



QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) DECEMBER 2022

DUNMORE RECYCLING & WASTE DEPOT
44 BUCKLEYS ROAD,
DUNMORE, NSW, 2529

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

Prepared For: **Shellharbour City Council**

Project Number: **ENRS0033**

Date: **December 2022**



ENVIRONMENT & NATURAL RESOURCE SOLUTIONS
108 Jerry Bailey Road, Shoalhaven Heads, NSW
T 02 4448 5490 E: projects@enrs.com.au
ABN 68 600 154 596 WWW.ENRS.COM.AU

COMMERCIAL IN CONFIDENCE

This document has been prepared consistent with accepted scientific practice, supported by available data and resource conditions, as determined by limited data acquisition during the assessment period, evident at the site at the time. The designated recipients of this report accept all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using the results of the interpretation, the data, and any information or conclusions drawn from it, whether or not caused by any negligent act or omission. To the maximum permitted by law, *ENRS Pty Ltd* excludes all liability to any person or identity, arising directly or indirectly from using the information or material contained herein.

INTELLECTUAL PROPERTY LAWS PROTECT THIS DOCUMENT


Copyright in the material provided in this document is owned by *ENRS Pty Ltd*, and third parties may only use the information in the ways described in this legal notice:

- Temporary copies may be generated, necessary to review the data.
- A single copy may be copied for research or personal use.
- The documents may not be changed, nor any part removed including copyright notice.
- Request in writing is required for any variation to the above.
- An acknowledgement to the source of any data published from this document is mandatory.

ACKNOWLEDGEMENTS

The project was conducted through close liaison with Shellharbour City Council (SCC) and ALS Environmental.

Author and Document Control

Written/Submitted by:	Reviewed / Approved by:
 Taite Beeston (BSc.) <i>Geologist & Environmental Consultant</i>	 Rohan Last (BSc. MSc) <i>Hydrogeologist & Environmental Scientist</i>

Record of Distribution

Copies	Report No. & Title	Status	Date	Prepared for:
1 x PDF	202203_ENRS0033r1e1_SCC Dunmore QEMR	Rev.1	9 th February 2023	ALS c/- Shellharbour City Council (SCC)

EXECUTIVE SUMMARY

Environment & Natural Resource Solutions (ENRS Pty Ltd) were commissioned as independent environmental consultants by *ALS Environmental* (Wollongong) on behalf of *Shellharbour City Council* (SCC) to prepare the Quarterly Monitoring Report for the Dunmore Recycling and Waste Depot (herein referred to as the Site).

This report summarises the results of field testing and laboratory analysis conducted by ALS for the December 2022 quarterly monitoring period. This Quarterly Report provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

The Site was established in 1945 and has been managed by Shellharbour Council (SC) since 1983. The Site accepts putrescible and non-putrescible waste within its managed landfill cell. Recycling activities conducted at the site include Resource Recovery Centre, Revolve Centre and Food Organics and garden Organics (FOGO) processing.

Waste regulation in NSW is administered by the EPA under the Protection of the Environment Operations (POEO) Act (1997); the *Waste Avoidance and Resource Recovery Act* (2001).

The Site operates under the conditions of two (2) EPLs:

- **EPL No. 5984.** Landfill activities. Consisting of; extractive activities, waste disposal and composting.
- **EPL No. 12903.** Resource recovery activities. Consisting of; composting and waste storage within the FOGO Facilities and Resource Recovery Centre.

A copy of the relevant EPL sections outlining the sampling requirements is provided in **Appendix A** (EPL No. 5984). ENRS note that EPL No. 12903 does not specify sample points.

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
- Identify trends of the environmental monitoring data over the reporting period;
- Identify any on-site or off-site impacts associated with operation of the Site;
- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in a Quarterly Environmental Monitoring Report.

The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the March 2021 monitoring period in regard to the following tasks:

- Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by ALS as required by the EPLs for the respective reporting period.

- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);
- Review all quarterly environmental monitoring reports from the 2020-2021 reporting period and available data from the last three (3) years; Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

Based on the findings obtained during the December 2022 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;
- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate, sulphate and salinity (EC) within multiple groundwater bores including; BH1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-14, BH-15, BH-18, BH-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- With the exception of Nitrate, Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria.
- On nine (9) out of twelve (12) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the December 2022 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and

- This report must be read in conjunction with the attached Statement of Limitations.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	II
1.0 INTRODUCTION	1
1.1 Project Background	1
1.1.1 Site History.....	1
1.1.2 EPL Requirements	1
1.2 Objectives	2
1.3 Scope of Work	2
2.0 SITE DESCRIPTION	2
2.1 Location	2
2.2 Surrounding Land use	3
2.2.1 Sensitive Receptors	4
2.3 Topography & Drainage.....	4
2.4 Soil Landscape	4
2.5 Geology	4
2.6 Hydrogeology.....	5
2.6.1 Existing Bores	5
2.6.2 Flow Regime	5
2.7 Surface Water.....	5
3.0 ASSESSMENT CRITERIA	6
3.1 Contaminants of Potential Concern	6
3.2 Water Quality Guidelines	6
3.2.1 ANZG Guidelines	6
3.2.2 National Environmental Protection Measure (NEPM)	7
3.3 Dust Deposition Assessment Criteria	7
3.4 Surface Methane GAS Assessment Criteria	8
3.5 Gas accumulation monitoring in enclosed structures.....	8
4.0 SAMPLING METHODOLOGY.....	8
4.1 Water Sampling	8
4.1.1 Location of Water Monitoring Points.....	8
4.1.2 Depth to Water	8
4.1.3 Sample Collection	9
4.1.4 Groundwater Sampling.....	9
4.1.5 Field Testing	9
4.2 Dust Deposition sampling	10
4.3 Surface Methane Gas Monitoring	10
4.4 Gas Accumulation Monitoring in enclosed structures	10

4.5	Laboratory Analysis	10
4.6	Flare Monitoring	10
5.0	QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)	11
5.1	Data Quality Objectives	11
5.2	QA/QC Procedures	11
5.3	EPL Non-Compliance	12
6.0	WATER QUALITY RESULTS	12
6.1	Overflow Results.....	12
6.2	Field Testing	12
6.3	Physical Indicators	13
6.3.1	Depth	13
6.3.2	Temperature	13
6.3.3	Salinity (EC & TDS).....	13
6.3.4	Dissolved Oxygen	14
6.3.5	pH	14
6.3.6	Total Suspended Solids (TSS)	15
6.4	Inorganic Analytes	16
	Nutrients	16
6.4.1	Ammonia.....	16
6.4.2	Nitrate	16
6.4.3	Nitrite	17
	Anions 17	
6.4.4	Chloride.....	17
6.4.5	Fluoride	18
6.4.6	Sulphate.....	18
6.4.7	Total Alkalinity	19
6.4.8	Bicarbonate Alkalinity	19
	Metals & Metalloids.....	19
6.4.9	Manganese	19
6.4.10	Iron (Total Fe)	19
6.4.11	Iron (Dissolved Fe).....	20
6.4.12	Calcium	20
6.4.13	Potassium	20
6.5	Organic Analytes	21
6.5.1	Total Organic Carbon	21
7.0	DUST GAUGE RESULTS	22
8.0	METHANE MONITORING.....	24
8.1	Surface Gas Methane	24
8.2	Gas accumulation monitoring in enclosed structures.....	24

9.0	ENVIRONMENTAL ASSESSMENT	24
9.1	Monitoring Point Summary.....	24
9.2	Environmental Management.....	24
9.2.1	Landfill Operations	24
9.3	Environmental Safeguards.....	25
9.4	Monitoring Program	25
10.0	CONCLUSIONS	25
11.0	LIMITATIONS.....	27
12.0	REFERENCES	28

LIST OF TABLES, FIGURES & APPENDICES

TABLES

Table 1: Site Identification
Table 2: Surrounding Land use
Table 3: Groundwater Assessment Criteria
Table 4: Adopted Guideline Criteria
Table 5: Data Quality Objectives
Table 6: Summary Table of Overflow Events
Table 7: Summary of Dust Gauge Results
Table 8: Summary of Flare Operating Temperatures
Table 9: Water Quality Results Comparison of Quarterly Monitoring Results Against Site Assessment Criteria
Table 10: Duplicate Groundwater Sample Results and QC Data
Table 11: Duplicate Surface Water Results and QC Data

FIGURES

Figure 1: Site Location Map
Figure 2: Sampling Points & Site Plan
Figure 3: Surface Methane Gas Sample Transects
Figure 4: Regional Geology
Figure 5: Registered Bores

CHARTS

Chart 1 - Monthly plot of Dust Deposition Gauge Results
Chart 2 - Weekly Flare Operating Temperatures
Chart 3 to Chart 18 – Groundwater Water Quality Results 2017-2022
Chart 19 to Chart 34 – Onsite Surface Water Quality Results 2017-2022
Chart 35 to Chart 46 – Rocklow Creek Surface Water Quality Results 2017-2022
Chart 47 to Chart 61 – Leachate Water Quality Results 2017-2022

APPENDICES

Appendix A EPL 5984 Sampling Point Summary (NSW EPA, 10/02/2022)
Appendix B Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Water Samples
Appendix C Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Dust Samples
Appendix D Surface Gas (Methane) Field Sheets
Appendix E Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Overflow Event
Appendix F Calibration Certificates
Appendix G Gas Flare Reports

1.0 INTRODUCTION

Environment & Natural Resource Solutions (ENRS Pty Ltd) were commissioned as independent environmental consultants by *ALS Environmental* (Wollongong) on behalf of *Shellharbour City Council* (SCC) to prepare the Quarterly Environmental Monitoring Report (QEMR) for the Dunmore Recycling and Waste Depot (*herein referred to as the Site*).

This (QEMR) summarises the results of field testing and laboratory analysis conducted by ALS for the December 2022 monitoring period, and provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

1.1 PROJECT BACKGROUND

1.1.1 Site History

The Site was established in 1945 and has been managed by Shellharbour City Council (SCC) since 1983. The Site accepts putrescible and non-putrescible waste within its managed landfill cell. Recycling activities conducted at the site include Resource Recovery Centre, Revolve Centre and Food Organics and garden Organics (FOGO) processing.

In late 2020 to July 2021 Shellharbour City Council moved away from sole reliance on traditional onsite leachate management techniques through initiating a secondary leachate treatment option in which leachate was transported from site for processing at a contractor facility.

In early 2021 Shellharbour City Council constructed a new Leachate Treatment Plant (LTP) on site, which was commissioned in July/August 2021. The LTP is comprised of three primary biological treatment units, including an anoxic reactor, nitrifying reactor, and sequencing batch reactor. The treated stream meets Sydney Water requirements for discharge into Sydney Water sewer, under a trade waste agreement. On average the LTP discharges 60kL/day of treated water, equating to approximately 22ML of leachate removal from site per annum.

1.1.2 EPL Requirements

Waste regulation in NSW is administered by the EPA under the Protection of the Environment Operations (POEO) Act (1997); the *Waste Avoidance and Resource Recovery Act* (2001).

The Site operates under the conditions of two (2) EPLs:

- **EPL No. 5984.** Landfill activities. Consisting of; extractive activities, waste disposal and composting.
- **EPL No. 12903.** Resource recovery activities. Consisting of; composting and waste storage within the FOGO Facilities and Resource Recovery Centre.

A copy of the relevant EPL sections outlining the sampling requirements is provided in **Appendix A** (EPL No. 5984). ENRS note that EPL No. 12903 does not specify sample points.

1.2 OBJECTIVES

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
- Identify trends of the environmental monitoring data over the reporting period;
- Identify any on-site or off-site impacts associated with operation of the Site;
- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in an Annual Environmental Monitoring Report.

1.3 SCOPE OF WORK

The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the December 2022 monitoring period in regard to the following tasks:

- Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by ALS as required by the EPLs for the respective reporting period.
- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);
- Review all quarterly environmental monitoring reports from the 2021-2022 reporting period and available data from the last three (3) years;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2.0 SITE DESCRIPTION

2.1 LOCATION

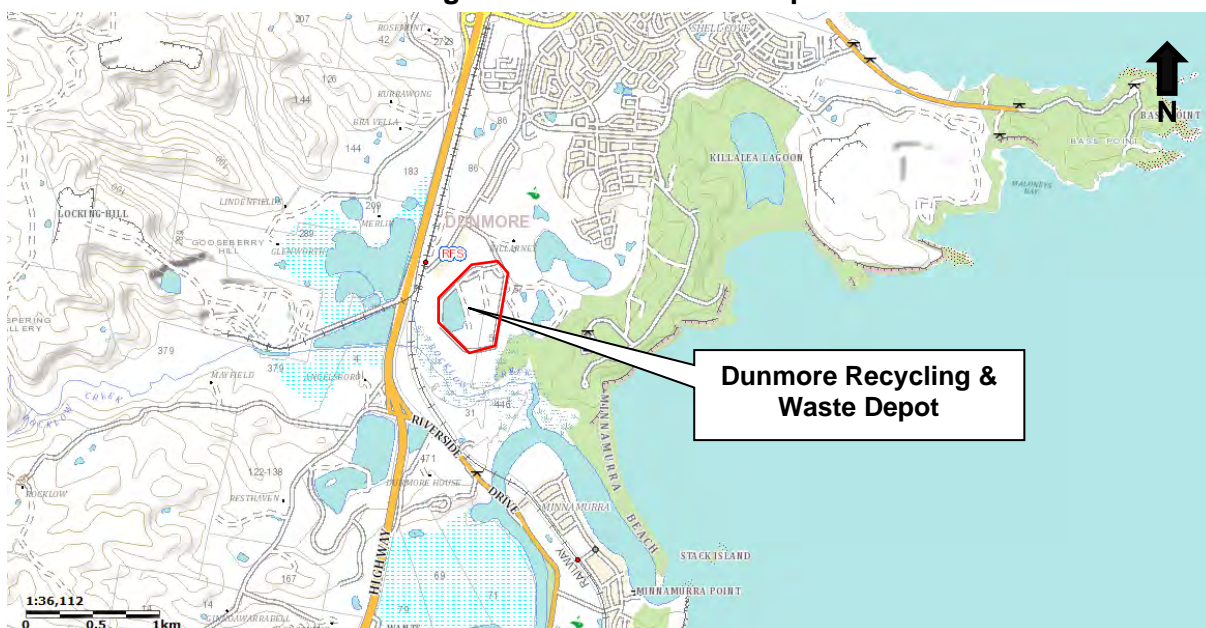
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 1** below. Details of the Site boundary and sampling points

are provided in the Site Plan (see **Figure 2**). The key features required to identify the Site are summarised in **Table 1**.

Table 1: Site Identification

Aspect	Description
Site	Dunmore Recycling and Waste Depot
Street Address	44 Buckleys Road, Dunmore, NSW 2529
Site Area	72.36 hectares
Title Identifier	Lot 21 DP 653009, Lot 1 DP 419907
Zoning	RU1 Primary Production
Local Government Area	Shellharbour City Council

Figure 1: Site Location Map



Source: SIX Maps (<https://maps.six.nsw.gov.au/>) (cited 16/01/2020)

2.2 SURROUNDING LAND USE

The current activities and operations on adjacent properties and the surrounding area include:

Table 2: Surrounding Land use

Direction	Land Use
North:	Buckleys Road, commercial infrastructure and open grassland. Residential dwellings along the northwest border of the Site. Golf course further to the northeast.

Direction	Land Use
East:	Dunmore Resources and Recycling facility immediately to the east, bushland to the southeast.
South:	Bushland, Rocklow Creek (300m from landfill activities). Further to Kiama Community Recycling Centre and Riverside Drive.
West:	Bushland to the southwest, scattered trees immediately to the west and further to the Princes Highway. Boral Quarries complex beyond the Highway. Residential dwellings to the Northwest.

2.2.1 Sensitive Receptors

The nearest sensitive receptors are likely to include:

- Recreational users of the Minnamurra River estuary environs;
- Down gradient stakeholders; and
- Down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE) near discharge zones.

2.3 TOPOGRAPHY & DRAINAGE

A review of the current series Albion Park (90281N) 1:25,000 topographic map sheet was conducted to assess the regional topography and to identify potential runoff and groundwater controls in the region. Topography provides a useful indicator for groundwater controls including gradient and flow path.

The Site presents low topographic relief, remaining between approximately 3-5 mAHD across the entirety of the Site. The regional topographic gradient trends south-southeast towards Rocklow Creek and Minnamurra River.

2.4 SOIL LANDSCAPE

The previous annual monitoring report (Environmental Earth Sciences 2018) reported the soil profile at the Site as organic, black, massive sandy loam topsoil overlying loose bleached light grey sand with iron staining in the subsoil.

Review of the online *Shellharbour City Council Acid Sulphate Soil Risk Map* indicates that the Site lies within a **Class 3** area, suggesting that works beyond 1 metre below the ground level (mbGL) have the potential to encounter Acid Sulphate Soils (ASS).

2.5 GEOLOGY

A review of the Site geology was undertaken with reference to the Wollongong 1:250,000 geological series sheet (Si56.9) and the Shellharbour-Kiama area coastal quaternary 1:50,000 geology sheet (See **Figure 4**). The Site is predominately underlain by the Quaternary alluvial deposits (Qal) characterised as Holocene backbarrier flat; marine sand, silt, clay, gravel and shell (Qhbf). The northern most corner of the site is intersected by the Gerringong Volcanics (Pbb) characterised by Latite. Based on the mapped geology, previous investigations and

borehole logs, the Site infrastructure including the landfill cell is located within the alluvial deposits.

2.6 HYDROGEOLOGY

Groundwater resources in the area are expected to be associated with *Shallow unconfined* alluvial and unconsolidated systems, generally less than 20 m in depth with moderate to high transmissivity, variable water quality, and strongly controlled by rainfall recharge.

2.6.1 Existing Bores

A network of groundwater monitoring bores is installed at the Site to provide specific data on the quality and nature of groundwater. Given the spatial distribution of the bores and disturbed ground condition expected within the land fill cell, groundwater contours could not be accurately mapped.

A review of the *NSW Office of Water (NOW)* existing bore records was conducted to develop the conceptual understanding of regional groundwater conditions, including aquifer depths, yields, water quality, and distribution. A search of the Bureau of Meteorology Australian Groundwater Explorer groundwater database identified a total of eighty-eight (88) registered bores within one and a half (1.5) kilometres of the Site (see **Figure 5**). Registered bores in the area are predominantly associated with the Landfill Site and with the quarry complex (*Boral Site*) to the west of the EPL Site. The majority of bores are registered for monitoring purposes, excluding a single well (GW044447), which is registered for stock and domestic purposes. The stock bore is located approximately one (1) kilometre to the north of the Site, on the western side of the Princes Highway, which is considered to be up gradient of the Site and not in direct hydraulic connectivity. Registered bore depths are between 1.25 m and 22 m. Bore records indicate shallow unconsolidated aquifer systems.

2.6.2 Flow Regime

Previous reports (*Environmental Earth Sciences*, 2018) have identified that groundwater flows vary across the Site, but the general trend is south, towards Rocklow Creek.

Based on the unconfined nature of the aquifers, the shallow groundwater flow is inferred to mimic topography with low to moderate hydraulic gradients flowing towards the south.

The Site and adjoining land, was largely unsealed with potential for local recharge from rainfall infiltration. Likely discharge areas are predominantly to the south and east of the Site including swamps and Rocklow Creek. The waterbodies surrounding the Site are recognised as State Environmental Planning Policy No.14 (SEPP14) registered wetlands and Proximity Areas for Coastal Wetlands border the eastern, southern and western boundaries of the Site.

2.7 SURFACE WATER

The Site topography indicates that surface water flow will generally trend to the east towards off Site wetlands and southeast towards Rocklow Creek. These present the primary regional drainage structures for natural surface water and runoff. A series of stormwater infrastructure is present at the Site which is expected to capture run off. Infrastructure includes but not limited

to; stormwater drains; sedimentation ponds; levee banks; collection and diversion drains; and leachate dams.

3.0 ASSESSMENT CRITERIA

3.1 CONTAMINANTS OF POTENTIAL CONCERN

This section of the report provides a summary of the Contaminants of Potential Concern (CoPC) associated with the Site. CoPC's are identified in the Sites EPL/s which document the CoPC and water quality indicators required to be monitored. Analytical requirements for all water sampling are provided in Appendix A.

3.2 WATER QUALITY GUIDELINES

Nationally developed guidelines are provided in the National Water Quality Management Strategy (NWQMS): Guidelines for Groundwater Protection in Australia (ARMCANZ & ANZECC 1995). For the purpose of this assessment, the relevant criteria selected to protect environmental values are summarised in **Table 3** below:

Table 3: Groundwater Assessment Criteria

Environmental Value	Relevant Guideline
Ecosystems / Health Screening Levels	ANZG (2018) (Australian and New Zealand Guidelines for Fresh and Marine Water Quality).
	National Environment Protection Measure (NEPM) (2013).
Drinking Water	Australian Drinking Water Guidelines (ADWG) (2018)

3.2.1 ANZG Guidelines

The relevant criteria for this water quality assessment are the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG;2018). The ANZG (2018) provide Default Guideline Values (DGVs) for four (4) levels of protection categorised by the percentage of species possibly affected, being 80%, 90%, 95% or 99% of species. Values for a level of protection for 95% of species in a marine environment have been adopted and are displayed in **Table 4**. Where DVGs are not available reference is made against the ANZECC (2000) Trigger Values (TVs). The *NSW Office of Water* (DECCW;2007) endorsed groundwater management guidelines recommend assessment for aquatic ecosystems based on the **95 per cent of species level of protection**.

Table 4: Adopted Guideline Criteria

Parameter	Groundwater Guideline	Surface water Guideline
Ammonia	0.9 mg/L	0.9 mg/L
Nitrate	10.6 mg/L	10.6 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units

Parameter	Groundwater Guideline	Surface water Guideline
Soluble Iron	0.3 mg/L	0.3 mg/L
Manganese	1.9 mg/L	1.9 mg/L
Electrical Conductivity	125-2200 µS/cm	125-2200 µS/cm

Table 3.3.2 of the ANZECC (2000) also provides stressor values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems. The table provides a stressor guideline of 0.2mg/L at pH 8 for lowland rivers. For the purposes of this assessment, the value has been applied to Rocklow Creek samples.

3.2.2 National Environmental Protection Measure (NEPM)

The NSW EPA has endorsed the use of the Groundwater Investigation Levels (GILs) given in the 2013 ASC NEPM 'Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater'. The latest NEPM provide a framework for risk-based assessment of groundwater contamination.

Groundwater Health Screening Levels (HSLs) are provided for four (4) land use categories for vapour intrusion (Table 1A[4]) associated with Total Recoverable Hydrocarbons TRH (F1 & F2) and BTEX compounds.

NEPM	Description of Land use Categories
HIL A	Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
HIL B	Residential B with minimal opportunities for soil access; includes buildings with fully and permanently paved yard space such as high-rise buildings and apartments.
HIL C	Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
HIL D	Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
GILs	Groundwater Investigation Levels (GILs) should be applied based on the receiving environment and groundwater resources. GILs are provided in NEPM Table 1C for; Fresh Waters; Marine Waters; and Drinking Water;
EILs	Ecological Investigation Levels (EILs) for common contaminants in the top two (2) metres of soil based on three (3) generic land use settings: <ul style="list-style-type: none"> • Areas of ecological significance; • Urban residential areas and public open space; and • Commercial and industrial land uses.

3.3 DUST DEPOSITION ASSESSMENT CRITERIA

Criteria for collection and assessment of dust deposition concentrations are provided within the Australian standard AS3580.10.1 - Methods for sampling and analysis of ambient air; method 10.1- Determination of particulate matter - Deposited matter - Gravimetric method. AS3580.10.1 provides an acceptable level of 4 g/m²/month.

3.4 SURFACE METHANE GAS ASSESSMENT CRITERIA

The NSW EPA Solid Waste Landfill Guidelines 2nd Edition (2016) provides sampling methodologies and threshold for surface methane gas concentrations at landfill sites. The acceptable threshold for capped landfills is 500 parts per million (ppm) at 5 cm above the capping surface.

3.5 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The NSW EPA Solid Waste Landfill Guidelines 2nd Edition (2016) provides sampling methodologies and threshold gas levels to ensure that gas is not accumulating within enclosed structures on or within 250m of deposited waste or leachate storage. The acceptable threshold for 1% (volume/volume).

4.0 SAMPLING METHODOLOGY

Field sampling was conducted by *ALS Environmental* (Wollongong) as commissioned by SCC on quarterly basis. ENRS understands that sampling was conducted in accordance with ALS sampling protocols with reference to current industry standards and Code of Practices. The following sub-sections provide a summary of the sampling methodologies.

Monitoring frequency is defined by the EPL's and is designed to capture necessary site data to support assessment of Site conditions (quarterly and annual), any long-term trends or overflow events. Monitoring is conducted quarterly and annually for selected analytes with additional overflow and event-based sampling triggered by Site conditions.

4.1 WATER SAMPLING

4.1.1 Location of Water Monitoring Points

Groundwater and surface water monitoring requirements are defined by the EPL No. 5984, as provided in Appendix A. The water sampling regime includes; five (5) surface waters, one (1) located onsite and four (4) located off-site; twelve (12) groundwater monitoring wells surrounding the landfill operations; and one (1) leachate point. Sampling locations are illustrated in **Figure 2** attached.

4.1.2 Depth to Water

Prior to sampling, the depth to the groundwater table was measured from the top of casing (TOC) using a water dipper and clear disposable bailer. The bores were inspected for the presence of hydrocarbon and the thickness of any LNAPL was measured visually in clear disposable bailers. ***No LNAPL was identified in monitoring Wells.***

4.1.3 Sample Collection

Sampling is conducted independently by *ALS Environmental* under contract with SCC. Chain of Custody records and field sheets are provided in Appendix D. ENRS understand sampling was conducted in accordance with *ALS* sampling protocols.

4.1.4 Groundwater Sampling

Groundwater wells were sampled in order of distance from any areas of known contamination to ensure that lower contaminated wells are sampled before likely higher contaminated wells. Groundwater bores were purged prior to sampling by removing at least three (3) well volumes with samples being collected using clear disposal bailers or low flow parameter stabilisation methods applied with field sheets provided to document pumping volumes and field parameters. Post sampling all samples were sealed in laboratory-prepared sampling containers appropriate for the analysis.

Surface water samples were collected as ‘grab samples’ from the midpoint of the source at mid-depth.

Post flushing, leachate samples were sampled from a tap on the discharge line directly into purpose specific, pre preserved sample containers.

All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

Any loss of volatile compounds was kept to a minimum by employing the following sampling techniques:

- Minimal practical disturbance during sampling;
- Samples placed in sample containers as soon as possible;
- Sample containers contain zero headspace;
- Samples placed directly on ice and transported to the laboratory as soon as possible; and
- Employing the most appropriate analytical method to minimise volatile losses at the laboratory.

4.1.5 Field Testing

Field testing was conducted during bore purging and sampling to record physical water parameters. A multi-probe water quality meter was used to measure the following parameters:

- Oxygen Reduction Potential (ORP, representing redox).
- Electrical Conductivity (Salinity - EC);
- Temperature; and
- pH (Acidity).

4.2 DUST DEPOSITION SAMPLING

Measurement of dust deposition was carried out in accordance with the Australian Standard AS3580.10.1 (2016). This Australian Standard provides a mean of determining the mean surface concentration of deposited matter from the atmosphere.

Dust collection gauges were set up for a one (1) month period between the dates; **18th November** and **7th December 2022**. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

4.3 SURFACE METHANE GAS MONITORING

The concentration of methane gas (in units of ppm) at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling the wind speed was below 10 km/hr. Testing was conducted using a calibrated *LaserOne* portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in **Appendix F**.

One field technician commenced data collection along transect lines in a grid pattern across the landfill surface at 25-metre spacings. A site plan depicting the sampled transect line is provide in **Figure 3**. Transects were recorded using a Magellan *SporTrak* GPS. The concentration of methane gas was measured at a height of 5 cm above the ground in areas with intermediate or final cover over the emplaced waste.

4.4 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The concentration of methane gas (in units of percent volume/volume) inside all enclosed structures within 250m of emplaced waste or leachate storage facility at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling testing was conducted using a calibrated *LaserOne* portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in **Appendix F**.

The internal methane concentrations for each enclosed structure were recorded by a field technician. A site plan depicting the location onsite of each structure provided in **Figure 3**. Any depressions or surface fissures away from the sampling grid were also investigated.

4.5 LABORATORY ANALYSIS

ALS, a NATA accredited laboratory, was contracted by SCC to undertake the sample analysis in accordance with current standards. Laboratory QA/QC results are detailed in the Laboratory reports contained in the appendices section of this report.

4.6 FLARE MONITORING

Landfill gases (LFG) are formed through bacterial action on emplaced waste and are a normal by-product of Landfilling operations. Landfill gas is a mixture of many different gases, typically its major components include methane and carbon dioxide. Smaller concentrations of

nitrogen, oxygen, ammonia, sulphides, hydrogen, carbon monoxide, and nonmethane organic compounds (NMOCs) and Volatile Organic Compounds (VOC's) may also be present.

When operated efficiently the use of a gas flare to burn landfill gas can significantly reduce emissions of methane, NMOCs and VOC's.

The flare was monitored, maintained and operated by *LGI LTD*. Copies of LFG reports for the relevant reporting period are included as **Appendix G**.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

5.1 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) are required to define the quality and quantity of data needed to support management decisions. The process for establishing DQO's is documented by Australian Standard: AS 4482.1-2005 and referenced by the National Environment Protection (Assessment of Site Contamination) Measure (NEPC;2013). The DQO's for the investigation were to obtain representative data to allow assessment of:

- groundwater quality;
- The risks posed to human health and the environment, including potential future users of the Site; and
- The requirements for any further investigative works.

The assessment was conducted to a standard consistent with generally accepted and current professional consulting practice for such an investigation. The evaluation criteria adopted for the investigation are summarised in **Table 5**.

Table 5: Data Quality Objectives

DQO	Evaluation Criteria
Documentation completeness	Completion of field records, chain of custody documentation, laboratory test certificates from NATA-accredited laboratories.
Data comparability	Use of appropriate techniques for the sampling, storage and transportation of samples. Use of NATA accredited laboratory using NEPM endorsed procedures.
Data representativeness	Adequate sampling coverage of all areas of environmental concern at the Site, and selection of representative samples.
Precision and accuracy for sampling and analysis	Use properly trained and qualified field personnel and achieve field and laboratory QA/ QC criteria.

5.2 QA/QC PROCEDURES

It should be noted that whilst the EPL does not require field duplicates, ENRS recommend sampling include rinseate samples and field duplicates at the standard rate of 1 in 10, or field QA/QC is conducted in accordance with *ALS* procedures.

The majority of the QA/QC data provided for this report by SC was prepared by ALS and is included in the attached ALS QC and QCI reports. ALS is NATA accredited for field sampling and laboratory testing.

Relative Percent Difference (RPD) analysis of all duplicate and triplicate samples(s) results was performed by ENRS and is included in the report as **Table 9** and **Table 10**. Results were generally reported within the acceptance criteria documented in Table 4 of AS4482.1-2005, the RPD for inorganics was set at <30% and for organics set at <50%.

Since all QA/QC results complied with the required standards, or showed variations that would have no significant effect on the quality of the data or the conclusions of this environmental assessment. Therefore, the data was considered acceptable for use in this assessment.

5.3 EPL NON-COMPLIANCE

No non-compliances were noted during the December 2022 quarterly monitoring period. Monitoring requirements are defined by the EPL.

6.0 WATER QUALITY RESULTS

Laboratory results for groundwater and surface water were provided to ENRS for tabulation and comparison with relevant EPL assessment criteria. A summary of results is provided in **Table 9** with comparison against the relevant Site Assessment Criteria (SAC). The laboratory certificates of analysis are provided in Appendix B.

6.1 OVERFLOW RESULTS

Overflow samples were taken from SWP-1 on two (2) occasions during Q3 monitoring period. Summary results are included in **Table 6** and are consistent with EPA guidelines.

A full summary of results is provided in **Table 9** with comparison against the relevant Site Assessment Criteria (SAC). Laboratory certificates of analysis are provided in Appendix B and are discussed in detail within the relevant sections of this report.

Table 6: Summary Table of Overflow Events

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
21/10/2022	7.9	23	22.0	52.2
25/10/2022	7.9	17	24.9	60.0

6.2 FIELD TESTING

Field testing was conducted by ALS during sampling to record physical water parameters. A water quality meter is used to measure the following parameters in the field:

- Electrical Conductivity (Salinity);

- pH (Acidity) and
- Dissolved Oxygen (surface waters only).

6.3 PHYSICAL INDICATORS

6.3.1 Depth

Groundwater

Depth of ground water to top of casing (TOC) ranged between **0.73 mbgl** (BH-15, 05/12/2022) to **4.53 mbgl** (BH-14 & BH19r, 05/12/2022). Across the Site groundwater levels were generally consistently with historical data sets.

6.3.2 Temperature

Groundwater

Temperature of groundwater in the December 2022 monitoring period ranged between **17.3 degrees Celsius** (BH-22, 05/12/2022) and **25.2 degrees Celsius** (BH-1C, 05/12/2022).

Results are consistent with historical data.

Surface Waters

Surface water temperature at SWP-1 was **19.5 degrees Celsius** (02/12/2022). Temperatures of **21.5 degrees Celsius** and **18.9 degrees Celsius** were observed for the overflow samples dated 21/10/2022 and 25/10/2022 respectively.

