



QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) MARCH 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: **March 2022**

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ACKNOWLEDGEMENTS

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

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Copies	Report No. & Title	Status	Date	Prepared for:
1 x PDF	202203_ENRS0033r1e1_SCC Dunmore QEMR	Rev.1	20 th March 2022	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 March 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 March 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;
- Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria;
- During the March 2022 quarter further reductions in analyte concentrations of all Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were observed for Potassium, Calcium and Sulphate and Fluoride.
- Flare operating temperature were generally observed to be above the target operating threshold of 760 degrees Celsius but did fall below on four (4) occasions 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;
- No non-compliances with the EPL were reported during the March 2022 monitoring period;
- Based on this review of the March 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
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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 March 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 (SSC) 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 March 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 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.

2.0 SITE DESCRIPTION

2.1 LOCATION

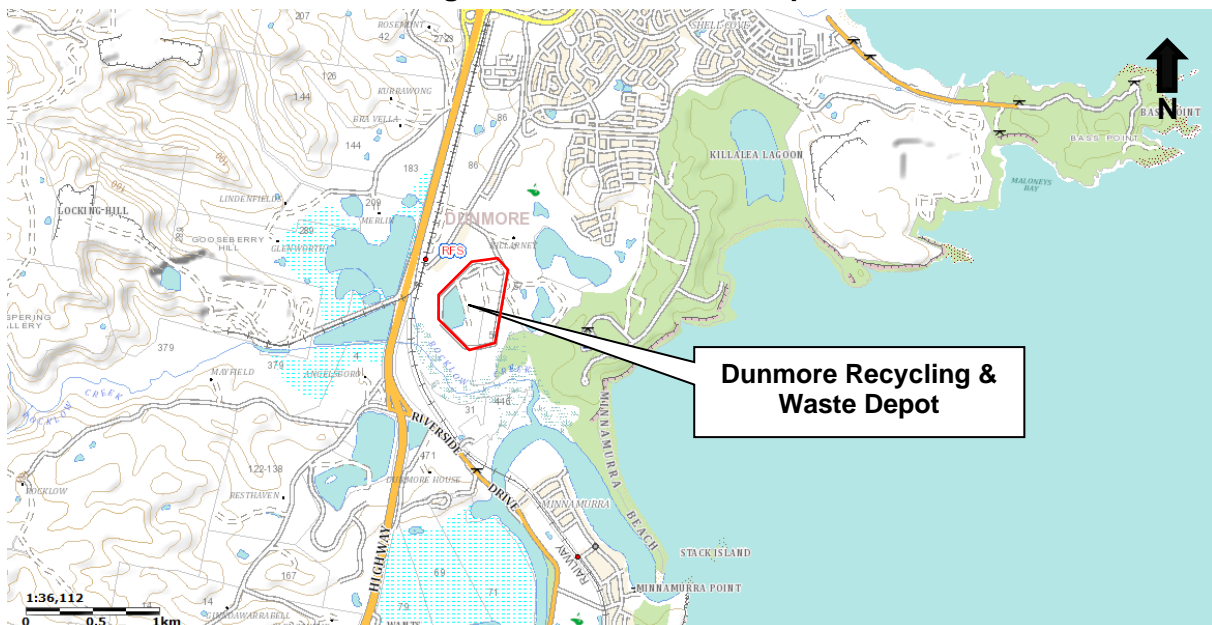
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure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

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

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 two (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 or low flow parameter stabilisation methods applied with field sheets provided to document

pumping volumes and field parameters. Samples were collected using clear disposal bailers, and were sealed in laboratory-prepared sampling containers appropriate for the analysis. All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

Surface water and leachate samples were collected using as 'grab samples' from the midpoint of the structure and at mid-depth.

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 March 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 ACUMMULATION MOITORING 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 rinsate 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 March 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 three (3) occasions during Q2 monitoring period. Summary results are included in **Table 6**. Results were consistent with EPA guidelines.

A full 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.

Table 6: Summary Table of Overflow Events

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
03/03/2022	8.1	17	23.1	101.8
10/03/2022	7.6	8	22.4	28.4
30/03/2020	7.8	12	22.9	19.8

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 **0.49 mbgl** (BH-15, 10/03/2022) to **3.58 mbgl** (BH-12r, 10/03/2022). Across the Site groundwater levels were consistently higher in comparison to historical data sets.

6.3.2 Temperature

Groundwater

Temperature of groundwater in the March 2022 monitoring period ranged between **18.5 degrees Celsius** (BH-15, 10/03/2022) and **23.0 degrees Celsius** (BH-1C, 10/03/2022).

Results are consistent with historical data.

Surface Waters

Surface water temperature at SWP-1 was **18.1 degrees Celsius** (10/03/2022)

Results are consistent with historical data.

Leachate

Leachate Temperatures at the leachate Tank (LP-1) was **22.0 degrees Celsius** (07/03/2022).

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 mg/L = 0.68 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 $\mu\text{S/cm}$ - 2,200 $\mu\text{S/cm}$** (~1,500 mg/L).

Groundwater

During the March 2022 monitoring period, salinity ranged between; **236 $\mu\text{S/cm}$** (BH-18, 10/03/2022) and **7,420 $\mu\text{S/cm}$** (BH-1C, 10/03/2022). Four (4) monitoring points reported salinity values in excess of freshwater SAC of **2,200 $\mu\text{S/cm}$** , **7,420 $\mu\text{S/cm}$** (BH-1c), **4,360 $\mu\text{S/cm}$** (BH-9), **2,460 $\mu\text{S/cm}$** (BH-12r), **2,460 $\mu\text{S/cm}$** (BH-21).

With the exception of BH1c and BH12r which were consistent with historical data, EC readings generally trended down across the site.

Surface Waters

Electrical Conductivity results for onsite surface water (SWP-1, 10/03/2022) was **1,470 $\mu\text{S/cm}$** which corresponds to a calculated Total Dissolved Solids result of **1,029 mg/L**. These results were below the TV.

Electrical conductivity for offsite surface waters ranged between **555 $\mu\text{S/cm}$** (SWC-DOWN, 10/03/2022) to **2,360 $\mu\text{S/cm}$** (SWC-UP, 10/03/2022).

Total Dissolved Solids results for offsite surface waters located along Rocklow Creek ranged between **350 mg/L** (SWC-DOWN, 10/03/2022) to **1,320 mg/L** (SWC-UP, 10/03/2022).

Although the results Total Dissolved Solids and EC results appear significantly lower than historical data they are consistent with a tidal creek experiencing heavy rainfall events.

Leachate

Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution. Leachate salinity for March 2022 monitoring was **11,200 $\mu\text{S/cm}$** (LP1, 7/03/2022) which was above the TV. Results are consistent with historical data.

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 **3.33 mg/L** (07/03/2022). 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 **2.43 mg/L** (SWC-UP, 10/03/2022) to **7.17 mg/L** (SWC-DOWN, 10/03/2022). These results are consistent with a tidal creek passing through a mangrove swamp and are consistent with previous data.

Leachate

Dissolved oxygen at LP1 (Leachate Tank) was **1.32 mg/L** (07/03/2022). 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 6.0** (BH-14, 10/03/2022) and **pH 7.2** (BH-3, BH-19r and BH-21, 10/03/2022). With the exception of BH-14 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

Surface water for the March 2022 monitoring period reported pH values of between **pH 7.1** (SWC-DOWN2 and SWC_UP, 10/03/2022) and **pH 7.6** (SWP-1, 10/03/2022). All surface water were reported within the ANZECC recommended range of pH 6.5-8.0 and are consistent with historical data.

Leachate

Leachate pH was as reported as **pH 8.8** (LP-1, 07/03/2022). Results were reported above the ANZECC recommended range of pH 6.5-8.5. Leachate pH has 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 the March 2022 monitoring period were reported between **10 mg/L** (SWC-DOWN, 10/03/2022 and SWC- 2, 10/03/2022) and **12 mg/L** (SWC-DOWN2, 10/03/2022). All results were below the **50mg/L** TV.

TSS results 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 March 2022 monitoring period, ammonia was measured within groundwater monitoring bores between **0.20 mg/L** (BH18, 10/03/2022) and **347 mg/L** (BH-1c, 10/03/2022). With the exception of BH-18 all groundwater wells exceeded of the adopted trigger value of **0.91 mg/L** for the March 2022 monitoring period. However, since the corresponding pH was below 8.00 pH units it was not considered significant. This was consistent with historical values.

Surface Water

Ammonia in surface water samples ranged from **0.32 mg/L** (SWC_DOWN_2, 10/03/2022) to **2.21 mg/L** (SWP-1, 10/03/2022). The result for SWP-1, SWC_2, and SWC_UP all exceeded the adopted trigger value of **0.91 mg/L** during the monitoring period. However, since the corresponding pH was below 8.00 pH units it was not considered significant.

Leachate

Ammonia in leachate was reported between **1020 mg/L** (LP1, 07/03/2022). High ammonia concentrations are expected in untreated leachate.

6.4.2 Nitrate

Groundwater

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **46.10 mg/L** (BH-14, 10/03/2022). Although results generally continue to trend downward a total of four (4) groundwater wells reported exceedances above the TV of 0.7mg/L in the March 2022 monitoring period, including BH-3, BH-12r, BH-13 and BH-14.

Surface Water

The nitrate concentration of the onsite surface water SWP-1 in the March 2022 monitoring period was **0.05 mg/L** (SWP-1; 10/03/2022).

