	pH_Units			6.5 - 8.0		7.8	7.1	7.23	7.75	7.74
	Temp	°C					27.22	27.3	29.7	32.3	34.28
HM in water - dissolved	Iron (Filtered)	mg/L	0.01		1.84		0.65	0.78	0.82	0.13	3.2
	Manganese (Filtered)	mg/L	0.005	1.9	1.9		0.011	0.02	0.015	0.006	0.28
HM in water - total	Iron	mg/L	0.01		1.84		0.93	1.4	1.5	1	4.3
	Manganese	mg/L	0.005	1.9	1.9		0.011	0.041	0.029	0.095	0.34
Ion Balance	Alkalinity (Carbonate)	mg/L	5				<PQL	<PQL	<PQL	<PQL	40
	Alkalinity (Hydroxide) as CaCO3	mg/L	5				<PQL	<PQL	<PQL	<PQL	<PQL
	Alkalinity (total) as CaCO3	mg/L	5		12.283		9	11	17	73	510
	Alkalinity (Bicarbonate as	mg/L	5				9	11	17	73	470
	Calcium (Filtered)	mg/L	0.5		2.05		1	2	1	21	41
	Chloride	mg/L	1		54.49		31	34	38	110	550
	Ionic Balance	%					-7	-5	-15	-5	-9
	Magnesium (Filtered)	mg/L	0.5		10.05		2	2	1	6.4	23
	Potassium (Filtered)	mg/L	0.5		2.282		1	2	2	15	69
	Sodium (Filtered)	mg/L	0.5		34		16	19	20	63	370
	Sulphate	mg/L	1		3.1		3	3	3	33	17
Miscellaneous Inorganics	Ammonia as N	mg/L	0.005	0.9	0.9		<PQL	<PQL	<PQL	0.045	46
	Fluoride	mg/L	0.1				<PQL	<PQL	<PQL	<PQL	0.1
	Nitrate (as N)	mg/L	0.005	0.7	0.7		0.11	<PQL	<PQL	0.34	0.29
	TOC	mg/L	1		33.1		17	19	20	14	91
	TSS	mg/L	5		33.415		<PQL	11	15	100	21
Total Phenolics	Phenolics Total	mg/L	0.05	0.32	0.32		<PQL	<PQL	<PQL	<PQL	<PQL

Notes
Only EPL Trigger Level Exceedances highlighted

Table F4 - Field and Laboratory Results for Groundwater - April 2022 - Q3

Analyte		Units	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	BH1	BH2	BH3	BH4	BH01-2
						LocCode	MP1	MP2	MP3	MP12	MP14
						Sampled Date	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Field	Dissolved Oxygen (Filtered)	mg/L					-	10.90	17.01	16.57	18.18
	EC (Field)	uS/cm			1065		-	1610	1481	1930	1550
	pH (Field)	pH_Units			6.5 - 8.0		-	7.1	7.0	7.1	7.0
	PID (Top of Well)	ppm					<1	<1	<1	<1	<1
	Temp	°C					-	20.0	20.5	20.7	19.8
Ion Balance	Magnesium (Filtered)	mg/L	0.5		10.05		-	17	27	31	18
Miscellaneous Inorganics	Ammonia as N	mg/L	0.005	0.9	0.9		-	<PQL	0.130	<PQL	<PQL
	Nitrate (as N)	mg/L	0.005	0.7	0.7		-	0.220	3.600	0.180	0.230

Notes
Only EPL Trigger Levels exceedances highlighted

Table F5 - Field and Laboratory Results for Surface water - April 2022 - Q3

Analytes		Units	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	S4	S5	S6	S7	L8
						LocCode	MP4	MP5	MP6	MP7	MP8
						Sampled Date	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Field	Dissolved Oxygen (Filtered)	mg/L			12.057		13.99	6.1	4	17.72	2.46
	EC (field)	uS/cm			1065		79	834	404	2580	723
	pH (Field)	pH_Units			6.5 - 8.0		8.53	7.6	7.6	8.29	7.73
	Temp	°C					21.7	20.7	20.2	25.3	27.5
HM in water - dissolved	Iron (Filtered)	mg/L	0.01		1.84		1.9	1.3	0.5	1.6	3.7
	Manganese (Filtered)	mg/L	0.005	1.9	1.9		0.005	0.16	<PQL	0.24	0.24
HM in water - total	Iron	mg/L	0.01		1.84		0.8	2.6	1.9	1.6	4.1
	Manganese	mg/L	0.005	1.9	1.9		0.01	0.2	0.6	0.3	0.3
Ion Balance	Alkalinity (Carbonate)	mg/L	5				<PQL	<PQL	<PQL	<PQL	<PQL
	Alkalinity (Hydroxide) as CaCO3	mg/L	5				<PQL	<PQL	<PQL	<PQL	<PQL
	Alkalinity (total) as CaCO3	mg/L	5		12.283		<PQL	73	63	120	630
	Alkalinity (Bicarbonate as	mg/L	5				<PQL	73	63	120	630
	Calcium (Filtered)	mg/L	0.5		2.05		<PQL	14	13	31	29
	Chloride	mg/L	1		54.49		15	74	71	120	410
	Ionic Balance	%					12	-2	0	0	-17
	Magnesium (Filtered)	mg/L	0.5		10.05		0.6	5	5.2	8.9	16
	Potassium (Filtered)	mg/L	0.5		2.282		1	7.9	7.8	13	55
	Sodium (Filtered)	mg/L	0.5		34		12	53	49	85	310
	Sulphate	mg/L	1		3.1		3	9	10	19	28
Miscellaneous Inorganics	Ammonia as N	mg/L	0.005	0.9	0.9		0.012	4.7	4	8.6	110
	Fluoride	mg/L	0.1				<PQL	<PQL	<PQL	<PQL	0.1
	Nitrate (as N)	mg/L	0.005	0.7	0.7		0.02	<PQL	<PQL	<PQL	3.1
	TOC	mg/L	1		33.1		13	20	20	39	93
	TSS	mg/L	5		33.415		12	79	33	990	65
Total Phenolics	Phenolics Total	mg/L	0.05	0.32	0.32		<PQL	<PQL	<PQL	<PQL	-

Notes
Only EPL Trigger Level Exceedances highlighted

Table F6 - Field and Laboratory Results for Surface water - July 2022 - Q4

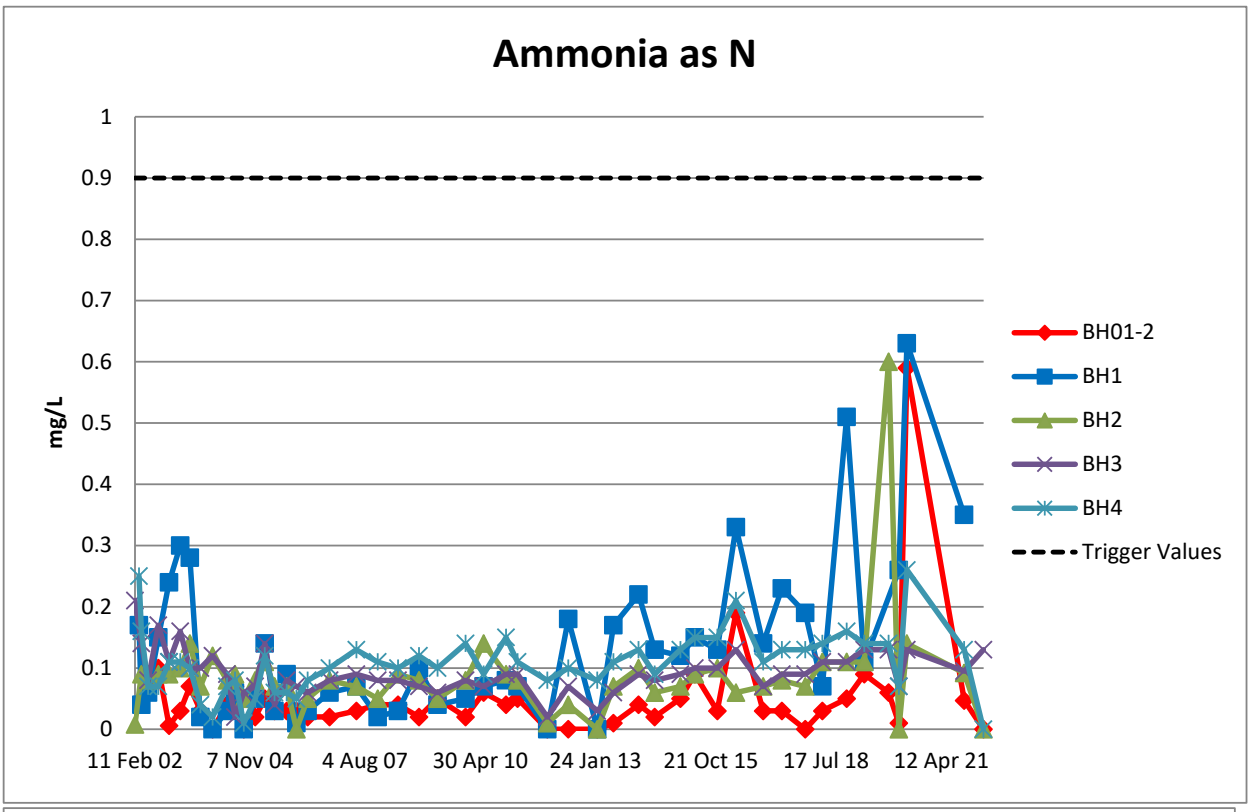
Analytes		Units	Column	Min	Max	PQL	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels Licence 6269	Field_ID	S4	S5	S6	S7	L8	S4A	L8A
									LocCode	MP4	MP5	MP6	MP7	MP8	MP4	MP8
									Sampled Date	7/07/2022	6/07/2022	6/07/2022	7/07/2022	7/07/2022	13/07/2022	13/07/2022
Field	Dissolved Oxygen (Filtered)	mg/L	14		12.057			12.057		14.8	17.5	11.7	17.8	14.7	10.8	18.1
	EC (field)	uS/cm	12		1065			1065		41	319	89	493	1840	73	2780
	pH (Field)	pH_Units	11	6.5	8			6.5 - 8.0		7.8	7.3	8.8	7.7	8.0	6.7	8.9
	Temp	°C	15		1.00E+06					16.1	16.2	16.7	17	15.9	14.1	16.4
HM in water - dissolved	Iron (Filtered)	mg/L	82		1.84	0.01		1.84		1.4	0.33	1.4	0.52	5.6	2.6	8.7
	Manganese (Filtered)	mg/L	83		1.9	0.005	1.9	1.9		0.007	0.04	<PQL	<PQL	0.25	0.017	0.3
HM in water - total	Iron	mg/L	86		1.84	0.01		1.84		1.4	5.1	3.4	3.5	7.2	4.1	11
	Manganese	mg/L	87		1.9	0.005	1.9	1.9		0.01	0.072	0.015	0.12	0.27	0.023	0.39
Ion Balance	Alkalinity (Carbonate)	mg/L	75		1.00E+06	5				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	34
	Alkalinity (Hydroxide) as CaCO3	mg/L	73		1.00E+06	5				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
	Alkalinity (total) as CaCO3	mg/L	76		12.283	5		12.283		<PQL	42	<PQL	90	460	5	640
	Alkalinity (Bicarbonate as	mg/L	74		1.00E+06	5				<PQL	42	<PQL	90	460	5	610
	Calcium (Filtered)	mg/L	69		2.05	0.5		2.05		<PQL	12	2	26	22	1	33
	Chloride	mg/L	78		54.49	1		54.49		5	43	12	59	280	15	450
	Ionic Balance	%	79	-1.00E+06	1.00E+06					25	-8	22	-9	-21	0	-21
	Magnesium (Filtered)	mg/L	72		10.05	0.5		10.05		0.8	3	0.7	5.3	11	1.0	17
	Potassium (Filtered)	mg/L	70		2.282	0.5		2.282		0.9	6.9	5.4	13	36	2.0	77
	Sodium (Filtered)	mg/L	71		34	0.5		34		5.2	23	7.7	33	190	11	270
	Sulphate	mg/L	77		3.1	1		3.1		2	20	3	33	12	6	19
Miscellaneous Inorganics	Ammonia as N	mg/L	62		0.9	0.005	0.9	0.9		0.007	2.5	0.14	8.6	76	0.023	110
	Fluoride	mg/L	64		1.00E+06	0.1				<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.1
	Nitrate (as N)	mg/L	63		0.7	0.005	0.7	0.7		0.19	0.21	0.35	0.02	2.9	0.02	2.7
	TOC	mg/L	65		33.1	1		33.1		16	25	21	62	67	12	83
	TSS	mg/L	66		33.415	5		33.415		22	510	760	400	330	94	160
Total Phenolics	Phenolics Total	mg/L	59		0.32	0.05	0.32	0.32		<PQL	<PQL	<PQL	0.08	<PQL	<PQL	<PQL