Results are consistent with historical data.

Leachate

Leachate Temperatures at the leachate Tank (LP-1) was **19.9 degrees Celsius** (02/12/2022).

Results are consistent with historical data.

6.3.3 Salinity (EC & TDS)

Salinity is reported by the laboratory as either Electrical Conductivity (EC) or Total Dissolved Solids (TDS). The ANZECC guidelines document a conversion ratio of $0.68 \text{ mg/L} = 0.68 \text{ EC } (\mu\text{S/cm})$. Table 3.3.3 of the ANZECC (2000) guidelines document default TV for EC in lowland freshwater rivers between **125 $\mu\text{S/cm}$** and **2,200 $\mu\text{S/cm}$** (~1,500 mg/L).

Groundwater

During the December 2022 monitoring period, salinity ranged between; **692 $\mu\text{S/cm}$** (BH-4, 05/12/2022) and **7,160 $\mu\text{S/cm}$** (BH-1C, 05/12/2022). Four (4) monitoring points reported

salinity values in excess of freshwater SAC of **2,200 µS/cm**, **7,350 µS/cm** (BH-1c), **3,580 µS/cm** (BH-9), **2,650 µS/cm** (BH-15), **2,500 µS/cm** (BH-21).

EC readings generally consistent with historical data.

Surface Waters

Electrical Conductivity results for onsite surface water (SWP-1, 02/12/2022) was **1,500 µS/cm** which corresponds to a calculated Total Dissolved Solids result of **1,020 mg/L (Calculated Value)**. These results were below the TV.

Electrical conductivity for offsite surface waters ranged between **14,100 µS/cm** (SWC-2, 02/12/2022) to **29,100 µS/cm** (SWC-DOWN_2, 02/12/2022).

Total Dissolved Solids results for offsite surface waters located along Rocklow Creek ranged between **9,700 mg/L** (SWC-2, 02/12/2022) to **23,300 mg/L** (SWC-DOWN_2, 02/12/2022).

Results are consistent with historical data and typical of a tidal creek.

Leachate

Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution. Leachate salinity for December 2022 monitoring was **9,310 µS/cm** (LP1, 02/12/2022) which was above the TV. Results are slightly higher than noted in the previous two months but remain below the mean value of **11,948 µS/cm** observed between 1/2/2017 and 02/12/2022.

6.3.4 Dissolved Oxygen

Levels of Dissolved Oxygen (DO) were measured in the field during sampling. DO reflects the equilibrium between oxygen-consuming processes and oxygen-releasing processes. DO can initiate redox reactions resulting in the uptake or release of nutrients. Low DO concentrations can result in adverse effects on many aquatic organisms which depend on oxygen for their efficient metabolism. At reduced DO concentrations many compounds become increasingly toxic, for example Zinc, Lead, Copper, phenols, cyanide, hydrogen sulphide and Ammonia.

The ANZECC (2000) guidelines Table 3.3.2 outlines a range between 85% to 110% saturation for low land rivers. Assuming a water temperature of 18°C this is equivalent to approximately 7-11 mg/L or ppm.

Surface Waters

Dissolved Oxygen at SWP-1 was **3.43 mg/L** (02/12/2022). SWP-1 was not discharging at the time of sampling and are consistent with previous data.

Dissolved Oxygen for the offsite surface waters at Rocklow Creek ranged from **4.49 mg/L** (SWC-DOWN_2, 02/12/2022) to **7.07 mg/L** (SWC-DOWN, 02/12/2022). Results are generally above historical readings but are consistent with a tidal creek passing through a mangrove swamp.

Leachate

Dissolved oxygen at LP1 (Leachate Tank) was **5.58 mg/L** (02/12/2022). Results were consistent with previous data.

6.3.5 pH

pH is a measure of hydrogen activity. pH determines the balance between positive hydrogen ions (H⁺) and negative hydroxyl ions (OH⁻) and provides a test of water acidity (low pH) or

alkalinity (high pH). Most natural freshwaters have a pH in the range 6.5 to 8.0. Changes in pH may affect the physiological functioning of biota and affect the toxicity of contaminants. Both increases and decreases in pH can result in adverse effects, although decreases are likely to cause more significant problems. Low pH indicates acidic conditions which may increase the mobility of heavy metals, whilst high pH indicates alkaline conditions which may also generate Ammonia. Previous investigations of other regional Landfill Sites in the Illawarra-Shoalhaven (Forbes Rigby;1996) report regionally acidic groundwater with low readings in the range of 4.3 pH associated with silica saturation and oxidation of accessory marcasites grains (iron sulphide).

Groundwater

Groundwater pH was reported between **pH 7.0** (BH-1c and BH-14, 05/12/2022) and **pH 8.4** (BH-19r 05/12/2022). All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0 and are generally consistent with historical data.

Surface Water

The pH of the onsite surface water for the December 2022 monitoring period was reported at **pH 7.5** (SWP-1, 02/12/2022).

The pH of the offsite surface waters for the December 2022 monitoring period were reported at **pH 7.0** for all sample locations associated with Rocklow Creek, (SWC_2, SWC_UP, SWC_DOWN, SWC_DOWN_2, 02/12/2022).

All surface water were reported within the ANZECC recommended range of pH 6.5-8.5 and are consistent with historical data.

Leachate

Leachate pH was as reported as **pH 8.5** (LP-1, 02/12/2022). Results were reported above the ANZECC recommended range of pH 6.5-8.5. Although the December 2022 result is slightly reduced in comparison to pH since march 2021, Leachate pH has generally been trending upward since September 2021.

6.3.6 Total Suspended Solids (TSS)

TSS provides a measure of turbidity reported as the mass of fine inorganic particles suspended in the water. Measurement of TSS provides a valuable indication of the sediment and potential nutrient load. Elevated TSS decreases light penetration whilst phosphorus is absorbed onto sediment surfaces.

TSS was reported for surface water only.

Concentrations for onsite surface waters during the December 2022 monitoring period were reported as **14 mg/L** (SWP_1, 02/12/2022).

Concentrations for offsite surface waters during the December 2022 monitoring period were reported between **5 mg/L** (SWC_UP, SWC_DOWN, SWC_Down_2, 02/12/2022) and **10 mg/L** (SWC_2, 02/12/2022).

All TSS results were below the **50mg/L** TV and are generally consistent with historical results.

6.4 INORGANIC ANALYTES

Nutrients

Water samples were analysed for select nutrients including Ammonia, Ammonium, Nitrate and Nitrite. The most bio-available forms of Nitrogen are Ammonium (NH₄⁺) and Nitrate (NO₃⁻). Ammonia is an oxygen-consuming compound and is toxic to aquatic biota at elevated concentrations. Ammonia toxicity increases under low oxygen levels and higher pH.

6.4.1 Ammonia

Groundwater

For the December 2022 monitoring period, ammonia was measured within groundwater monitoring bores between **0.93 mg/L** (BH14, 05/12/2022) and **345 mg/L** (BH-1c, 05/12/2022). All groundwater wells exceeded of the adopted trigger value of **0.91 mg/L** for the December 2022 monitoring period. However, since the corresponding pH was below 8.50 pH units it was not considered significant. Results are generally consistent with historical values.

Surface Water

Ammonia in onsite surface water samples was reported as **8.52 mg/L** (SWP-1, 02/12/2022). The result for SWP-1 exceeded the adopted trigger value of **0.91 mg/L** during the monitoring period. However, since the corresponding pH was below 8.50 pH units it was not considered significant.

Additional Overflow samples taken on the 21/10/2022 and 25/10/2022 produce ammonia results of **16.4 mg/L** and **15.8 mg/L** respectively. Once again, since the corresponding pH was below 8.50 pH units it was not considered significant.

Ammonia in offsite surface water samples associated with Rocklow Creek ranged from **0.32 mg/L** (SWC_UP, 02/12/2022) to **0.58 mg/L** (SWC_DOWN, 02/12/2022). Results were below the ammonia TV of **0.90mg/L** but above the stressor value of **0.2mg/L**. The results were considered to be generally consistent with historical results.

Leachate

Ammonia in leachate was reported between **773 mg/L** (LP1, 02/12/2022). Although high ammonia concentrations are expected in untreated leachate ammonia concentrations appear to be trending down slightly since the implementation of the new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021.

6.4.2 Nitrate

Groundwater

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **2.39 mg/L** (BH-3, 05/12/2022). Although results generally continue to trend downward a total of two (2) groundwater wells reported exceedances above the TV of 0.7mg/L in the December 2022 monitoring period, including BH-3 and BH-14.

Surface Water

The nitrate concentration of the onsite surface water SWP-1 in the December 2022 monitoring period was **0.02 mg/L** (SWP-1; 02/12/2022).

Nitrate concentration for Rocklow Creek surface water samples in the December 2022 monitoring period ranged between **0.04 mg/L** (SWC-DOWN_2; 02/12/2022) and **0.11 mg/L** (SWC_2; 02/12/2022).

Only SWC_2 returned a result above the TV of **0.7mg/L** during the December 2022 monitoring period.

Leachate

With results of <1mg/L in both the September and December 2022 monitoring periods the Nitrate concentration of leachate (LP-1) appears to have risen sharply through both monitoring periods however the ALS Laboratory report advises that the Nitrate LOR has been raised due to matrix effects. As a result of this the September and December 2022 results are not directly comparable to previous data but are included in the data set as a matter of record and to promote closer scrutiny in subsequent sampling events.

6.4.3 Nitrite

Groundwater

Results for Nitrite in groundwater were reported between **<0.01 mg/L** in multiple bores and **0.27 mg/L** (BH-3, 05/12/2022). Results continue to trend downward. No exceedances to the TV of 0.7mg/L in the December 2022 monitoring period.

Surface Water

During the December 2022 monitoring period surface water SWP-1 was reported as **0.04 mg/L**. Results are generally consistent with previous data and below the accepted TV.

Leachate

With results of <1mg/L in both the September and December 2022 monitoring periods the Nitrite concentration of leachate (LP-1) appears to have risen sharply through both monitoring periods however the ALS Laboratory report advises that the Nitrate LOR has been raised due to matrix effects. As a result of this the September and December 2022 results are not directly comparable to previous data but are included in the data set as a matter of record and to promote closer scrutiny in subsequent sampling events.

Anions

6.4.4 Chloride

Groundwater

Results for Chloride in groundwater were reported between **33 mg/L** in (BH-14, 05/12/2022) and **904 mg/L** (BH-1c, 05/12/2022). The results are consistent with historical data.

Surface Water

During the December 2022 monitoring period chloride results for surface water SWP-1 was **225 mg/L** (02/12/2022). The results are below the accepted TV and are generally consistent with historical data. Chloride results for overflow samples were **214 mg/L** (21/10/2022) and **178 mg/L** (25/10/2022) respectively.

Leachate

Chloride at the Leachate Tank (LP-1) was **1710 mg/L** (02/12/2022). Results are generally consistent with previous data.

6.4.5 Fluoride

Groundwater

Results for Fluoride in groundwater were reported between **<0.1 mg/L** (BH-4, 05/12/2022) and **0.6 mg/L** (BH-14, 05/12/2022). Results are consistent with historical data.

Surface Water

During the December 2022 monitoring period the fluoride result for Onsite surface water was **0.4 mg/L** (SWP-1, 2/12/2022). Results are generally consistent with historical data.

Fluoride levels in overflow samples taken from SWP-1 proved to be **0.4 mg/L** for both samples (SWP-1, 21/12/2022 and 25/12/2022).

Offsite surface water results ranged from of **0.6 mg/L** (SWC_2 and SWC_UP, 02/12/2022) and **0.8 mg/L** (SWC_DOWN_2, 2/12/2022). Results are generally consistent with historical data.

Leachate

The fluoride result at the Leachate tank (LP-1) was **0.2 mg/L** (02/12/2022). Results have been trending down since August 2018 and have stabilised at 0.2 mg/L for the last four quarters.

6.4.6 Sulphate

Groundwater

Results for Sulphate in groundwater were reported between **10 mg/L** (BH-1C and BH-9, 05/12/2022) and **534 mg/L** (BH-15, 05/12/2022). It is noted that Laboratory analytical reports advise that sulphate LOR's have been raised for both the September and December results. In light of this action the September and December 2022 results are not directly comparable to previous data but are included in the data set as a matter of record and to promote closer scrutiny in subsequent sampling events. Results are generally consistent with previous data.

Surface Water

Sulphate in onsite surface water was **96 mg/L** (SWP-1, 02/12/2022). Levels are consistent with previous data.

Sulphate levels in overflow samples were recorded at **115 mg/L** (SWP-1, 21/12/2022) and **104 mg/L** (SWP-1, 25/12/2022).

Sulphate in offsite surface water associated with Rocklow Creek ranged from **680 mg/L** (SWC_UP, 02/12/2022) and **1500 mg/L** (SWP_DOWN_2, 02/12/2022). Historical data indicates increased sulphate levels in all offsite surface waters for the December 2022 monitoring round however despite this the sulphate concentration levels for Rocklow Creek surface waters have been decreasing since 16/06/2021.

Leachate

Sulphate level at the leachate tank (LP-1) in the December 2022 monitoring period was **<100 mg/L** (02/12/2022). The laboratory analytical report advises that sulphate LOR's were raised for this sample due to matrix effects. As a result of this the December 2022 result is not directly comparable to previous data but is included in the data set as a matter of record and to promote

closer scrutiny in subsequent sampling events. Prior to the December 2022 monitoring round sulphate concentration in leachate has been trending down since 2017 and was consistent at **<10 mg/L** since December 2020.

6.4.7 Total Alkalinity

Surface Water

Total Alkalinity at SWP-1 was **464 mg/L** (02/12/2022). Historical data indicates an upward trend in Total Alkalinity since 2019.

Leachate

Total Alkalinity in Leachate (LP-1) was **3,600 mg/L** (02/12/2022). Results are consistent with historical data.

6.4.8 Bicarbonate Alkalinity

Groundwater

Bicarbonate in groundwaters ranged from **287 mg/L** (BH-19r, 05/12/2022) to **2,780 mg/L** (BH-1C, 05/12/2022). Results are generally consistent with historical data.

Metals & Metalloids

6.4.9 Manganese

Groundwater

Manganese was analysed as dissolved manganese in groundwater, total manganese in surface water and total manganese in leachate sampling points. Concentrations of dissolved manganese in groundwater for the December 2022 monitoring period were reported between **0.021 mg/L** (BH-22, 05/12/2022) and **0.679 mg/L** (BH-9, 05/12/2022). Results are generally consistent with historical data.

Surface Water

The total manganese concentration at SWP-1 was from **0.842 mg/L** (02/12/2022). Results are consistent with historical data.

Manganese levels in overflow samples were recorded at **0.304 mg/L** (SWP-1, 02/12/2022) and **0.903 mg/L** (SWP-1, 02/12/2022)

Leachate

Total Manganese concentrations in leachate was reported as **0.101 mg/L** (Leachate Tank LP-1, 02/12/2022).

Manganese concentrations for all samples are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable.

6.4.10 Iron (Total Fe)

Iron was measured as total Iron in selected surface water samples including SWP-1 and Leachate Tank.

Surface Water

Concentrations of total iron for onsite surface water was reported as **0.14 mg/L** (SWP-1, 02/12/2022). Results are generally consistent with historical data.

Leachate

Concentration of iron at the leachate Tank (LP-1) was reported between **1.35 mg/L** (02/12/2022). Results are generally consistent with historical data.

6.4.11 Iron (Dissolved Fe)

Groundwater

Dissolved iron was measured within selected groundwater and surface water sampling points. Groundwater results were reported between **<0.05 mg/L** (BH3, 05/12/2022) and **10.2 mg/L** (BH15, 05/12/2022). Results are generally consistent with historical data.

6.4.12 Calcium

Calcium was measured within selected groundwater and surface water sampling points.

Groundwater

Groundwater results were reported between **75 mg/L** (BH-19r, 05/12/2022) and **185 mg/L** (BH13, 05/12/2022). Calcium levels are generally consistent with historical data.

Surface Water

Calcium in onsite surface was measured at **65 mg/L** (SWP-1, 02/12/2022). The result is generally consistent with previous data.

Calcium in overflow samples from SWP-1 on the 21/10/2022 and 25/10/2022 was **65 mg/L** and **65 mg/L** respectively.

Calcium in offsite surface ranged from **124 mg/L** (SWC_2, 02/12/2022) to **242 mg/L** (SWC_DOWN_2, 02/12/2022). Although the Calcium levels in Rocklow Creek have been generally trending down since December 2019, all offsite surface water samples exhibited 3-5-fold increases in calcium levels during the December 2022 monitoring round.

Leachate

Calcium concentration in Leachate (LP-1) for the December 2022 monitoring period was **39 mg/L** (02/12/2022).

Historical observations indicate that calcium levels have been generally trending down since 2017.

6.4.13 Potassium

Potassium was measured within selected groundwater and surface water sampling points.

Groundwater

Groundwater results were reported between **14 mg/L** (BH-14, 05/12/2022) and **219 mg/L** (BH1c, 05/12/2022). The potassium levels for groundwaters are generally consistent with historical data.

Surface Water

During the December 2022 monitoring period potassium levels for the offsite groundwaters ex Rocklow Creek ranged from **101 mg/L** (SWC_2, 02/12/2022) to **216 mg/L** (SWC-DOWN_2, 02/12/2022).

Historical data indicates that potassium concentrations in surface waters have been trending down since 2018 to an average level of **14 mg/L** in the September 2022 monitoring period. Increased levels recorded in December 2022 with an average concentration of **150 mg/L** also correspond to large increases in salinity indicate that the higher levels are most likely due the site being sampled on an incoming tide.

6.5 ORGANIC ANALYTES

6.5.1 Total Organic Carbon

Total Organic Carbon (TOC) provides a measure of the total concentration of organic material in a water sample. TOC is typically higher in surface water than groundwater, however high TOC is also characteristic of leachate from landfill. TOC provides a marker for biological activity associated with contaminant degradation and can be used to delineate contaminant plumes. TOC influences geochemical processes by:

- acting as proton donors/acceptors;
- providing pH buffering;
- participating in mineral dissolution/precipitation reactions; and
- providing carbon substrate for microbe-based biodegradation.

TOC was reported during the December 2022 monitoring period at the following concentrations:

Groundwater

TOC levels ranged between **14 mg/L** (BH-4; 05/12/2022) and **203 mg/L** (BH-1c; 05/12/2022). Results are consistent with historical data.

Surface Water

In the December 2022 monitoring period the TOC levels in the onsite surface waters were determined as **30 mg/L** (SWP-1; 02/12/2022).

TOC levels in overflow samples taken from SWP-1 on the 21/10/22 and 25/10/22 were **28 mg/L** and **23 mg/L** respectively.

In the December 2022 monitoring period the TOC levels in the offsite surface waters ranged between **7 mg/L** (SWC-DOWN_2; 02/12/2022) and **9 mg/L** (SWC_2 and SWC_DOWN; 02/12/2022). The results are generally consistent with historical data.

Leachate

For the December 2022 monitoring period TOC concentration in leachate was **506 mg/L** (LP-1 Leachate Storage Tank 02/12/2022). The results are generally consistent with previous data

7.0 DUST GAUGE RESULTS

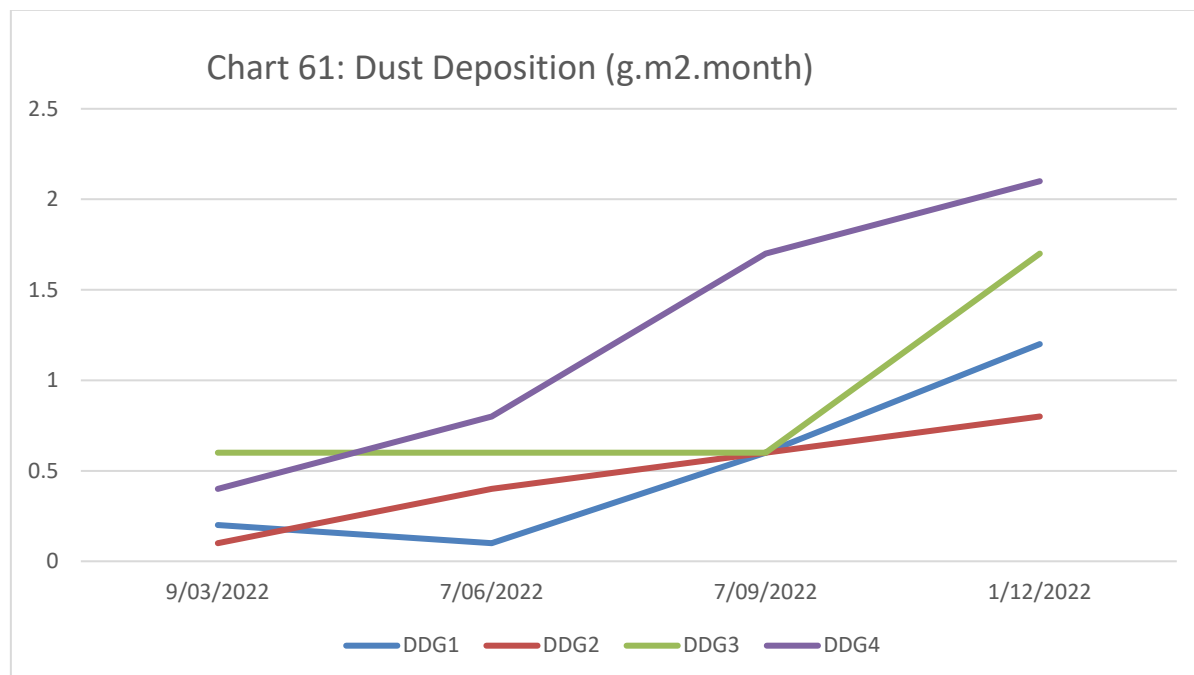
The below table provides the results of the dust depositions results. A total of four (4) dust collectors were onsite for one (1) month between **4th May** and **7th December 2022**, in general accordance with AS3580.10.1. A summary of results is provided in **Table 7** below.

Table 7: Summary of Dust Gauge Results

Sample ID	Guideline Criteria (g/m ² /month)	Total Insoluble Matter (g/m ² /month)	Comments
DDG1	4	1.2	Satisfactory
DDG2		0.8	Satisfactory
DDG3		1.7	Satisfactory
DDG4		2.1	Satisfactory

Results for depositional dust during the December 2022 quarterly monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m²/month**.

Chart 1: Monthly plot of Dust Deposition Gauge Results

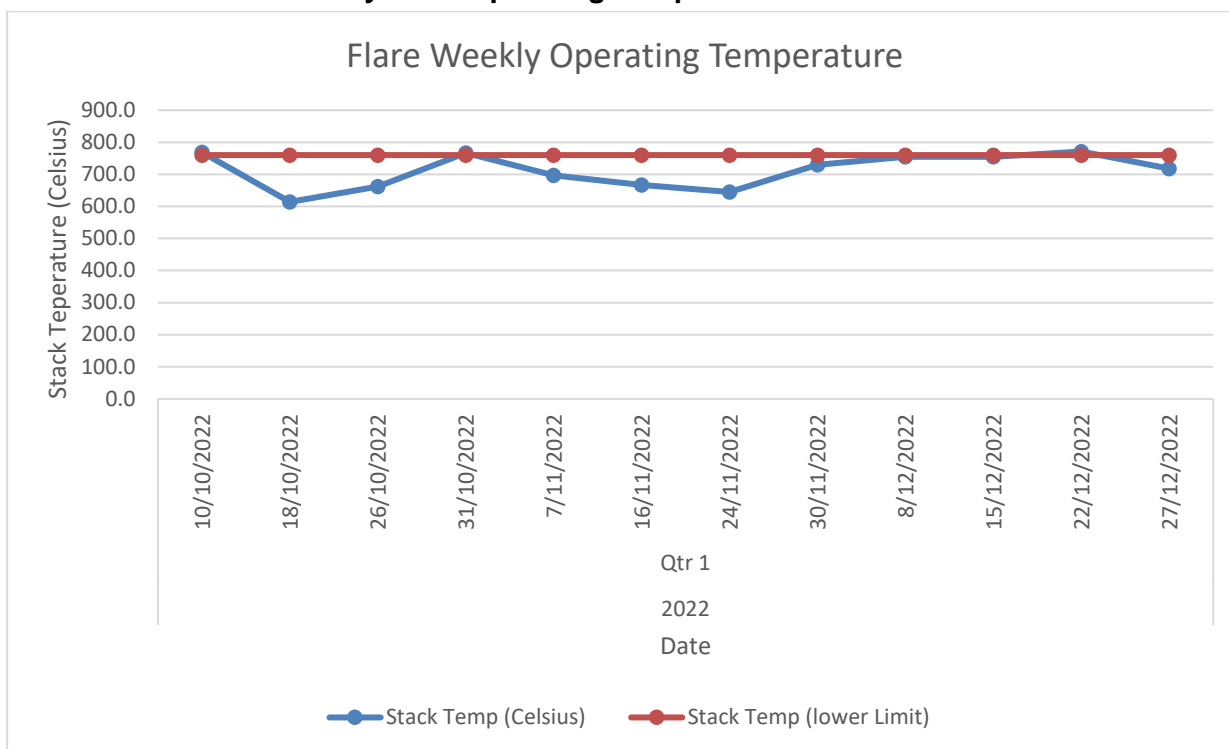


The results were considered satisfactory. Dust gauge locations are provided in **Figure 2** attached. It is recommended that monitoring is continued in accordance with EPL 5984.

Table 8: Summary of Flare Operating Temperatures

Year	Monitoring Period	Date	Compliant	Non-Compliant
2022	Qtr 1	10/10/2022	769.0	
		18/10/2022		614.0
		26/10/2022		662.0
		31/10/2022	767.0	
		7/11/2022		697.0
		16/11/2022		667.0
		24/11/2022		645.0
		30/11/2022		730.0
		8/12/2022		755.0
		15/12/2022		755.0
		22/12/2022	771.0	
		27/12/2022		718.0

Chart 2: Weekly Flare Operating Temperatures June Quarter 2022



Weekly average operating temperatures supplied by LGI displayed typical variation associated with a continuous process.

Weekly operating temperatures at the Flare fell below the Operational temperature Limit of 760 degrees on 9 out of 12 occasions during the June monitoring period based on weekly summarise data.

The actions taken to address the root causes are outlined in the LGI Gas Flare reports included as **Appendix G**.

8.0 METHANE MONITORING

8.1 SURFACE GAS METHANE

The surface gas monitoring for the December 2022 monitoring period *DID NOT* detect any levels of methane above the EPA license limits of 500 ppm. The results were considered satisfactory. A table of results is provided in Appendix D.

8.2 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The internal methane testing for enclosed structures within 250m of the landfill during the December 2022 monitoring period *DID NOT* detect any levels of methane above the EPA license limits of 1% V/V. The results were considered satisfactory. A table of results is provided in Appendix D.

9.0 ENVIRONMENTAL ASSESSMENT

9.1 MONITORING POINT SUMMARY

Field measurements and NATA laboratory results for dust and methane results for the December 2022 monitoring period reported satisfactory results. Water results including leachate, groundwater, onsite and offsite surface water reported concentrations of analytes within the range historical values. Water results from the last four (4) years have been tabulated and presented **Charts 3-61** attached.

Groundwater and surface water within the Site boundary generally reported multiple high levels of analytes considered to be characteristic of landfill and leachate. Offsite sample locations within Rocklow Creek generally reported results consistent with previous monitoring events. .

All dust gauges reported satisfactory results over the December 2022 monitoring period.

Results of surface methane gas monitoring recorded satisfactory results. The landfill surface cap was therefore considered intact and effective during the monitoring period.

Gas accumulation monitoring reported satisfactory results for all enclosed structures within 250m of emplaced waste or leachate storage facility.

Results for flare monitoring reported consistent temperature exceedances throughout the December 2022 monitoring period.

9.2 ENVIRONMENTAL MANAGEMENT

9.2.1 Landfill Operations

ENRS understand ‘solid’ waste (general solid waste putrescible and non-putrescible) landfill operations are ongoing at the Site. Landfill practices should be conducted in accordance with the Site’s Landfill Environmental Management Plan (LEMP) and the EPA Solid Waste Landfill Guidelines (EPA; 2016).

9.3 ENVIRONMENTAL SAFEGUARDS

Appropriate management actions are required to continue to prevent and detect potential groundwater and surface water pollution. The nearest sensitive receptors for any uncontrolled Site water and leachate include; areas of adjoining bushland; recreational users of the Minnamurra River estuary environs, down gradient stakeholders; and down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE).

It is recommended that any drainage and detention structures are inspected annually by a suitably qualified environmental professional to assess their structural integrity and identify the need for any maintenance (such as removal of deep rooted vegetation, sediment, and re-lining).

Access tracks to sampling points should be inspected prior to each quarterly sampling events. Continue to review annual surface and groundwater monitoring results from up and down gradient of the land fill cells and offsite sampling locations within Rocklow Creek. Continue to monitor surface methane gas in order to assess the capping integrity of the landfill cells.

9.4 MONITORING PROGRAM

The water, dust and surface methane monitoring program are required to demonstrate that Site activities are not generating any off-site pollution. The Site's EPL's and monitoring regime should be reviewed annually.

Review of the December 2022 monitoring results indicate no significant change in environmental conditions at the Site during the past 3 months. Future sampling events should continue to monitor the key indicators of leachate within surface and ground waters, especially concentration of ammonia and nitrate.

Should monitoring continue to report any significant changes in analyte concentrations the need for additional monitoring locations should be reviewed, including additional groundwater monitoring bores both up and down gradient locations of areas with analytical exceedances.

It is recommended that water quality results from future monitoring rounds continue be forwarded to a suitably qualified environmental professional for review within the laboratory holding time to compare against relevant guidelines and identify any irregularities so that additional testing may be conducted within the holding time.

10.0 CONCLUSIONS

Based on the findings obtained during the December 2022 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;

- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate, sulphate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-14, BH-15, BH-18, BH-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- With the exception of Nitrate, Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria.
- On nine (9) out of twelve (12) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the December 2022 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and
- This report must be read in conjunction with the attached Statement of Limitations.

11.0 LIMITATIONS

This report and the associated services performed by ENRS are in accordance with the scope of services set out in the contract between ENRS and the Client. The scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

ENRS derived the data in this report primarily from visual inspections, examination of available records, interviews with individuals with information about the site, and if requested, limited sample collection and analysis made on the dates indicated. In preparing this report, ENRS has relied upon, and presumed accurate, certain information provided by government authorities, the Client and others identified herein. The report has been prepared on the basis that while ENRS believes all the information in it is deemed reliable and accurate at the time of preparing the report, it does not warrant its accuracy or completeness and to the full extent allowed by law excludes liability in contract, tort or otherwise, for any loss or damage sustained by the Client arising from or in connection with the supply or use of the whole or any part of the information in the report through any cause whatsoever.

Limitations also apply to analytical methods used in the identification of substances (or parameters). These limitations may be due to non-homogenous material being sampled (i.e., the sample to be analysed may not be representative), low concentrations, the presence of 'masking' agents and the restrictions of the approved analytical technique. As such, non-statistically significant sampling results can only be interpreted as 'indicative' and not used for quantitative assessments.

The data, findings, observations, conclusions and recommendations in the report are based solely upon the state of the site at the time of the investigation. The passage of time, manifestation of latent conditions or impacts of future events (e.g., changes in legislation, scientific knowledge, land uses, etc) may render the report inaccurate. In those circumstances, ENRS shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of the report.