Nitrate concentration for Rocklow Creek surface water samples in the March 2022 monitoring period ranged between **<0.01 mg/L** (SWC-UP; 10/03/2022) and **0.22 mg/L** (SWC-DOWN_2; 10/03/2022).

The Nitrate concentration of all surface water samples was below the TV of **0.7mg/L**.

Leachate

Nitrate concentration of leachate (LP-1) was **<0.1mg/L** in the March 2022 monitoring period.

6.4.3 Nitrite

Groundwater

Results for Nitrate in groundwater during the March 2022 monitoring period were reported between **<0.01 mg/L** in multiple bores and **0.06 mg/L** (BH-3, 10/03/2022). No exceedances were reported for nitrite during the March 2022 monitoring period. All results are below the accepted TV and consistent with previous data.

Surface Water

During the March 2022 monitoring period surface water SWP-1 was reported as **0.08 mg/L**. Although higher than Results are below the accepted TV.

Leachate

Leachate LP1 result was reported as to **<0.1 mg/L** (07/12/2021). Results are below the accepted TV and consistent with previous data.

Anions

6.4.4 Chloride

Groundwater

Results for Chloride in groundwater were reported between **7 mg/L** in (BH-18, 10/03/2022) and **855 mg/L** (BH-1c, 10/03/2022). With the exception of BH-12r which remains consistent with previous data, mean ground water chloride concentration has been trending down since December 2019.

Surface Water

During the March 2022 monitoring period chloride results for surface water SWP-1 was **184 mg/L** (10/03/2022). The results are below the accepted TV and are generally consistent with historical data.

Leachate

Chloride at the Leachate Tank (LP-1) was **1290 mg/L** (07/03/2022). Chloride results have been trending down since February 2019.

6.4.5 Fluoride

Groundwater

Results for Fluoride in groundwater were reported between **<0.1 mg/L** in multiple bores and **0.6 mg/L** (BH-14, 10/03/2022). Results are consistent with historical data.

Surface Water

Surface water results ranged from of **<0.1 mg/L** (SWC_DOWN and SWC_DOWN_2, 10/03/2022) and **0.4 mg/L** (SWP-1, 10-03-2022). Results are generally consistent with historical data.

Leachate

The fluoride result at the Leachate tank (LP-1) was **0.2 mg/L** (07/03/2022). Results are consistent with historical data.

6.4.6 Sulphate

Groundwater

Results for Sulphate in groundwater were reported between **4 mg/L** (BH-18, 10/03/2022) and **332 mg/L** (BH-22, 10/03/2022). Results are generally consistent with previous data.

Surface Water

Sulphate in surface water ranged from **34 mg/L** (SWC_DOWN, 10/03/2022) and **192 mg/L** (SWP-1, 10/03/2022). Historical data indicates a stepwise reduction in sulphate concentration levels for Rocklow Creek surface waters from 16/06/2021 with further reduction noted in Rocklow Creek during the March 2022 period.

Leachate

Sulphate level at the leachate tank (LP-1) in the March 2022 monitoring period was **<10 mg/L** (07/03/2022). The sulphate concentration in leachate has been trending down since 2017 and has been consistent at **<10 mg/L** since December 2020.

6.4.7 Total Alkalinity

Surface Water

Total Alkalinity at SWP-1 ranged was **276 mg/L** (10/03/2022). Results are consistent with historical data.

Leachate

Total Alkalinity in Leachate (LP-1) was **4,030 mg/L** (07/03/2022). Results are consistent with historical data.

6.4.8 Bicarbonate Alkalinity

Groundwater

Bicarbonate in groundwaters ranged from **76 mg/L** (BH-14, 10/03/2022) to **2,330 mg/L** (BH-1C, 10/03/2022). 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 March 2022 monitoring period were reported between **0.005 mg/L** (BH-3, 10/03/2022) and **0.540 mg/L** (BH-9, 10/03/2022). Results are generally consistent with historical data.

Surface Water

The total manganese concentration at SWP-1 was from **0.180 mg/L** (10/03/2022). Results are consistent with historical data.

Leachate

Total Manganese concentrations in leachate was reported as **0.129 mg/L** (Leachate Tank LP-1, 07/03/2022). A step change reduction in manganese has been noted for the last two (2) monitoring periods with the March 2022 result down by 72% lower on the mean manganese result since Feb 2019. These values are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable. Concentrations of Manganese should continue to be reviewed during subsequent monitoring events.

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 **0.490 mg/L** (SWP-1, 10/03/2022). Results are generally consistent with historical data.

Leachate

Concentration of iron at the leachate Tank (LP-1) was reported between **1.08 mg/L** (07/03/2022). 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, 10/03/2022) and **12.2 mg/L** (BH1c, 10/03/2022). 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 **30 mg/L** (BH-18, 10/03/2022) and **229 mg/L** (BH12r, 10/03/2022). With the exception of BH-12r, reductions in calcium concentration were

observed for all groundwater samples ranging from a 7.46% reduction (BH-1C, 10/03/2022) to 66.4% reduction (BH-4, 10/03/2022).

Surface Water

Calcium in surface water ranged from **15 mg/L** (SWC_DOWN, 10/03/2022) to **42 mg/L** (SWP-1 10/03/2022).

In comparison to historical data calcium levels in Rocklow Creek continue to decline and have reached the lowest recorded levels in the March 2020 monitoring period with percent reductions ranging from 59.6% (SWC_2, 10/03/2020) to 95.1% (SWC_DOWN, 10/03/2022) when compared to mean calcium concentrations from November 2017.

Leachate

Calcium concentration in Leachate (LP-1) for the March 2022 monitoring period was **69 mg/L** (07/03/2020).

Historical observations indicate that low calcium levels have been observed for four (4) of the last six (6) sampling events since 15/12/2020 at LP-1. Leachate calcium concentration for the March 2022 period is 60.3% lower than the mean calcium concentration since 2017 of **174 mg/L**.

6.4.13 Potassium

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

Groundwater

Groundwater results were reported between **3 mg/L** (BH-18, 10/03/2022) and **205 mg/L** (BH1C, 10/03/2022). With the exception of BH-15 which continues to decrease the potassium levels for groundwaters are generally consistent with historical data.

Surface Water

During the March 2022 monitoring period potassium levels for the offsite groundwaters ex Rocklow Creek ranged from **6 mg/L** (SWC-DOWN, 10/03/2022) to **18 mg/L** (SWC-2 and SWC_UP, 10/03/2022).

Historical data indicates that potassium concentrations in surface waters have been trending down since 2018. A step change reduction which took place in June 2021 coupled with an additional step change reduction in March 2020 has produced the lowest potassium results on record for all Rocklow Creek sample locations with reductions of 62.7% (SWC_2, 10/03/2020) to 98.0% (SWC_DOWN, 10/03/2022) when compared to the mean potassium results for each site since November 2017.

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 March 2022 monitoring period at the following concentrations:

Groundwater

TOC levels ranged between **6 mg/L** (BH-18; 10/03/2022) and **182 mg/L** (BH-1c; 10/03/2022). Results are consistent with historical data.

Surface Water

In the March 2022 monitoring period the TOC levels ranged between 14 mg/L (SWC- DOWN, 10/03/2022) and 28 mg/L (SWC_UP, 10/03/2022). With the exception of SWP-1 results are generally elevated in comparison to historical data.

Leachate

For the March 2022 monitoring period TOC concentration in leachate was **498 mg/L** (LP-1 Leachate Storage Tank 07/03/2022). 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 **8th February** and **9th March 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	0.1	Satisfactory
DDG2		<0.1	Satisfactory
DDG3		0.3	Satisfactory
DDG4		0.3	Satisfactory

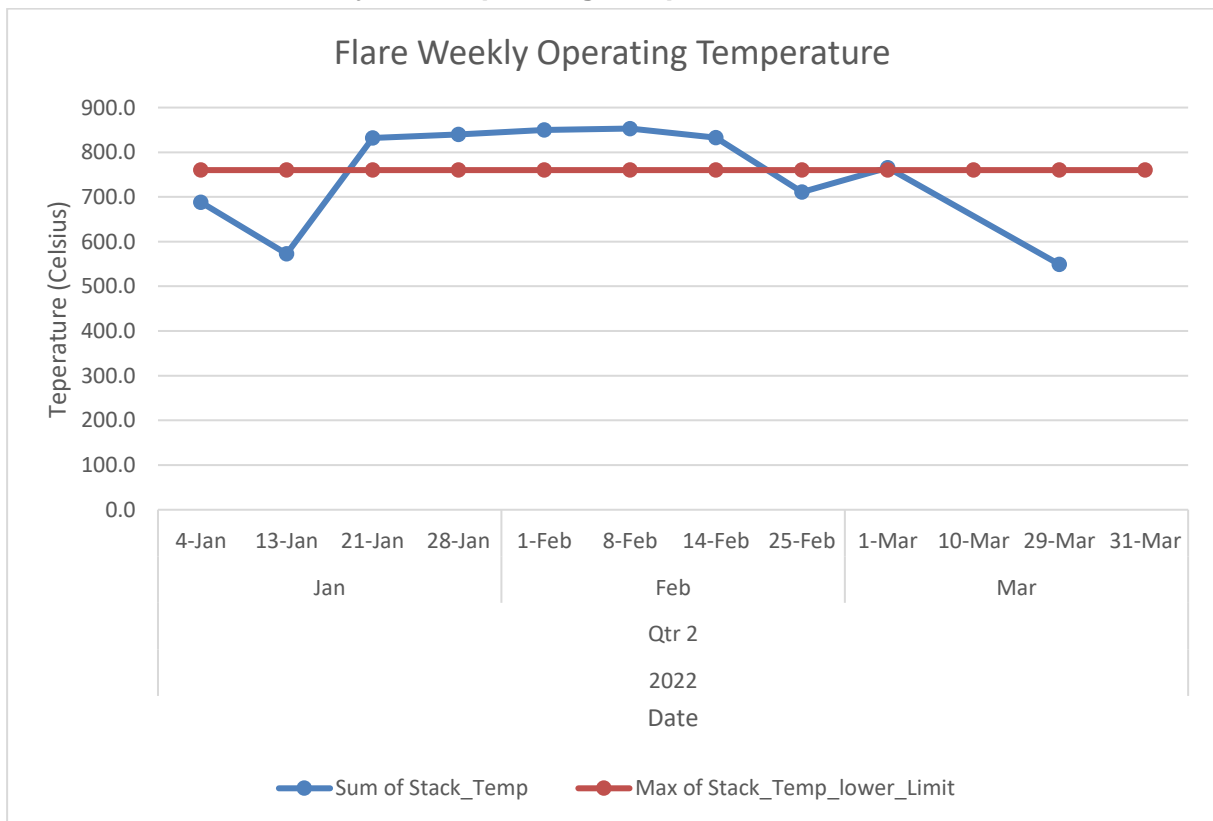
Results for depositional dust during the March 2022 quarterly monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m²/month**.