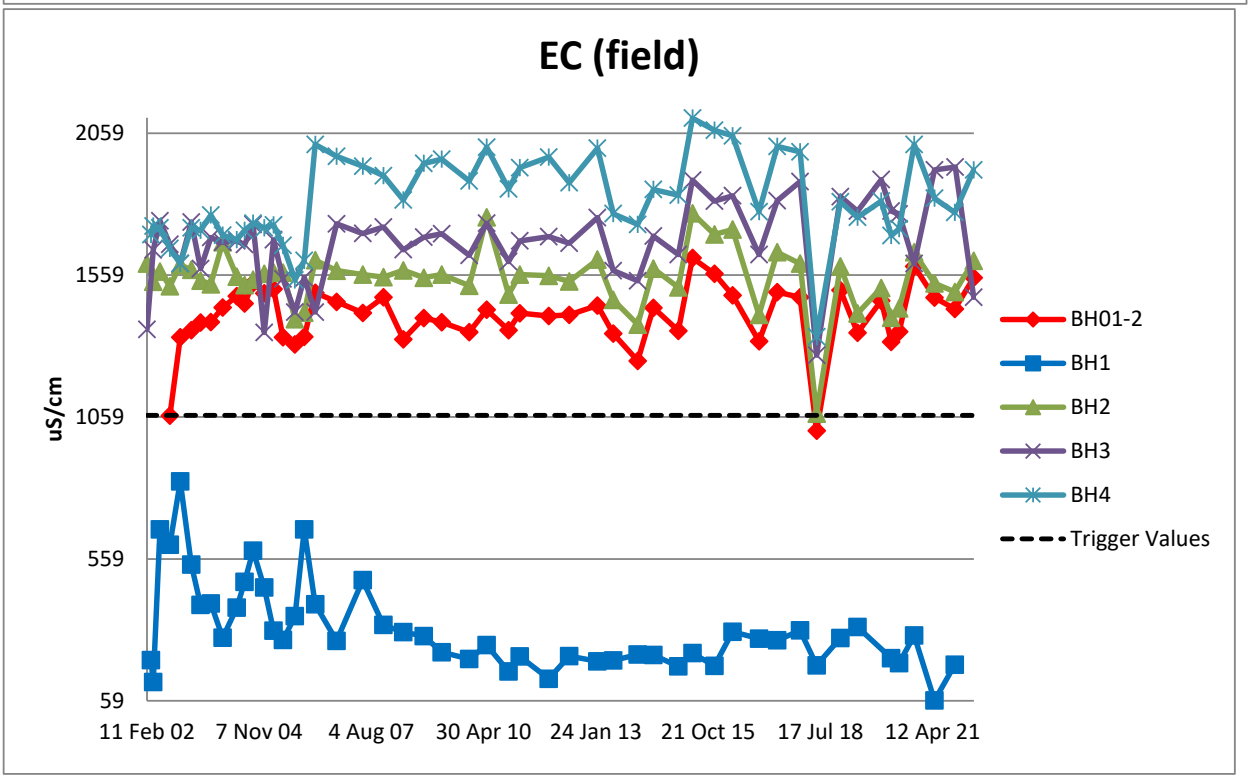
Notes
Only EPL Trigger Level Exceedances highlighted

Appendix G

Graphed Historical Data:

Figure G1 – Groundwater Chemistry (Ammonia and EC) vs Time
Figure G2 – Groundwater Chemistry (Magnesium and Nitrate) vs Time
Figure G3 – Groundwater Chemistry (pH) vs Time
Figure G4 – Surface Water Chemistry (Chloride and EC) vs Time
Figure G5 – Surface Water Chemistry (Iron and Magnesium) vs Time
Figure G6 – Surface Water Chemistry (Manganese and Nitrate) vs Time
Figure G7 – Surface Water Chemistry (pH and Potassium) vs Time
Figure G8 – Surface Water Chemistry (Sodium and Sulfate) vs Time
Figure G9 – Surface Water Chemistry (TSS and TOC) vs Time