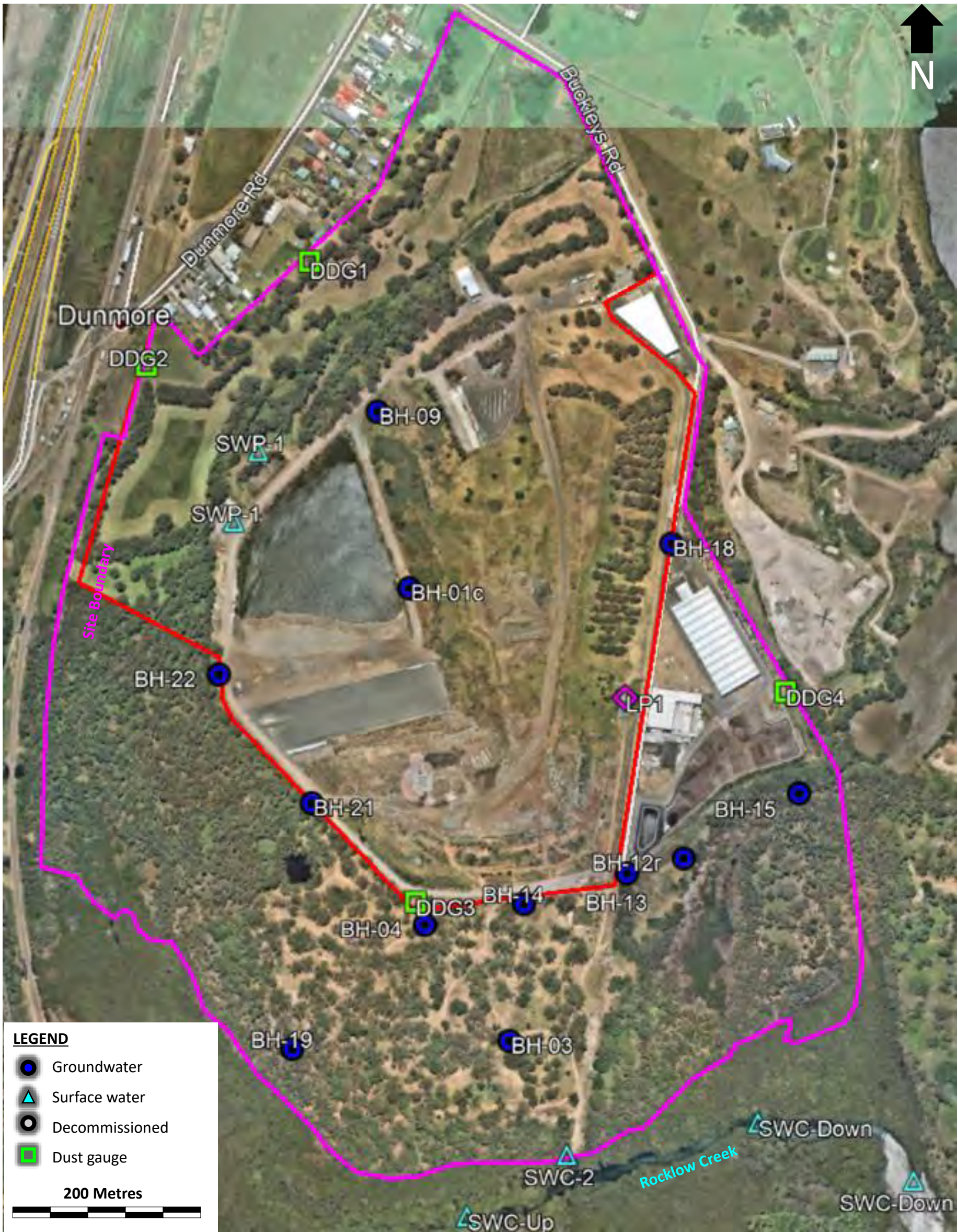
This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between ENRS and the Client. ENRS accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in respect of any use of or reliance upon this report by any third party or parties.

It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

12.0 REFERENCES

- ANZECC (1996). Guidelines for the Laboratory Analysis of Contaminated Materials.
- ANZECC (2000) Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment & Conservation Council. ISBN 09578245 0 5 (set).
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
- Australian Government (2011) National Health & Medical Research Council. National Resource Management Ministerial Council. National Water Quality Strategy. Australian Drinking Water Guidelines.
- Australian Standard AS 3580.10.1. Methods for sampling and analysis of ambient air; method 10.1- Determination of particulate matter - Deposited matter - Gravimetric method
- Environmental Earth Sciences (2018) Annual Report 2018- Environmental Monitoring at the Dunmore Recycling and Waste Depot, Dunmore, New South Wales
- NEPC (2013). National Environment Protection (Assessment of Site Contamination) Measure.
- Netherlands (1994) Environmental Quality Objectives in the Netherlands. Ministry of Housing, Spatial Planning and the Environment, Netherlands Government. ISBN 90-6092-783-4.
- NSW Department of Environment and Climate Change (2009a). Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997
- NSW Department of Environment and Conservation (1997). Guidelines for the Assessment and Management of Groundwater Contamination
- NSW EPA (1995) Sampling Design Guidelines. ISBN 0-7310-3756-1.
- NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Sites.
- NSW Department of Environment and Conservation (1997). Guidelines for the Assessment and Management of Groundwater Contamination.
- NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills. ISBN 0 7310 3774 X
- NSW EPA (2016) Environmental Guidelines: Solid Waste Landfills (2nd Edition). ISBN 978 1 76039 350 2
- NSW EPA (Mar. 2020) Environmental Protection Licence (EPL) 5984
- NSW EPA (Dec. 2017) Environmental Protection Licence (EPL) 12903
- NSW Government (1997). Protection of the Environment Operations Act.
- NSW Government (2005). Protection of the Environment (Waste) Regulation.
- NSW Landcom (2008). Managing Urban Stormwater: Soils and Construction, Volume 2B – Waste Landfills.

FIGURES



LEGEND

- Groundwater
- ▲ Surface water
- Decommissioned
- Dust gauge

200 Metres

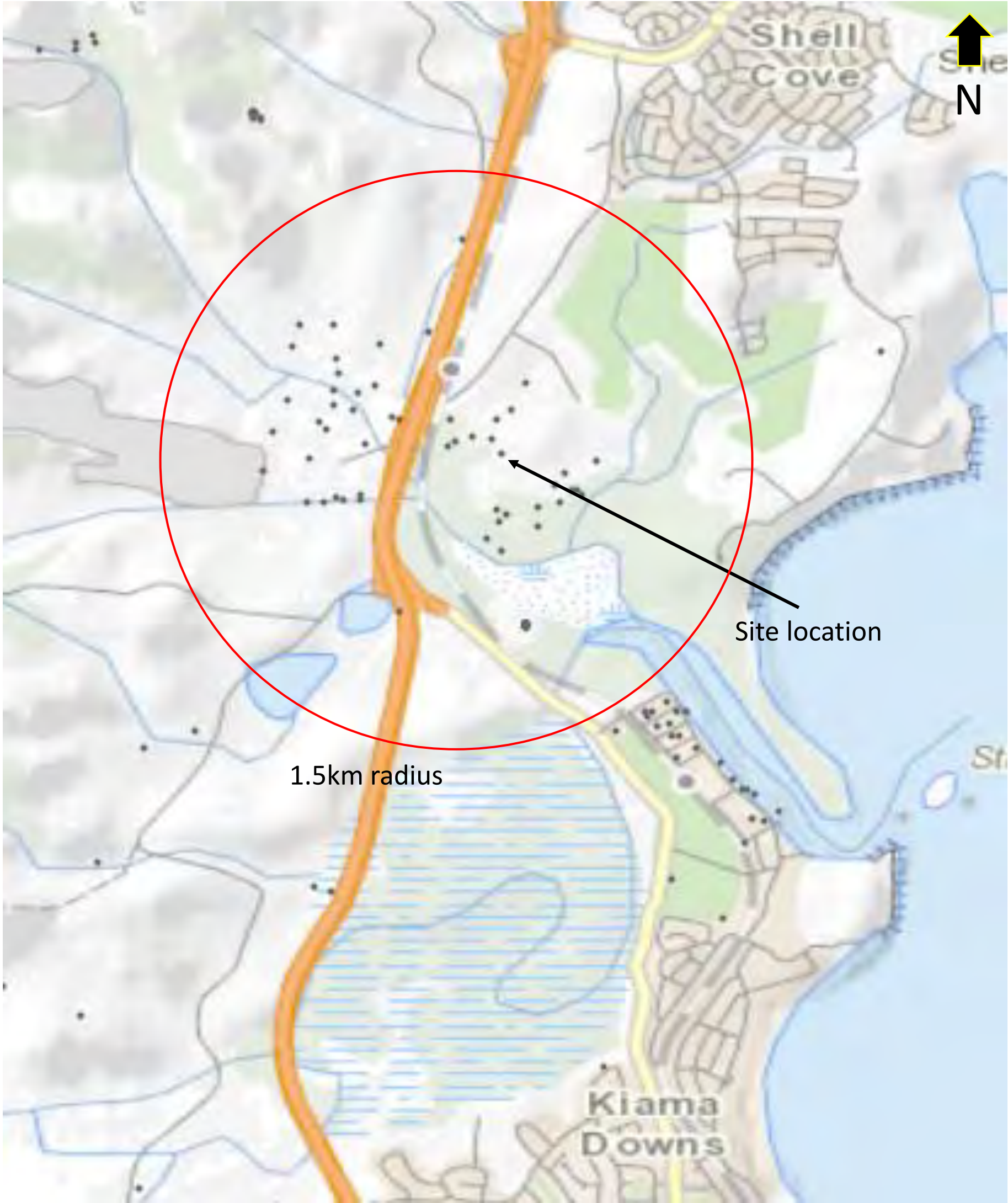
 Environment & Natural Resource Solutions 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	Shellharbour City Council	Drawn:	PL	Figure:	2
	Project:	ENRS0033	Source:	NearMaps	Date:	21/05/2021
	Location:	Dunmore Recycling & Waste Depot	Scale:	NA	Title:	Site Plan
		44 Buckleys Rd, Dunmore, NSW	Status:	Rev 2		



Environment & Natural Resource Solutions

108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535
Tel: 02 4448 5490 Fax: 02 90374708
projects@enrs.com.au www.enrs.com.au

Client:	Shellharbour City Council	Drawn:	PL	Figure:	3
Project:	ENRS0033	Source:	SixMaps	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	NA	Title:	Surface Gas Sample transects
		Status:	Rev 1		



Environment & Natural Resource Solutions
108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535
Tel: 02 4448 5490 Fax: 02 90374708
projects@enrs.com.au www.enrs.com.au

Client:	Shellharbour City Council	Drawn:	PL	Figure:	5
Project:	ENRS0033	Source:	NSW Office of Water	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	NA	Title:	Registered Bores
		Status:	Rev 1		

TABLES

TABLE 9: Total Concentration Results
Quarterly Water Monitoring Results - March 2022: Dunmore Recycling and Waste Depot

GILs - Trigger Values for Freshwater (Protection of 95% of Species) ^A					-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	-	0.7	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-	-		
GILs - Trigger Values for Marine Water (Protection of 95% of Species) ^A					-	-	-	-	-	-	-	-	-	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Australian Drinking Water Guidelines (2018) ^C				Health	-	-	-	-	-	0.5	-	-	1.5	-	3	50	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-	-		
				Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	-	-	-	-	-	250	-	-	-	-	5	6.5 - 8.5	-	-	-	
Dust Deposition Trigger Values																												4		
Lab Report No.	Sample No.	Sample type	EPA No.	Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Nitrite as N	Nitrate as N	Total Organic Carbon	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	pH	Electrical Conductivity (Non Compensated)	Temperature	Standing Water Level	Total Insoluble Matter	Comments
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	NTU	pH	µS/cm	°C	mbgl	mbgl	-
				Laboratory PQL	1	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	1	1	1	1	0.01	0.1	5	0.1	0.01	1	0.1	0.01	0.1	-
EW2205534001	BH1c	Groundwater	3	Dec 2022	904	133			219	0.11		8.16	0.5	345	< 0.01	< 0.01	203	2,780	2,780	< 10					7.00	7,160	25.2	3.00		
EW2205534002	BH3	Groundwater	5	Dec 2022	140	126			44	0.02		< 0.05	0.2	9	0.27	2.39	17	330	330	158					8.10	1,160	17.6	3.01		
EW2205534003	BH4	Groundwater	6	Dec 2022	50	86			16	0.09		1.70	0.1	2	0.01	0.01	14	297	297	61					8.20	692	17.6	4.24		
EW2205534004	BH9	Groundwater	18	Dec 2022	392	180			69	0.68		0.32	0.4	124	< 0.01	< 0.01	79	1,820	1,820	< 10					7.30	3,580	18.7	2.94		
EW2205534005	BH12r	Groundwater	17	Dec 2022	107	154			28	0.51		6.52	0.2	4	< 0.01	0.01	21	568	568	119					7.30	1,340	19.4	4.15		
EW2205534006	BH13	Groundwater	10	Dec 2022	204	185			17	0.32		1.82	0.2	3	0.03	0.19	23	779	779	64					7.30	1,770	20.3	4.11		
EW2205534007	BH14	Groundwater	11	Dec 2022	33	82			14	0.08		0.07	0.6	1	0.01	1.57	18	334	334	80					7.00	756	19.7	4.53		
EW2205534008	BH15	Groundwater	7	Dec 2022	447	131			185	0.31		10.20	0.2	10	< 0.01	0.14	37	467	467	534					7.40	2,650	18.2	0.73		
EW2205534010	BH18	Groundwater	25	Dec 2022	76	87			18	0.08		1.85	0.2	2	< 0.01	< 0.01	22	458	458	12					7.20	880	18.3	1.97		
EW2205534009	BH19r	Groundwater	16	Dec 2022	52	75			37	0.07		0.97	0.2	2	0.01	< 0.01	19	287	287	53					8.40	724	17.6	4.53		
EW2205534011	BH21	Groundwater	23	Dec 2022	429	131			18	0.56		0.13	0.4	5	< 0.01	< 0.01	41	834	834	149					7.30	2,560	20.9	2.98		
EW2205534012	BH22	Groundwater	24	Dec 2022	235	94			43	0.02		0.12	0.4	56	< 0.01	0.01	34	606	606	283					8.10	1,910	17.3	2.77		
EW2205529001	SWP1	Surfacewater	1	Dec 2022	225	65	41	213	20	0.84	0.14	0.06	0.4	9	0.04	0.02	30	464	464	96	3.43		14	2.70	7.50	1,500	19.5			
EW2205529003	SWC_up	Surfacewater	20	Dec 2022	6,620	145	378	3,280	122	0.17	0.89	< 0.05	0.6	0	< 0.01	0.10	8	150	150	817	4.94		< 5	14.00	7.00	17,100	19.0			
EW2205529002	SWC_2	Surfacewater	19	Dec 2022	5,380	124	308	2,680	101	0.17	1.20	< 0.05	0.6	1	0.01	0.11	9	141	141	680	5.80		10	19.70	7.00	14,100	18.7			
EW2205529004	SWC_down	Surfacewater	21	Dec 2022	8,410	184	493	4,310	160	0.13	0.68	< 0.05	0.7	1	< 0.01	0.07	9	154	154	1,060	7.07		< 5	10.70	7.00	21,600	19.0			
EW2205529005	SWC_down_2	Surfacewater	22	Dec 2022	11,200	242	678	5,920	216	0.11	0.48	< 0.05	0.8	0	< 0.01	0.04	7	142	142	1,500	4.49		< 5	6.30	7.00	29,100	18.7			
EW2205533001	Leachate Storage Tank LP1	Leachate	2	Dec 2022	1,710	39			363	0.10	1.35		0.2	773	< 1.00	< 1.00	506	2,600	3,600	< 100	5.58	63.2			8.50	9,310	19.9			
0	SWP1	Surfacewater	1	25/10/2022	178	62	33	175	20		0.76	< 0.05	0.4	15.80	0.67	1.04	23	361	361	104	4.24		17	14.20	7.90	1,550	18.9			
0	SWP1	Surfacewater	1	21/10/2022	214	63	37	193	20		1.99	< 0.05	0.4	16.40	0.81	0.98	28	469	469	115	5.77		23		7.90	1,760	21.5			
EW2205528001	DDG1	Dust Deposition	0	Dec 2022																									1.20	
EW2205528002	DDG2	Dust Deposition	0	Dec 2022																									0.80	
EW2205528003	DDG3	Dust Deposition	0	Dec 2022																									1.70	
EW2205528004	DDG4	Dust Deposition	0	Dec 2022																									2.10	

Investigation levels apply to typical slightly-moderately disturbed systems. Trigger Levels for 95% of species. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.
ANZECC 2000 - pH Upper and Lower Limit for NSW Lowland Rivers (Table 3.3.2).
Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).
NEPM (2013 Table 1A(4) Groundwater HSLs for vapour intrusion (Sand 2m-4m)

TABLE 10: Duplicate Groundwater Sample Results and QC Data

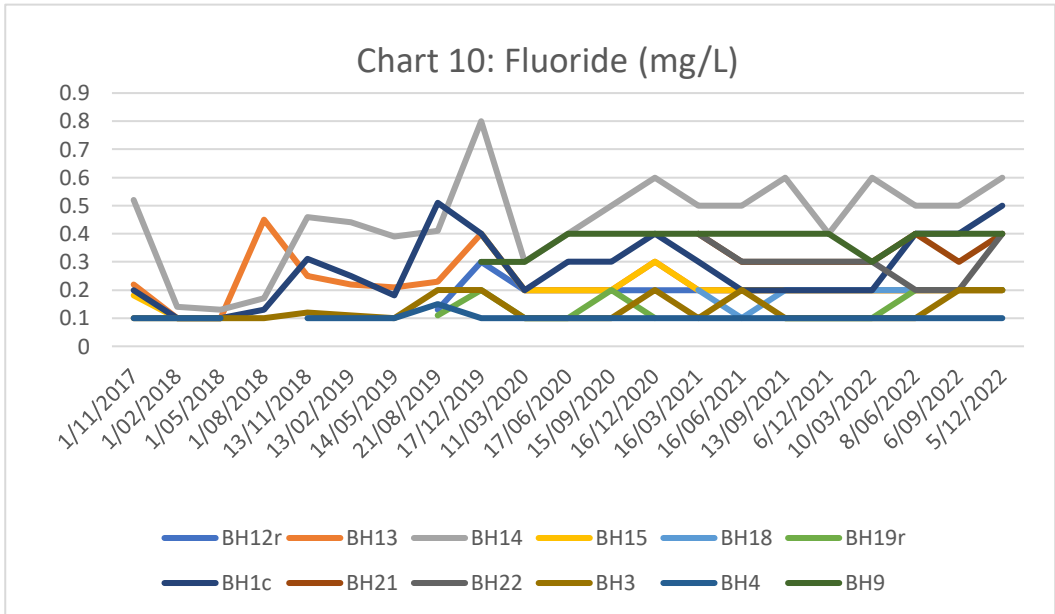
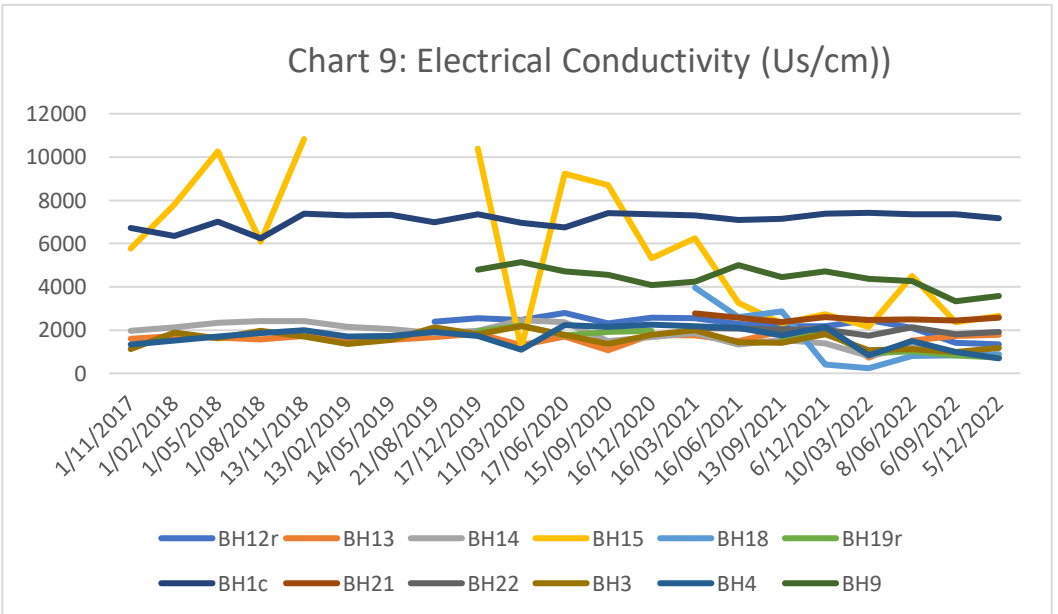
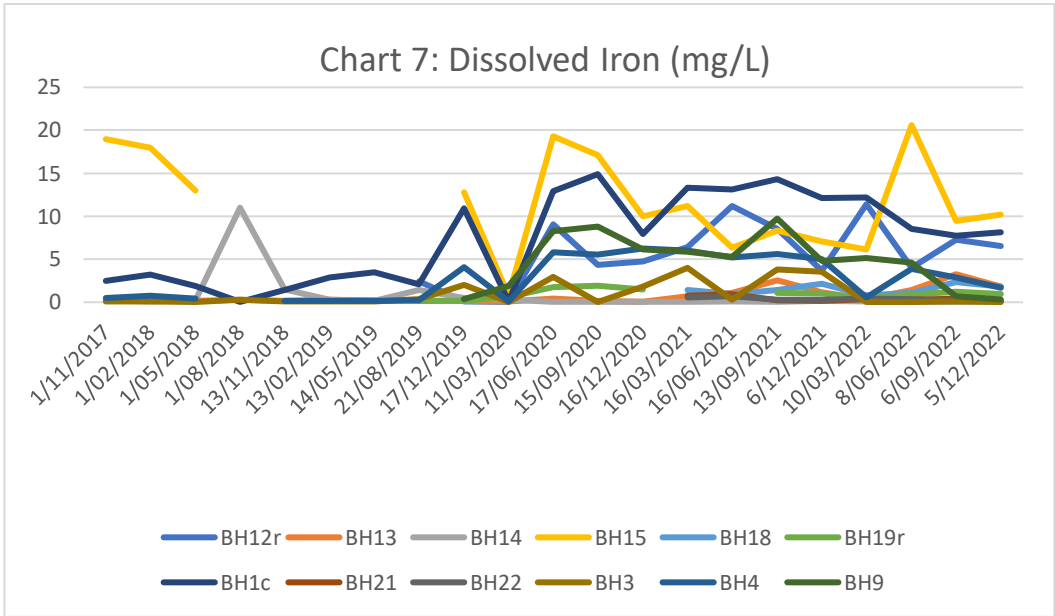
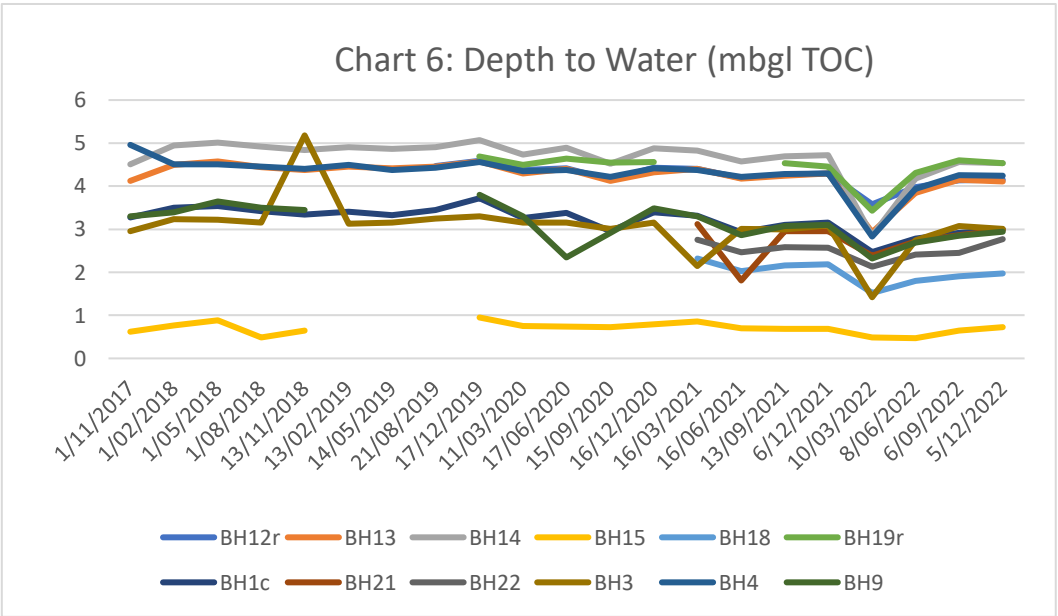
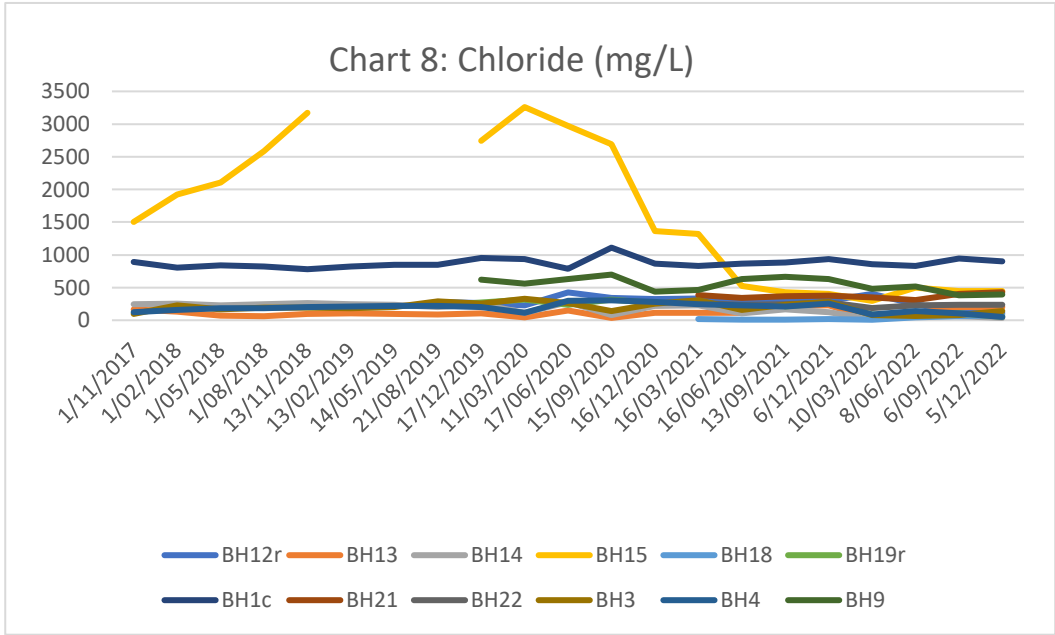
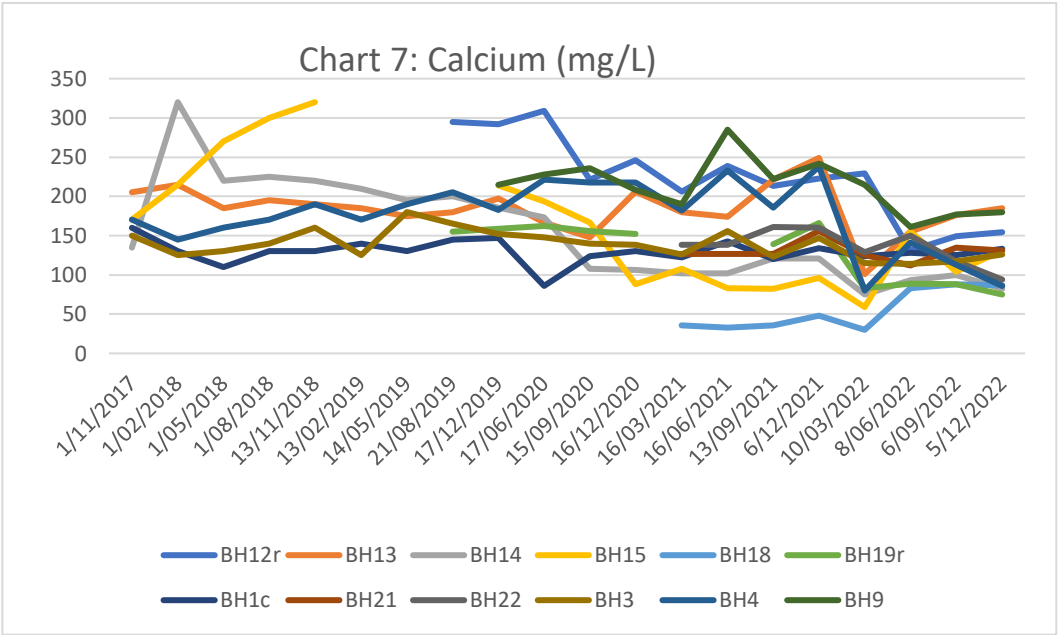
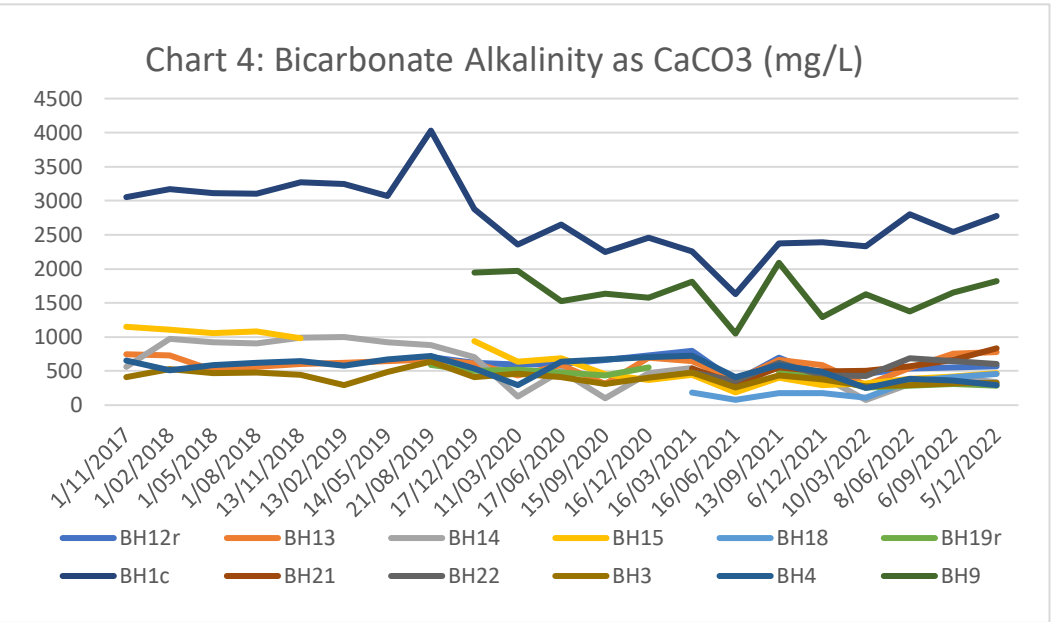
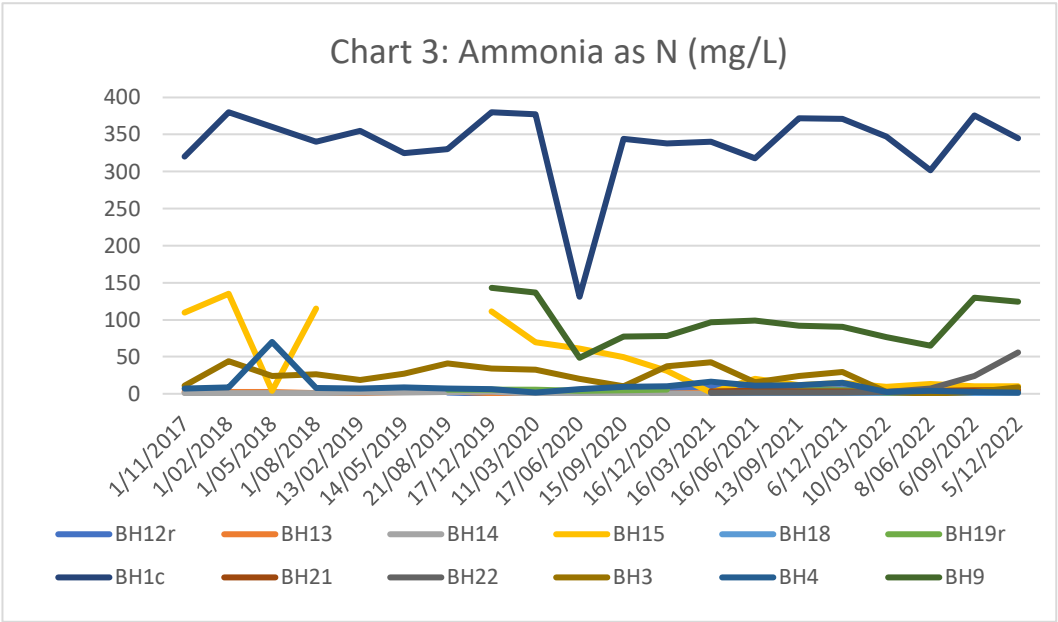
Lab Report No.				EW2205534004	EW2205534013	RPD
Sample No.				BH9	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				18	QC1	
Date Sampled				5/12/2022	5/12/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	392	390	✓ 0.51
Calcium	mg/L	1	5	180	177	✓ 1.68
Potassium	mg/L	1	5	69	68	✓ 1.46
Manganese	mg/L	0.001	0.005	0.679	0.670	✓ 1.33
Dissolved Iron	mg/L	0.05	0.25	0.32	0.31	✓ 3.17
Fluoride	mg/L	0.1	0.5	0.40	0.30	✓ 28.57
Ammonia as N	mg/L	0.01	0.05	124.00	119.00	✓ 4.12
Nitrite as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Total Organic Carbon	mg/L	1	5	79	80	✓ 1.26
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	5	1,820	1,820	✓ 0.00
Total Alkalinity as CaCO ₃	mg/L	1	5	1,820	1,820	✓ 0.00
Sulfate as SO ₄ - Turbidimetric	mg/L	1	5	< 10	< 10	✓ 0.00
pH	pH	0.01	0.05	7.30	7.30	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	3,580	3,580	✓ 0.00
Temperature	°C	0.1	0.5	18.7	18.7	✓ 0.00
Standing Water Level	mbgl	-		2.94	2.94	✓ 0.00