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

Monitoring Period	Month	Date	Average Flare Temp
Qtr 2	Jan	4-Jan	688.0
		13-Jan	573.0
		21-Jan	832.0
		28-Jan	840.0
	Mean January Temp		733.3
	Feb	1-Feb	850.0
		8-Feb	853.0
		14-Feb	833.0
		25-Feb	711.0
	Mean February Temp		811.8
	Mar	1-Mar	765.0
		10-Mar	
		29-Mar	549.0
		31-Mar	
Mean March Temp		657.0	
Qtr 2 Total		749.4	

Chart 1: Weekly Flare Operating Temperatures March Quarter 2022



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

Weekly operating temperatures at the Flare were generally above the Lower Limit of 760 degrees throughout the March 2022 monitoring period only falling below the lower control limit on 4 out of 10 occasions.

LGI advise that reduced Flare temperatures are a consequence of high moisture levels within the landfill negatively impacting gas extraction operations. The actions taken to address the root causes are outlined in the LGI Gas Flare report included as **Appendix G**.

8.0 METHANE MONITORING

8.1 SURFACE GAS METHANE

The surface gas monitoring for the March 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 March 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 March 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 1-59** 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 satisfactory results.

Generally, all dust gauges reported satisfactory results over the March 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 March 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 March 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 March 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;
- Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria;
- During the March 2022 quarter further reductions in analyte concentrations of all Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were observed for Potassium, Calcium and Sulphate and Fluoride.
- Flare operating temperature were generally observed to be above the target operating threshold of 760 degrees Celsius but did fall below on four (4) occasions 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;
- No non-compliances with the EPL were reported during the March 2022 monitoring period;
- Based on this review of the March 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.

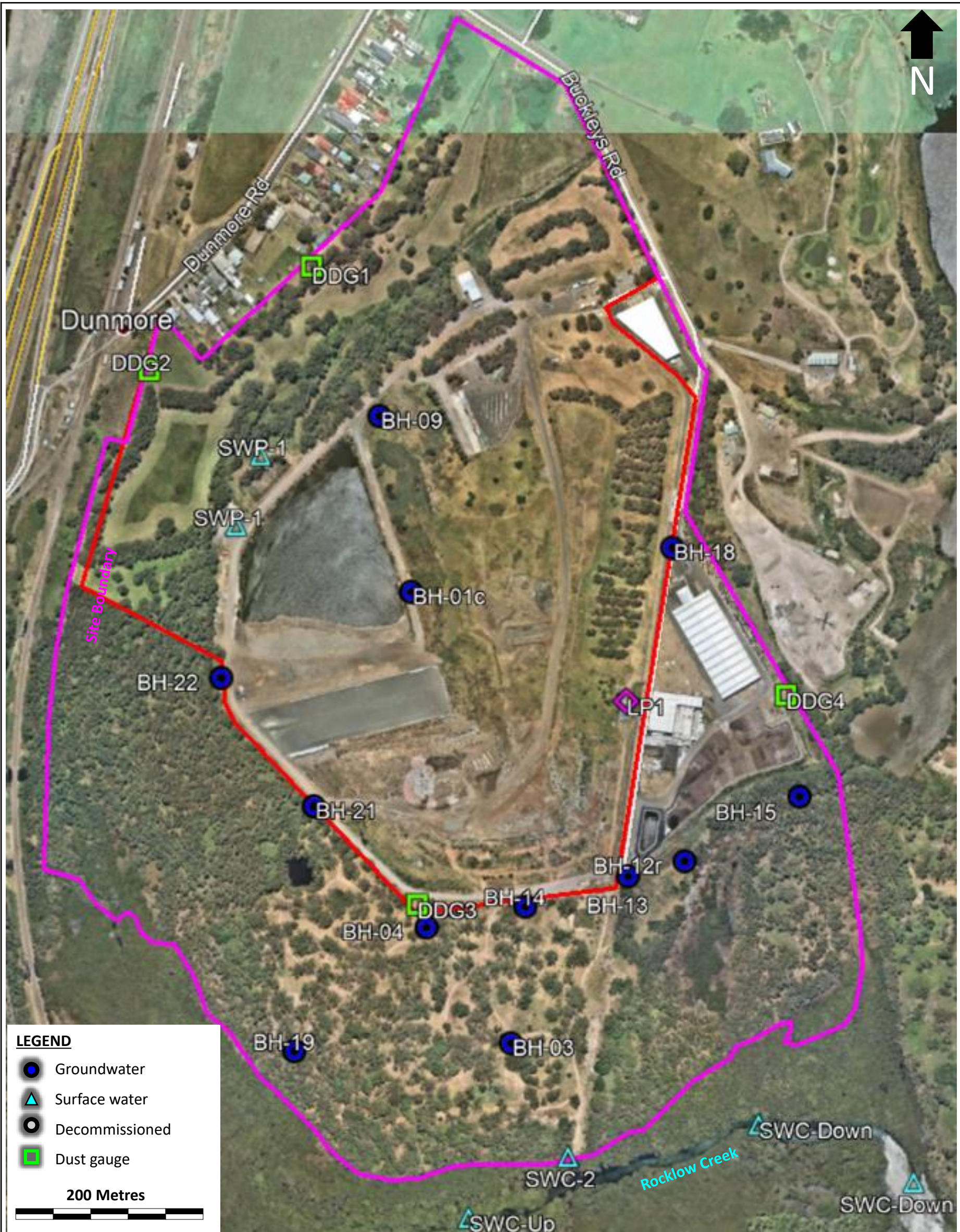
This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between ENRS and the Client. ENRS accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in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

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FIGURES



LEGEND

- Groundwater
- ▲ Surface water
- Decommissioned
- Dust gauge

200 Metres



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Client:	Shellharbour City Council	Drawn:	PL	Figure:	2
Project:	ENRS0033	Source:	NearMaps	Date:	21/05/2021
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	NA	Title:	Site Plan
		Status:	Rev 2		