Groundwater Ammonia Vs Time (Feb 2002 - April 2022)	**Figure G1**
Groundwater EC Vs Time (Feb 2002 - April 2022)	
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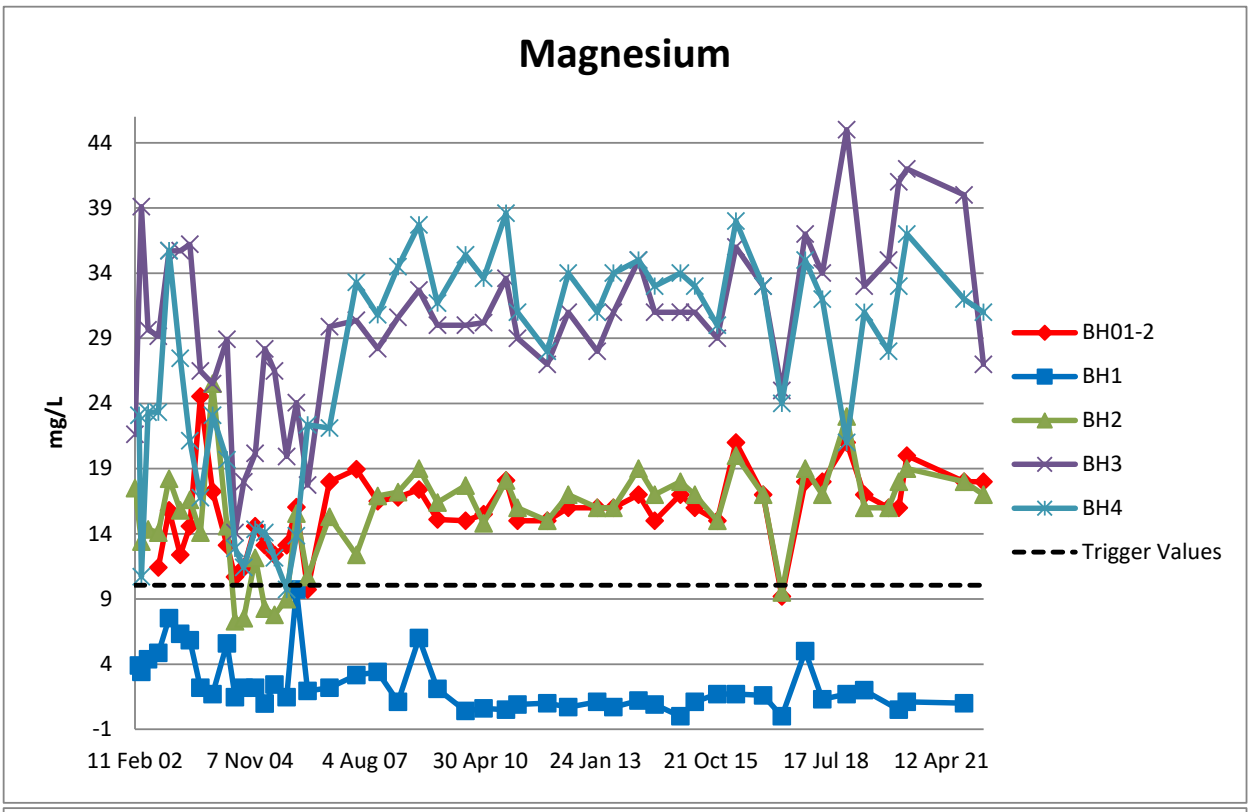
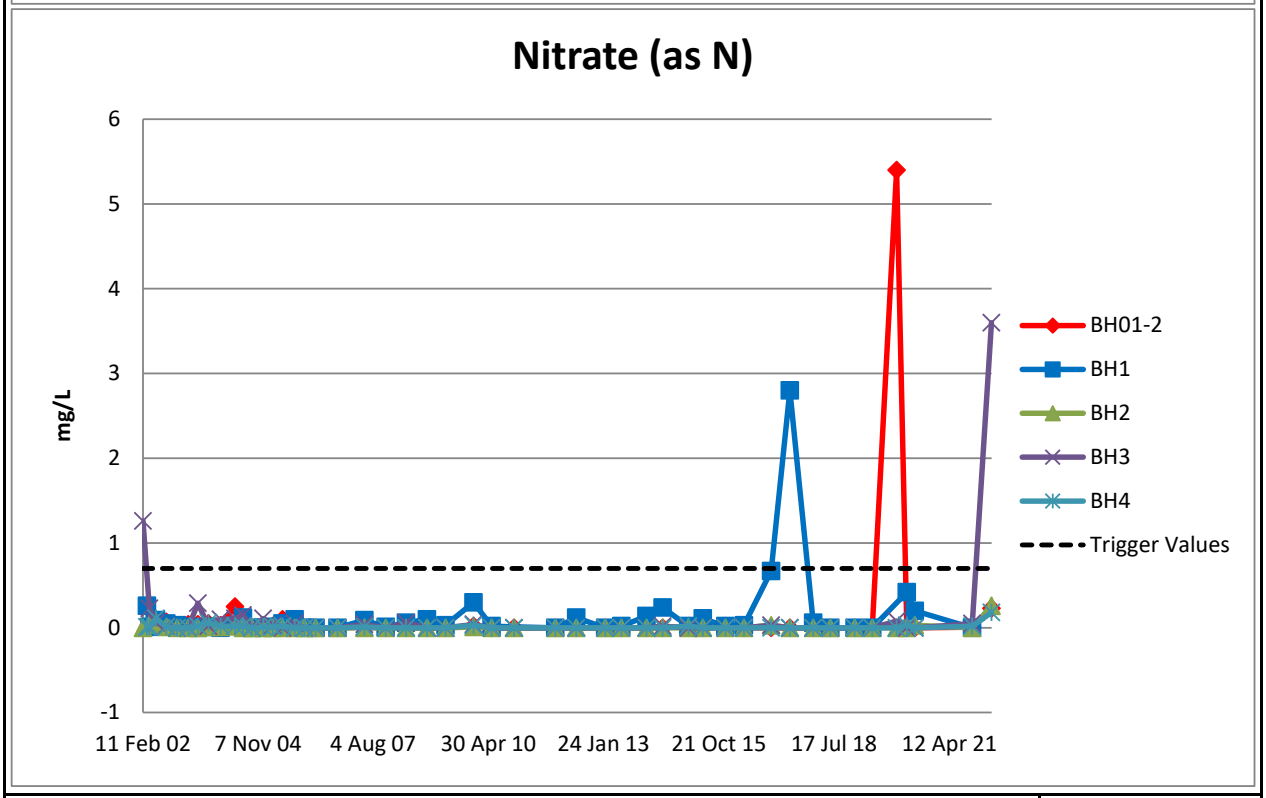
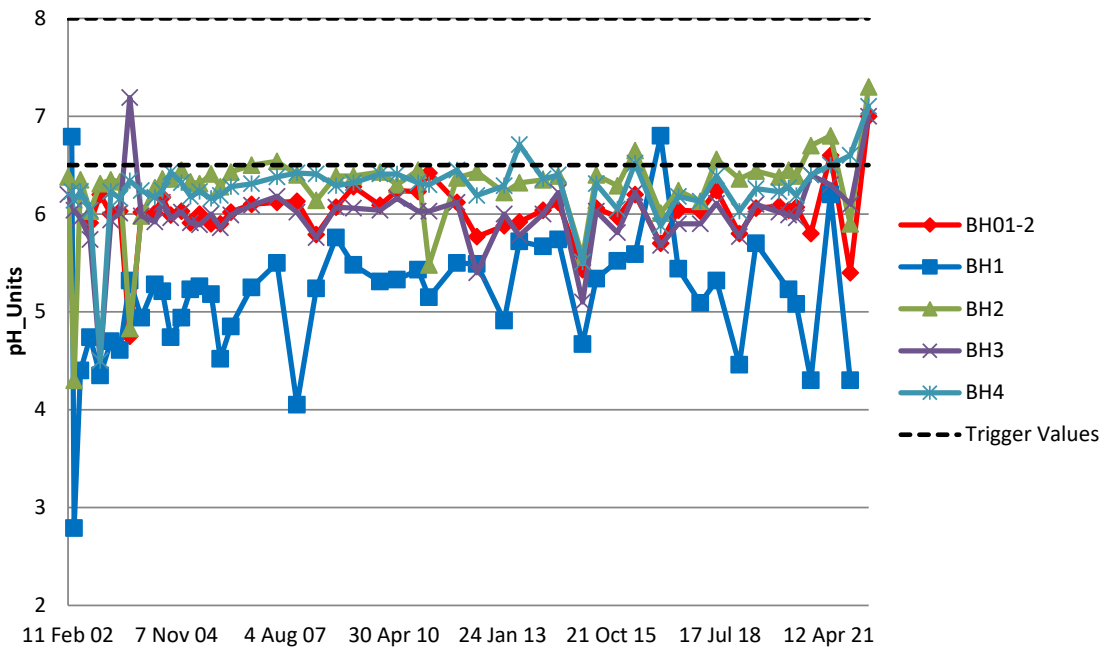




Groundwater Magnesium Vs Time (Feb 2002 - April 2022)	**Figure G2**
Groundwater Nitrate (as N) Vs Time (Feb 2002 - April 2022)	
Project No: 89781.00 **Kempsey Landfill**	**Douglas Partners** *Geotechnics / Environment / Groundwater*



Groundwater pH Vs Time (Feb 2002 - April 2022)

Figure G3

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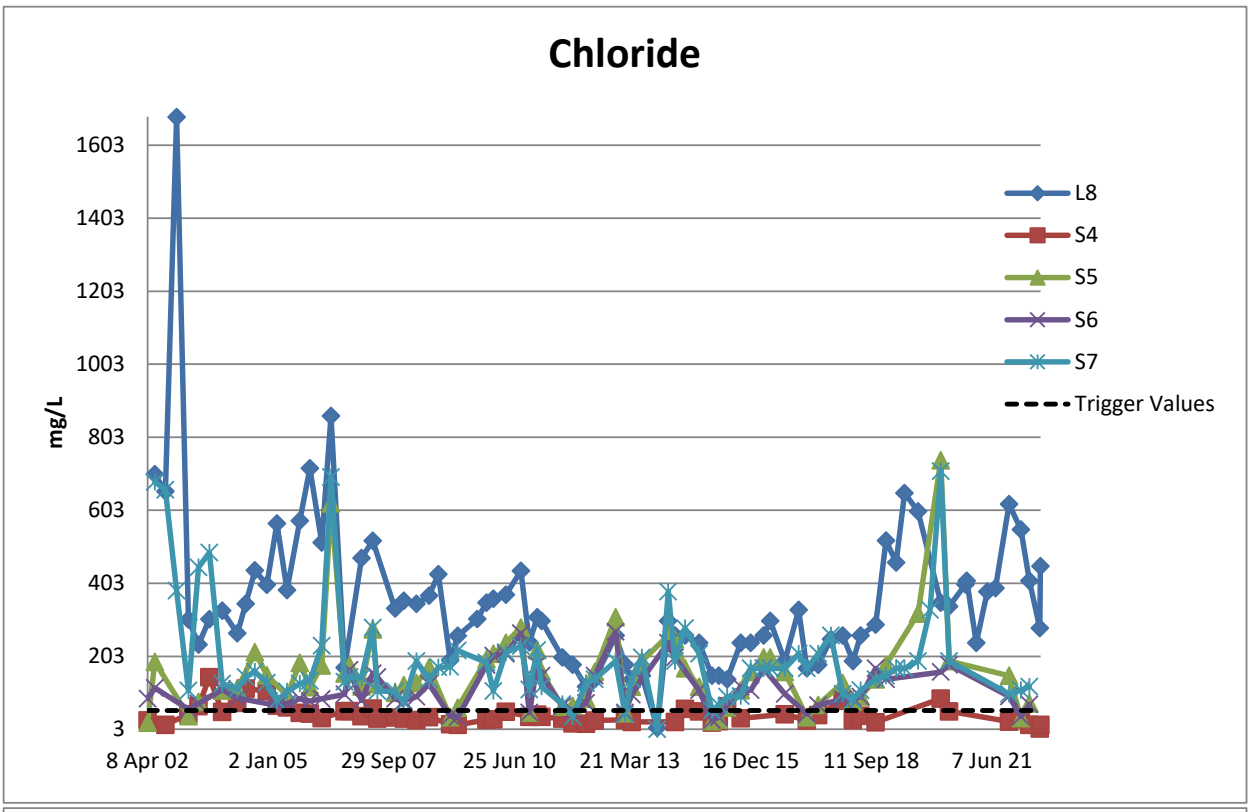