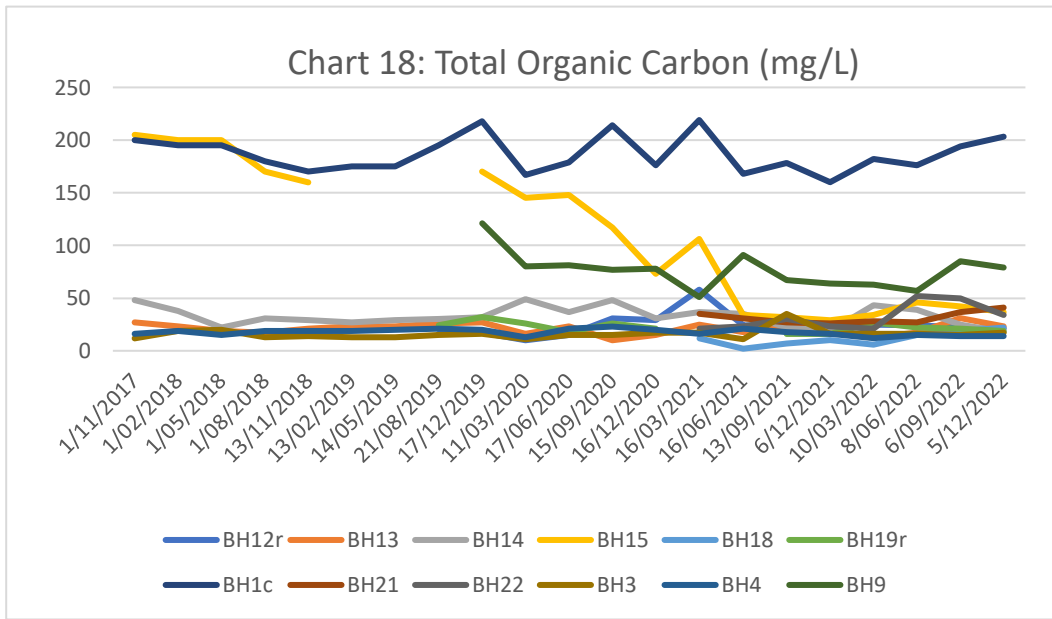
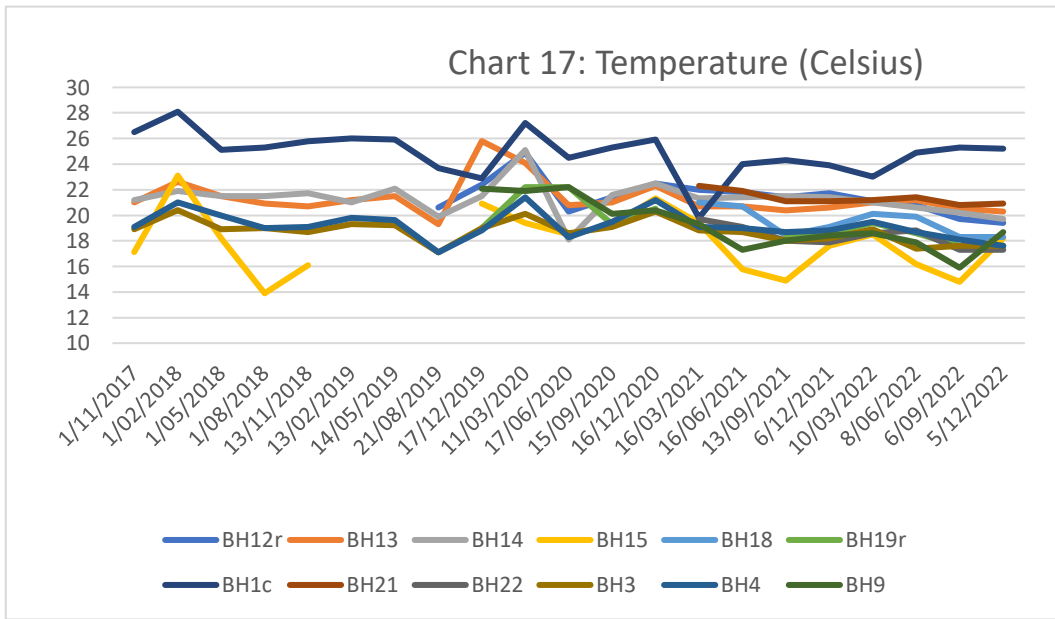
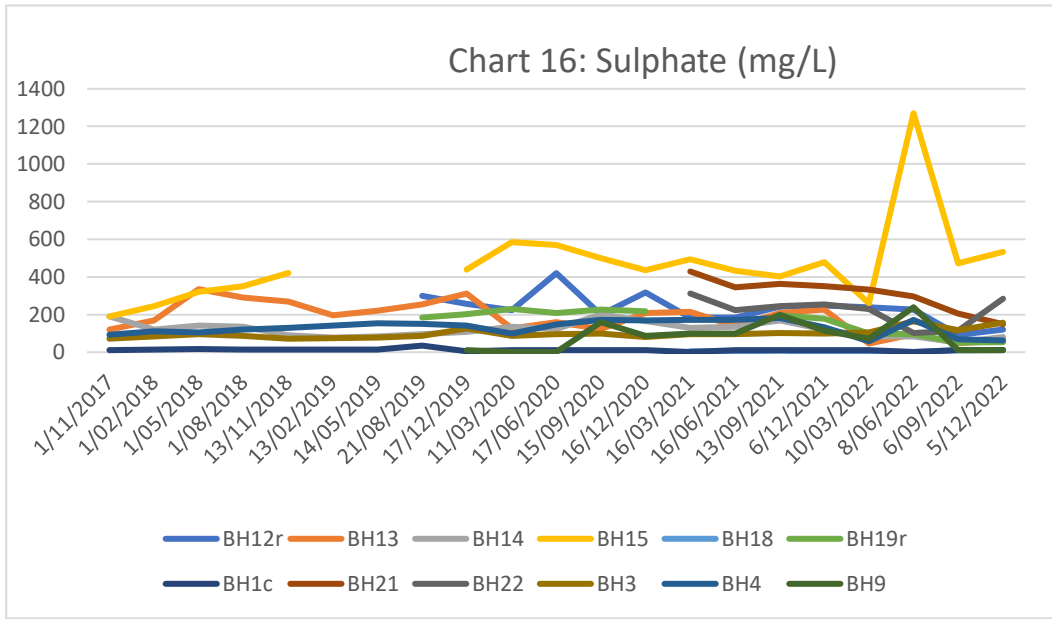
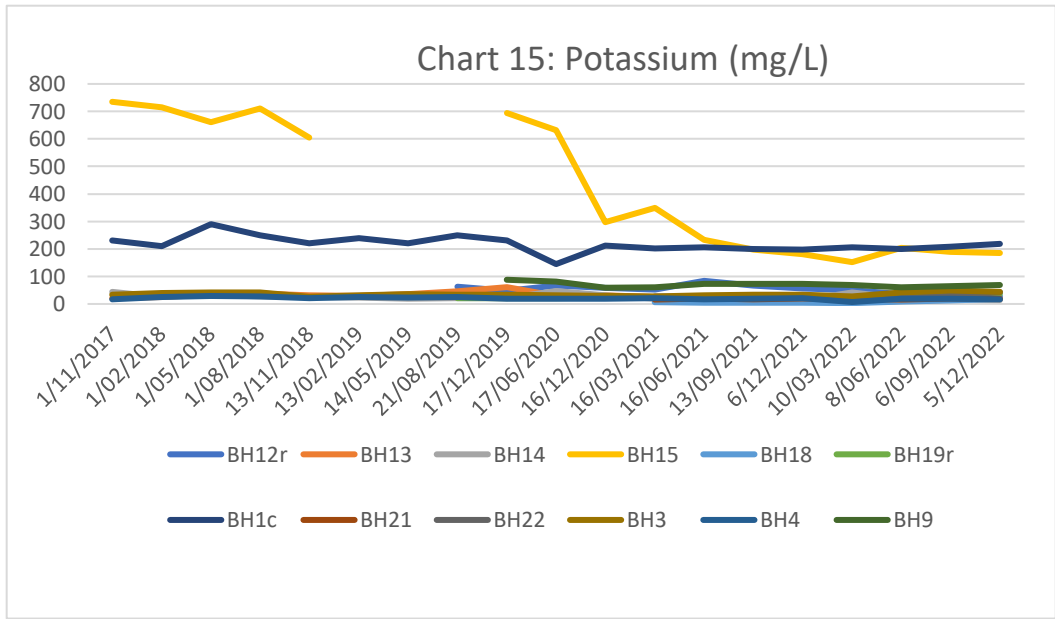
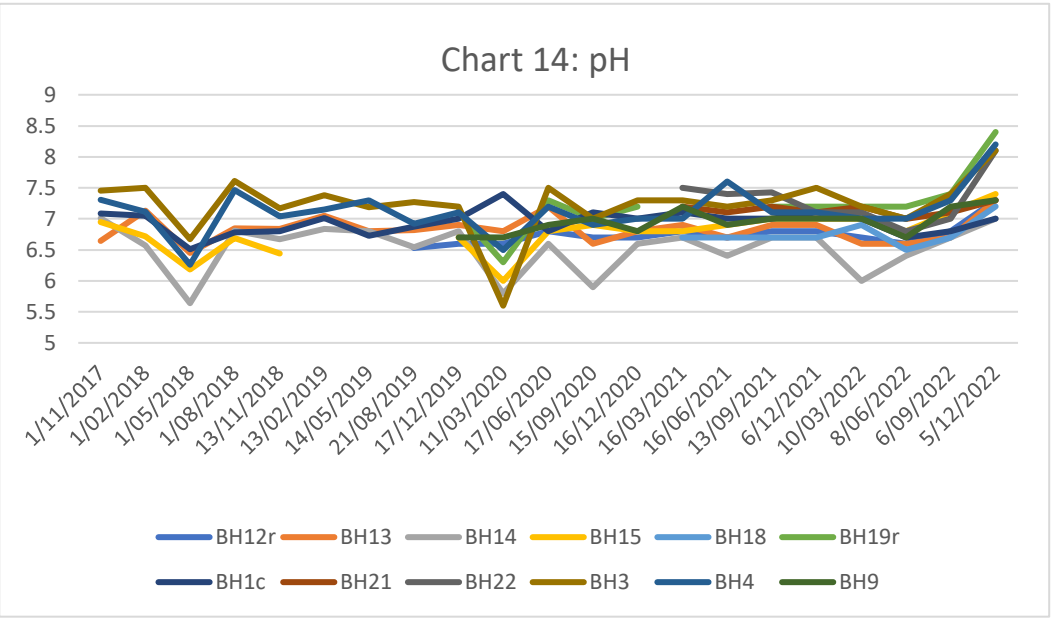
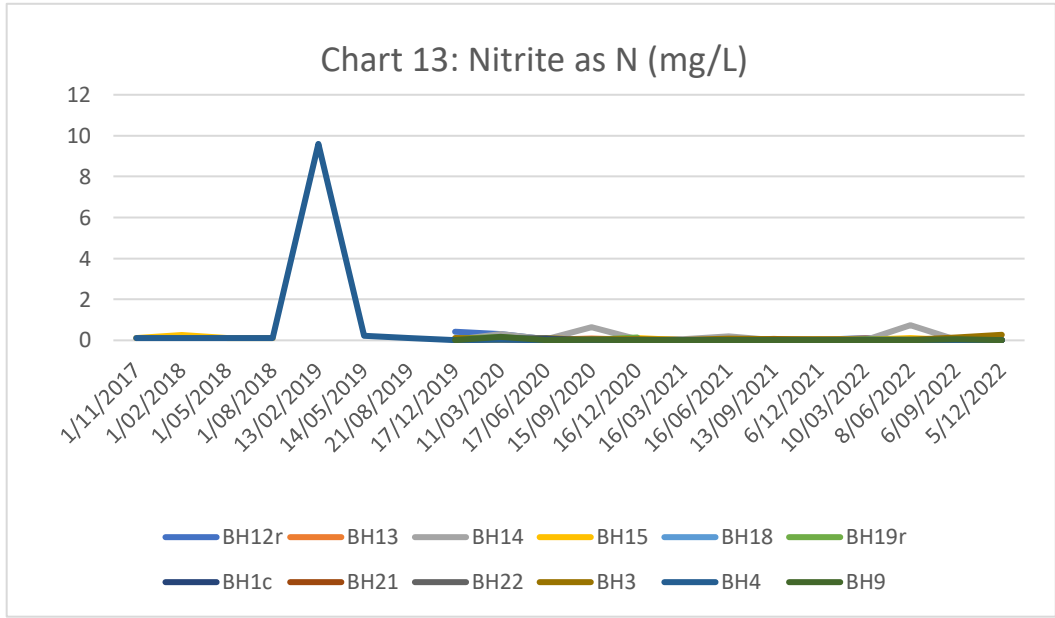
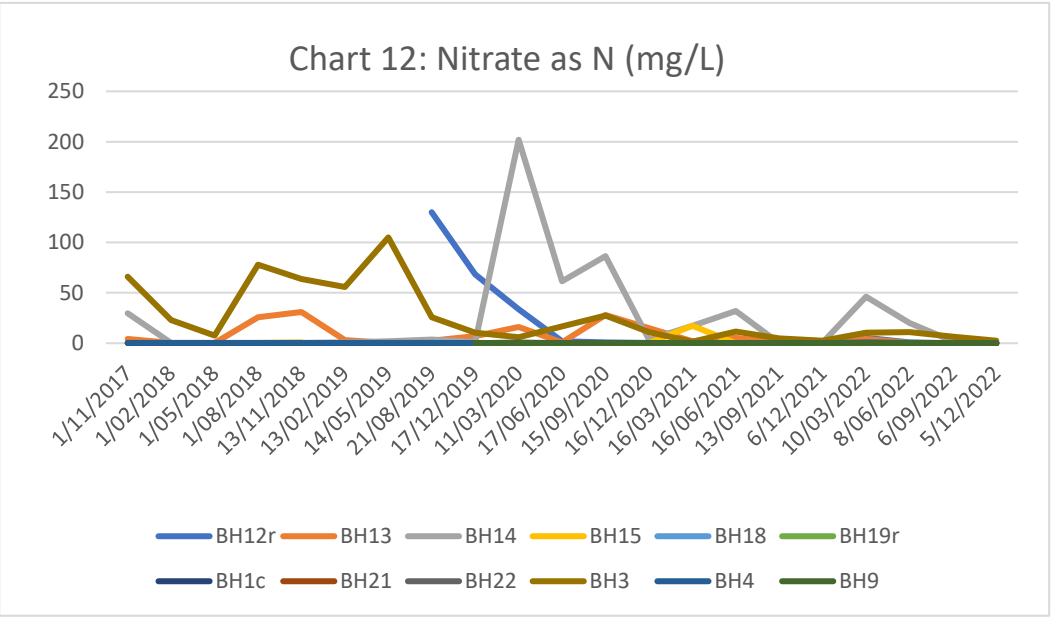
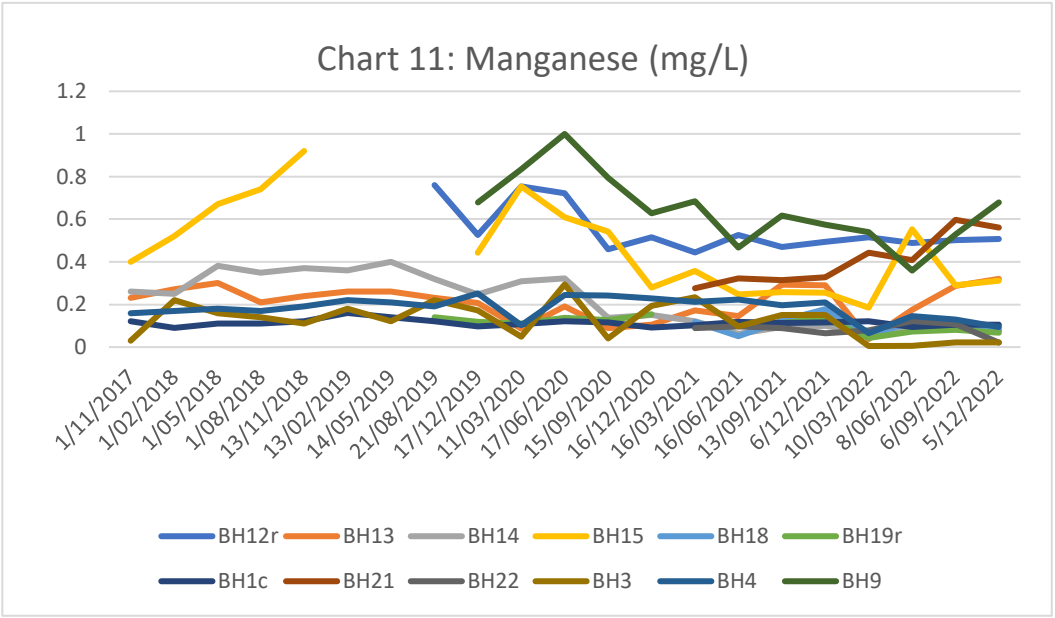
TABLE 11: Duplicate Surface Water Results and QC Data

Lab Report No.				EW2205529002	EW2205529006	RPD
Sample No.				SWC_2	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				19	QC2	
Date Sampled				2/12/2022	2/12/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	5,380	5,390	✓ 0.19
Calcium	mg/L	1	5	124	127	✓ 2.39
Potassium	mg/L	1	5	101	106	✓ 4.83
Manganese	mg/L	0.001	0.005	0.165	0.161	✓ 2.45
Total Iron	mg/L	0.05	0.25	1.20	1.11	✓ 7.79
Dissolved Iron	mg/L	0.05	0.25	< 0.05	< 0.05	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.6	0.6	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	0.53	0.60	✓ 12.39
Nitrite as N	mg/L	0.01	0.05	0.01	0.01	✓ 0.00
Nitrate as N	mg/L	0.01	0.05	0.11	0.11	✓ 0.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.12	0.12	✓ 0.00
Total Organic Carbon	mg/L	1	5	9	9	✓ 0.00
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	5	141	132	✓ 6.59
Total Alkalinity as CaCO ₃	mg/L	1	5	141	132	✓ 6.59
Sulfate as SO ₄ - Turbidimetric	mg/L	1	5	680	704	✓ 3.47
Dissolved Oxygen	mg/L	0.01	0.05	5.80	5.81	✓ 0.17
pH	pH	0.01	0.05	7.00	7.00	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	14,100	14,100	✓ 0.00
Temperature	°C	0.1	0.5	18.7	18.7	✓ 0.00

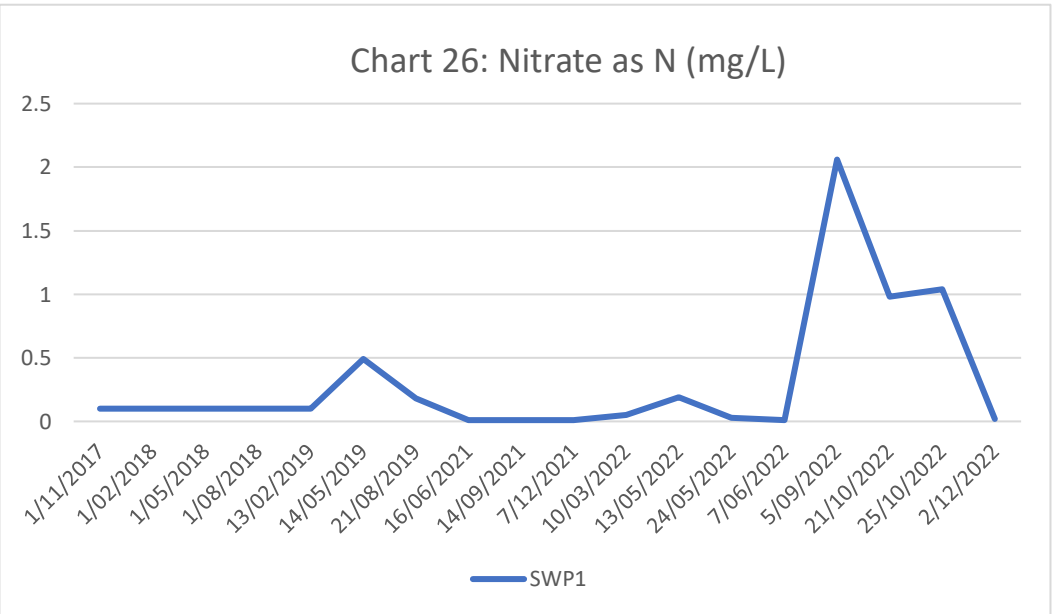
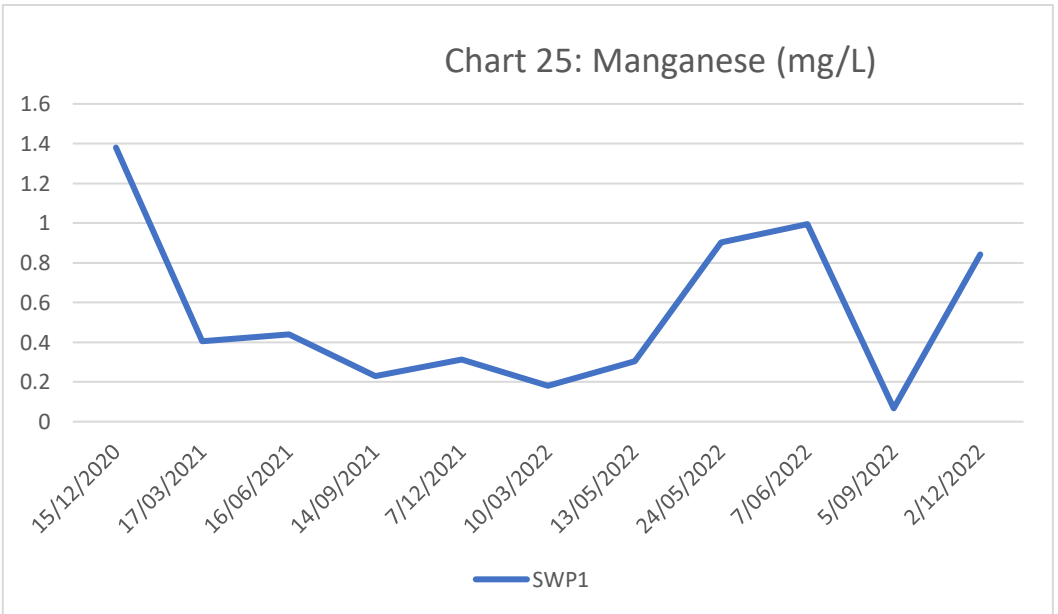
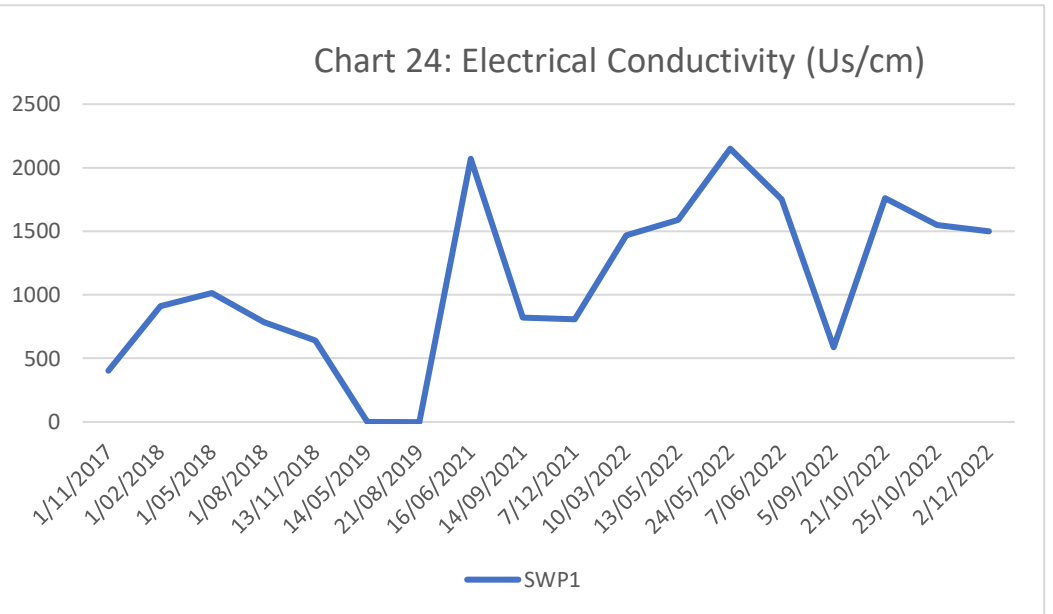
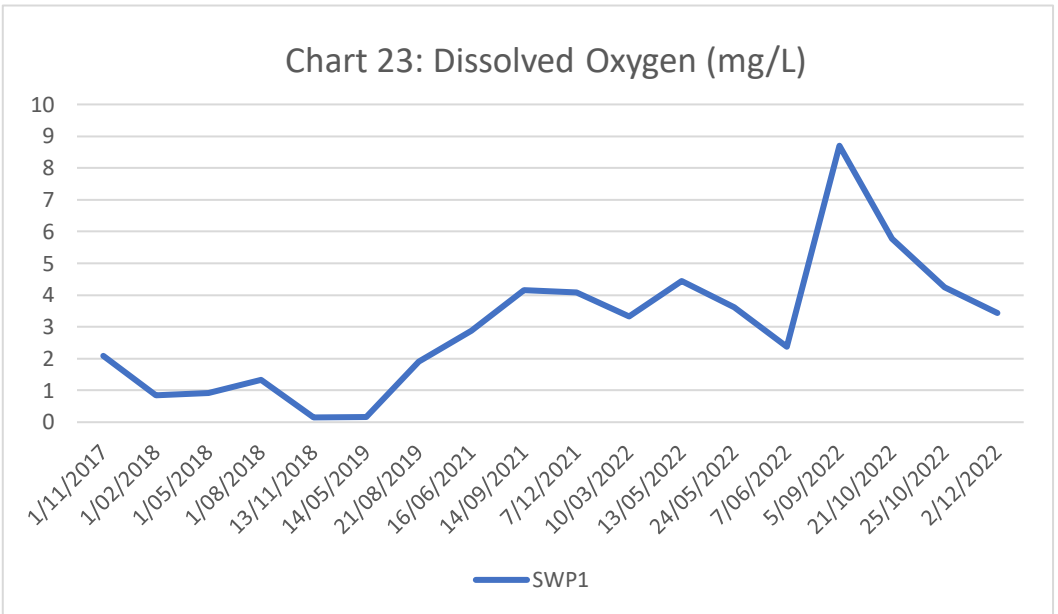
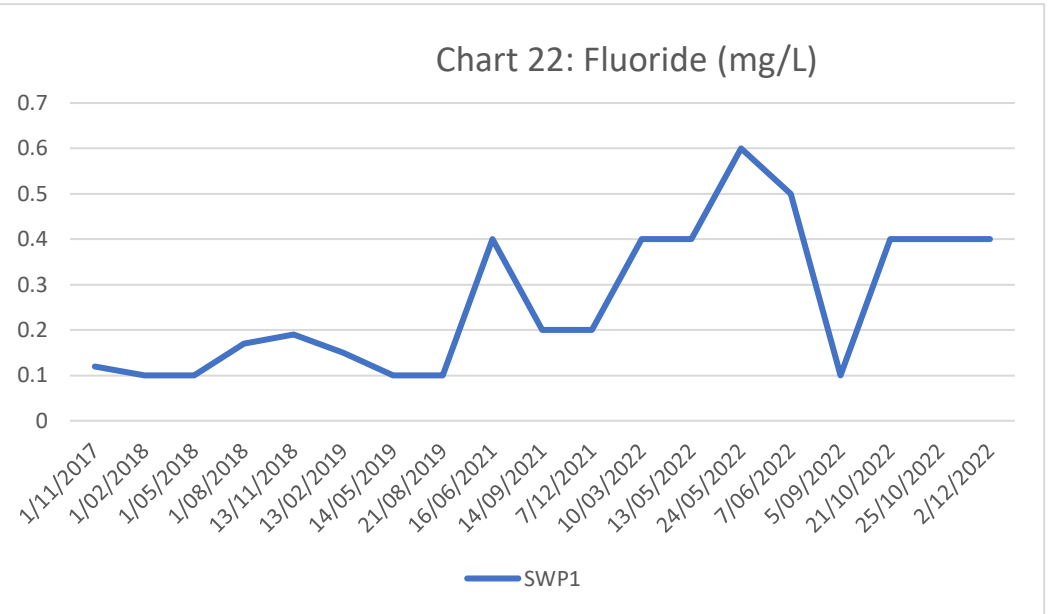
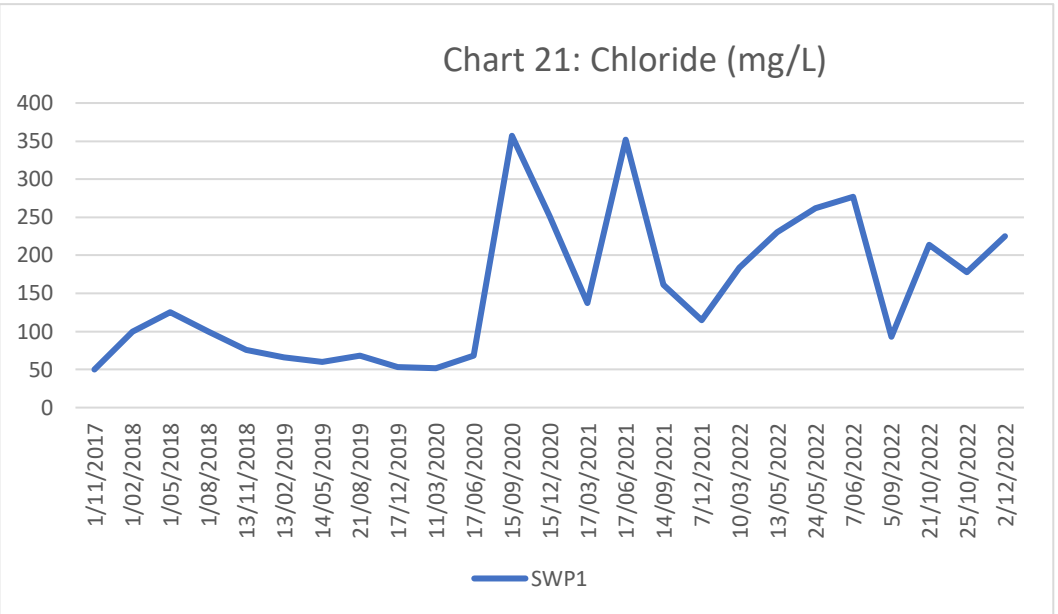
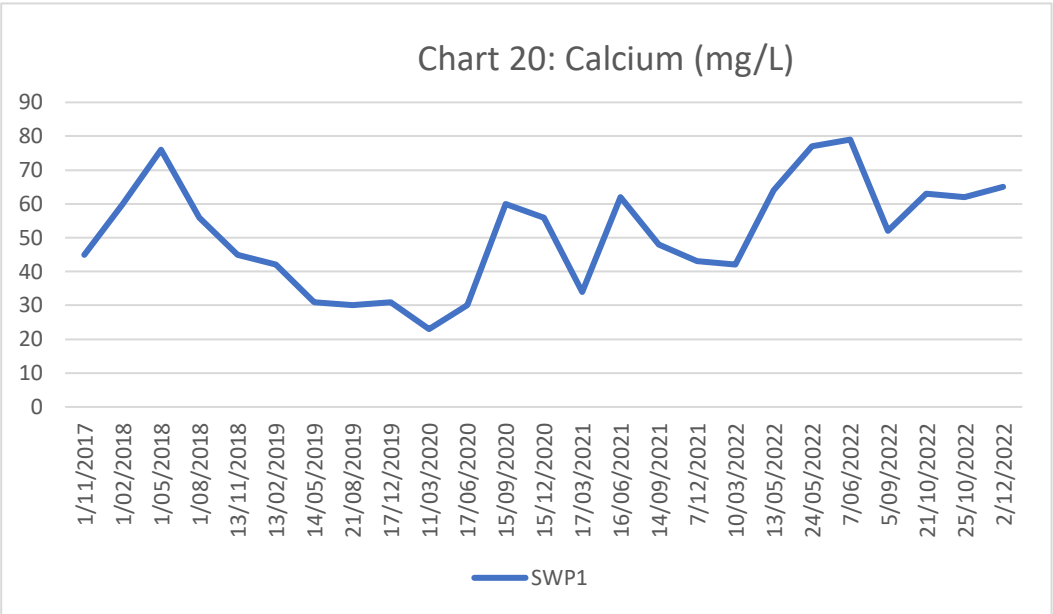
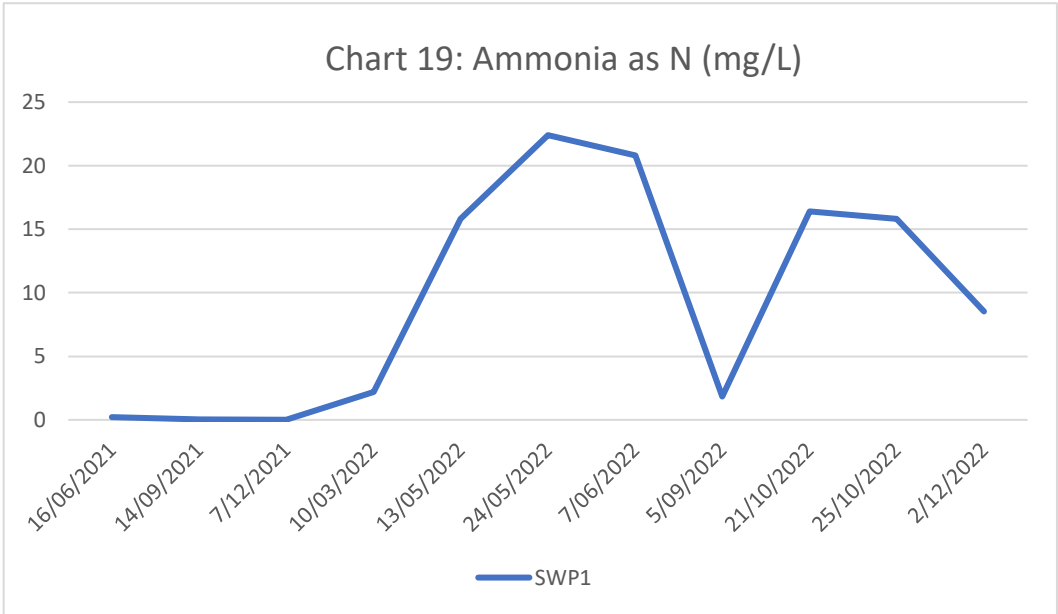
CHARTS