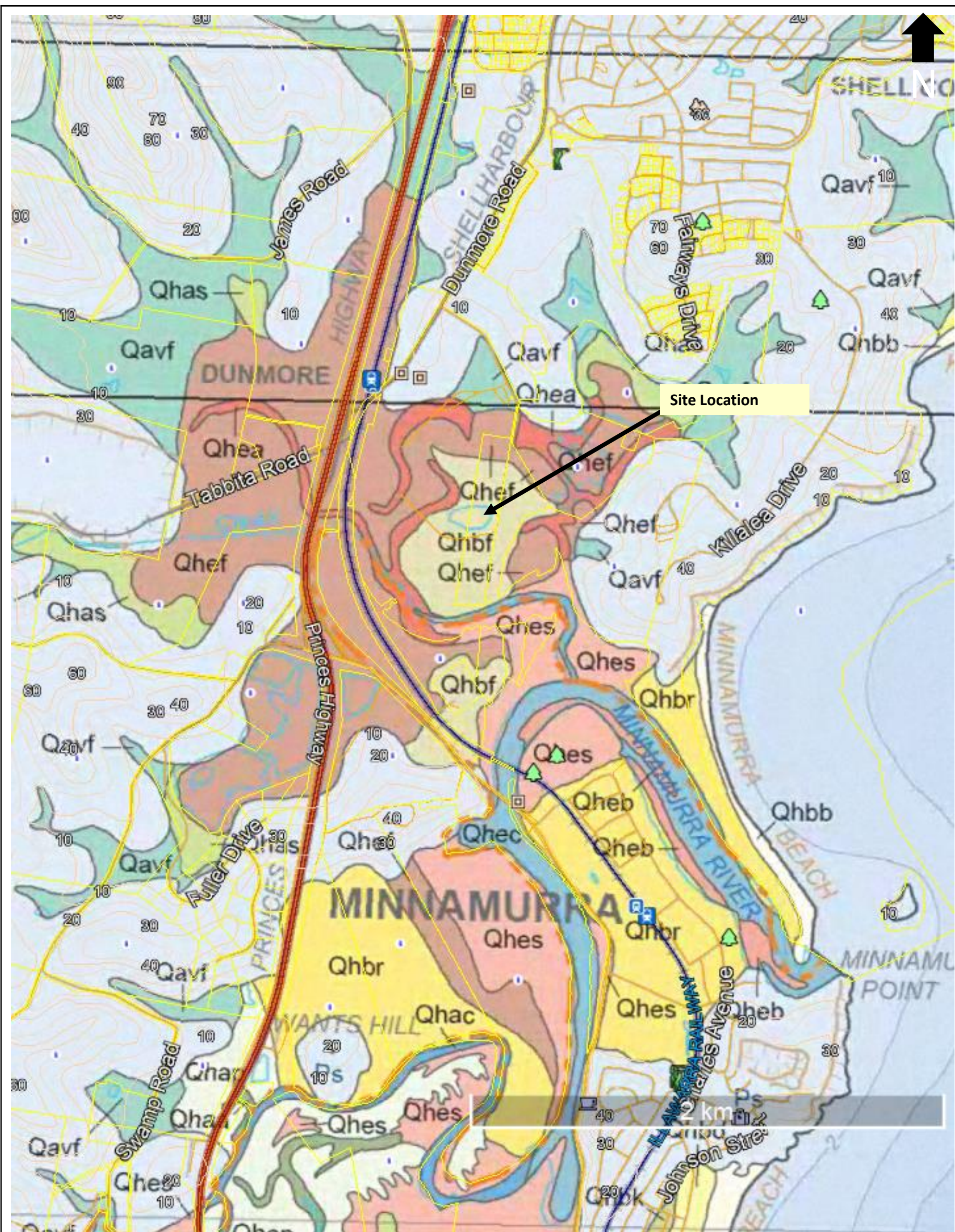


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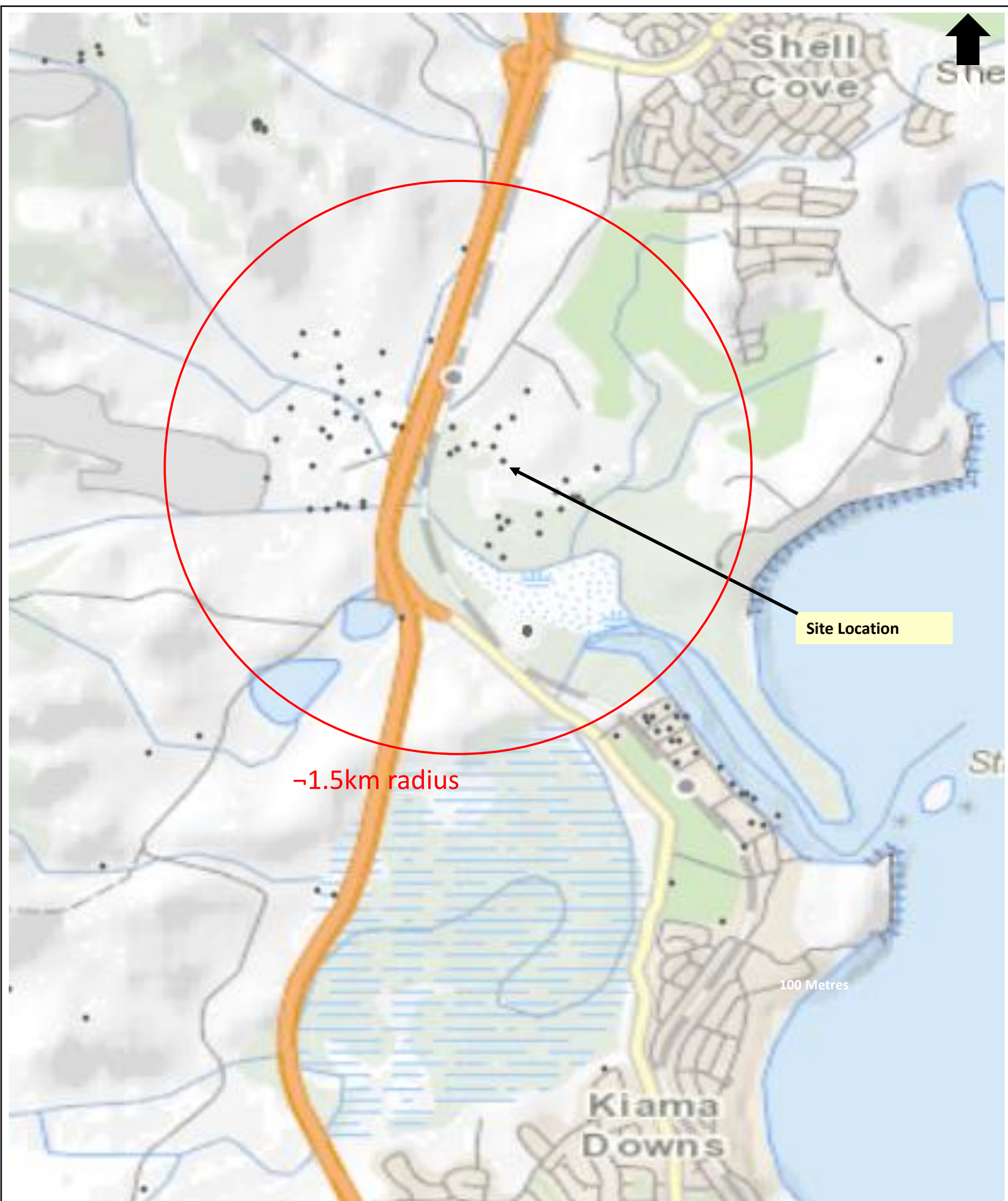
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Client:	Shellharbour City Council	Drawn:	PL	Figure:	3
Project:	ENRS0033	Source:	SixMaps	Date:	16/03/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	NA	Title:	Surface Gas Sample transects
		Status:	Rev 1		



ENRS 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:	4
	Project:	ENRS0033	Source:	DPI	Date:	16/01/2020
	Location:	Dunmore Recycling & Waste Depot 44 Buckley's Rd, Dunmore, NSW	Scale:	NA	Title:	Geology
			Status:	Rev 1		



Client:	Shellharbour City Council	Drawn:	PL	Figure:	5
Project:	ENRS0033	Source:	SixMaps	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	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

Lab Report		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	Comments
						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		µS/cm	°C	mbgl	
						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	-	-
	BH1c	Groundwater	3	Mar 2022	855	124			205	0.12		12.20	0.2	0.2	347	< 0.01	< 0.01	182	2,330	2,330	< 10					7.00	7,420	23.0	2.47	
	BH3	Groundwater	5	Mar 2022	82	115			27	0.01		< 0.05	< 0.1	0.1	2.56	0.03	10.20	16	280	280	104					7.20	1,060	18.9	1.42	
	BH4	Groundwater	6	Mar 2022	86	80			7	0.07		0.54	< 0.1	0.1	2.77	0.03	0.63	12	252	252	58					7.00	831	19.5	2.83	
	BH9	Groundwater	18	Mar 2022	484	215			69	0.54		5.15	0.3	0.3	76.8	< 0.01	0.01	63	1,630	1,630	73					7.00	4,360	18.6	2.32	
	BH12r	Groundwater	17	Mar 2022	405	229			50	0.52		11.40	0.2	0.2	4.98	0.10	5.20	25	465	465	240					6.70	2,460	21.1	3.58	
	BH13	Groundwater	10	Mar 2022	28	101			6	0.04		0.33	0.2	0.2	0.22	0.09	4.00	13	297	297	46					6.60	727	21.0	2.93	
	BH14	Groundwater	11	Mar 2022	18	75			41	0.07		0.09	0.6	0.6	0.29	0.01	46.10	43	76	76	85					6.00	796	21.0	2.85	
	BH15	Groundwater	7	Mar 2022	296	59			152	0.19		6.12	0.2	0.2	9.17	0.02	0.10	34	317	317	261					7.00	2,140	18.5	0.49	
	BH18	Groundwater	25	Mar 2022	7	30			3	0.06		0.81	0.2	0.2	0.20	< 0.01	< 0.01	6	113	113	4					6.90	236	20.1	1.52	
	BH19r	Groundwater	16	Mar 2022	91	83			22	0.04		0.48	0.1	0.1	1.67	0.05	0.52	27	258	258	98					7.20	924	19.4	3.43	
	BH21	Groundwater	23	Mar 2022	349	125			18	0.44		0.39	0.3	0.3	2.60	< 0.01	< 0.01	28	502	502	332					7.20	2,460	21.2	2.39	
	BH22	Groundwater	24	Mar 2022	186	129			22	0.08		0.41	0.3	0.3	2.13	< 0.01	< 0.01	21	428	428	230					7.10	1,740	18.6	2.13	
	SWP1	Surfacewater	1	Mar 2022	184	42	32	187	8	0.18	0.49	< 0.05	0.4	0.4	2.21	0.08	0.05	20	276	276	192	3.33		11	10.60	7.60	1,470	18.1		
	SWC_up	Surfacewater	20	Mar 2022	564	39	44	317	18	0.68	1.73	0.86	0.2	0.2	2.69	< 0.01	< 0.01	28	148	148	123	2.43		11	14.30	7.20	2,360	16.6		
	SWC_2	Surfacewater	19	Mar 2022	362	33	31	218	18	0.29	1.53	0.80	0.2	0.2	1.95	< 0.01	0.06	27	135	135	84	3.34		10		7.10	1,620	17.0		
	SWC_down	Surfacewater	21	Mar 2022	110	15	11	70	6	0.09	1.32	0.32	0.1	0.1	0.36	< 0.01	0.17	14	67	67	29	7.17		10	15.00	7.20	555	15.4		
	SWC_down_2	Surfacewater	22	Mar 2022	135	16	13	82	7	0.10	1.39	0.30	0.1	0.1	0.32	0.02	0.22	15	70	70	34	6.46		12	14.80	7.10	642	17.4		
	Leachate Storage Tank LP1	Leachate	2	Mar 2022	1,290	69			367	0.13	1.08		0.2	0.2	1020	< 0.10	< 0.10	498	3,620	4,030	< 10	1.32	15.7			8.80	11,200	22.0		