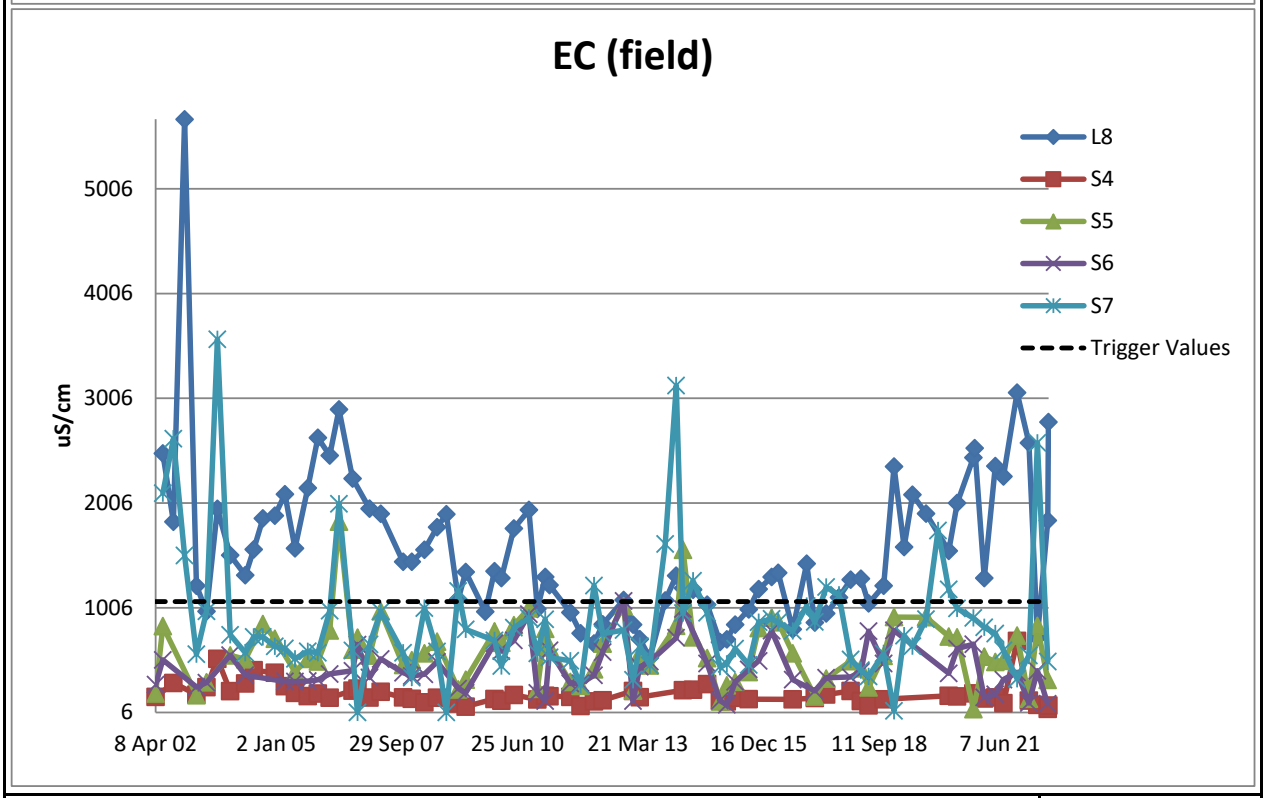

Surface Water Chloride Vs Time (Feb 2002 - July 2022)	**Figure G4**
Surface Water EC Vs Time (Feb 2002 - July 2022)	
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