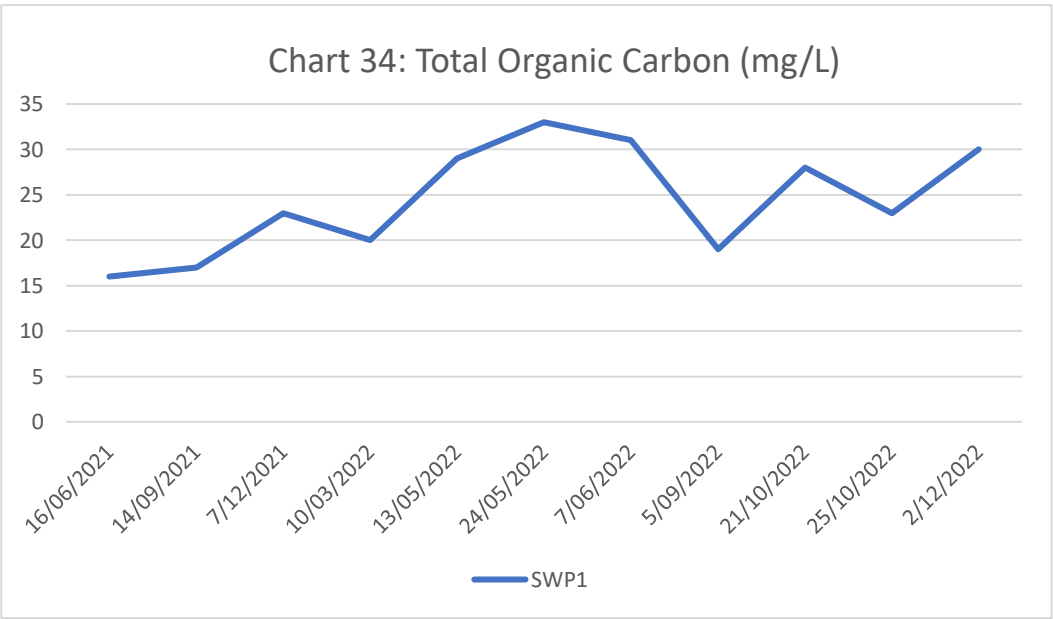
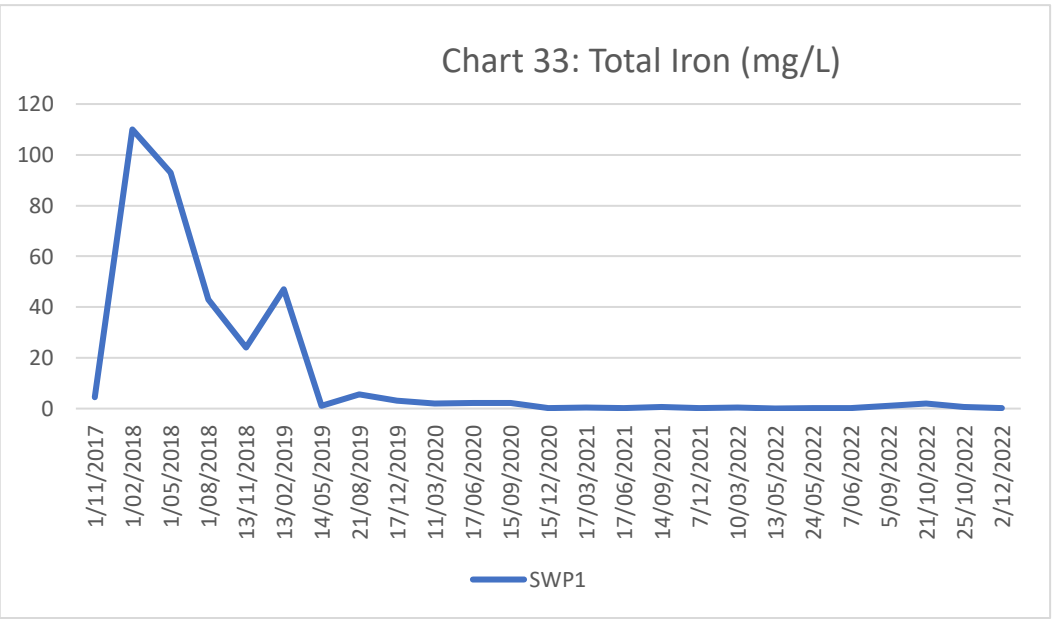
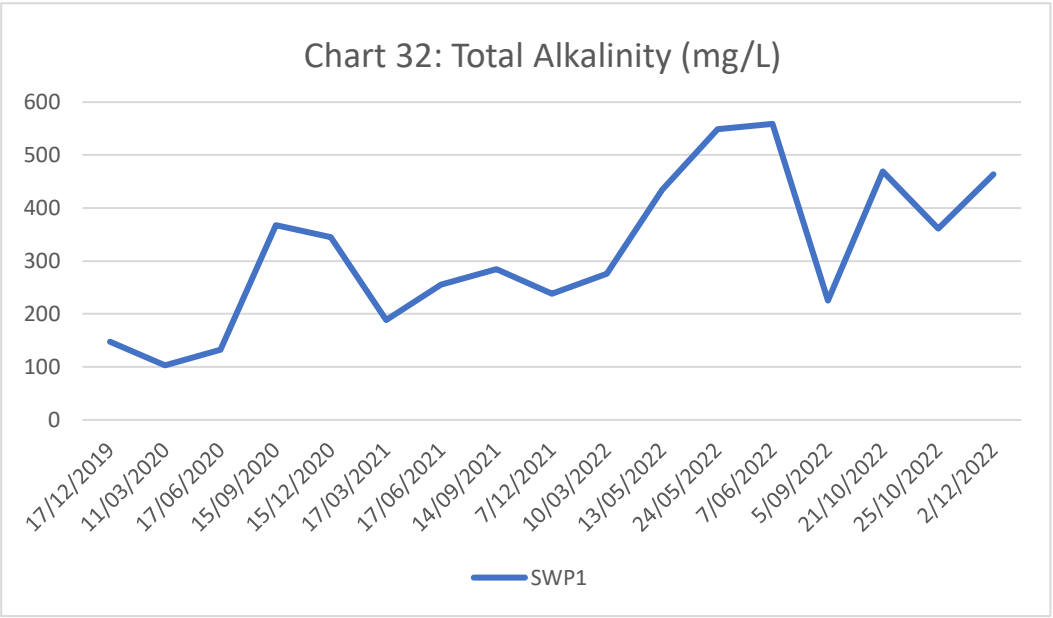
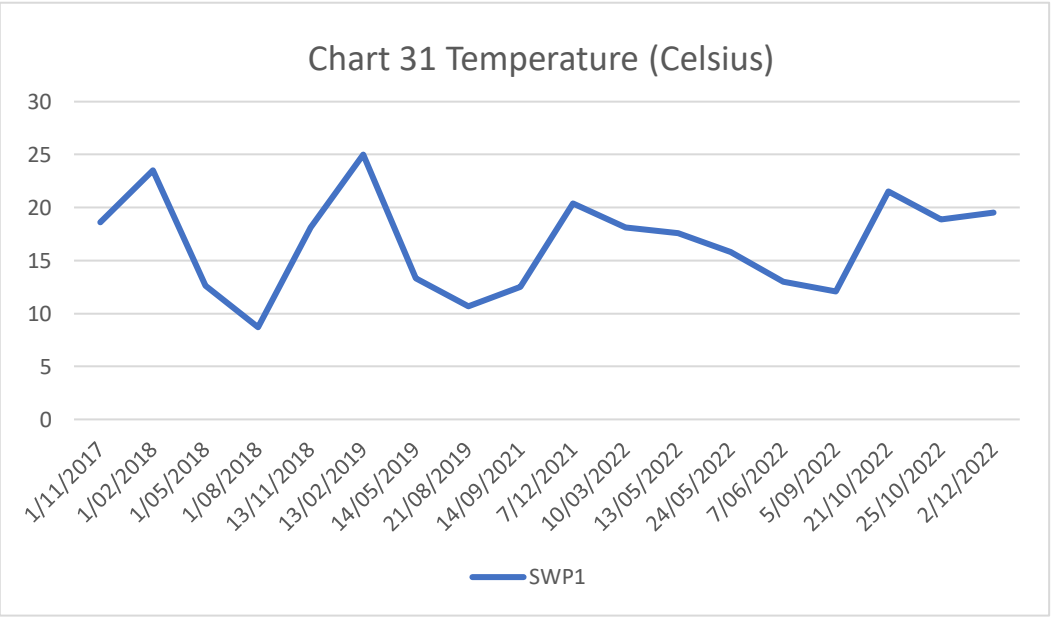
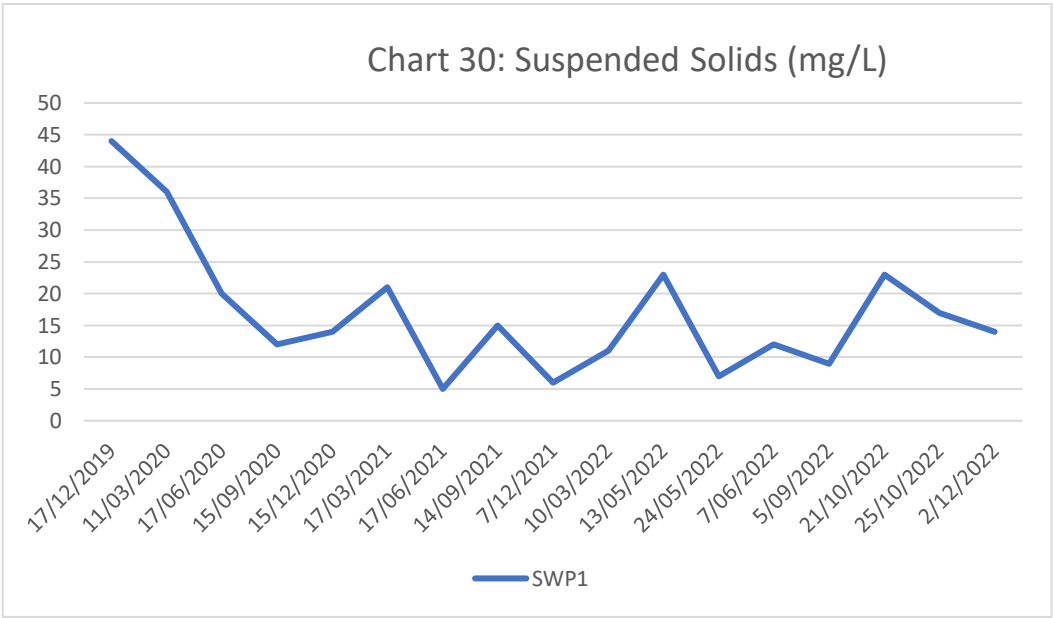
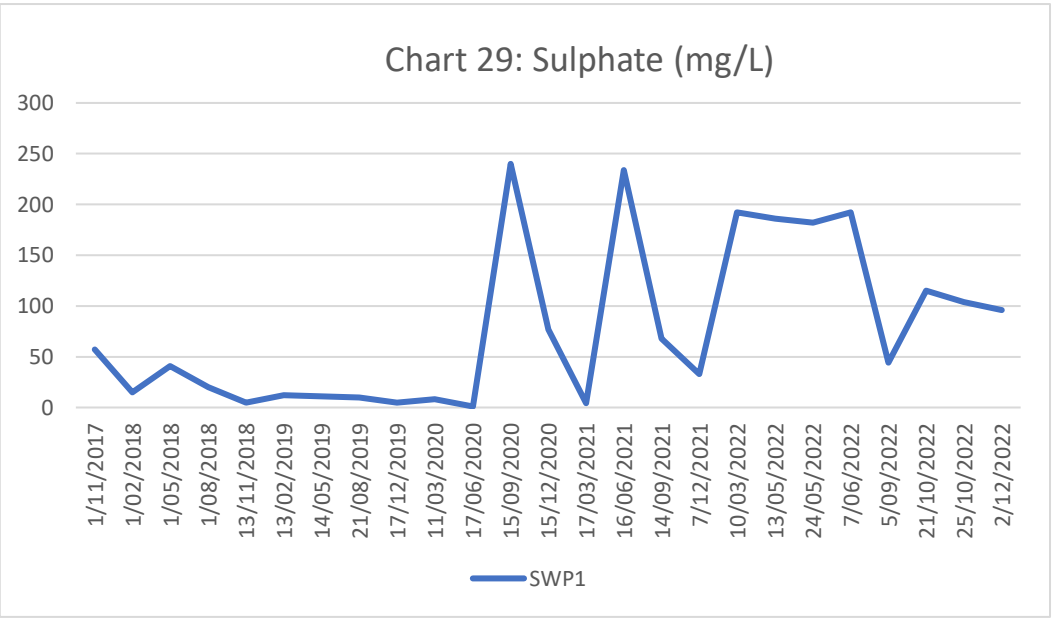
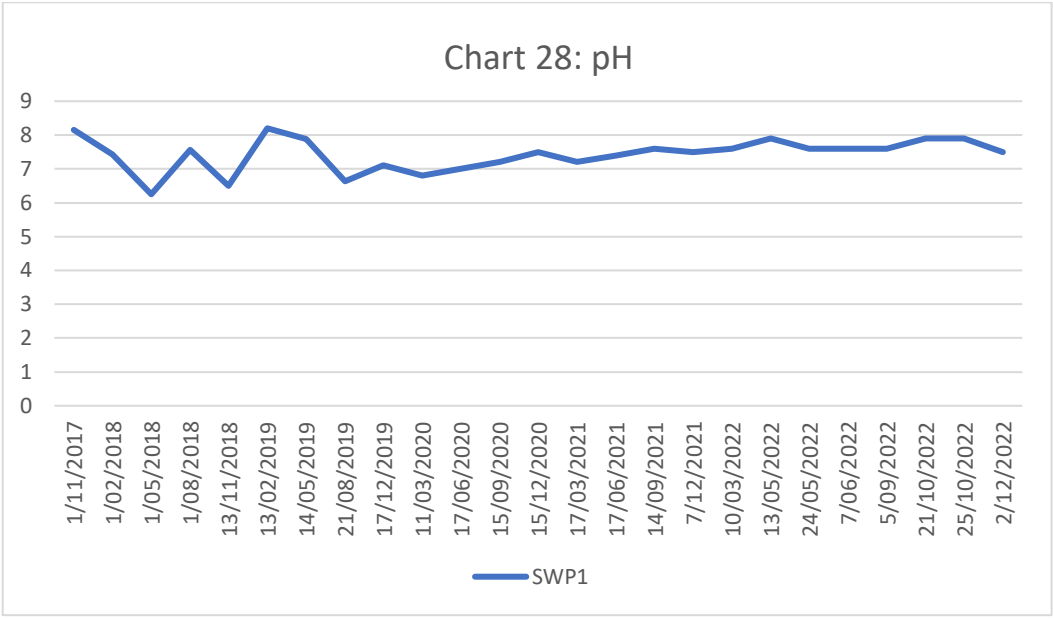
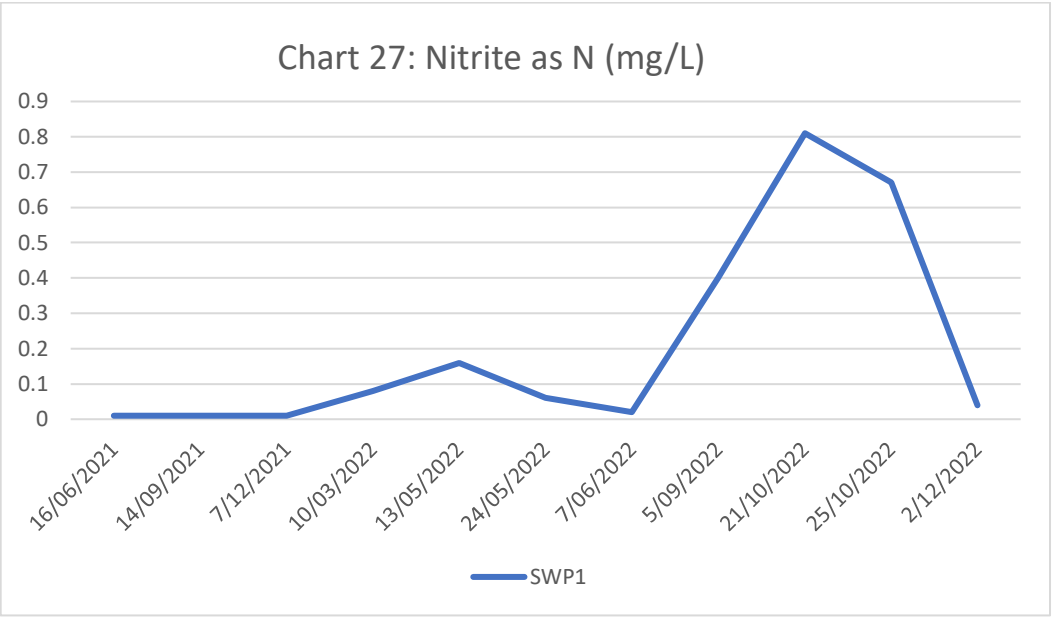
Charts 3-18: Groundwater Charts



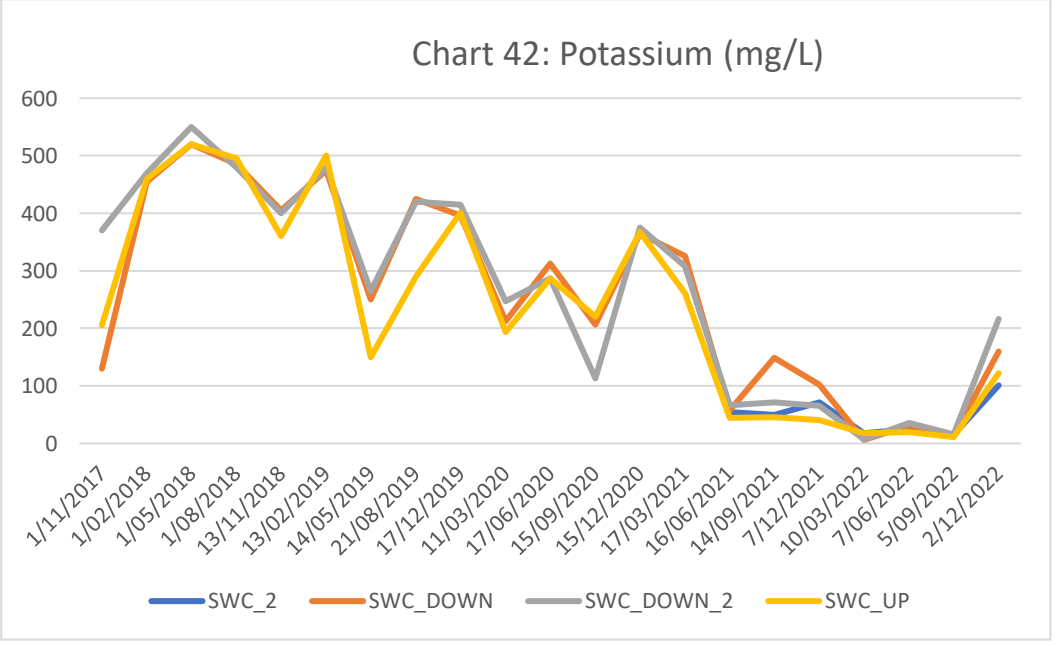
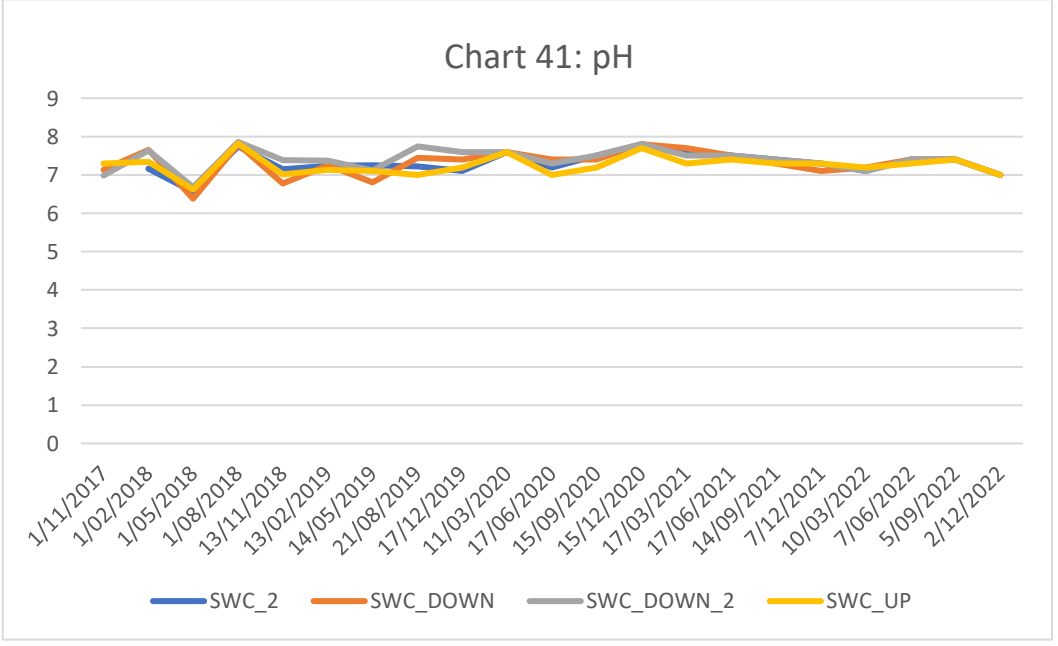
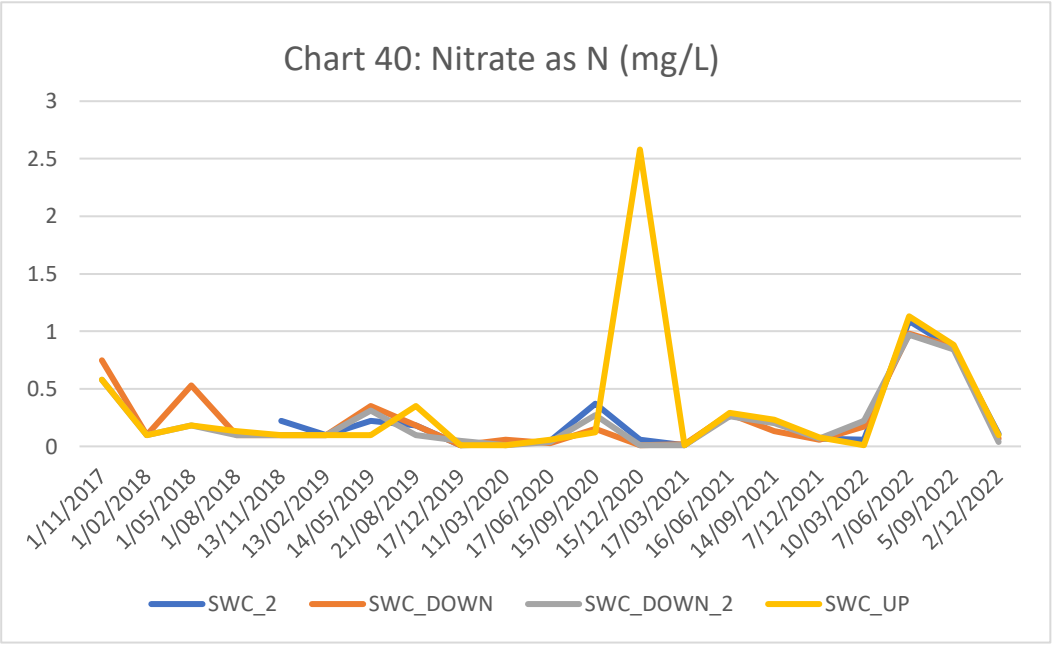
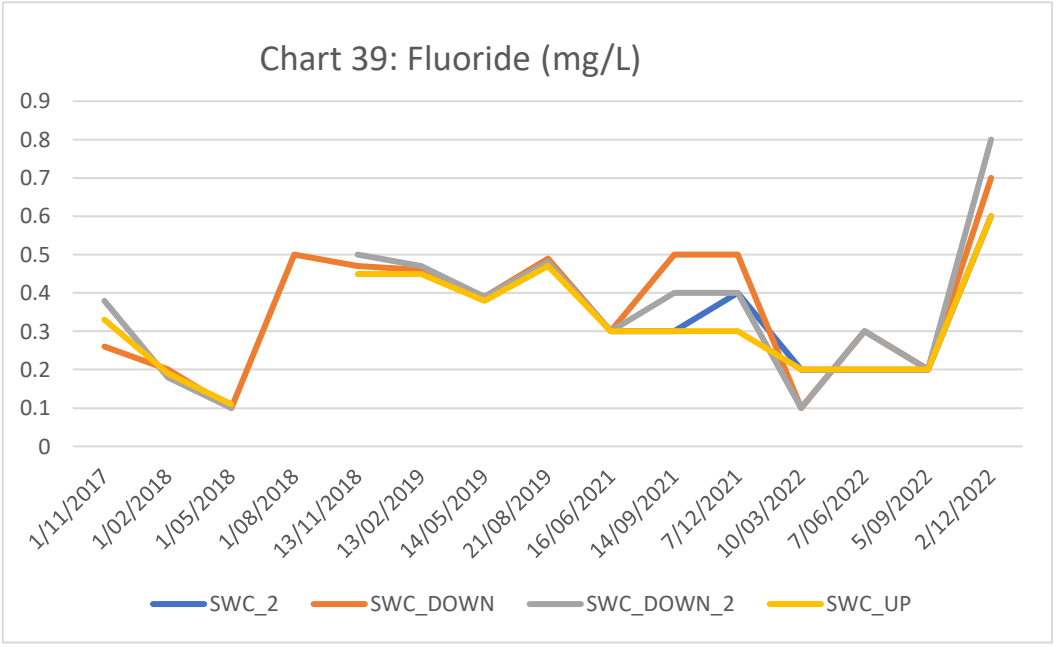
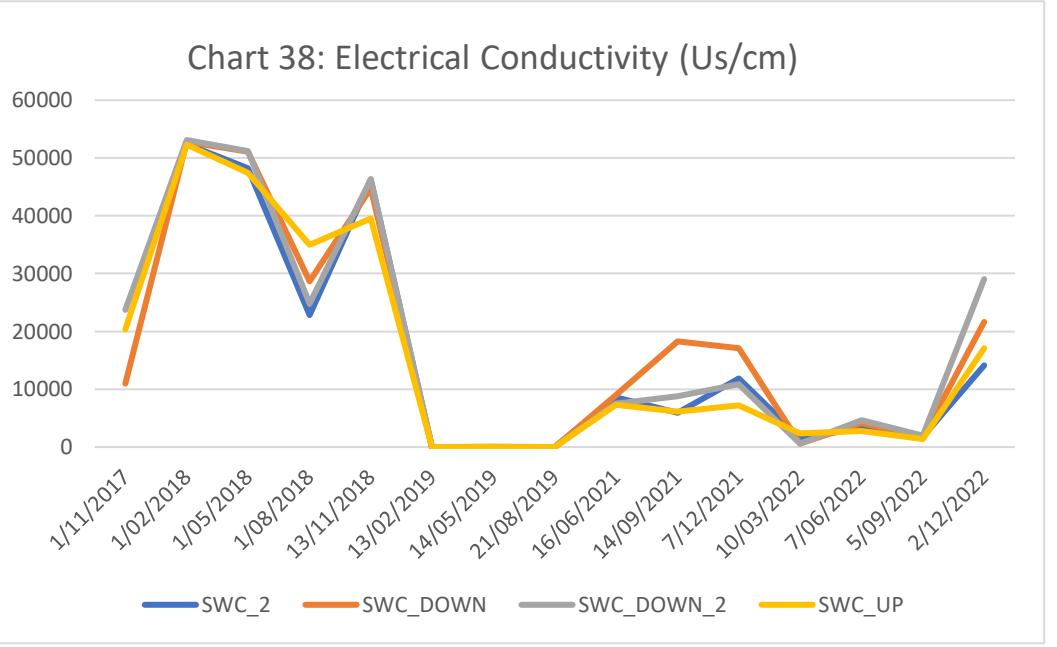
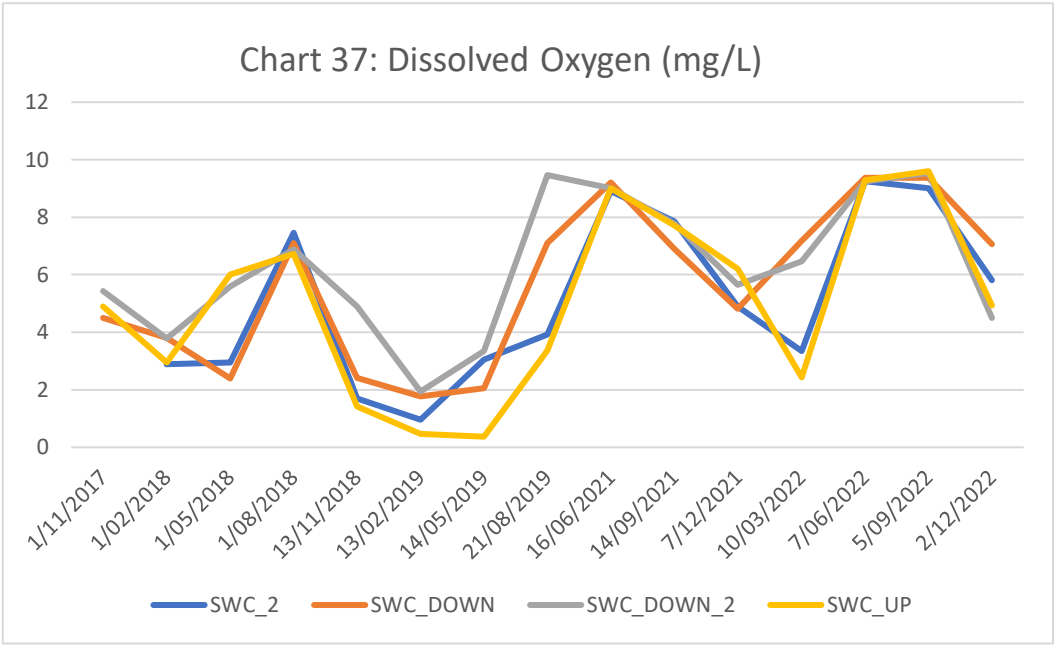
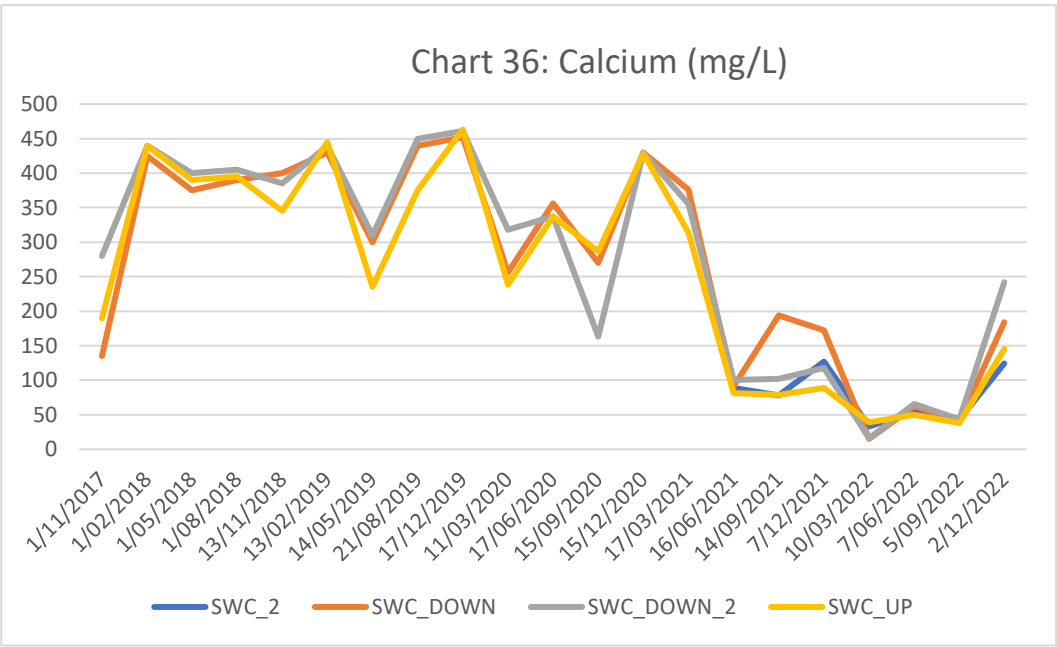
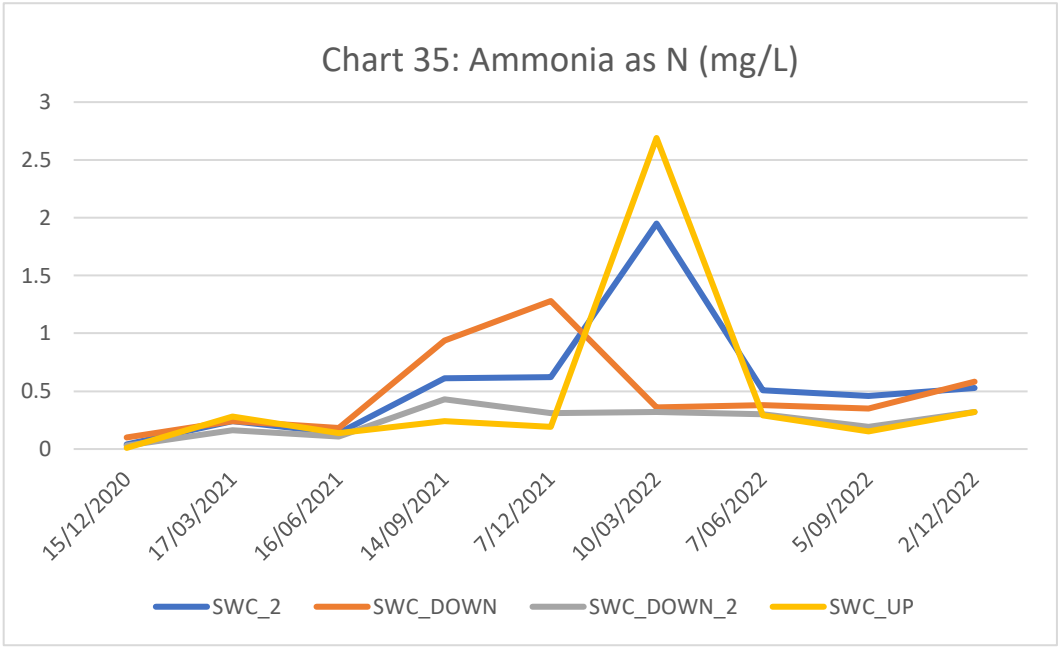