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

TABLE 10: Duplicate Groundwater Sample Results and QC Data						
Lab Report.						RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				10/03/2022	10/03/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	7	7	✓ 0.00
Calcium	mg/L	1	5	30	30	✓ 0.00
Potassium	mg/L	1	5	3	3	✓ 0.00
Manganese	mg/L	0.001	0.005	0.055	0.056	✓ 2.70
Dissolved Iron	mg/L	0.05	0.25	0.81	0.80	✓ 1.86
Fluoride	mg/L	0.1	0.5	0.2	0.3	✗ 60.00
Ammonia as N	mg/L	0.01	0.05	0.20	0.19	✓ 7.69
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	6	6	✓ 0.00
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	113	114	✓ 1.32
Total Alkalinity as CaCO3	mg/L	1	5	113	114	✓ 1.32
Sulfate as SO4 - Turbidimetric	mg/L	1	5	4	4	✓ 0.00
pH	pH	0.01	0.05	6.90	6.90	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	236	236	✓ 0.00
Temperature	°C	0.1	0.5	20.1	20.1	✓ 0.00
Standing Water Level	mbgl	-		1.5	1.5	✓ 0.00

TABLE 11: Duplicate Surface Water Results and QC Data

TABLE 11: Duplicate Surface Water Results and QC Data						
Lab Report.						RPD
Sample No.				SWC_UP	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				20	QC2	
Date Sampled				10/03/2022	10/03/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	564	563	✓ 0.27
Calcium	mg/L	1	5	39	38	✓ 3.90
Potassium	mg/L	1	5	18	18	✓ 0.00
Manganese	mg/L	0.001	0.005	0.680	0.668	✓ 2.67
Total Iron	mg/L	0.05	0.25	1.73	1.99	✓ 20.97
Dissolved Iron	mg/L	0.05	0.25	0.86	0.86	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.2	0.2	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	2.69	2.75	✓ 3.31
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	28	31	✓ 15.25
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	148	147	✓ 1.02
Total Alkalinity as CaCO3	mg/L	1	5	148	147	✓ 1.02
Sulfate as SO4 - Turbidimetric	mg/L	1	5	123	117	✓ 7.50
Dissolved Oxygen	mg/L	0.01	0.05	2.43	1.84	✗ 41.45
pH	pH	0.01	0.05	7.20	7.10	✓ 2.10
Electrical Conductivity (Non Compensated)	µS/cm	1	5	2,360	2,350	✓ 0.64
Temperature	°C	0.1	0.5	16.6	16.7	✓ 0.90

TABLE 10: Duplicate Groundwater Sample Results and QC Data

TABLE 10: Duplicate Groundwater Sample Results and QC Data						
Lab Report.						RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				10/03/2022	10/03/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	7	7	✓ 0.00
Calcium	mg/L	1	5	30	30	✓ 0.00
Potassium	mg/L	1	5	3	3	✓ 0.00
Manganese	mg/L	0.001	0.005	0.055	0.056	✓ 2.70
Dissolved Iron	mg/L	0.05	0.25	0.81	0.80	✓ 1.86
Fluoride	mg/L	0.1	0.5	0.2	0.3	✗ 60.00
Ammonia as N	mg/L	0.01	0.05	0.20	0.19	✓ 7.69
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	6	6	✓ 0.00
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	113	114	✓ 1.32
Total Alkalinity as CaCO3	mg/L	1	5	113	114	✓ 1.32
Sulfate as SO4 - Turbidimetric	mg/L	1	5	4	4	✓ 0.00
pH	pH	0.01	0.05	6.90	6.90	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	236	236	✓ 0.00
Temperature	°C	0.1	0.5	20.1	20.1	✓ 0.00
Standing Water Level	mbgl	-		1.5	1.5	✓ 0.00

TABLE 11: Duplicate Surface Water Results and QC Data

TABLE 11: Duplicate Surface Water Results and QC Data						
Lab Report.						RPD
Sample No.				SWC_UP	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				20	QC2	
Date Sampled				10/03/2022	10/03/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	564	563	✓ 0.27
Calcium	mg/L	1	5	39	38	✓ 3.90
Potassium	mg/L	1	5	18	18	✓ 0.00
Manganese	mg/L	0.001	0.005	0.680	0.668	✓ 2.67
Total Iron	mg/L	0.05	0.25	1.73	1.99	✓ 20.97
Dissolved Iron	mg/L	0.05	0.25	0.86	0.86	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.2	0.2	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	2.69	2.75	✓ 3.31
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	28	31	✓ 15.25
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	148	147	✓ 1.02
Total Alkalinity as CaCO3	mg/L	1	5	148	147	✓ 1.02
Sulfate as SO4 - Turbidimetric	mg/L	1	5	123	117	✓ 7.50
Dissolved Oxygen	mg/L	0.01	0.05	2.43	1.84	✗ 41.45
pH	pH	0.01	0.05	7.20	7.10	✓ 2.10
Electrical Conductivity (Non Compensated)	µS/cm	1	5	2,360	2,350	✓ 0.64
Temperature	°C	0.1	0.5	16.6	16.7	✓ 0.90

CHARTS

Charts 1-16: Groundwater Charts

Chart 2: Ammonia as N (mg/L)

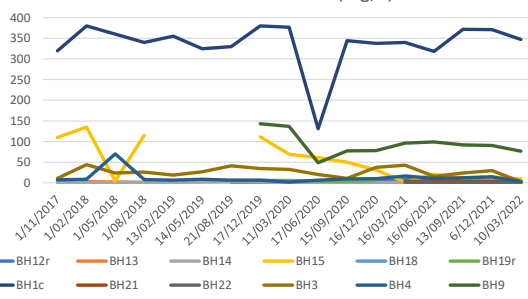


Chart 3: Bicarbonate Alkalinity as CaCO3 (mg/L)

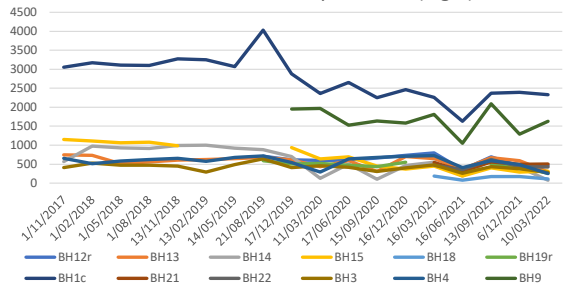


Chart 4: Calcium (mg/L)

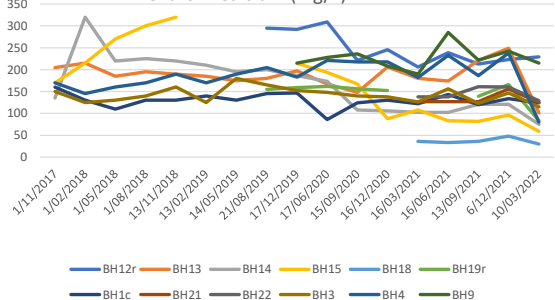


Chart 5: Chloride (mg/L)

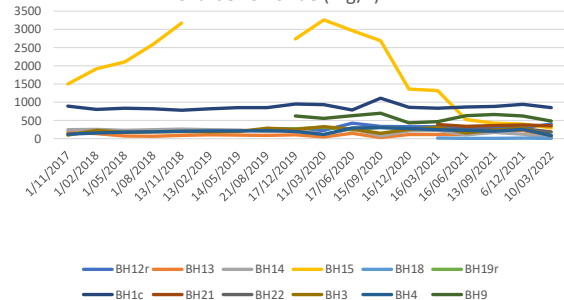


Chart 6: Depth to Water (mbgl TOC)

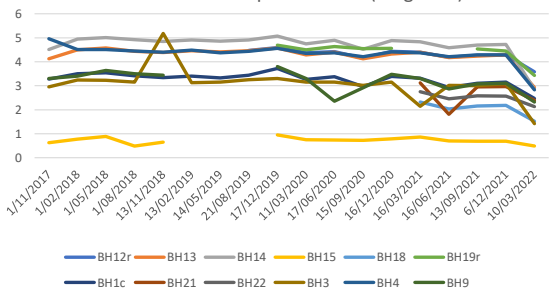


Chart 7: Dissolved Iron (mg/L)

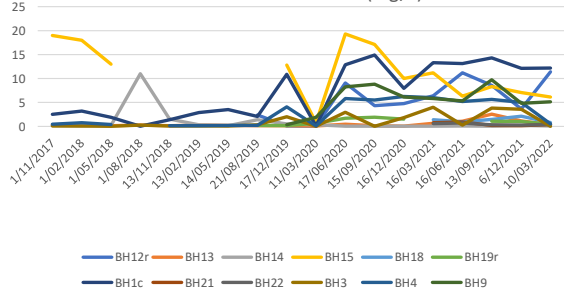


Chart 8: Electrical Conductivity (Us/cm)