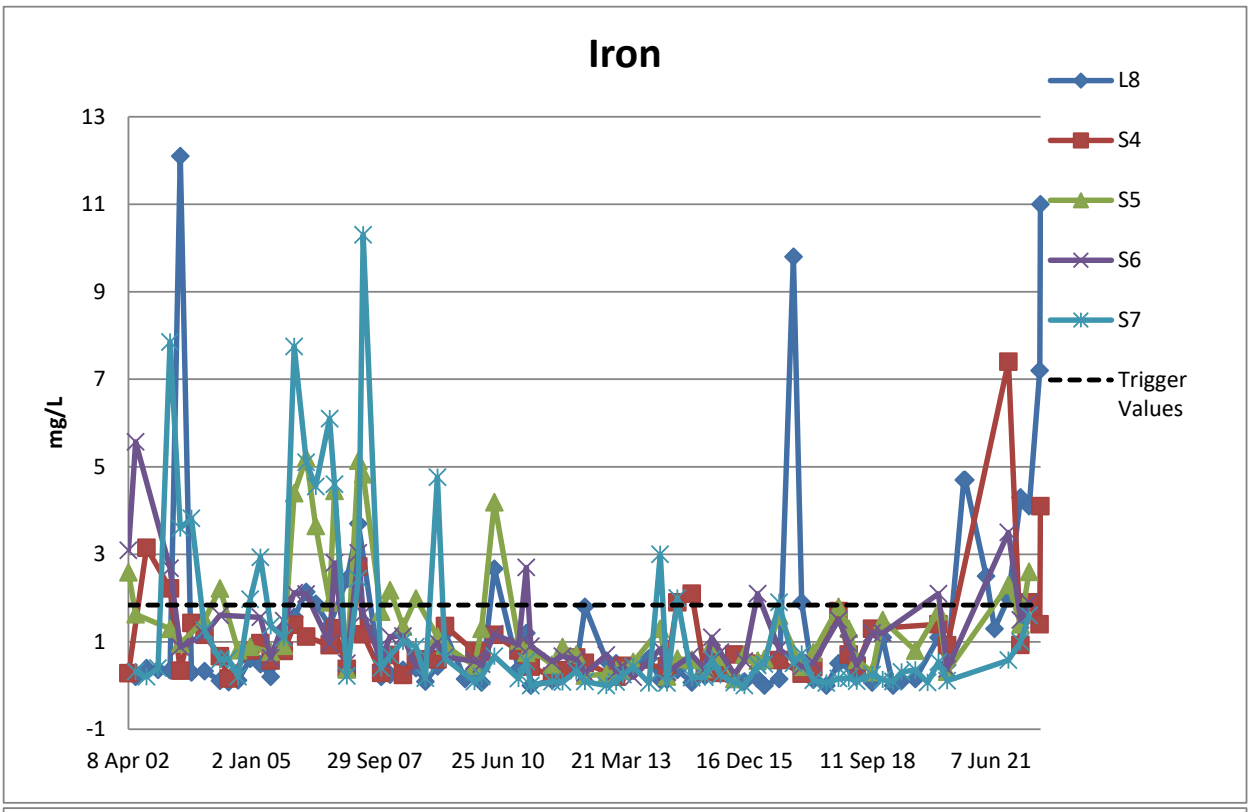
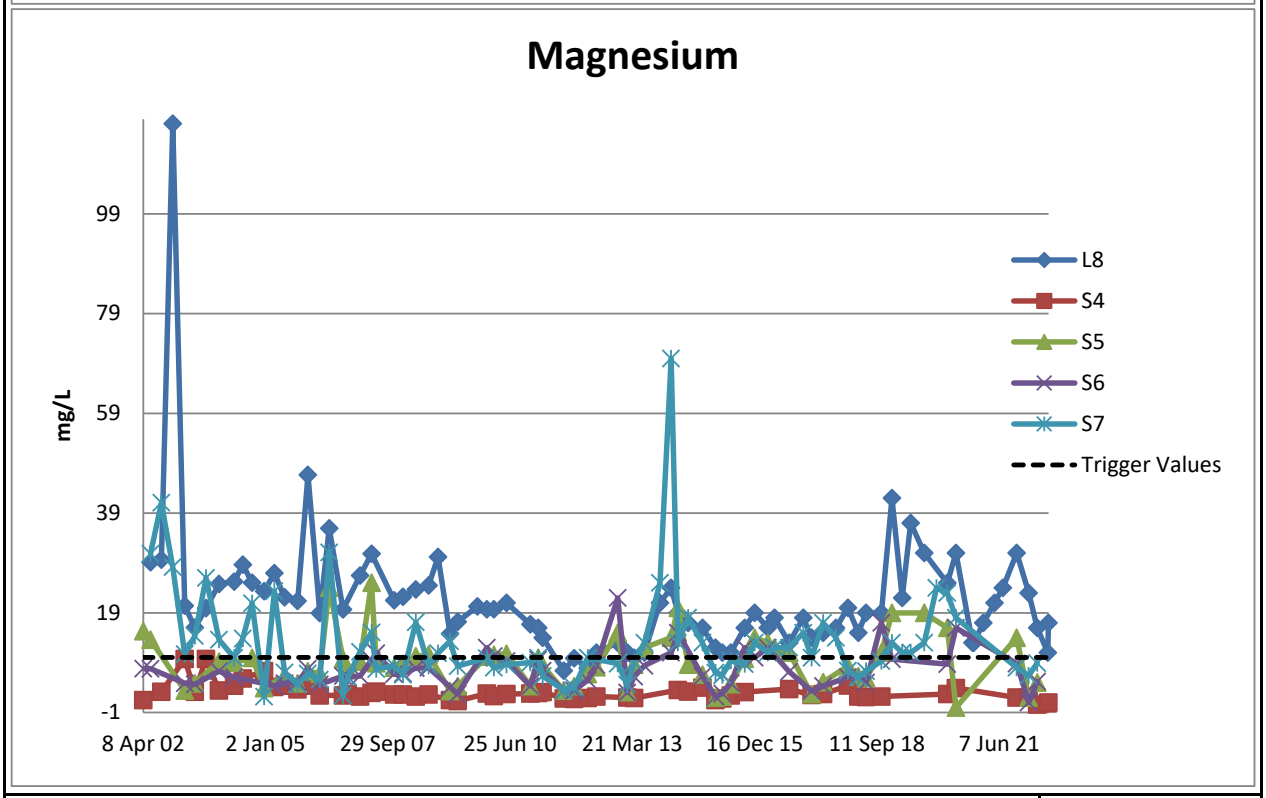
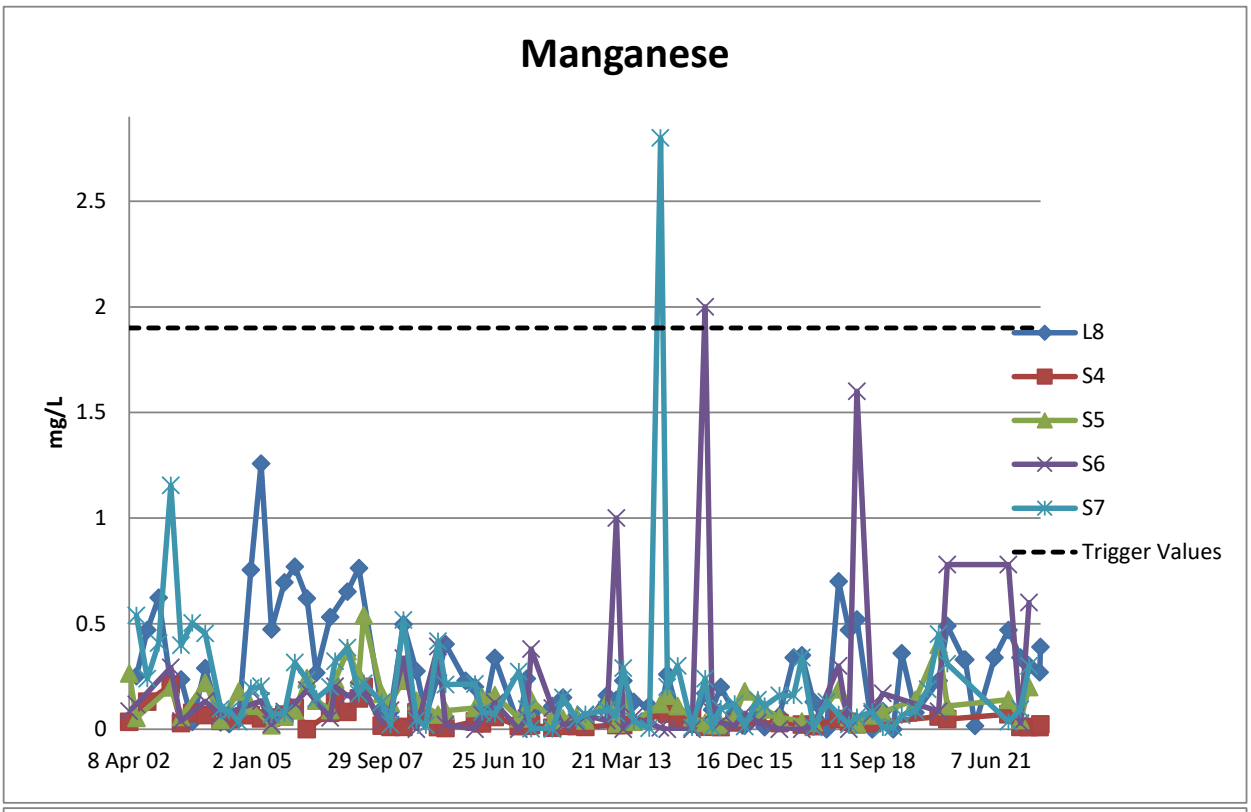
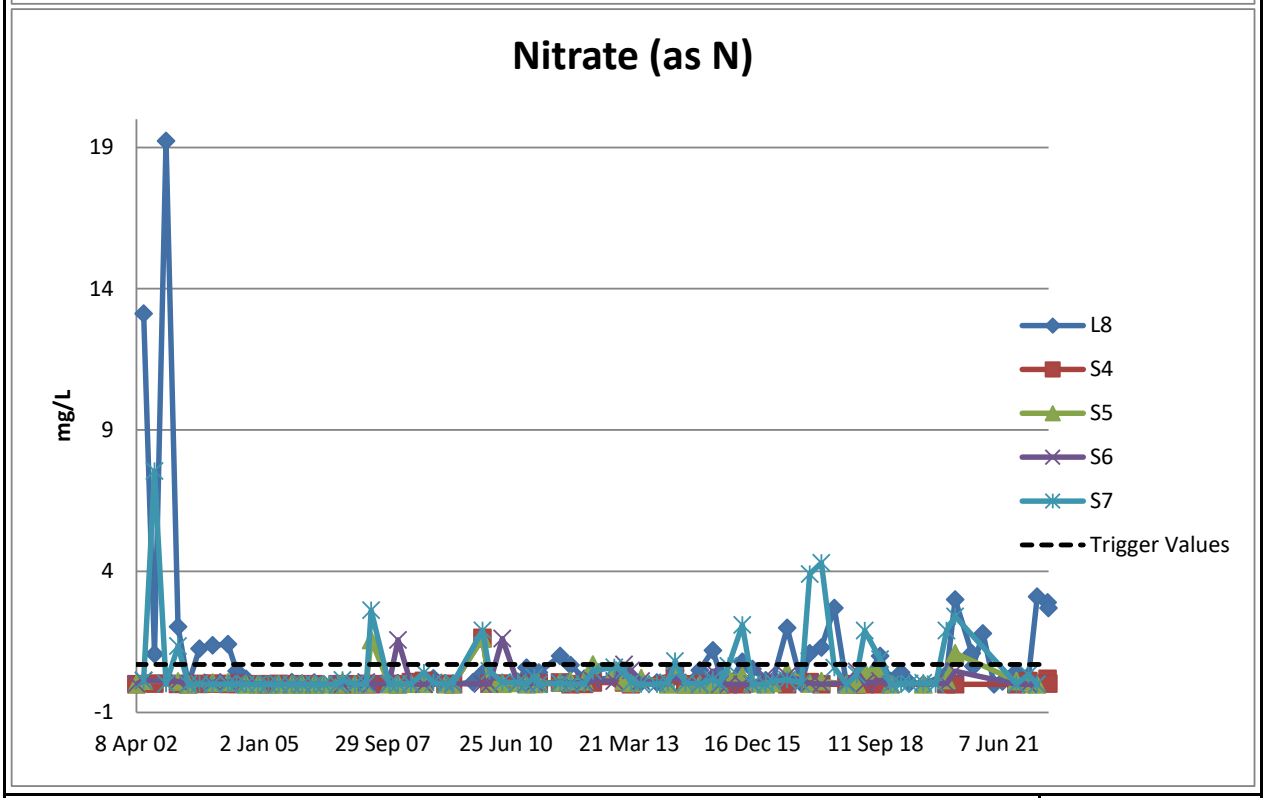