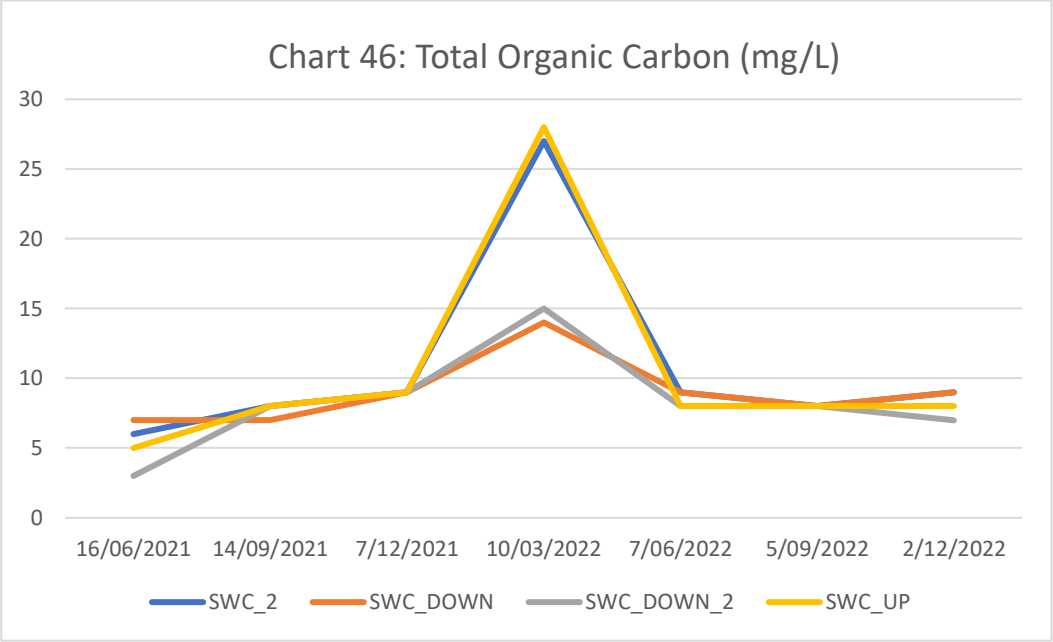
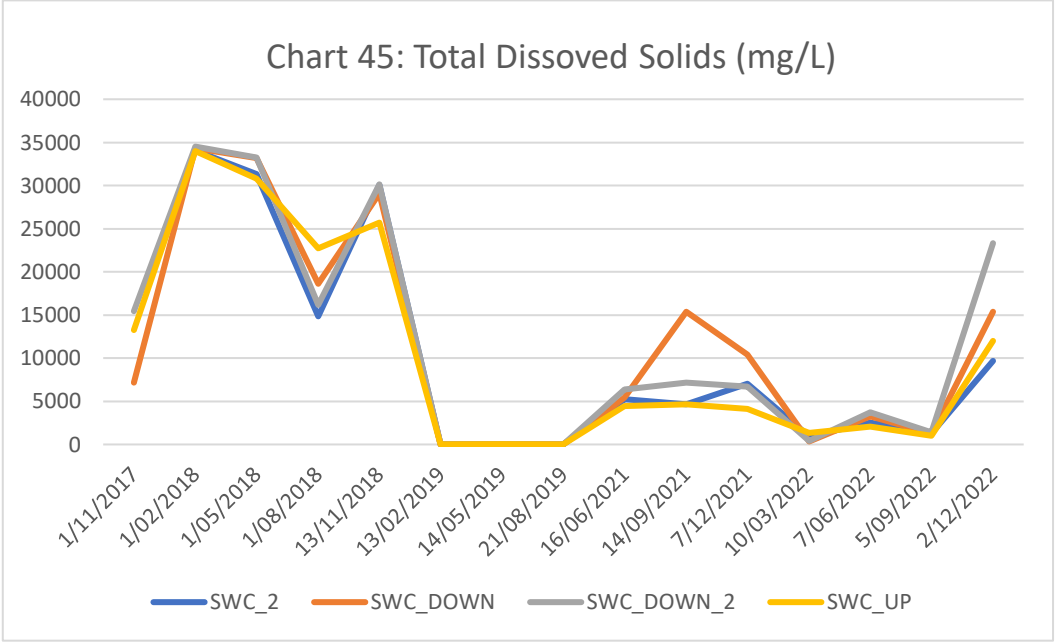
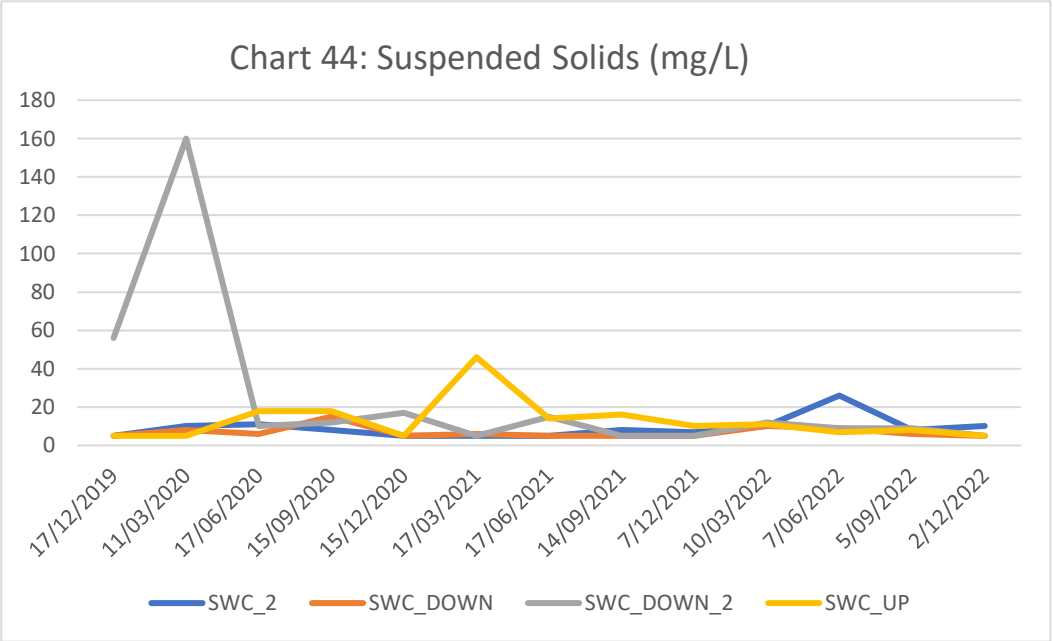
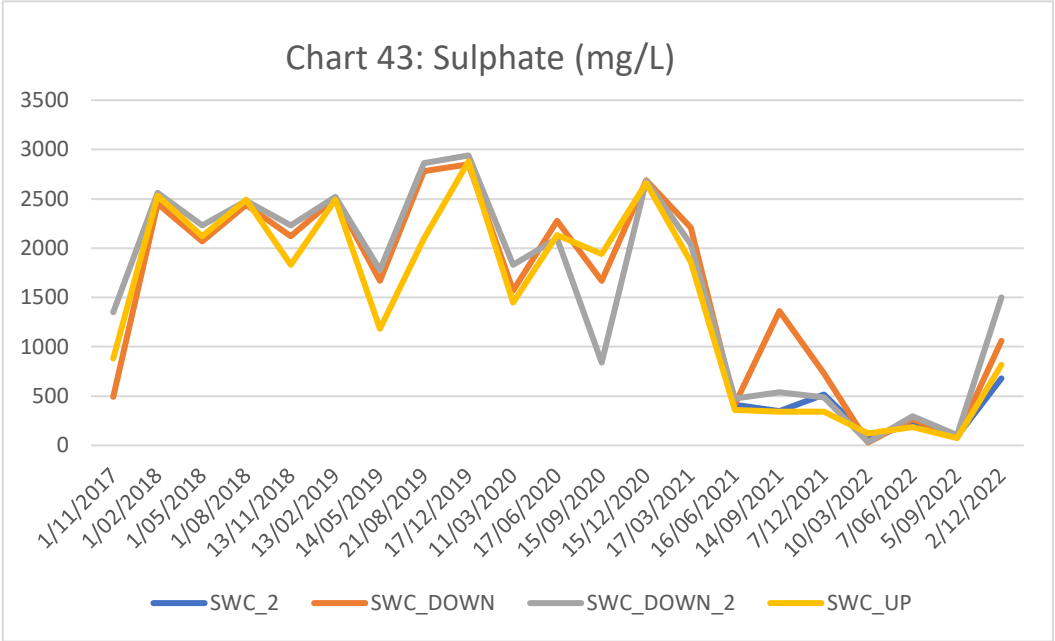
Charts 19-34: Onsite Surface Water Charts





Charts 35-46: Rocklow Creek Surface Water Charts





Charts 47-61 Leachate Water Quality Charts

Chart 47: Ammonia as N (mg/L)

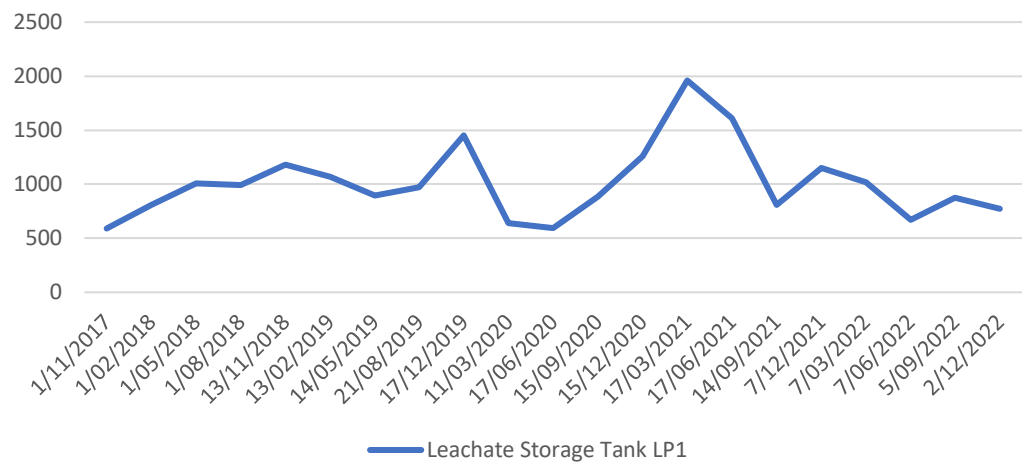


Chart 48: Calcium (mg/L)

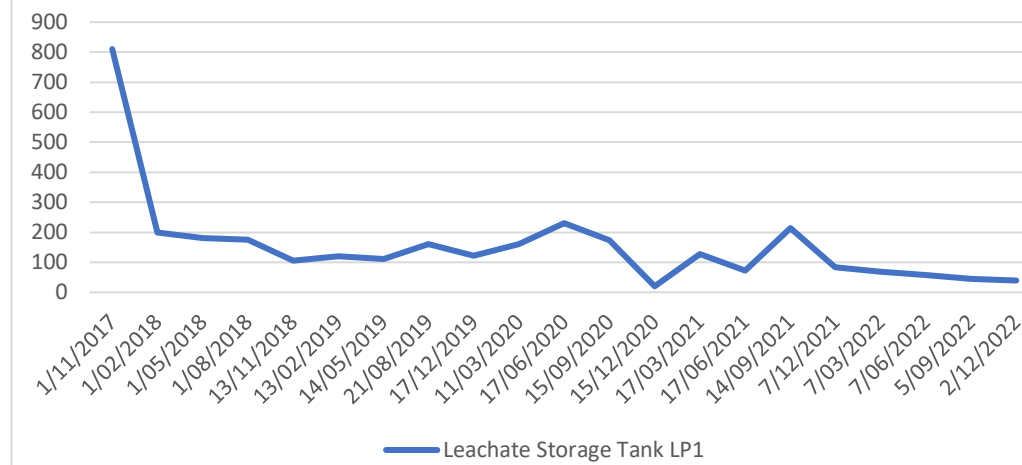


Chart 49: Chloride (mg/L)

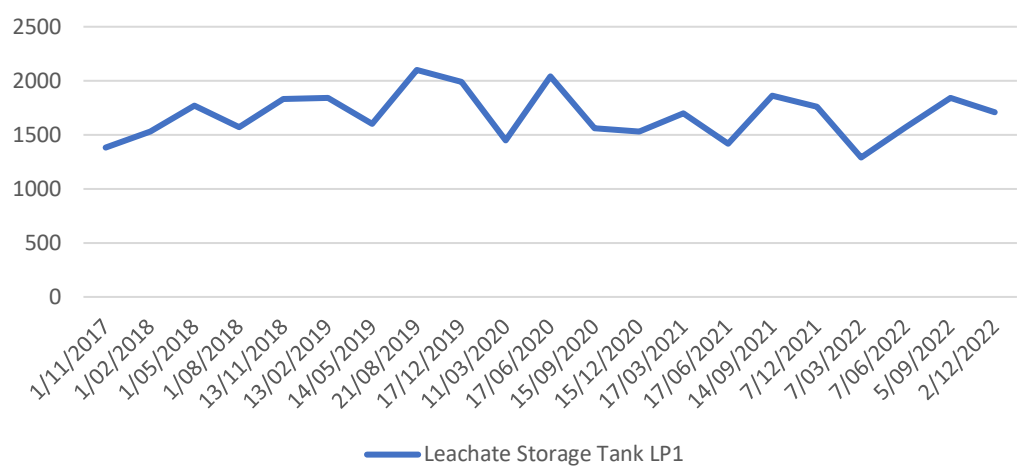


Chart 50: Dissolved Oxygen (mg/L)

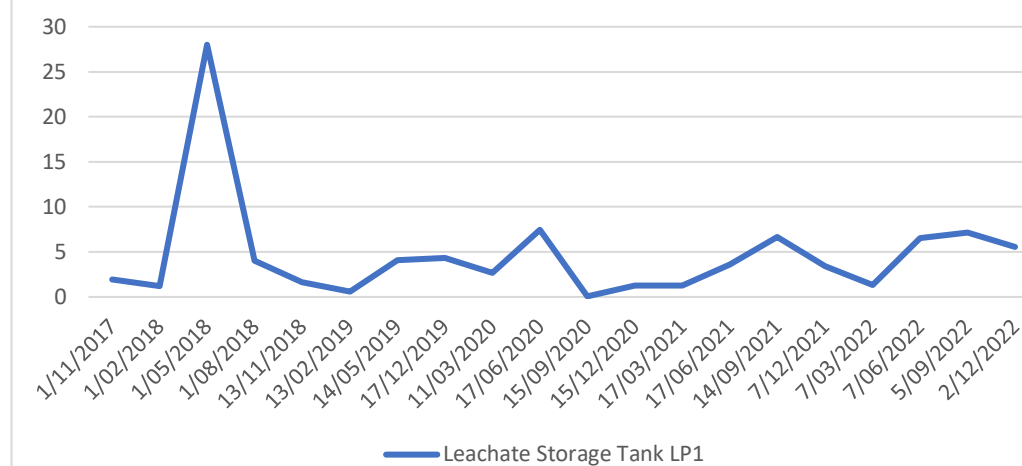


Chart 51: Electrical Conductivity (Us/cm))

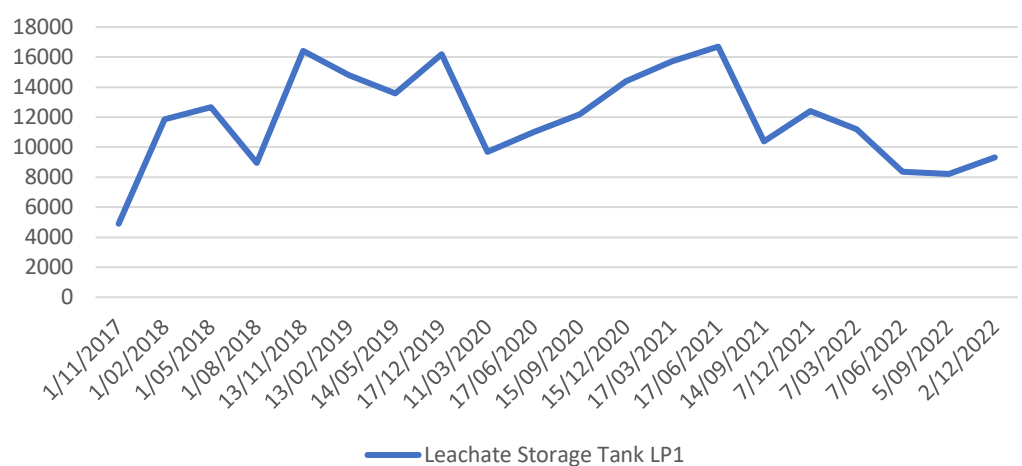


Chart 52: Fluoride (mg/L)

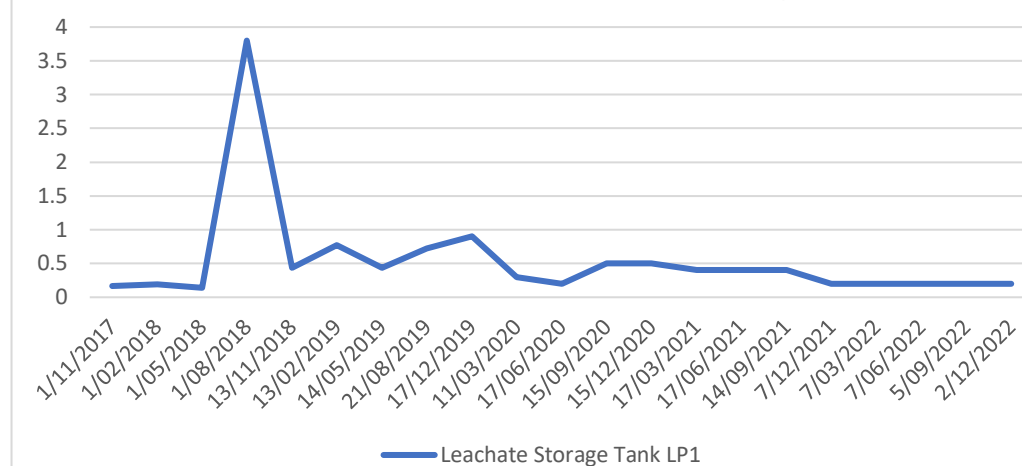


Chart 53: Manganese (mg/L)

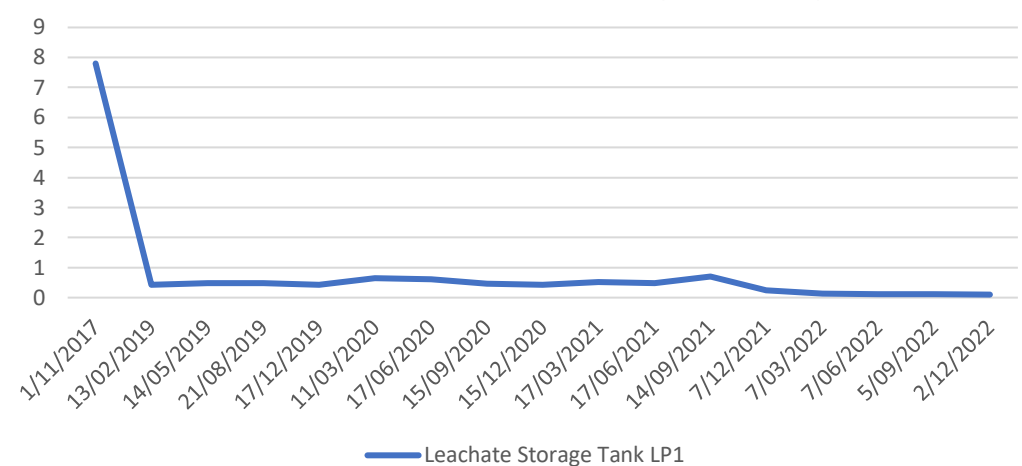
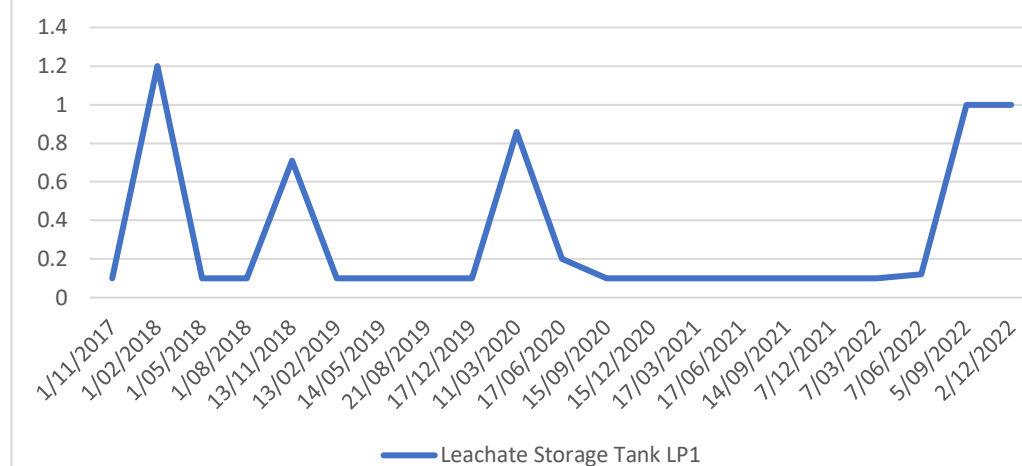
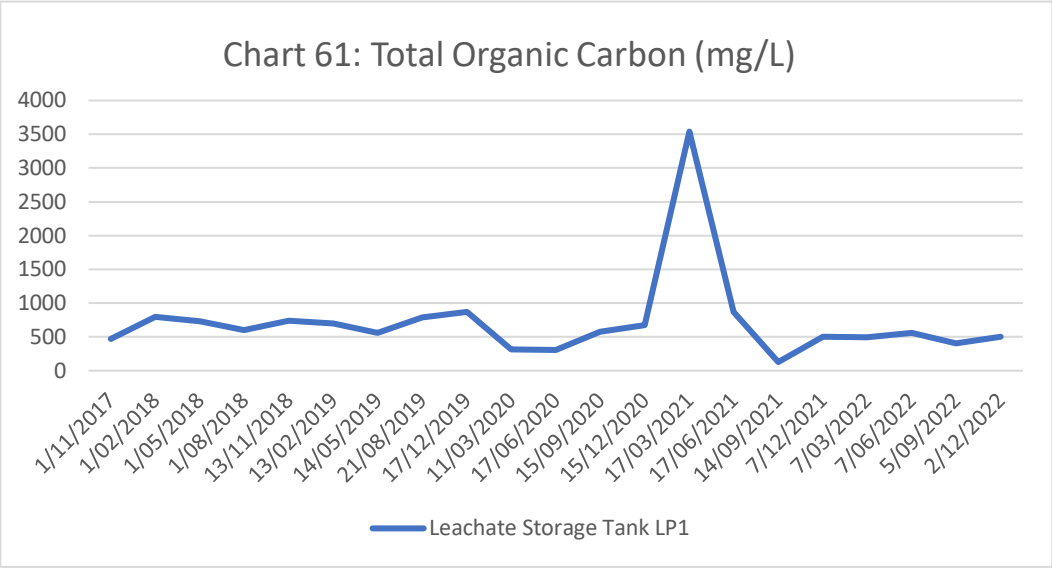
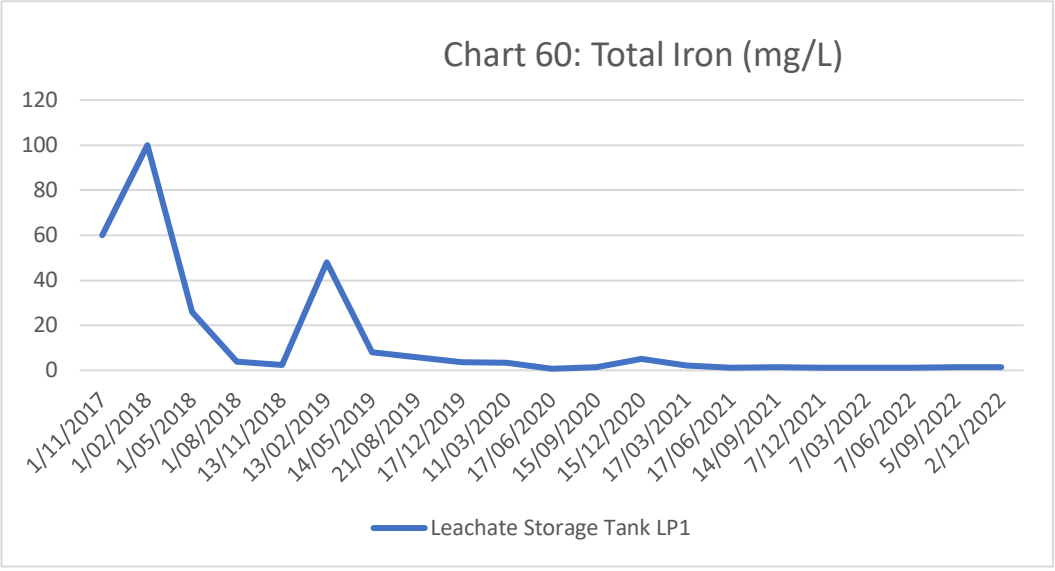
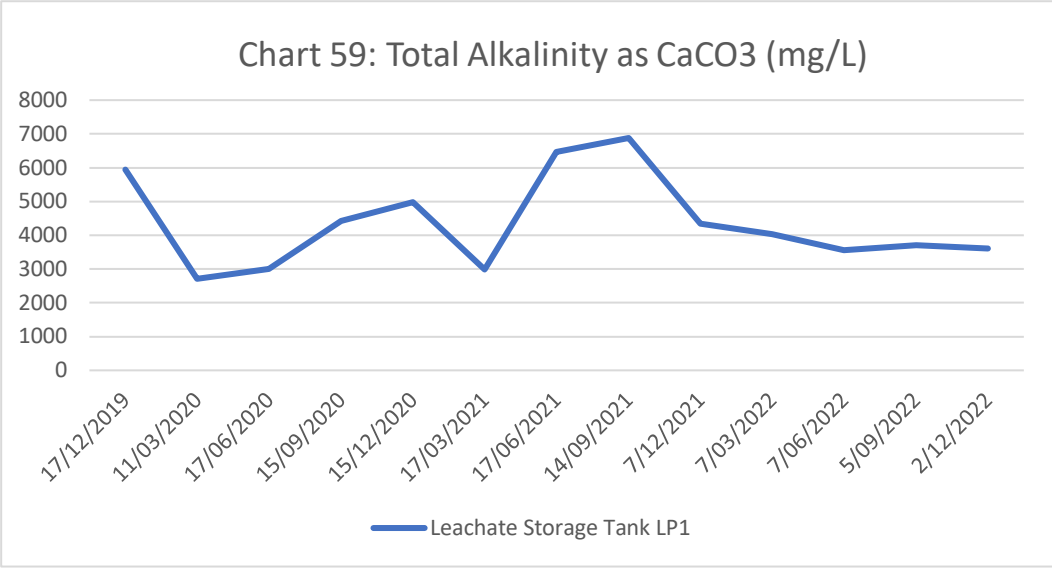
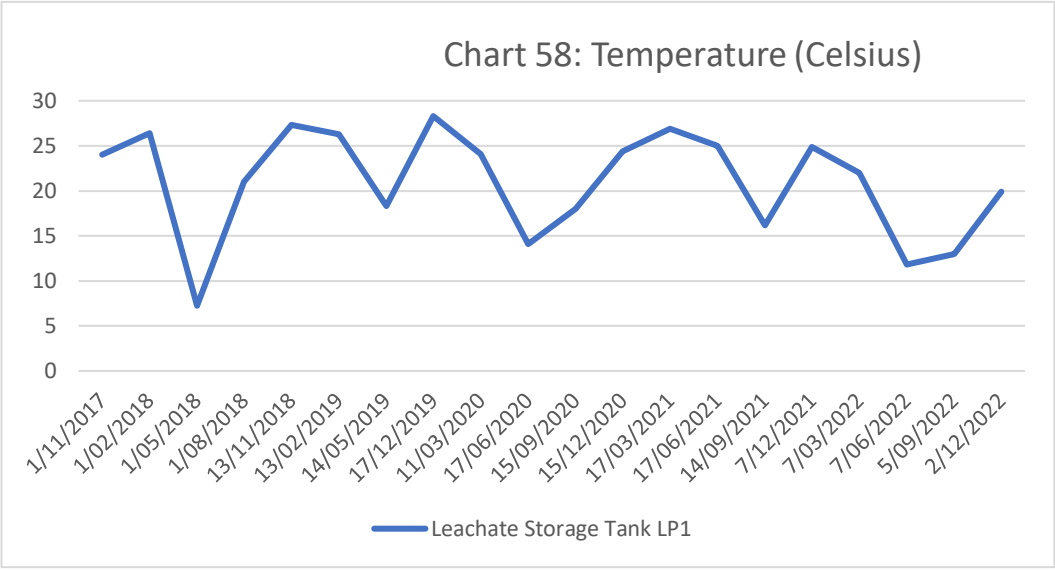
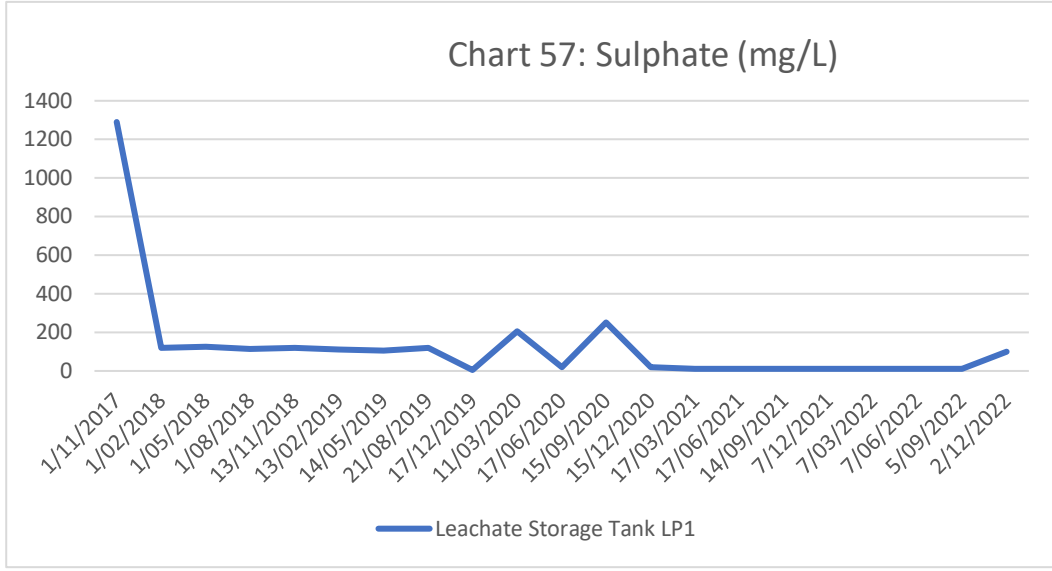
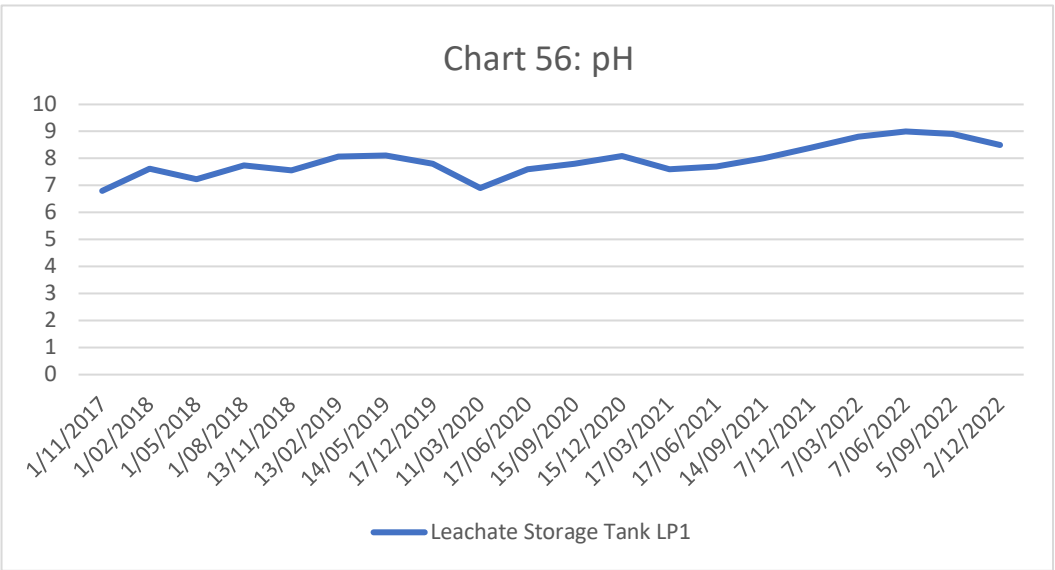
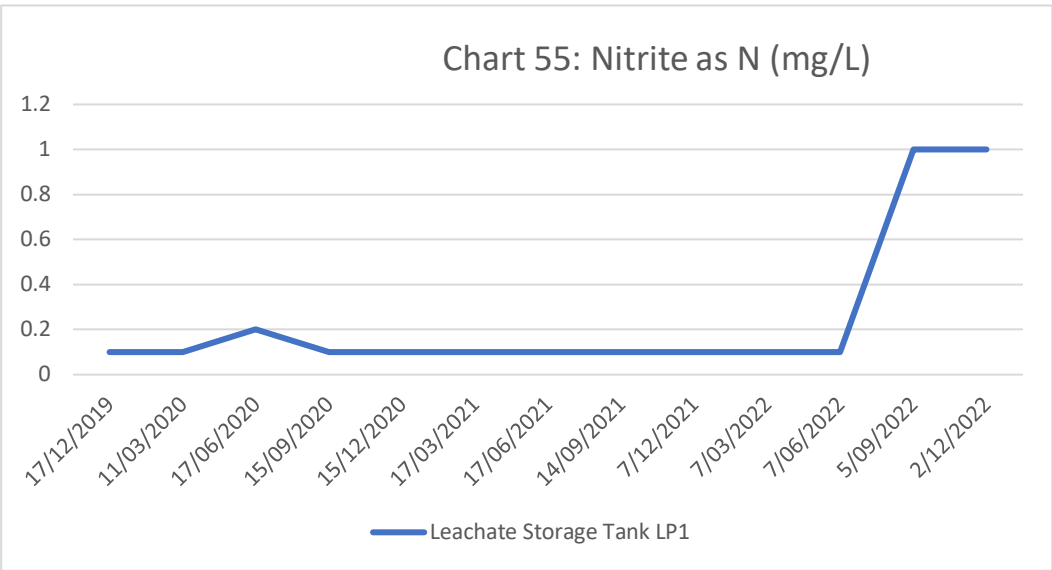


Chart 54: Nitrate as N (mg/L)





APPENDICES

Appendix A

EPL 5984 Sampling Point Summary (NSW EPA, 10/02/2022)

2	Leachate monitoring	Leachate tank labelled LP1 on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
3	Groundwater monitoring	BH1c - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
5	Groundwater monitoring	BH3 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
6	Groundwater monitoring	BH4 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
7	Groundwater monitoring	BH15 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
10	Groundwater monitoring	BH13 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
11	Groundwater monitoring	BH14 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
16	Groundwater monitoring	BH19 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
17	Groundwater monitoring	BH12R - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).