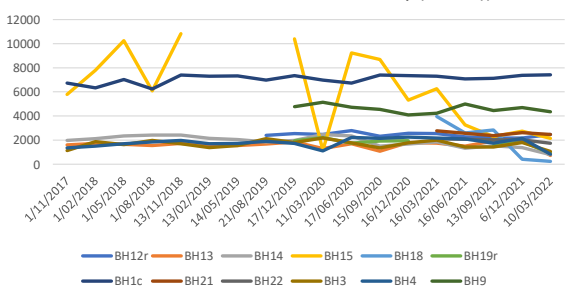
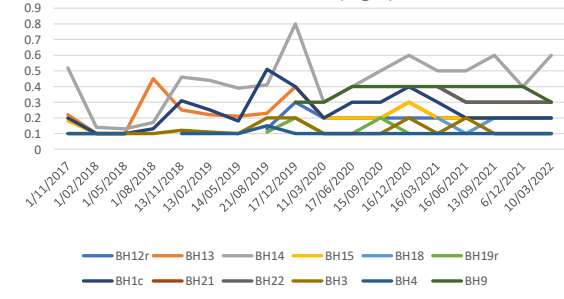
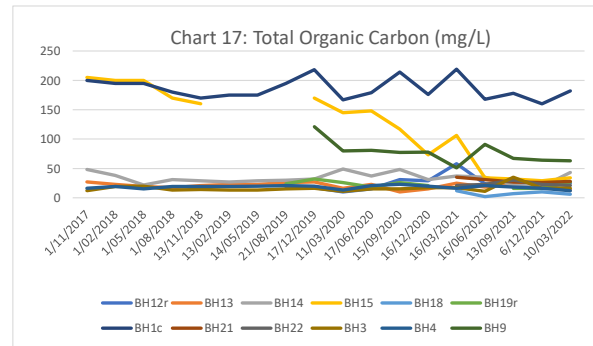
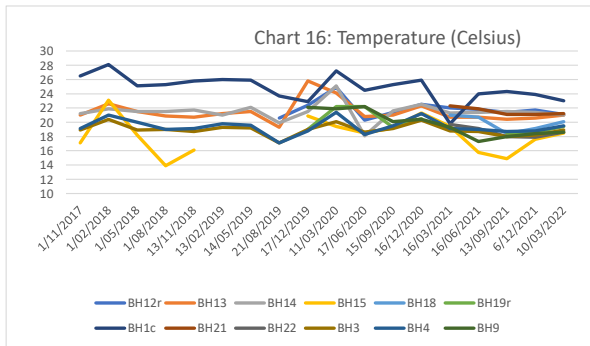
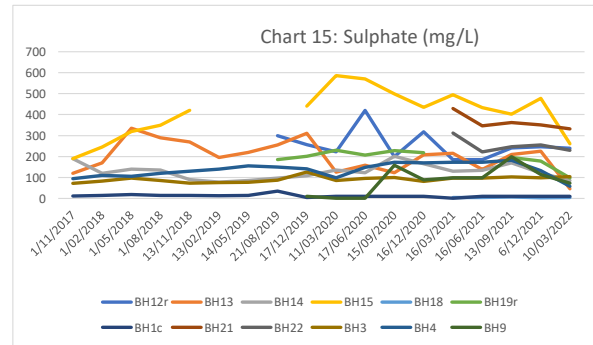
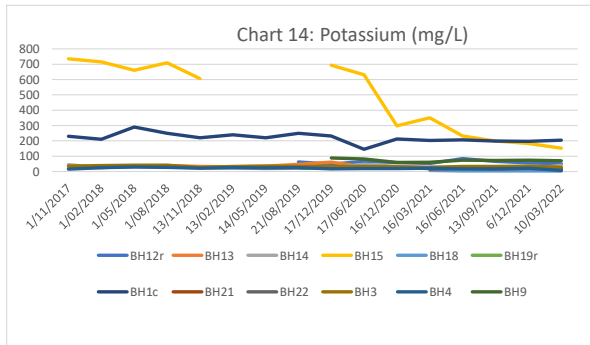
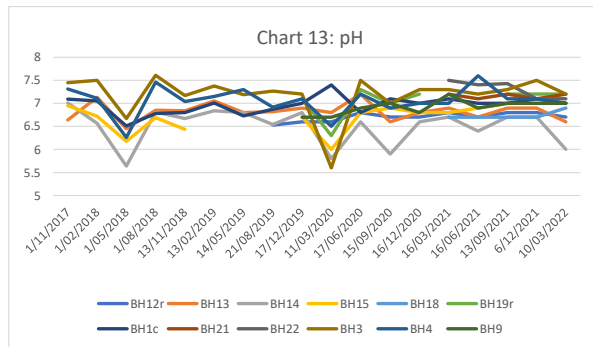
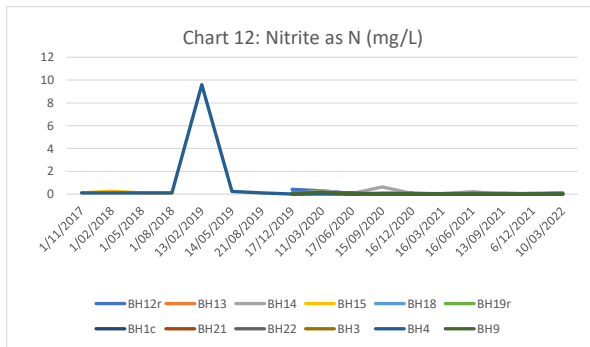
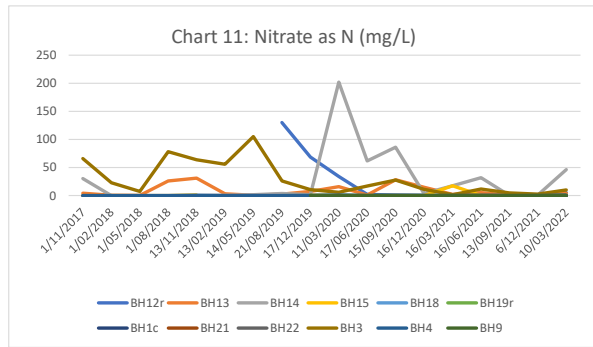
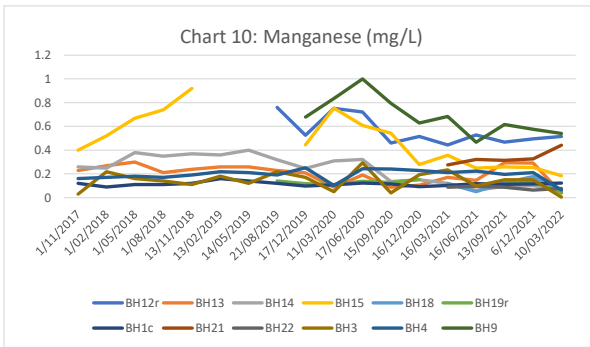
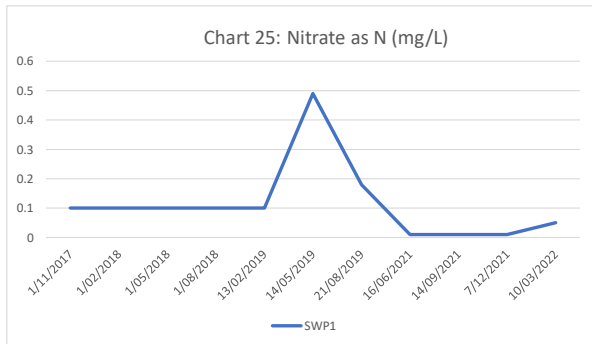
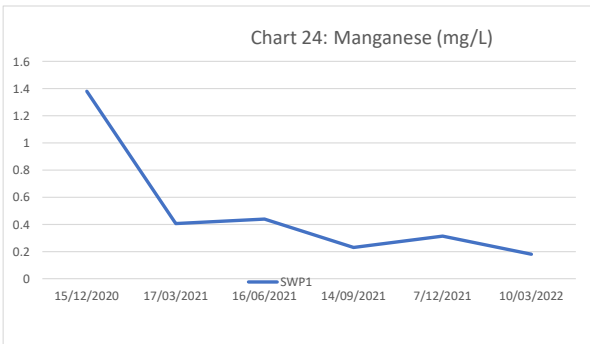
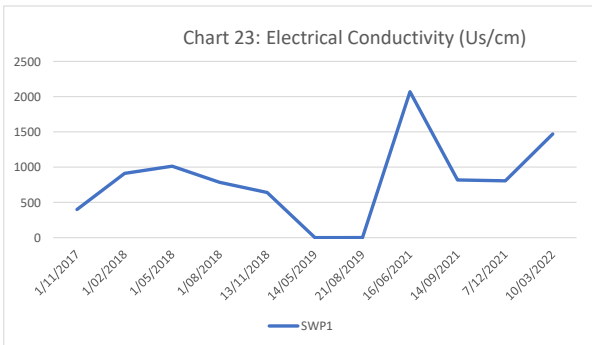
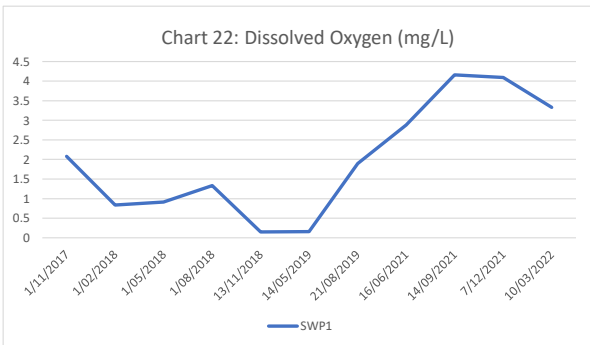
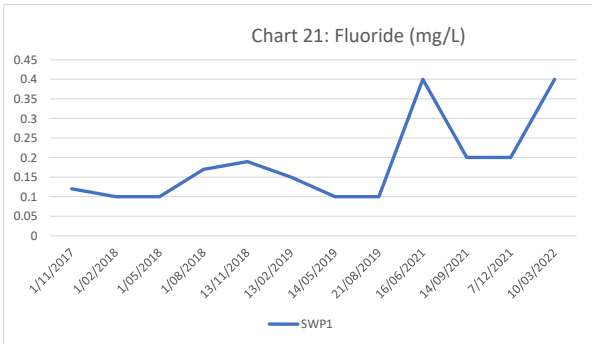
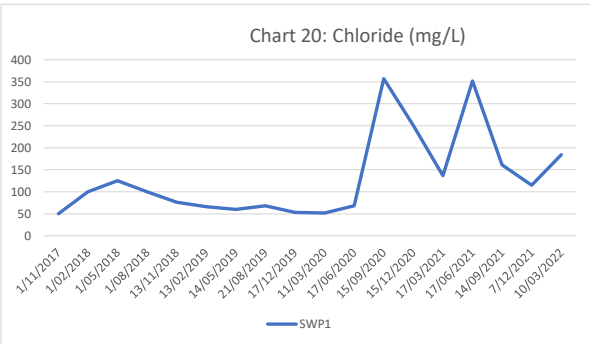
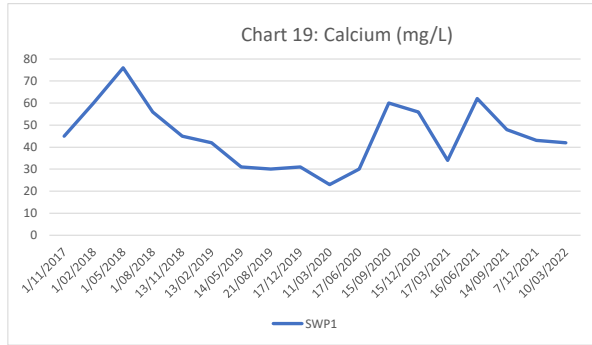
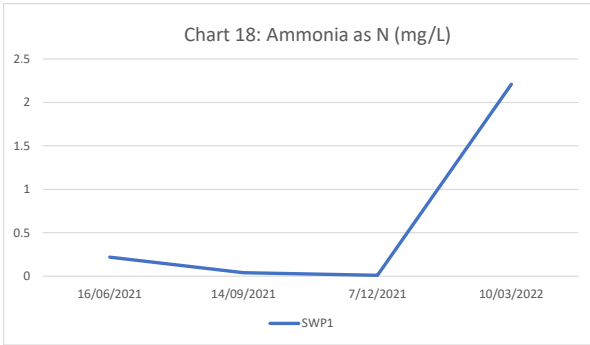