Surface Water Iron Vs Time (Feb 2002 - July 2022)	**Figure G5**
Surface Water Magnesium Vs Time (Feb 2002 - July 2022)	
Project No: 89781.00 **Kempsey Landfill**	Douglas Partners Geotechnics / Environment / Groundwater





Surface Water Manganese Vs Time (Feb 2002 - July 2022)	**Figure G6**
Surface Water Nitrate (as N) Vs Time (Feb 2002 - July 2022)	
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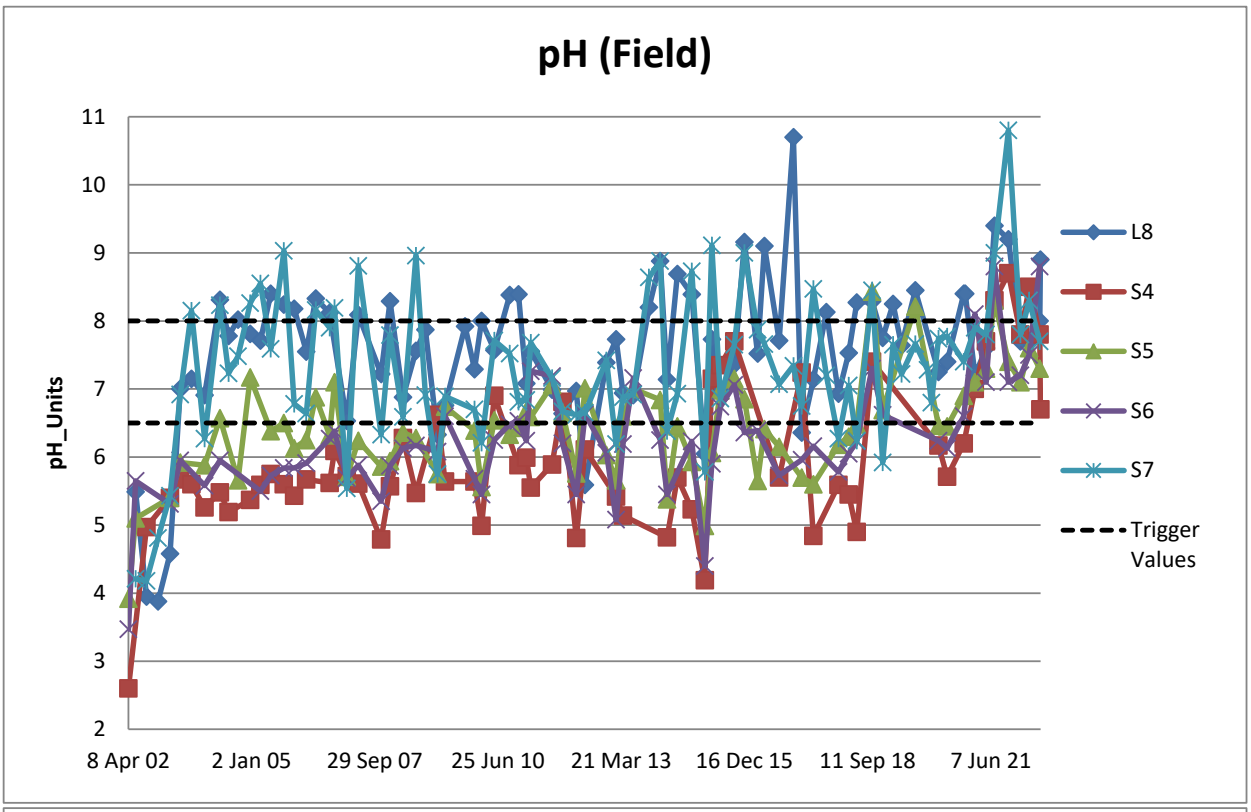
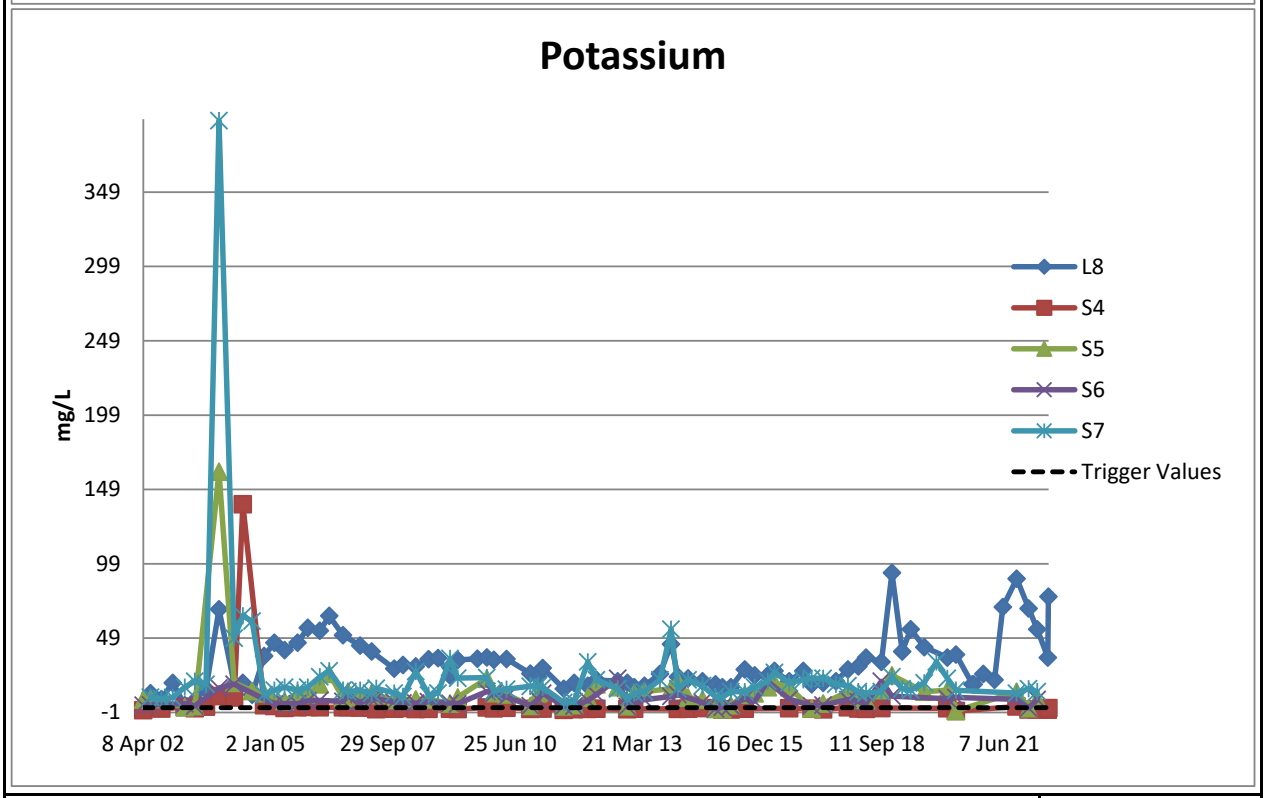
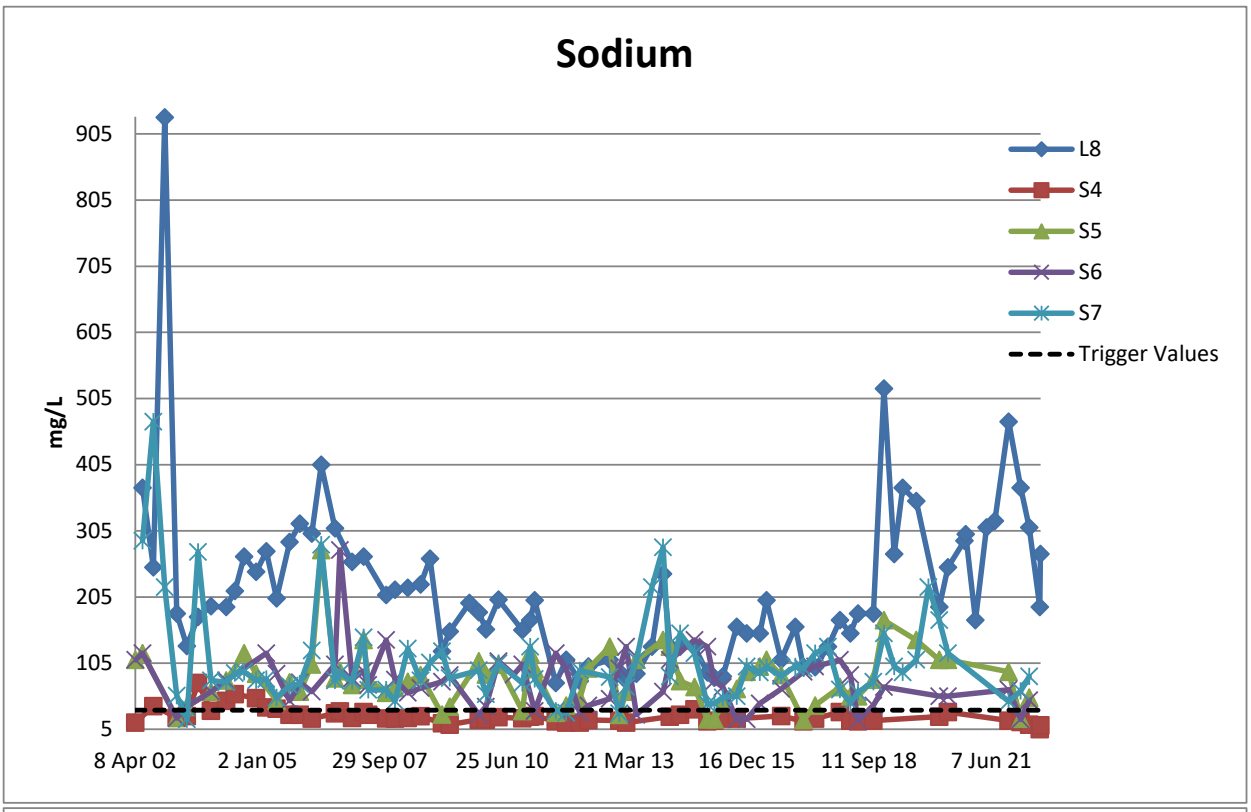
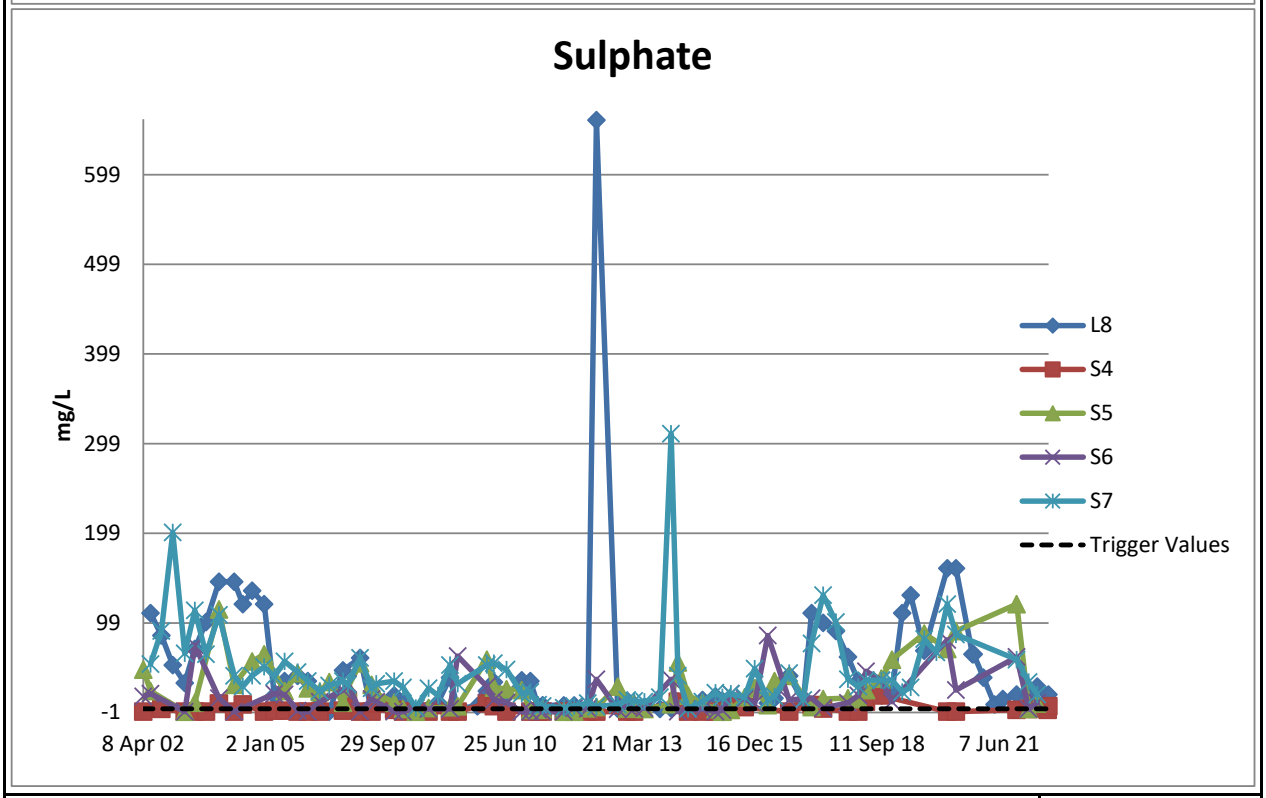