18	Groundwater monitoring	BH9 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
19	Surface Water Monitoring	SWC_2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
20	Surface Water Monitoring	SWC_UP - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
21	Surface Water Monitoring	SWC_DOWN - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
22	Surface Water Monitoring	SWC_DOWN2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
23	Groundwater Monitoring	BH21 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).
24	Groundwater monitoring	BH22 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).
25	Groundwater monitoring	BH18 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).

Appendix B

Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Water Samples



CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodlark Rd, Smithfield NSW 2178
 Ph: 02 8734 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
 Ph: 02 4963 8433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Strand St, Stafford QLD 4053
 Ph: 07 3245 7222 E: samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Deuma Ct, Bohle QLD 4816
 Ph: 07 4795 0600 E: townsville.samples@alsenviro.com

☐ Melbourne: 2-4 Wattle Rd, Springvale VIC 3171
 Ph: 03 8549 0600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5039
 Ph: 08 8359 0800 E: adelaide@alsenviro.com

☐ Perth: 10 Hord Way, Melale WA 6060
 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250
 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS: <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle) Custody Seal intact? <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Freeze or freeze on prior present upon receipt? <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Random Sample Temperature on Receipt: 5.3 °C Other comment:	
OFFICE: 41 Burrell St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):			
PROJECT: Dunmore Quarterly Ground Waters EPL		ALS QUOTE NO.: WO/030/19 TENDER			
ORDER NUMBER:				COC SEQUENCE NUMBER (Circle)	
PROJECT MANAGER: Ryan Stirling				COC: 1 2 3 4 5 6 7	
SAMPLER: Robert Dalio		SAMPLER MOBILE:		OF: 1 2 3 4 5 6 7	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		RECEIVED BY: Aneta	
Email Reports to:		RELINQUISHED BY: Robert Dalio		DATE/TIME: 5/12/22. 13:30	
Email Invoice to:		DATE/TIME: 5/12/22		RELINQUISHED BY:	
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:		CC reports to:		DATE/TIME:	

Environmental Division
 Wollongong
 Work Order Reference
EW2205534



Telephone : 02 42253125

ALS USE ONLY		SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite pr) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So4, Cl, F)	Filtered Ca, K, I	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)	Send to Eurofins		
	BH1C	5.12.22 9:30	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH3	12:55	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH4	13:45	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH9	8:35	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH12R	11:50	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH13	12:10	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH14	12:30	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH15	11:15	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH19R	13:20	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH18	10:50	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH21	10:20	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH22	9:55	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	Duplicate	8:35	W			✓	✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	TriPLICATE	✓ 8:35	W									✓		Field Tests - pH, EC, Temp & SWL
TOTAL					10									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
 V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass.
 Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order : **EW2205534**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Groundwaters EPL
Order number : 1045179
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER GROUNDWATERS
No. of samples received : 14
No. of samples analysed : 13

Page : 1 of 8
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 05-Dec-2022 16:46
Date Analysis Commenced : 05-Dec-2022
Issue Date : 20-Dec-2022 13:48



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Aneta Prosaroski	Environmental Services Representative	Administration - Wollongong, NSW
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate on sample 4 & 13 due to sample matrix.
- ED041G: LOR raised for Sulfate on sample 1 due to sample matrix.
- EK057G: It has been noted that Nitrite is greater than NOX. (Confirmed by re-analysis)
- It has been noted that Nitrite is greater than NOx for sample 9, however this difference is within the limits of experimental variation.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling via Bailer Method.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sample collection of Ground Waters by in-house EN67 where the "surface layer of the aquifer was sampled".
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					05-Dec-2022 09:30	05-Dec-2022 12:55	05-Dec-2022 13:45	05-Dec-2022 08:35	05-Dec-2022 11:50
Compound	CAS Number	LOR	Unit		EW2205534-001	EW2205534-002	EW2205534-003	EW2205534-004	EW2205534-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.0	8.1	8.2	7.3	7.3
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		7160	1160	692	3580	1340
EA116: Temperature									
Temperature	----	0.5	°C		25.2	17.6	17.6	18.7	19.4
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		2780	330	297	1820	568
Total Alkalinity as CaCO ₃	----	1	mg/L		2780	330	297	1820	568
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		<10	158	61	<10	119
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		904	140	50	392	107
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		133	126	86	180	154
Potassium	7440-09-7	1	mg/L		219	44	16	69	28
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.106	0.022	0.094	0.679	0.508
Iron	7439-89-6	0.05	mg/L		8.16	<0.05	1.70	0.32	6.52
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.5	0.2	0.1	0.4	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		345	8.51	1.62	124	3.74
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	0.27	0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	2.39	0.01	<0.01	0.01
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	2.66	0.02	<0.01	0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		203	17	14	79	21



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					05-Dec-2022 09:30	05-Dec-2022 12:55	05-Dec-2022 13:45	05-Dec-2022 08:35	05-Dec-2022 11:50
Compound	CAS Number	LOR	Unit		EW2205534-001	EW2205534-002	EW2205534-003	EW2205534-004	EW2205534-005
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		3.00	3.01	4.24	2.94	4.15



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					05-Dec-2022 12:10	05-Dec-2022 12:30	05-Dec-2022 11:15	05-Dec-2022 13:20	05-Dec-2022 10:50
Compound	CAS Number	LOR	Unit		EW2205534-006	EW2205534-007	EW2205534-008	EW2205534-009	EW2205534-010
				Result	Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.3	7.0	7.4	8.4	7.2
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1770	756	2650	724	880
EA116: Temperature									
Temperature	----	0.5	°C		20.3	19.7	18.2	17.6	18.3
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		779	334	467	287	458
Total Alkalinity as CaCO ₃	----	1	mg/L		779	334	467	287	458
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		64	80	534	53	12
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		204	33	447	52	76
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		185	82	131	75	87
Potassium	7440-09-7	1	mg/L		17	14	185	37	18
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.320	0.082	0.311	0.068	0.078
Iron	7439-89-6	0.05	mg/L		1.82	0.07	10.2	0.97	1.85
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.2	0.6	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		3.32	0.93	10.3	2.35	1.51
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.03	0.01	<0.01	0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.19	1.57	0.14	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.22	1.58	0.14	<0.01	<0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		23	18	37	19	22



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					05-Dec-2022 12:10	05-Dec-2022 12:30	05-Dec-2022 11:15	05-Dec-2022 13:20	05-Dec-2022 10:50
Compound	CAS Number	LOR	Unit		EW2205534-006	EW2205534-007	EW2205534-008	EW2205534-009	EW2205534-010
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		4.11	4.53	0.73	4.53	1.97



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					05-Dec-2022 10:20	05-Dec-2022 09:55	05-Dec-2022 08:35	----	----
Compound	CAS Number	LOR	Unit		EW2205534-011	EW2205534-012	EW2205534-013	-----	-----
				Result	Result	Result	Result	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.3	8.1	7.3	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2560	1910	3580	----	----
EA116: Temperature									
Temperature	----	0.5	°C		20.9	17.3	18.7	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		834	606	1820	----	----
Total Alkalinity as CaCO3	----	1	mg/L		834	606	1820	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		149	283	<10	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		429	235	390	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		131	94	177	----	----
Potassium	7440-09-7	1	mg/L		18	43	68	----	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.562	0.021	0.670	----	----
Iron	7439-89-6	0.05	mg/L		0.13	0.12	0.31	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.4	0.3	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		4.92	55.8	119	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	0.01	<0.01	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		41	34	80	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					05-Dec-2022 10:20	05-Dec-2022 09:55	05-Dec-2022 08:35	----	----
Compound	CAS Number	LOR	Unit		EW2205534-011	EW2205534-012	EW2205534-013	-----	-----
					Result	Result	Result	----	----
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level				----	0.01	m AHD	2.98	2.77	3.94
								----	----

Inter-Laboratory Testing

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)



CHAIN OF CUSTODY

ALS Laboratory: **please tick** →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
Ph: 02 8784 8555 E: samples.sydney@alsenviro.com

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com

☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171
Ph: 03 8549 5600 E: samples.melbourne@alsenviro.com

☐ **Perth:** 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com

☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com

☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
Ph: 07 4796 0600 E: samples.townsville@alsenviro.com

☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0890 E: samples.adelaide@alsenviro.com

☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: samples.launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle) Cleanly Seal Intact? Yes No N/A Free Ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: 6.2 °C Other comment:
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	(Standard TAT may be longer for some tests e.g.: Ultra Trace Organics)	<input type="checkbox"/> Non Standard or urgent TAT (List due date):	
PROJECT:	Dunmore Quarterly Surface Waters EPL	ALS QUOTE NO.:	WO/030/19 TENDER	
ORDER NUMBER:				
PROJECT MANAGER:	Ryan Stirling			
SAMPLER:	Robert Dalio	SAMPLER MOBILE:		
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		
Email Reports to:		RELINQUISHED BY:	Robert Dalio	
Email Invoice to:		DATE/TIME:	2/12/22	
		RECEIVED BY:	Aneta	
		DATE/TIME:	2/12/22	
		RELINQUISHED BY:		
		DATE/TIME:		
		RECEIVED BY:		
		DATE/TIME:		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:

ALS USE ONLY		SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
	SWP1	2/12/22 11:35	W			✓	✓	✓	✓				Field Tests - pH, EC, DO & Temp	
	SWC_2	9:55	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_UP	8:50	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_DOWN	9:00	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_DOWN_2	9:15	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	Duplicate	9:55	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
					TOTAL	10								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
 V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Pres
 Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division
Wollongong
Work Order Reference
EW2205529



Telephone : 02 42253125

CERTIFICATE OF ANALYSIS

Work Order : **EW2205529**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Surface Water EPL
Order number : 147649
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER SURFACE WATER
No. of samples received : 6
No. of samples analysed : 6

Page : 1 of 7
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 02-Dec-2022 14:55
Date Analysis Commenced : 02-Dec-2022
Issue Date : 09-Dec-2022 17:53



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for sample 5 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
Sampling date / time				02-Dec-2022 11:35	02-Dec-2022 09:55	02-Dec-2022 08:50	02-Dec-2022 09:00	02-Dec-2022 09:15
Compound	CAS Number	LOR	Unit	EW2205529-001	EW2205529-002	EW2205529-003	EW2205529-004	EW2205529-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.5	7.0	7.0	7.0	7.0
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1500	14100	17100	21600	29100
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	9700	12000	15400	23300
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	14	10	<5	<5	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	2.7	19.7	14.0	10.7	6.3
EA116: Temperature								
Temperature	----	0.5	°C	19.5	18.7	19.0	19.0	18.7
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	464	141	150	154	142
Total Alkalinity as CaCO ₃	----	1	mg/L	464	141	150	154	142
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	96	680	817	1060	1500
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	225	5380	6620	8410	11200
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	65	124	145	184	242
Magnesium	7439-95-4	1	mg/L	41	308	378	493	678
Sodium	7440-23-5	1	mg/L	213	2680	3280	4310	5920
Potassium	7440-09-7	1	mg/L	20	101	122	160	216
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.06	<0.05	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.842	0.165	0.169	0.130	0.114
Iron	7439-89-6	0.05	mg/L	0.14	1.20	0.89	0.68	0.48
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.6	0.6	0.7	0.8



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
Sampling date / time				02-Dec-2022 11:35	02-Dec-2022 09:55	02-Dec-2022 08:50	02-Dec-2022 09:00	02-Dec-2022 09:15
Compound	CAS Number	LOR	Unit	EW2205529-001	EW2205529-002	EW2205529-003	EW2205529-004	EW2205529-005
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	8.52	0.53	0.32	0.58	0.32
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	0.01	mg/L	8.42	0.53	0.32	0.58	0.32
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.04	0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.02	0.11	0.10	0.07	0.04
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.06	0.12	0.10	0.07	0.04
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	17.6	169	207	262	350
∅ Total Cations	----	0.01	meq/L	16.4	151	184	241	331
∅ Ionic Balance	----	0.01	%	3.59	5.65	5.78	4.18	2.80
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	30	9	8	9	7
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	3.43	5.80	4.94	7.07	4.49



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time				02-Dec-2022 09:55	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2205529-006	-----	-----	-----	-----	-----
Result				Result	----	----	----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.0	----	----	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	14100	----	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	9660	----	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	10	----	----	----	----	----
EA045: Turbidity									
Turbidity	----	0.1	NTU	19.0	----	----	----	----	----
EA116: Temperature									
Temperature	----	0.5	°C	18.7	----	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	132	----	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	132	----	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	704	----	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	5390	----	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	127	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	318	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	2750	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	106	----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.161	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.11	----	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.6	----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time				02-Dec-2022 09:55	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2205529-006	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.60	----	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L	0.60	----	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.01	----	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.11	----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.12	----	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	169	----	----	----	----	----
∅ Total Cations	----	0.01	meq/L	155	----	----	----	----	----
∅ Ionic Balance	----	0.01	%	4.47	----	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	9	----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	5.81	----	----	----	----	----



Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser

(WATER) EA025: Total Suspended Solids dried at 104 ± 2 °C

(WATER) EK055G-NH₄: Ammonium as N by DA

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
 Ph 02 8794 8555 E:samples.sydney@a-service.com
☐ **Newcastle:** 5 Roseglen Rd, Warabrook NSW 2304
 Ph 02 4968 3433 E:samples.newcastle@a-service.com

☐ **Brisbane:** 32 Shand St. Stafford QLD 4053
 Ph:07 3243 7222 E:samples.brisbane@alselabs.com
☐ **Townsville:** 14-15 Dequina Ct. Bohie QLD 4318
 Ph:07 4796 0600 E:townsville.environmental@alselabs.com

☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171
 Ph: 03 8549 0800 E: samples.melbourne@qaisenviro.com

☐ **Adelaide:** 2-1 Burna Rd, Pooraka SA 5095
 Ph: 08 8359 0800 E: adelaide@qaisenviro.com

C Perth: 10 Hed Way, Malaga WA 6060
 Ph. 08 9209 7665 E: santolec.perth@alsenviro.com
C Launceston: 27 Wallington St, Launceston TAS 7250
 Ph. 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)		<input type="checkbox"/> Standard TAT (List due date): <input type="checkbox"/> Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)								
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		ALS QUOTE NO.: WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)		Custody Seal Intact? Yes No Free Use / Frozen Ice Bricks present upon receipt? Yes No Random Sample Temperature on Receipt: °C Other comment:								
PROJECT: Dunmore Quarterly Leachate				COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7	6.2	
1	2	3	4	5	6	7								
ORDER NUMBER:				OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7		
1	2	3	4	5	6	7								
PROJECT MANAGER: Ryan Stirling				RELINQUISHED BY:		RECEIVED BY:								
SAMPLER: Robert Dalro		SAMPLER MOBILE:		DATE/TIME:		DATE/TIME:								
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		2/12/22		2/12/22								
Email Reports to :														
Email Invoice to :														

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) <small>Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).</small>							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <small>(refer to codes below)</small>	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So ₄ , Cl, F), Filtered Ca, K	TOC	Total Fe & Mn	NT-4 (NO ₂ , NO ₃)				Comments on likely contaminant levels, dilution or samples requiring specific QC analysis etc.
	Leachate Storage Tank - LP1	2/12/26 10:45 W				✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
					TOTAL	10								

Environmental Division
Wollongong
Work Order Reference
EW2205533

Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order : **EW2205533**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Leachate Tank EPL
Order number : 147649
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER LEACHATE
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 4
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 02-Dec-2022 14:48
Date Analysis Commenced : 02-Dec-2022
Issue Date : 09-Dec-2022 16:39



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK059G: LOR raised for NOx on sample 1 due to sample matrix.
- EK057G: LOR raised for Nitrite on sample 1 due to sample matrix.
- EK058G: LOR raised for Nitrate on sample 1 due to sample matrix.
- ED041G: LOR raised for Sulfate on sample 1 due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.10 Wastewaters
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

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

Leachate Storage
Tank
LP1

02-Dec-2022 10:45

EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser



Analytical Results

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

Sample ID

				Leachate Storage Tank LP1	----	----	----	----
Sampling date / time				02-Dec-2022 10:45	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2205533-001	-----	-----	-----	-----
Result					----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued								
Nitrite + Nitrate as N	----	0.01	mg/L	<1.00	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	506	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	5.58	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation	63.2	----	----	----	----

Inter-Laboratory Testing

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

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA

Appendix C

Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Dust Samples



CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176
 Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
 Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Shand St, Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171
 Ph: 03 8549 9000 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095
 Ph: 08 8359 0890 E: adelaide@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090
 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250
 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date): <input type="checkbox"/> Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle) Custody Seal intact: Yes No N/A Free ice / frozen ice bricks present upon receipt: Yes No N/A Random Sample Temperature on Receipt: °C Other comment:	
OFFICE:	Dunmore	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)			
PROJECT:	Dunmore Dust	ALS QUOTE NO.:	WO/030/19 TENDER		
ORDER NUMBER:					
PROJECT MANAGER:	Joel Culton				
SAMPLER:	Robert Dehio	SAMPLER MOBILE:		RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME:	DATE/TIME:
Email Reports to :				DATE/TIME:	DATE/TIME:
Email Invoice to :				DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	A04 (Ash, CM, TIS)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	DDG1	1/12/22 9:25	AIR			✓								
	DDG2	9:40	AIR			✓								
	DDG3	8:45	AIR			✓								
	DDG4	8:33	AIR			✓								
TOTAL					10									

Environmental Division
 Wollongong
 Work Order Reference
EW2205528



Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
 V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
 Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order : **EW2205528**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Landfill Dust
Order number : 147649
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER DUST
No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 3
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 01-Dec-2022 13:00
Date Analysis Commenced : 02-Dec-2022
Issue Date : 12-Dec-2022 18:08



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW



General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Newcastle.**
- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth.
- Sample exposure period is 27 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- For dust analysis, the Limit of Reporting (LOR) referenced in the reports for deposited matter parameters represents the reporting increment rather than reporting limit.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST**
 (Matrix: **AIR**)

Sample ID

				DDG1 04/11/2022 - 01/12/2022	DDG2 04/11/2022 - 01/12/2022	DDG3 04/11/2022 - 01/12/2022	DDG4 04/11/2022 - 01/12/2022	----
Sampling date / time				01-Dec-2022 00:00	01-Dec-2022 00:00	01-Dec-2022 00:00	01-Dec-2022 00:00	----
Compound	CAS Number	LOR	Unit	EW2205528-001	EW2205528-002	EW2205528-003	EW2205528-004	-----
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	0.8	0.6	1.0	1.3	----
Ash Content (mg)	----	2	mg	12	9	16	20	----
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.4	0.2	0.7	0.8	----
Combustible Matter (mg)	----	2	mg	7	4	11	13	----
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	1.2	0.8	1.7	2.1	----
Total Insoluble Matter (mg)	----	2	mg	19	13	27	33	----

Page : 3 of 3
Work Order : EW2205528
Client : SHELLHARBOUR CITY COUNCIL
Project : Dunmore Landfill Dust



Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(AIR) EA125: Combustible Matter

(AIR) EA120: Ash Content

(AIR) EA141: Total Insoluble Matter

Appendix D

Surface Gas (Methane) Field Sheets

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd. Smithfield NSW 2176
 Ph. 02 8784 9555 E samples.sydney@aisenviro.com
☐ **Newcastle:** 5 Rosegun Rd, Warabrook NSW 2304
 Ph. 02 4968 0433 E samples.newcastle@aisenviro.com

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@aisenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4796 0600 E: townsville.environmental@aisenviro.com

☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171
 Ph: 03 8549 9800 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5096
 Ph: 08 8359 0800 E: adelaide@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com

☐ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)								
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		Quality Seal intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Has the reference been agreed upon? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Random Sample Temperature on Test? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Other comment:								
PROJECT: Dunmore Quarterly Methane Testing		ALS QUOTE NO.: WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)								
ORDER NUMBER:				COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7
1	2	3	4	5	6	7						
PROJECT MANAGER: Joel Culton				OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7
1	2	3	4	5	6	7						
SAMPLER:		SAMPLER MOBILE:		RELINQUISHED BY:								
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		Michael								
Email Reports to :				DATE/TIME:								
Email Invoice to :				13/12/22								
				RECEIVED BY:								
				Anete								
				DATE/TIME:								
				13/12/22								
				RELINQUISHED BY:								
				DATE/TIME:								
				DATE/TIME:								

[illegible]

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
7 = 7oz. Analyte Preserved Bottle; F = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

ALS Landfill Emissions Report

Client: Shellharbour City Council

Date: 13/12/2022

Site: Dunmore

Sampler(s) Robert DaLio, Michael Santos

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A					No Access,
B	1	6168 220	302 432	0.0	
B	2	6168 253	302 438	0.0	
B	3	6168 280	302 437	0.0	
B	4	6168 311	302 439	0.0	
B	5	6168 335	302 437	0.0	
B	6	6168 376	302 435	0.0	
B	7	6168 372	302 434	0.0	
C	1	6168 437	302 374	0.0	
C	2	6168 406	302 381	0.0	
C	3	6168 362	302 393	0.0	
C	4	6167 317	302 409	0.0	
C	5	6167 253	302 415	0.0	
C	6	6168 182	302 422	0.0	

C	7	6168 115	302 415	1.4	
C	8	6168 075	302 412	1.4	
D	1	6168 181	302 352	0.0	
D	2	6168 189	302 368	0.0	
D	3	6168 195	302 366	0.0	
D	4				No Safe Access
D	5				No Safe Access
D	6				No Safe Access
E	1	6168	302		No Safe Access
E	2	6168	302		No Safe Access
E	3	6168	302		No Safe Access
E	4	6168 188	302 342	0.0	
E	5	6168 202	302 340	0.0	
E	6	6168 222	302 336	0.0	
E	7	6168 244	302 330	0.0	
E	8	6168 255	302 324	0.0	
F	1	6168 160	302 325	0.0	
F	2	6168 170	302 323	0.0	
F	3	6168 179	302 325	0.0	
F	4	6168 189	302 324	0.0	

F	5	6168 241	302 314	0.0	
G	1	6168 410	302 249	0.0	
G	2	6168 419	302 289	0.0	
G	3	6168 442	302 325	0.0	
G	4	6168 466	302 360	0.0	
H	1	6168 487	302 376	0.0	
H	2	6168 465	302 295	0.0	
H	3	6168 393	302 220	0.0	
H	4	6168 330	302 161	0.0	
H	5	6168 277	302 112	0.0	
H	6	6168 241	302 085	0.0	
H	7	6168 162	301 077	0.0	
H	8	6168 078	301 073	0.0	
H	9	6167 991	302 149	2.3	
H	10	6167 889	302 246	0.0	
H	11	6167 876	302 317	0.0	
H	12	6167 887	302 423	0.0	
H	13	6168 396	302 555	0.0	
H	14	6168 350	302 549	0.0	
H	15	6168 290	302 539	0.0	
H	16	6168 221	302 558	0.0	

H	17	6168 176	302 585	0.0	
H	18	6168 122	302 620	0.0	
H	19	6168 079	302 617	0.0	
H	20	6168 111	302 568	0.0	
H	21	6168 160	302 540	0.0	
H	22	6168 093	302 513	0.0	
H	23	6168 230	302 525	0.0	
H	24	6168 291	302 530	0.0	
H	25	6167 380	302 544	0.0	
I	1				NO ACCESS EXCLUSION ZONE
J	1	6168 328	302 209	0.0	
J	2	6168 294	302 221	0.0	
J	3	6168 256	302 231	0.0	
J	4	6167 207	302 248	0.0	
J	5	6167 179	302 257	0.0	
K	1	6168 524	302 389	0.0	
K	2	6168 537	302 433	0.0	
K	3	6168 563	302 459	0.0	
K	4	6168 593	302 422	0.0	

L	1	6168 758	302 336	0.0	
L	2	6168 728	302 321	0.0	
L	3	6168 707	302 301	0.0	
L	4	6168 690	302 275	0.0	
L	5	6168 660	302 247	0.0	
L	6	6168 636	302 241	0.0	
Compressor Shed	1			0.0	
Office	1			0.0	
Community Recycling	1			0.0	
OLD Weighbridge	1			0.0	
OLD Weighbridge	1			0.0	
Revolve Shop Building	1			0.0	
Truckwash	1			0.0	
new Weighbridge	1			0.0	
Methane Blank (Pre testing)				0.0	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				0.0	Taken at entrance to Dunmore site before main gate
Comments:					
Sampling performed in accordance to EPA Environmental Guidelines Solid Waste Landfills, Second Edition, 2016					

Gas concentrations are reported as raw values without correction for background concentration.

Appendix E

Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Overflow Event

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd. Smithfield NSW 2176
 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd. Warbrook NSW 230
 Ph:02 4968 9413 E:samples.newcastle@alsenviro.com

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ **Melbourne:** 2-4 Westall Rd. Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com

☐ **Adelaide:** 2-1 Burma Rd. Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsenviro.com


☐ **Perth:** 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com

☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)		Custody Seal intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
PROJECT: Dunmore Quarterly Surface Waters SWP01 Overflow full Testing		ALS QUOTE NO.: WO/030/19 TENDER		Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
ORDER NUMBER:				Random Sample Temperature on Receipt: 6.2 °C	
PROJECT MANAGER: Joel Culton				Other comment:	
SAMPLER: Robert Dahio		SAMPLER MOBILE:		RECEIVED BY: Aneta	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME: 21/10/22	
Email Reports to :				DATE/TIME: 21/10/22	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:				CC reports to:		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price)								Additional Information
ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SWP1	21/10/2019	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
TOTAL					10									

Environmental Division
Wollongong
Work Order Reference
EW2204854



Telephone : 02 42253126

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = Vial with HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
7 = 70cc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

CERTIFICATE OF ANALYSIS

Work Order : **EW2204854**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Surface Water SWP01 Overflow
Order number : 147649
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER SURFACE WATER
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 4
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 21-Oct-2022 15:55
Date Analysis Commenced : 21-Oct-2022
Issue Date : 28-Oct-2022 16:40



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	---	---	---	---
Sampling date / time				21-Oct-2022 14:30	---	---	---	---
Compound	CAS Number	LOR	Unit	EW2204854-001	-----	-----	-----	-----
				Result	---	---	---	---
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.9	---	---	---	---
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1760	---	---	---	---
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	23	---	---	---	---
EA045: Turbidity								
Turbidity	----	0.1	NTU	40.0	---	---	---	---
EA116: Temperature								
Temperature	----	0.5	°C	21.5	---	---	---	---
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	---	---	---	---
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	---	---	---	---
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	469	---	---	---	---
Total Alkalinity as CaCO3	----	1	mg/L	469	---	---	---	---
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	115	---	---	---	---
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	214	---	---	---	---
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	63	---	---	---	---
Magnesium	7439-95-4	1	mg/L	37	---	---	---	---
Sodium	7440-23-5	1	mg/L	193	---	---	---	---
Potassium	7440-09-7	1	mg/L	20	---	---	---	---
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	---	---	---	---
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	1.99	---	---	---	---
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	---	---	---	---
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	16.4	---	---	---	---
EK055G-NH4: Ammonium as N by DA								



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
Sampling date / time					21-Oct-2022 14:30	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204854-001	-----	-----	-----	-----
					Result	----	----	----	----
EK055G-NH4: Ammonium as N by DA - Continued									
Ammonium as N	14798-03-9_N	0.01	mg/L		15.9	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.81	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.98	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.79	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		17.8	----	----	----	----
∅ Total Cations	----	0.01	meq/L		15.1	----	----	----	----
∅ Ionic Balance	----	0.01	%		8.23	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		28	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		5.77	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EA025: Total Suspended Solids dried at 104 ± 2°C

(WATER) EK055G-NH4: Ammonium as N by DA

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
 Ph 02 8784 8555 E:samples_sydney@aisenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304
 Ph 02 4968 9433 E:samples_newcastle@aisenviro.com

☐ **Brisbane:** 32 Shand St. Stalford QLD 4053
Ph:07 3243 7222 E:samples.brisbane@alsenviro.com

☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
Ph:07 4796 0600 E: townsville.environmental@alsenviro.com

☐ **Melbourne:** 2-4 Westall Rd. Springvale VIC 3171
 Ph: 03 8549 9600 E: samples.melbourne@aisenviro.com
☐ **Adelaide:** 2-1 Burma Rd. Pooraka SA 5095
 Ph: 08 8359 0890 E: adelaide@aisenviro.com


☐ Perth: 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@aisenviro.com

☐ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 8331 2158 E: launceston@aisenviro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)								
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		ALS QUOTE NO.: WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)								
PROJECT: Dunmore Quarterly Surface Waters SWP01 Overflow full Testing				COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7
1	2	3	4	5	6	7						
ORDER NUMBER:				OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>		1	2	3	4	5	6	7
1	2	3	4	5	6	7						
PROJECT MANAGER: Joel Culton				Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes								
SAMPLER: Robert Daniels		SAMPLER MOBILE:		Random Sample Temperature on Receipt: 6.3 °C								
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		Other comment:								
Email Reports to :		RELINQUISHED BY: Robert Daniels		RECEIVED BY: Aneta								
Email Invoicing to :		DATE/TIME: 25/10/24		DATE/TIME: 25/10/24								
		RELINQUISHED BY:		RECEIVED BY:								
		DATE/TIME:		DATE/TIME:								

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:				CC reports to:										Additional Information	
ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).									
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
	SWP1	25.10.22 7.53	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Tem	
TOTAL					10										

Environmental Division
Wollongong
Work Order Reference
EW2204898



Telephone : 02 42263125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order : **EW2204898**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Surface Water SWP01 Overflow
Order number : 147649
C-O-C number : ----
Sampler : Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER SURFACE WATER
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 4
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 25-Oct-2022 12:16
Date Analysis Commenced : 25-Oct-2022
Issue Date : 02-Nov-2022 18:16



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	----	----	----	----
Sampling date / time				25-Oct-2022 07:53	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204898-001	-----	-----	-----	-----
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.9	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1550	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	17	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	14.2	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	18.9	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	361	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	361	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	104	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	178	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	62	----	----	----	----
Magnesium	7439-95-4	1	mg/L	33	----	----	----	----
Sodium	7440-23-5	1	mg/L	175	----	----	----	----
Potassium	7440-09-7	1	mg/L	20	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.76	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	15.8	----	----	----	----
EK055G-NH4: Ammonium as N by DA								



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
Sampling date / time					25-Oct-2022 07:53	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204898-001	-----	-----	-----	-----
					Result	----	----	----	----
EK055G-NH4: Ammonium as N by DA - Continued									
Ammonium as N	14798-03-9_N	0.01	mg/L		15.3	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.67	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		1.04	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.71	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		14.4	----	----	----	----
∅ Total Cations	----	0.01	meq/L		13.9	----	----	----	----
∅ Ionic Balance	----	0.01	%		1.64	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		23	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.24	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EA025: Total Suspended Solids dried at 104 ± 2°C

(WATER) EK055G-NH4: Ammonium as N by DA

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

Appendix F

Calibration Certificates

Barry



an ecotec company

CERTIFICATE OF CALIBRATION

Issued By: Ecotec Solutions, Inc.