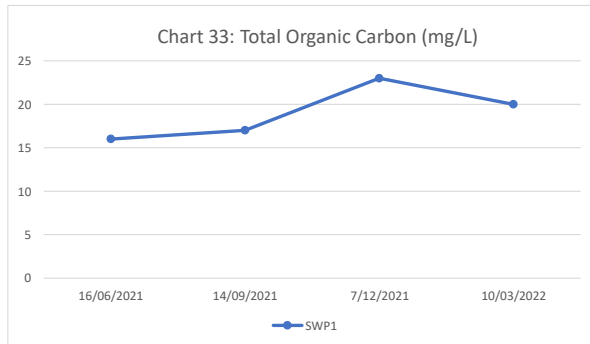
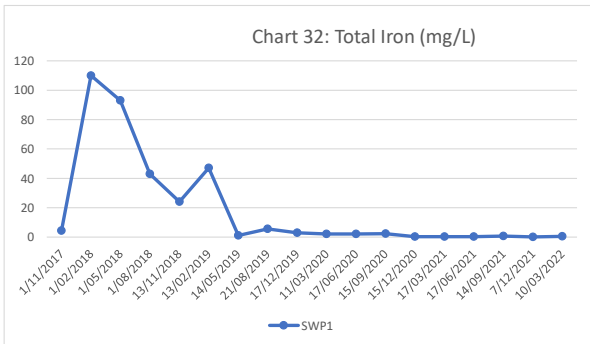
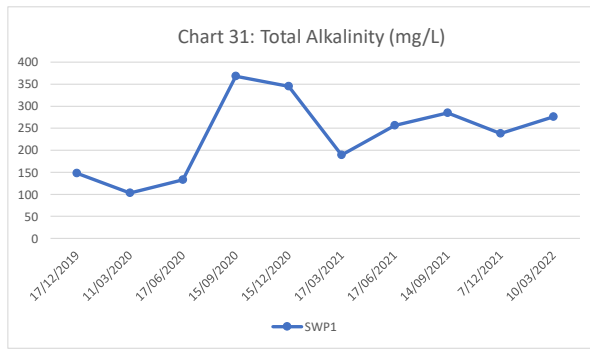
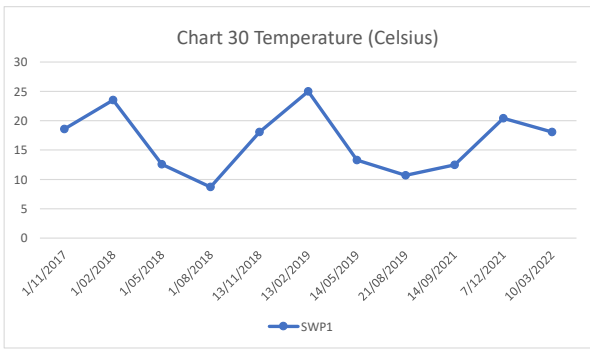
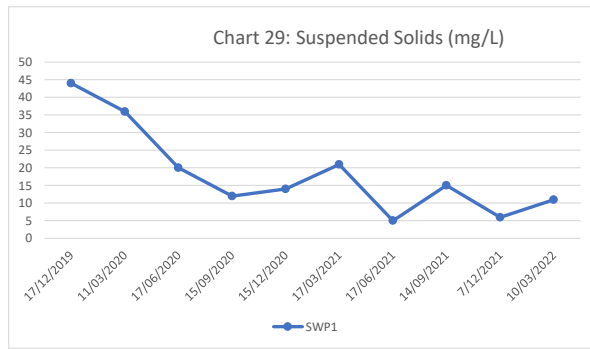
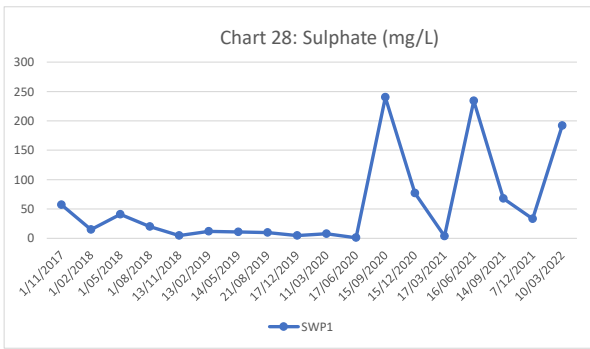
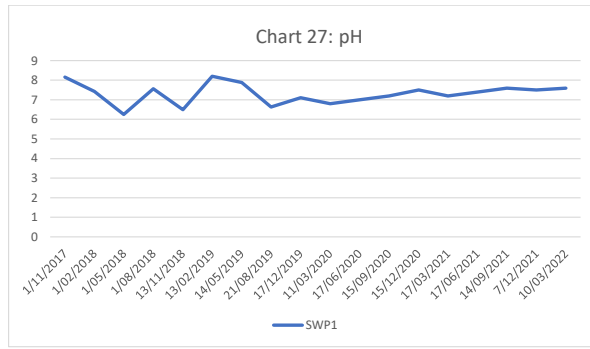
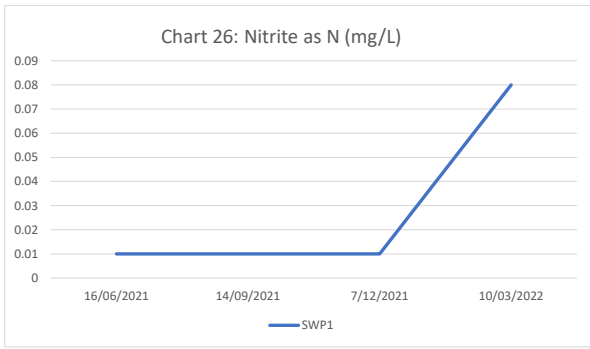
Chart 9: Fluoride (mg/L)