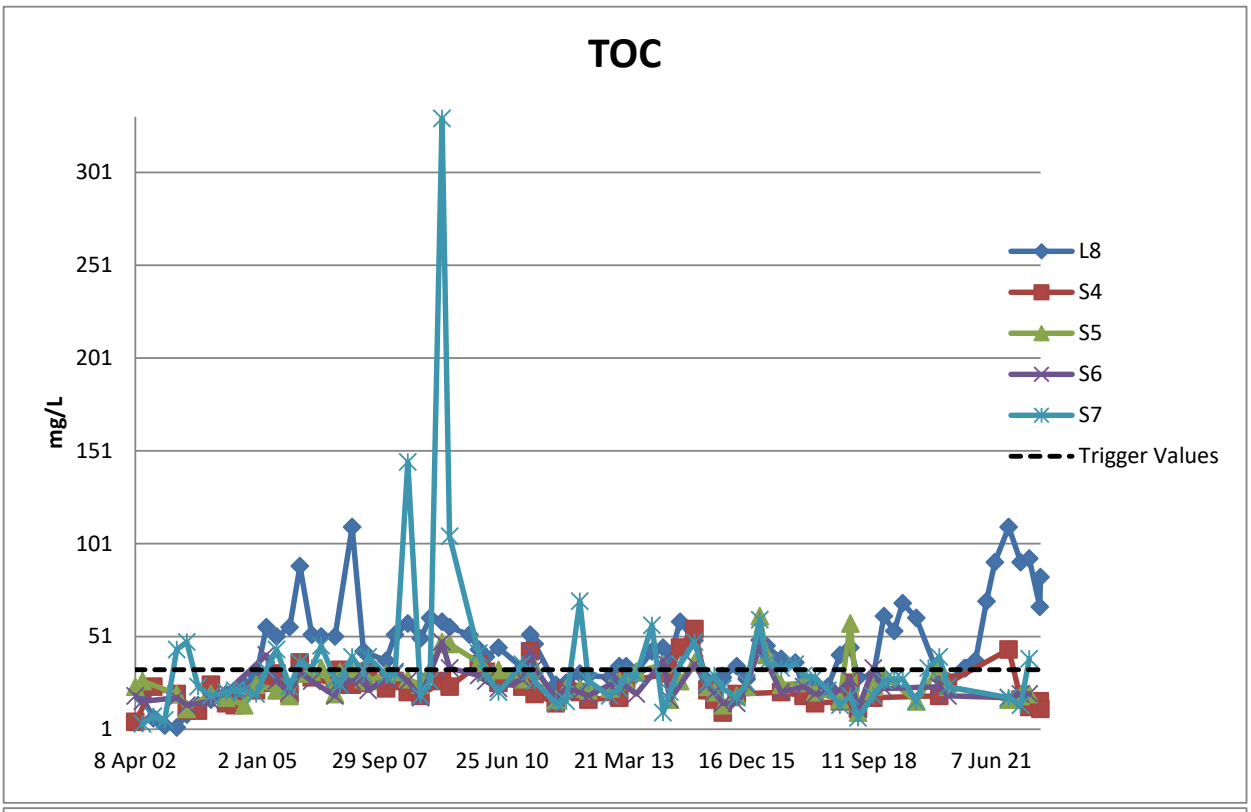


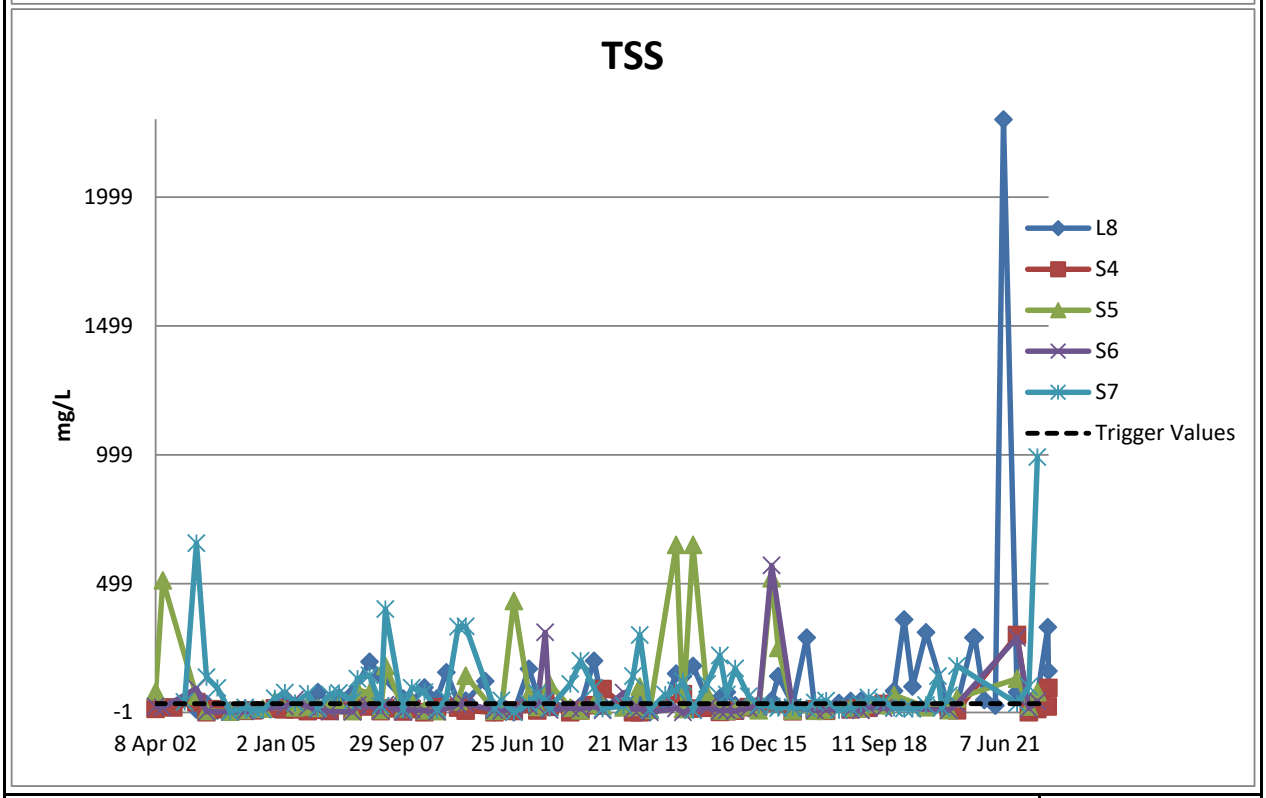
Surface Water pH Vs Time (Feb 2002 - July 2022)	**Figure G7**
Surface Water Potassium Vs Time (Feb 2002 - July 2022)	
Project No: 89781.00 **Kempsey Landfill**	Douglas Partners Geotechnics / Environment / Groundwater





Surface Water Sodium Vs Time (Feb 2002 - July 2022)	**Figure G8**
Surface Water Sulfate Vs Time (Feb 2002 - July 2022)	
Project No: 89781.00 **Kempsey Landfill**	Douglas Partners Geotechnics / Environment / Groundwater





Surface Water TOC Vs Time (Feb 2002 - July 2022) Surface Water TSS Vs Time (Feb 2002 - July 2022)	**Figure G9**
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Appendix H

Tabulated Annual Return Data

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Table H1: Annual Return Reporting Values for Monitoring Point 1 (BH1) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	1	0.350	0.350	0.350	Within historical data and below trigger level
Conductivity	µS/cm	1	186	186	186	Within historical data and below trigger level
Magnesium	mg/l	1	1.0	1.0	1.0	Within historical data and below trigger level
Nitrate	mg/l	1	0.005	0.005	0.005	Within historical data and below trigger level
pH	pH	1	4.3	4.3	4.3	Fluctuating as per historical data
Standing Water Level	AHD	3	29.345	31.978	37.015	Water level has increased and is within historical data
Temperature	°C	1	21.00	21.00	21.00	Consistent with historical data

Table H2: Annual Return Reporting Values for Monitoring Point 2 (BH2) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	2	0.005	0.049	0.092	Decreased and are within histoical data and trigger levels
Conductivity	µS/cm	2	1500	1555	1610	Consistent with hisortical data and exceed trigger levels
Magnesium	mg/l	2	17.0	17.5	18.0	Consistent with hisortical data and exceed trigger levels
Nitrate	mg/l	2	0.005	0.113	0.220	Slightly increased, witihn historical data and below trigger levels
pH	pH	2	5.9	6.5	7.1	Slightly increased, within trigger levels
Standing Water Level	AHD	3	23.766	24.183	24.566	Slighty increased and within historical data
Temperature	°C	2	18.10	19.05	20.00	Consistent with historical data

Table H3: Annual Return Reporting Values for Monitoring Point 3 (BH3) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	2	0.095	0.113	0.130	Within historical data and below trigger level
Conductivity	µS/cm	2	1481	1710.5	1940	Slightly decreased, below historical data and within trigger levels
Magnesium	mg/l	2	27.0	33.5	40.0	Within historical data and above trigger level
Nitrate	mg/l	2	0.05	1.825	3.600	Elevated (possibe spurious), exceed trigger level
pH	pH	2	6.1	6.6	7.0	Slightly increased, within trigger levels
Standing Water Level	AHD	3	23.359	23.906	24.459	Slightly increased, within historical data
Temperature	°C	2	20.10	20.32	20.54	Consistent with historical data

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Table H4: Annual Return Reporting Values for Monitoring Point 4 (S4) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	5	5.0	9.2	22.0	Average slightly exceeding trigger level
Ammonia	mg/l	5	0.005	0.010	0.023	Within historical data and below trigger level
Calcium	mg/l	5	0.5	1.0	2.0	Within historical data and below trigger level
Chloride	mg/l	5	5	18	31	Within historical data and below trigger level
Conductivity	µS/cm	5	41	88	126	Within historical data and below trigger level
Dissolved Oxygen	mg/l	5	7.69	11.99	14.80	Slightly increasing, average above trigger level
Fluoride	mg/l	5	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	5	0.65	2.21	4.50	Elevated result for Q1, within historical data
Magnesium	mg/l	5	0.6	1.3	2.0	Within historical data and below trigger level
Manganese (Filtered)	mg/l	5	0.005	0.017	0.047	Within historical data and below trigger level
Nitrate	mg/l	5	0.005	0.069	0.190	Within historical data and below trigger level
pH	pH	5	6.7	7.9	8.7	Slightly increasing, average above trigger level
Potassium	mg/l	5	0.9	1.6	3.0	Within historical data and below trigger level
Sodium	mg/l	5	5.2	12.4	18.0	Within historical data and below trigger level
Sulfate	mg/l	5	2	3.2	6	Within historical data and below trigger level
Temperature	°C	5	14.10	20.48	27.22	Consistent with historical data
Total Organic Carbon	mg/l	5	12	20	44	Within historical data and average below trigger level
Total Phenolics	mg/l	5	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	5	5	87	300	Elevated result for Q1, within historical data for Q3 and Q4