Calibration Date: February 15, 2022

Recommended Calibration: February 15, 2024

850 S Via Lata, Suite 115
Colton, CA 92324
909-906-1001

Certificate #: 202215023810912

www.ecotecco.com

Customer: ANRI Instruments & Controls

Description: Gas Analyzer

Model: Inspectra

Serial Number: 3810912

Calibration Results: The analyzer is considered to be in conformity with the specifications of reference.

Units	Gas	Certified Gas Concentration	Gas Traceability (Lot Number)	Instrument Reading	Tolerance
%	N ₂	99.999	N70086009803	0.2 PPM	5 PPM
PPM	CH ₄	10.0 PPM	70086129308	9.9 PPM	± 10%
PPM	CH ₄	500 PPM	70086030712	488.5 PPM	± 10%
PPM	CH ₄	2498 PPM	70086811308	2607.3 PPM	± 10%
PPM	CH ₄	10000 PPM	109631206	10077.9 PPM	± 10%
PPM	CH ₄	20000 PPM	109631303	20002.7 PPM	± 10%
PPM	CH ₄	999700 PPM	MET-040918-UHP	1003150 PPM	± 10%

Calibration Technician: Jose Munoz

Signature: 

Date: February 15, 2022

This certificate is issued in accordance with laboratory requirements of the National Institute of Standards and Technology. It provides traceability of measurement to recognized national standards, and to units of measurement realized at the National Institute of Standards and Technology or other recognized national standards laboratories. Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Appendix G

Gas Flare Reports



PROJECT PROFILE: **DUNMORE, NSW**

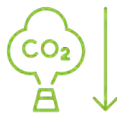
We expedite the transition to renewables with clean energy and carbon abatement solutions. Carbon credits enable a commercially viable project to create additional abatement.

Results Achieved since the Project Commenced*



BIOGAS CAPTURED

23.4 million m3



CARBON ABATEMENT

222 thousand tonnes
(t CO2e - environmental
benefit)



ACCUs CREATED

92 thousand Australian
Carbon Credit Units



SEEDLINGS PLANTED

3.7 million seedlings
planted for 10 years
(t CO2e)



CARS OFF THE ROAD

6,093 for the last 12
months of carbon
abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI installed a bespoke biogas management system with an LGI 1000 ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation, operations and maintenance of the biogas management system, including the monitoring and reporting services provided.

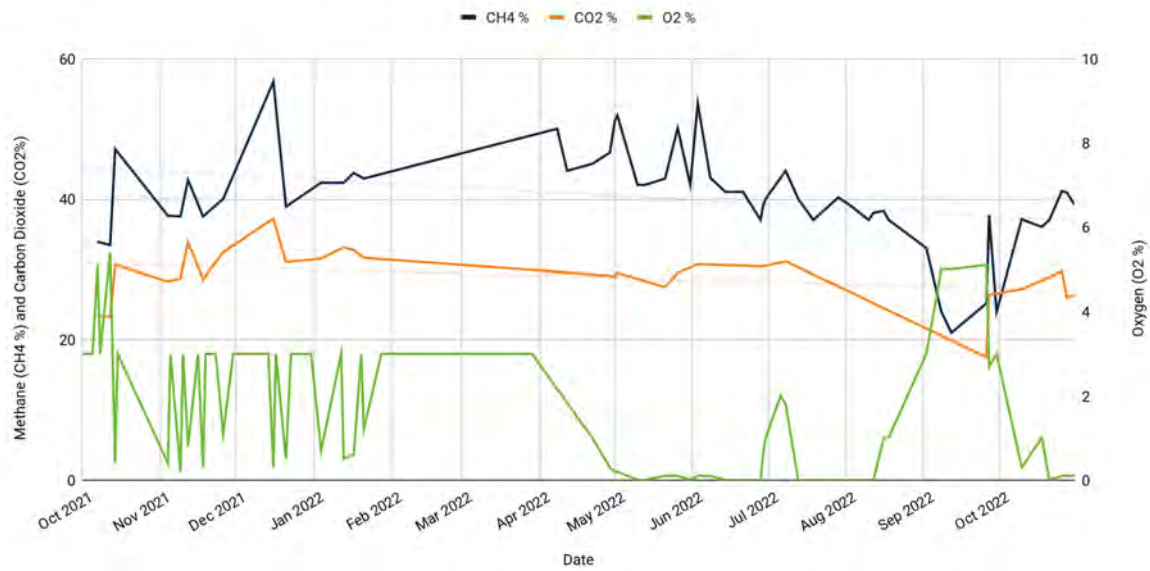
Site:	Dunmore	Report issue date:	14/11/2022
Report month:	October 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Jessica North

Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to assist council. • September 2016 - LGI disconnected the extended gas capture system to assist council. • November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system • November 2019 - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • April 2020 - LGI installed a flowline to sump 6 after earlier disconnection. • February 2021 - LGI installed 13 new vertical wells, including a new submain • March 2022 - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability • August 2022 - LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3
Comments on operation / maintenance:	Availability - 99.38% Down Time: 4.58hrs Field Tuned: - 31/10/2022
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

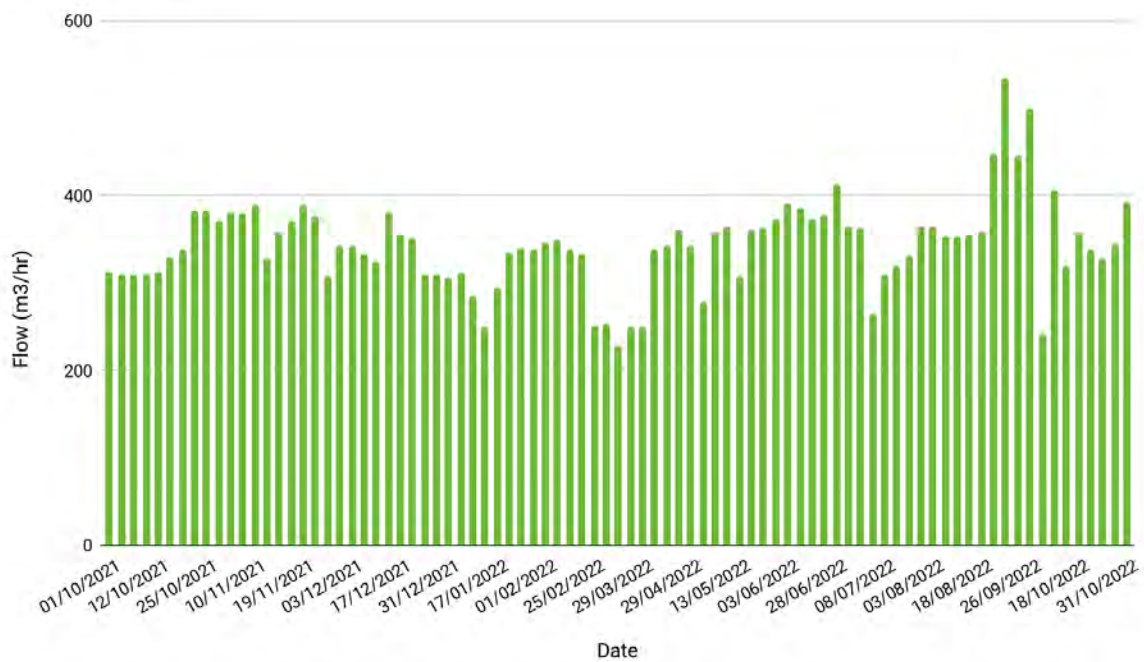
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
10/10/2022	37.1	27.2	0.3	320	769	23,176,716
18/10/2022	36	-	1	357	614	23,243,922
26/10/2022	41.1	29.7	0.1	327	662	23,311,015
31/10/2022	39.2	26.4	0.1	392	767	23,355,257
Average	38.35	27.77	0.37	349	703	-

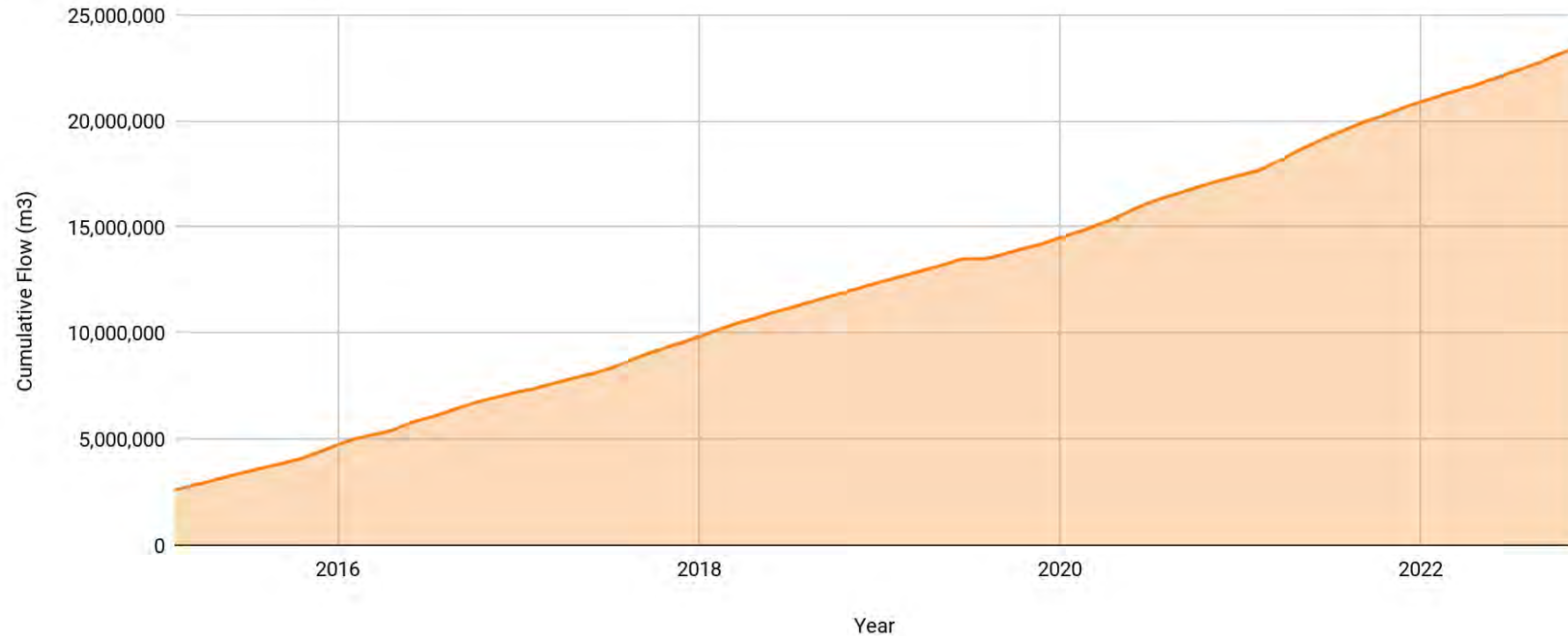
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 23,360,830 of combusted landfill gas up to 1 November 2022, which represents;
 - 221,872 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
 - 3,697,864 seedlings planted for 10 years
 - 6,093 (cars off the road for the last 12 months)
 - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.



Please note:

This report has been prepared by LGI Limited (LGI) with all reasonable skill, care and diligence, and taking account of the human power and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from LGI. LGI disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Where LGI has been accorded gas rights under the terms and conditions of the agreement with the client, the data contained in this report represents confidential commercial information and should not be copied or disseminated in any form to a third party without prior consent from LGI.



PROJECT PROFILE: **DUNMORE, NSW**

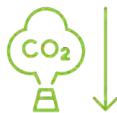
We expedite the transition to renewables with clean energy and carbon abatement solutions. Carbon credits enable a commercially viable project to create additional abatement.

Results Achieved since the Project Commenced*



BIOGAS CAPTURED

23.6 million m3



CARBON ABATEMENT

224 thousand tonnes
(t CO2e - environmental
benefit)



ACCUs CREATED

92 thousand Australian
Carbon Credit Units



SEEDLINGS PLANTED

3.7 million seedlings
planted for 10 years
(t CO2e)



CARS OFF THE ROAD

6,091 for the last 12
months of carbon
abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI installed a bespoke biogas management system with an LGI 1000 ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation, operations and maintenance of the biogas management system, including the monitoring and reporting services provided.

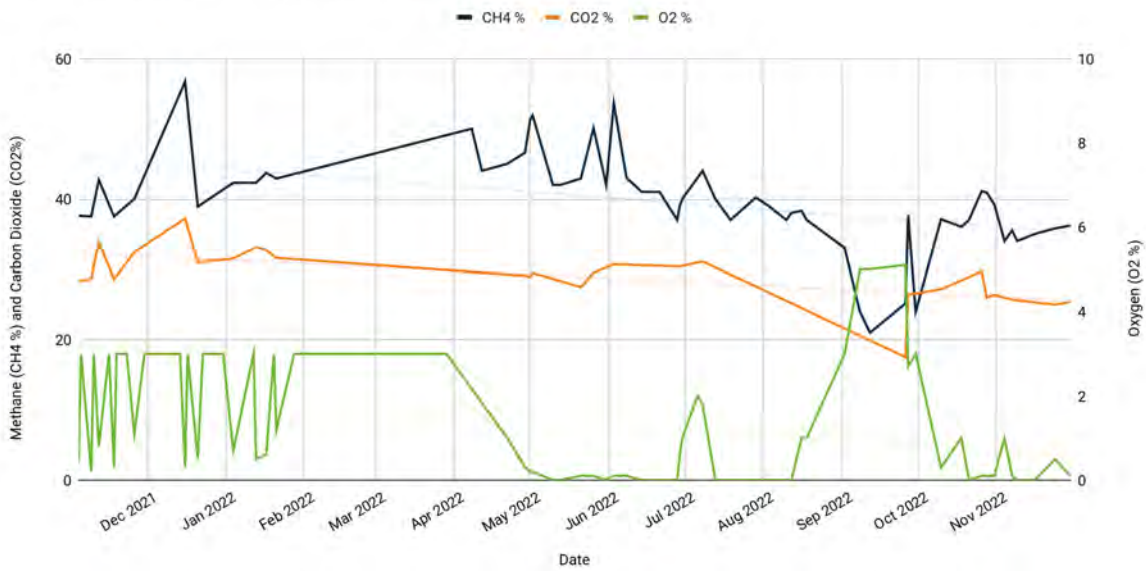
Site:	Dunmore	Report issue date:	16/12/2022
Report month:	November 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Thomas Schnatz

Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to assist council. • September 2016 - LGI disconnected the extended gas capture system to assist council. • November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system • November 2019 - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • April 2020 - LGI installed a flowline to sump 6 after earlier disconnection. • February 2021 - LGI installed 13 new vertical wells, including a new submain • March 2022 - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability • August 2022 - LGI repaired the 225mm mainline and adjacent sub main to allow for intermediate capping to continue across the top of cell 3
Comments on operation / maintenance:	Availability - 100.00% Down Time: 0.00hrs Field Tuned: - 30/11/2022
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

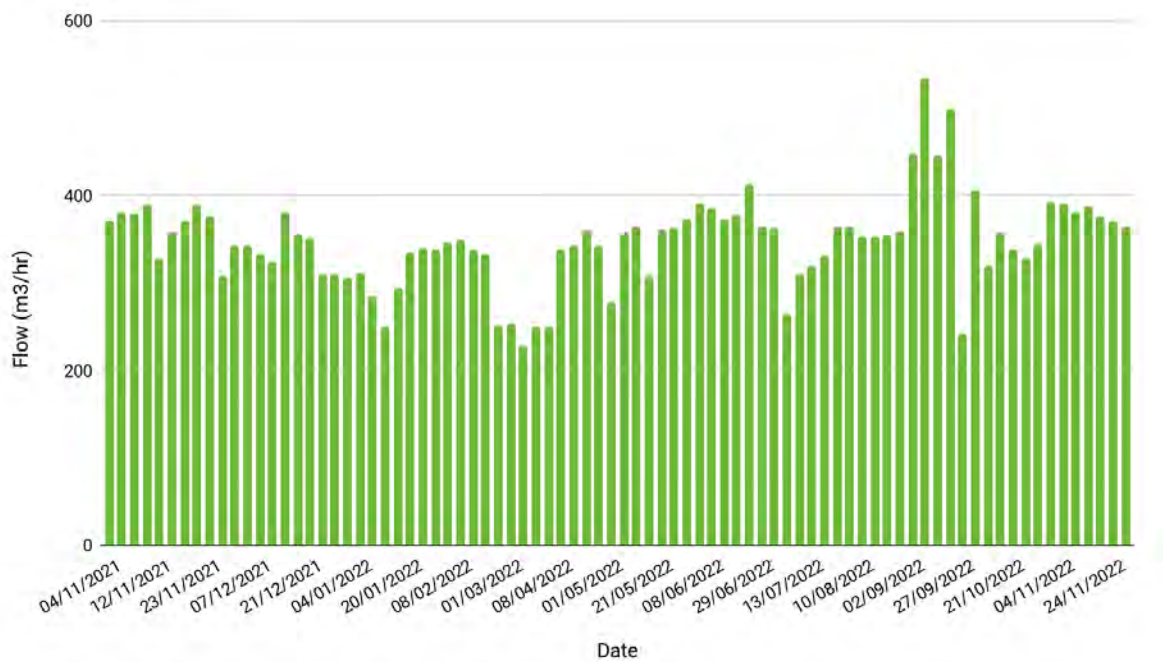
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
07/11/2022	35.5	25.7	0.1	380	697	23,419,647
16/11/2022	35	-	0	375	667	23,501,523
24/11/2022	35.8	25	0.5	370	645	23,573,405
30/11/2022	36.2	25.4	0.1	364	730	23,625,627
Average	35.625	25.37	0.175	372	685	-

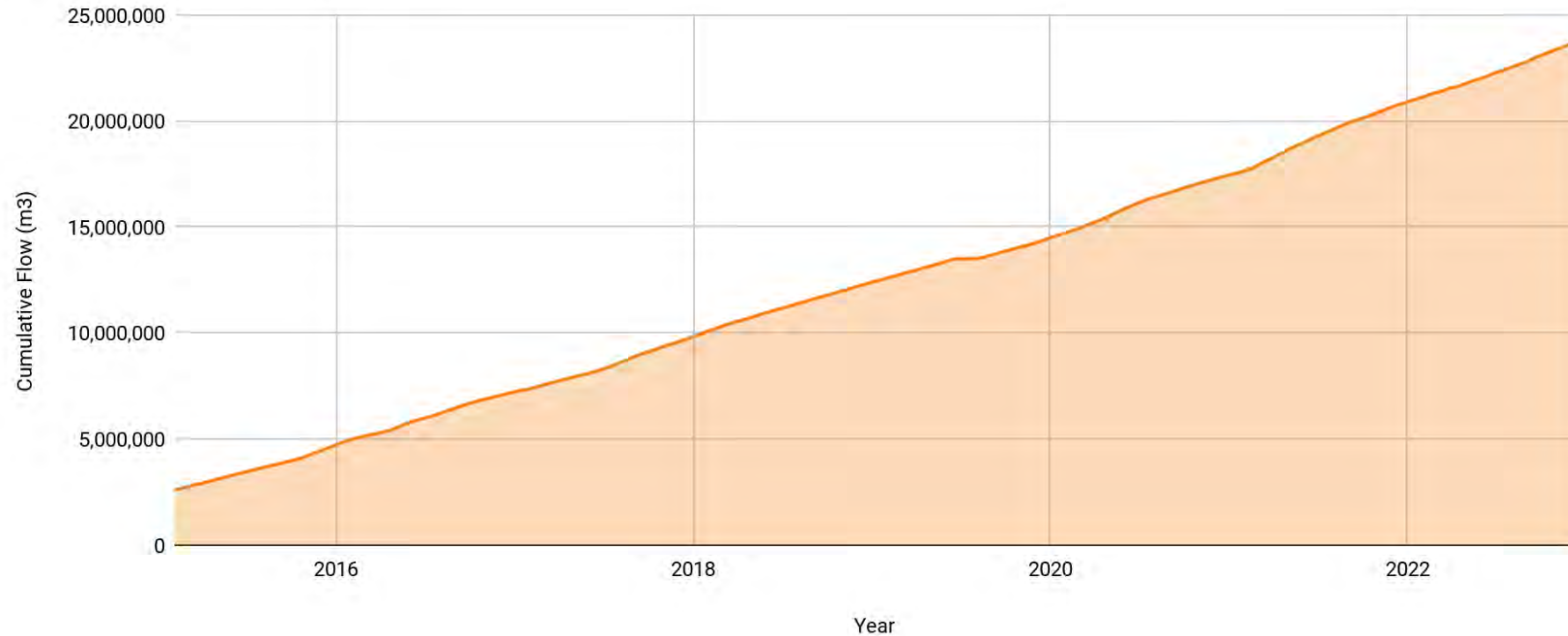
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 23,631,365 of combusted landfill gas up to 1 December 2022, which represents;
 - 224,441 tonnes of CO₂ equivalent (total methane abated by gas capture system to date).
 - 3,740,688 seedlings planted for 10 years
 - 6,091 (cars off the road for the last 12 months)
 - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.



Please note:

This report has been prepared by LGI Limited (LGI) with all reasonable skill, care and diligence, and taking account of the human power and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from LGI. LGI disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Where LGI has been accorded gas rights under the terms and conditions of the agreement with the client, the data contained in this report represents confidential commercial information and should not be copied or disseminated in any form to a third party without prior consent from LGI.



PROJECT PROFILE: **DUNMORE, NSW**

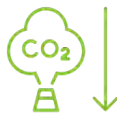
We expedite the transition to renewables with clean energy and carbon abatement solutions. Carbon credits enable a commercially viable project to create additional abatement.

Results Achieved since the Project Commenced*



BIOGAS CAPTURED

23.9 million m3



CARBON ABATEMENT

227 thousand tonnes
(t CO2e - environmental
benefit)



ACCUs CREATED

92 thousand Australian
Carbon Credit Units



SEEDLINGS PLANTED

3.8 million seedlings
planted for 10 years
(t CO2e)



CARS OFF THE ROAD

6,139 for the last 12
months of carbon
abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI installed a bespoke biogas management system with an LGI 1000 ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation, operations and maintenance of the biogas management system, including the monitoring and reporting services provided.

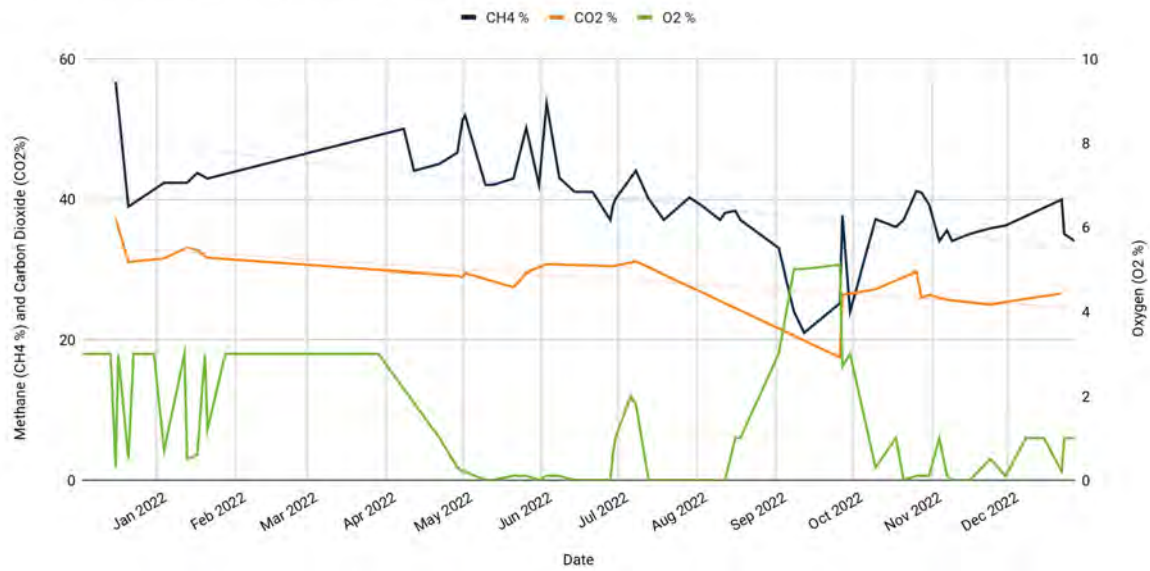
Site:	Dunmore	Report issue date:	16/01/2022
Report month:	December 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Thomas Schnatz

Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to assist council. • September 2016 - LGI disconnected the extended gas capture system to assist council. • November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system • November 2019 - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • April 2020 - LGI installed a flowline to sump 6 after earlier disconnection. • February 2021 - LGI installed 13 new vertical wells, including a new submain • March 2022 - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability August 2022 - LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3 - December 2022 - LGI installed a pneumatic bore pump in a j-trap, allowing for greater reliability of condensate management in the main gas line.
Comments on operation / maintenance:	Availability - 100.00% Down Time: 0.00hrs Field Tuned: - 22/12/2022
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

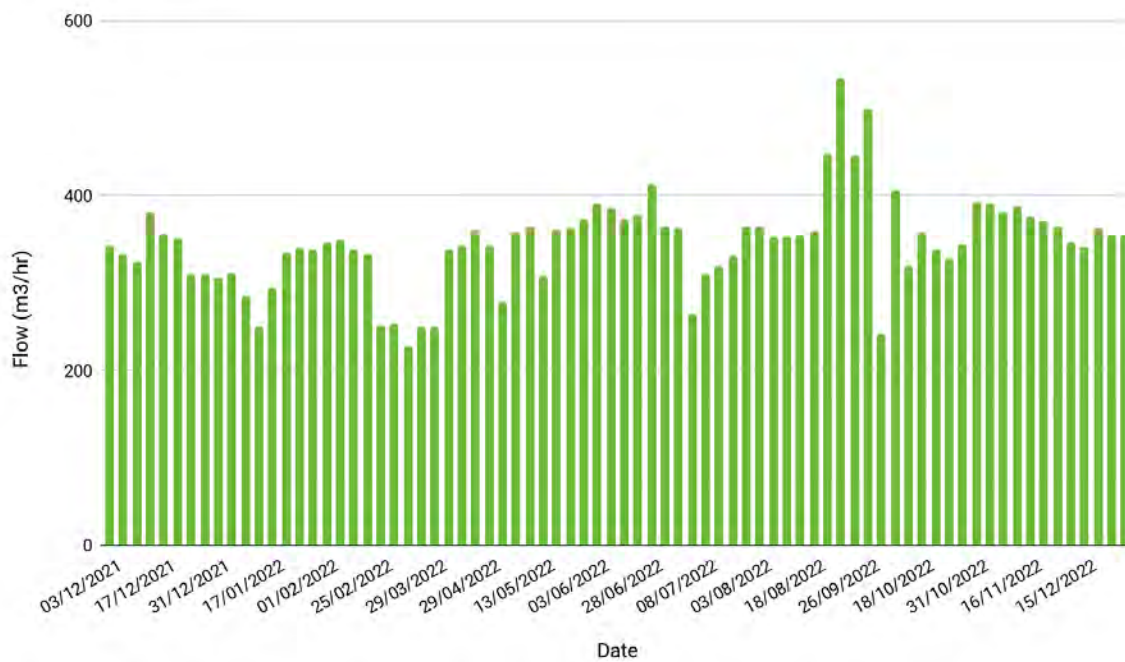
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
08/12/2022	-	-	1	346	755	23,693,447
15/12/2022	-	-	1	341	755	23,752,988
22/12/2022	39.9	26.6	0.2	363	771	23,811,530
27/12/2022	34	-	1	355	718	-
Average	36.95	26.6	0.8	351	750	-

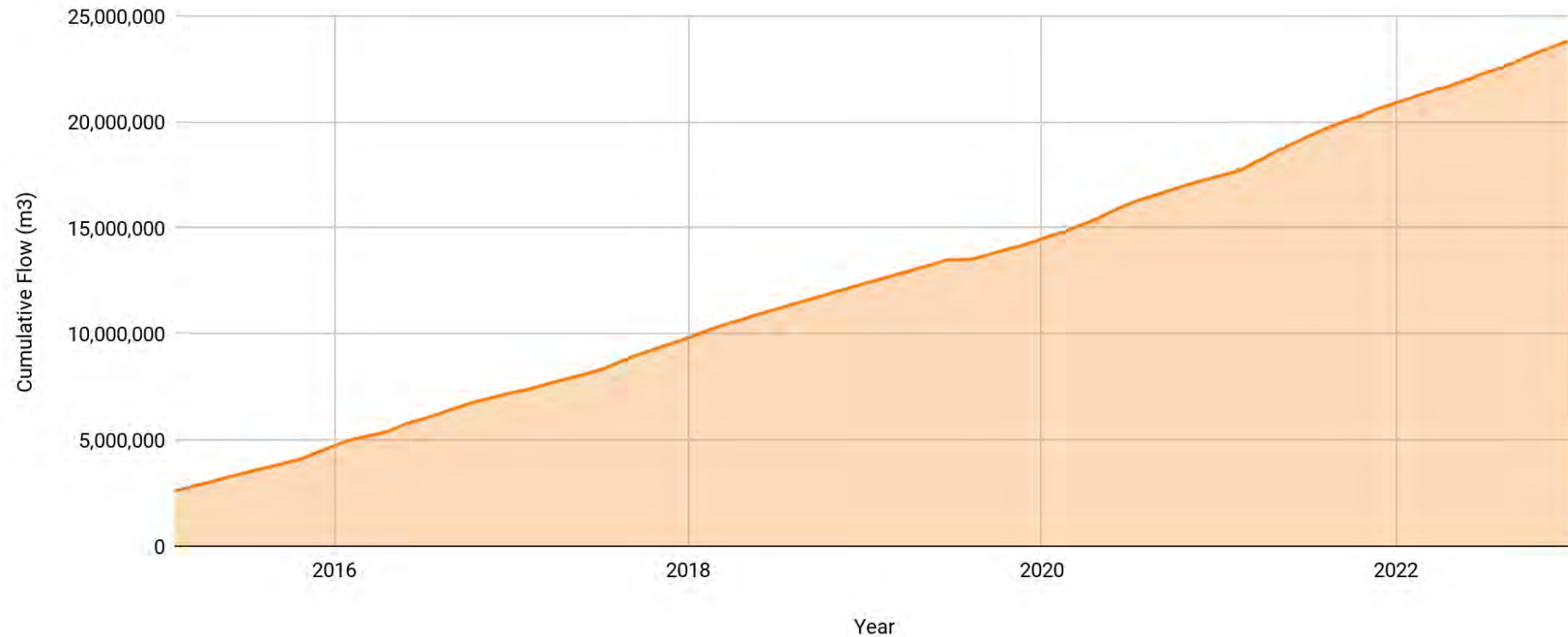
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 23,893,596 of combusted landfill gas up to 1 January 2023, which represents;
 - 226,932 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
 - 3,782,197 seedlings planted for 10 years
 - 6,139 (cars off the road for the last 12 months)
 - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.



Please note:

This report has been prepared by LGI Limited (LGI) with all reasonable skill, care and diligence, and taking account of the human power and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from LGI. LGI disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Where LGI has been accorded gas rights under the terms and conditions of the agreement with the client, the data contained in this report represents confidential commercial information and should not be copied or disseminated in any form to a third party without prior consent from LGI.