Table H5: Annual Return Reporting Values for Monitoring Point 5 (S5) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	4	11.0	39.3	73.0	Average exceeding trigger level
Ammonia	mg/l	4	0.005	1.826	4.700	Within historical data, Q3 and Q4 exceed trigger level
Calcium	mg/l	4	2.0	12.5	22.0	Within historical data, Q1, Q3 and Q4 exceeds trigger level
Chloride	mg/l	4	34	75	150	Within historical data, Q1 and Q3 exceeds trigger level
Conductivity	µS/cm	4	138	508	834	Within historical data and below trigger level
Dissolved Oxygen	mg/l	4	4.00	8.54	17.50	Within historical data, Q4 exceeds trigger level
Fluoride	mg/l	4	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	4	0.33	0.69	1.30	Within historical data and below trigger level
Magnesium	mg/l	4	2.0	6.0	14.0	Within historical data, Q1 exceeds trigger level
Manganese (Filtered)	mg/l	4	0.020	0.083	0.160	Within historical data and below trigger level
Nitrate	mg/l	4	0.005	0.085	0.210	Within historical data and below trigger level
pH	pH	4	7.1	7.4	7.6	Within historical data
Potassium	mg/l	4	2.0	7.5	13.0	Within historical data, Q1, Q3 and Q4 exceeds trigger level
Sodium	mg/l	4	19.0	46.8	92.0	Within historical data, Q1 and Q3 exceeds trigger level
Sulfate	mg/l	4	3	38	120	Average exceeding trigger level
Temperature	°C	4	16.20	20.38	27.30	Consistent with historical data
Total Organic Carbon	mg/l	4	17	20	25	Within historical data and below trigger level
Total Phenolics	mg/l	4	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	4	11	183	510	Within historical data, Q1, Q3 and Q4 exceeds trigger level

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Table H6: Annual Return Reporting Values for Monitoring Point 6 (S6) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	4	5.0	29.5	63.0	Within historical data, Q1, Q2 and Q3 exceed trigger level
Ammonia	mg/l	4	0.005	1.066	4.000	Within historical data, Q3 exceeds trigger level
Calcium	mg/l	4	1.0	6.8	13.0	Within historical data, Q1 and Q3 exceeds trigger level
Cholride	mg/l	4	12	53.5	93	Within historical data, Q1 and Q3 exceeds trigger level
Conductivity	µS/cm	4	89	245	404	Within historical data and below trigger level
Dissolved Oxygen	mg/l	4	4.00	7.26	11.70	Within historical data and below trigger level
Fluoride	mg/l	4	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	4	0.50	0.96	1.40	Within historical data
Magnesium	mg/l	4	0.7	3.9	8.8	Within historical data and below trigger level
Manganese (Filtered)	mg/l	4	0.005	0.059	0.210	Within historical data and below trigger level
Nitrate	mg/l	4	0.005	0.091	0.350	Within historical data and below trigger level
pH	pH	4	7.1	7.7	8.8	Within historical data, Q4 exceeds trigger level
Potassium	mg/l	4	2.0	5.8	7.8	Within historical data, Q1, Q3 and Q4 exceeds trigger level
Sodium	mg/l	4	7.7	35.4	65.0	Within historical data, Q1 and Q3 exceeds trigger level
Sulfate	mg/l	4	3	19	61	Within historical data, Q1 and Q3 exceeds trigger level
Temperature	°C	4	16.60	20.80	29.70	Consistent with historical data
Total Organic Carbon	mg/l	4	18	20	21	Within historical data and below trigger level
Total Phenolics	mg/l	4	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	4	15	275	760	Within historical data, Q1 and Q4 exceeds trigger level

Table H7: Annual Return Reporting Values for Monitoring Point 7 (S7) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	4	73.0	91.5	120.0	Within historical data and exceeds trigger level
Ammonia	mg/l	4	0.017	4.316	8.600	Within historical data, Q3 and Q4 exceeds trigger level
Calcium	mg/l	4	21.0	27.8	33.0	Within historical data and exceeds trigger level
Chloride	mg/l	4	59	97	120	Within historical data and exceeds trigger level
Conductivity	µS/cm	4	328	988	2580	Within historical data, Q3 elevated and exceeds trigger level
Dissolved Oxygen	mg/l	4	4.00	12.94	17.80	Within historical data, Q2, Q3 and Q4 exceeds trigger level
Fluoride	mg/l	4	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	4	0.01	0.57	1.60	Within historical data and within trigger level
Magnesium	mg/l	4	5.3	7.2	8.9	Within historical data
Manganese (Filtered)	mg/l	4	0.005	0.064	0.240	Within historical data and below trigger level
Nitrate	mg/l	4	0.005	0.093	0.340	Within historical data
pH	pH	4	7.7	8.6	10.8	Within historical data, Q1 and Q3 exceeds trigger level
Potassium	mg/l	4	12.0	13.3	15.0	Within historical data and exceeds trigger level
Sodium	mg/l	4	33.0	57.0	85.0	Within historical data and exceeds trigger level
Sulfate	mg/l	4	19	36	58	Within historical data and exceeds trigger level
Temperature	°C	4	17.00	24.73	32.30	Consistent with historical data
Total Organic Carbon	mg/l	4	14	33	62	Within historical data, Q3 and Q4 exceeds trigger level
Total Phenolics	mg/l	4	0.05	0.06	0.08	Within historical data and below trigger level
Total Suspended Solids	mg/l	4	34	381	990	Q1 and Q2 within historical data, exceeds trigger level and Q3 and Q4 elevated

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Table H8: Annual Return Reporting Values for Monitoring Point 8 (L8) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Alkalinity (As Calcium Carbonate)	mg/l	5	460.0	606.0	790.0	Within historical data and exceeds trigger level
Ammonia	mg/l	5	46.000	87.000	110.000	Within historical data and exceeds trigger level
Calcium	mg/l	5	22.0	37.4	62.0	Within historical data and exceeds trigger level
Chloride	mg/l	5	280	462	620	Within historical data and exceeds trigger level
Conductivity	µS/cm	5	723	2197	3060	Within historical data, Q1, Q2 and Q4 exceeds trigger level
Dissolved Oxygen	mg/l	5	2.46	11.37	18.10	Within historical data, Q2 and Q4 exceeds trigger level
Fluoride	mg/l	5	0.1	0.1	0.1	Within historical data and below trigger level
Iron (Filtered)	mg/l	5	0.32	4.30	8.70	Within historical data, Q2, Q3 and Q4 exceeds trigger level
Magnesium	mg/l	5	11.0	19.6	31.0	Within historical data and exceeds trigger level
Manganese (Filtered)	mg/l	5	0.240	0.296	0.410	Within historical data and below trigger level
Nitrate	mg/l	5	0.290	1.888	3.100	Within historical data and Q3 and Q4 exceeds trigger level
pH	pH	5	7.7	8.3	9.2	Within historical data, Q1 and Q4 exceeds trigger level
Potassium	mg/l	5	36.0	65.2	89.0	Within historical data and exceeds trigger level
Sodium	mg/l	5	190.0	322.0	470.0	Within historical data and exceeds trigger level
Sulfate	mg/l	5	12	19	28	Within historical data and exceeds trigger level
Temperature	°C	5	15.90	23.34	34.28	Consistent with historical data
Total Organic Carbon	mg/l	5	67	89	110	Within historical data and exceeds trigger level
Total Phenolics	mg/l	4	0.05	0.05	0.05	Within historical data and below trigger level
Total Suspended Solids	mg/l	5	21	131	330	Within historical data, Q1, Q3 and Q4 exceeds trigger level

Table H9: Annual Return Reporting Values for Monitoring Point 9 (Methane Buildings) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	100	0.000001	0.000003	0.000017	No exceedances recorded

Table H10: Annual Return Reporting Values for Monitoring Point 10 (Methane Surface) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	462	0.000001	0.000061	0.010099	Total of 5 localised exceedances (1 in Q1, 1 in Q3 and 3 in Q4)

Table H11: Annual Return Reporting Values for Monitoring Point 11 (Methane in Groundwater Bores) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Methane	%	10	0.000000	0.000000	0.000000	No exceedances recorded

Table H12: Annual Return Reporting Values for Monitoring Point 12 (BH4) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	2	0.005	0.068	0.130	Slightly decreased, within historical data and below trigger level
Conductivity	µS/cm	2	1780	1855	1930	Slightly increased, within historical data and exceed trigger level
Magnesium	mg/l	2	31.0	31.5	32.0	Slightly decreased, within historical data and exceed trigger level
Nitrate	mg/l	2	0.02	0.10	0.18	Slightly increased, within historical data and below trigger level
pH	pH	2	6.6	6.9	7.1	Slightly increased, below tigger level
Standing Water Level	AHD	3	23.328	23.735	23.938	Slightly increased, within historical data
Temperature	°C	2	20.68	20.69	20.70	Consistent with historical data

Table H13: Annual Return Reporting Values for Monitoring Point 14 (BH01-2) (2021 to 2022)

Analyte	Units	Annual Return Reporting Values				Comments
		Qty	Lowest Sample Value	Mean of Sample	Highest Sample Value	
Ammonia	mg/l	2	0.005	0.026	0.047	Slightly decreased, within historical data and below trigger level
Conductivity	µS/cm	2	1440	1495	1550	Slightly increased, within historical data and exceed trigger level
Magnesium	mg/l	2	18.0	18.0	18.0	Slightly decreased, within historical data and exceed trigger level
Nitrate	mg/l	2	0.01	0.12	0.23	Slightly increased, within historical data and below trigger level
pH	pH	2	5.4	6.2	7.0	Slightly increased, below tigger level
Standing Water Level	AHD	3	24.017	24.490	24.797	Slightly increased, within historical data
Temperature	°C	2	18.60	19.20	19.80	Consistent with historical data