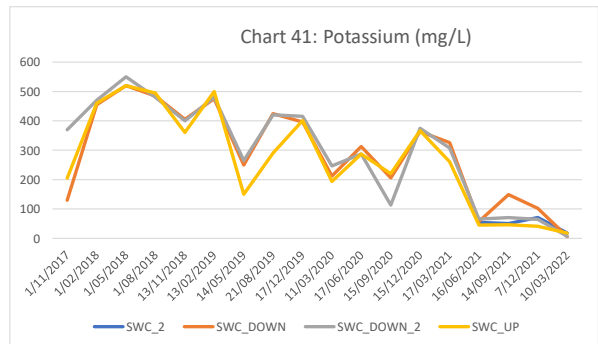
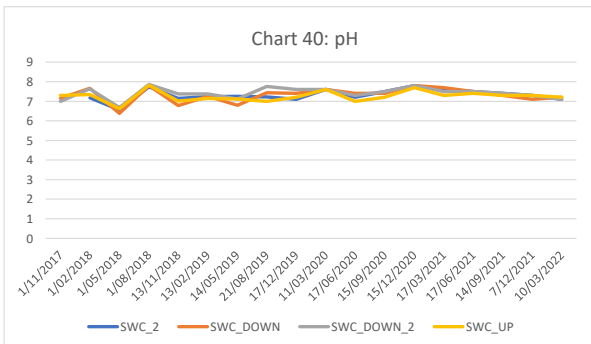
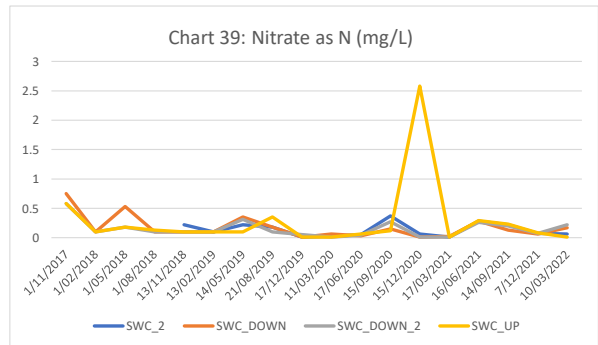
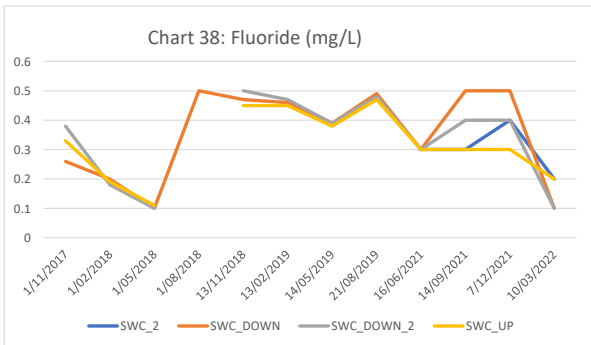
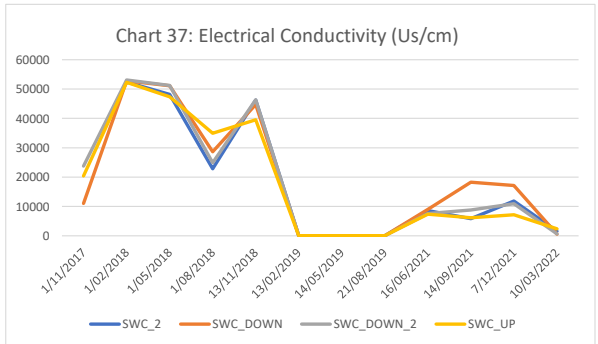
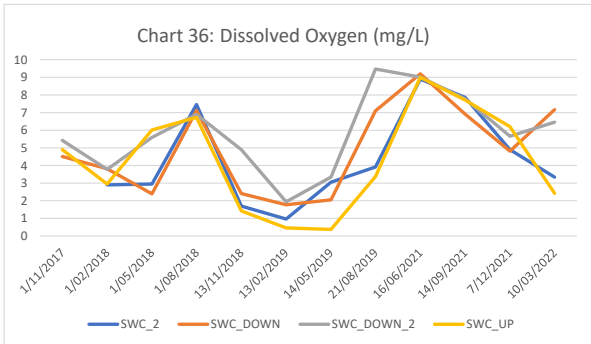
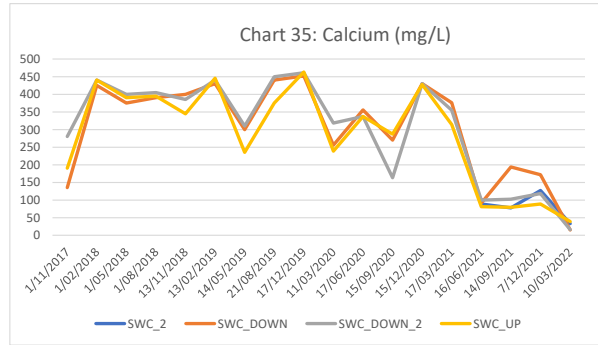
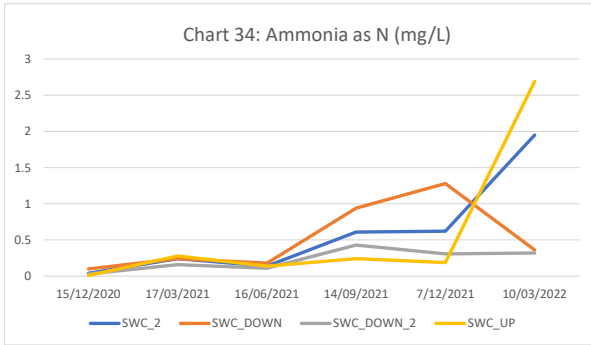


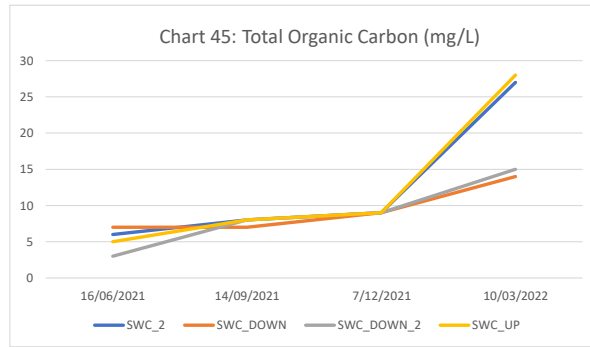
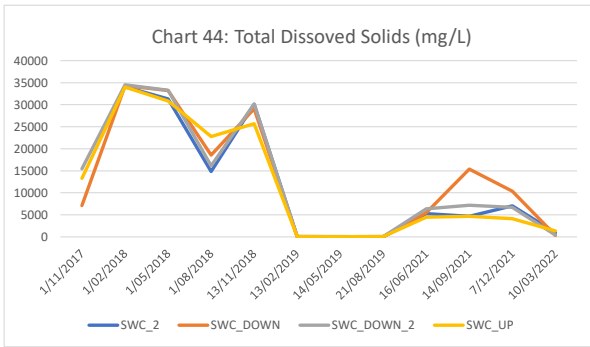
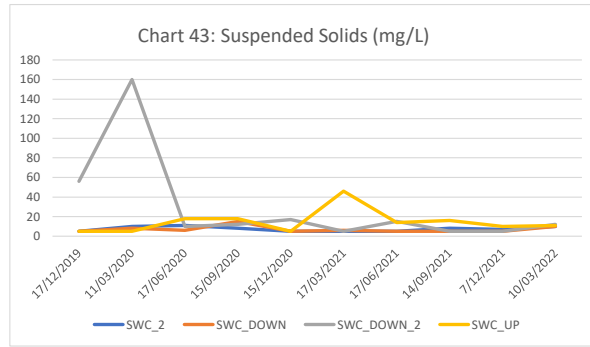
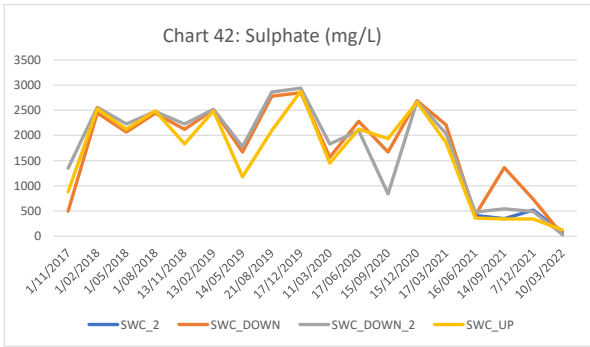
Charts 17-32: Onsite Surface Water Charts



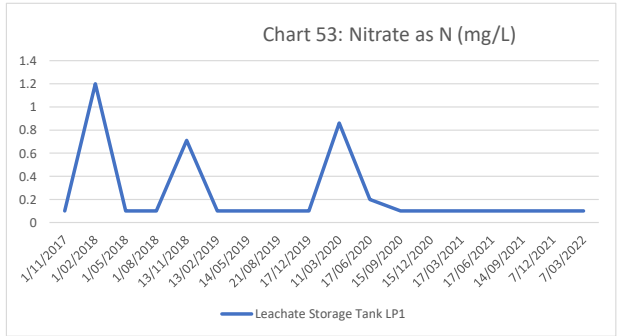
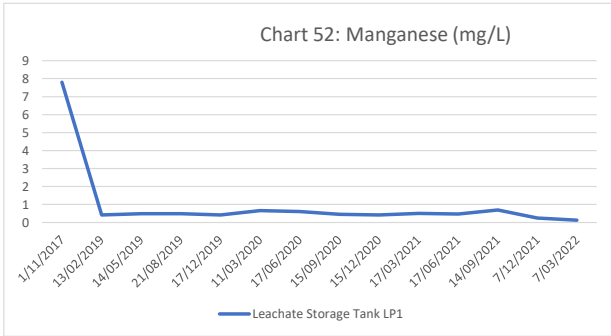
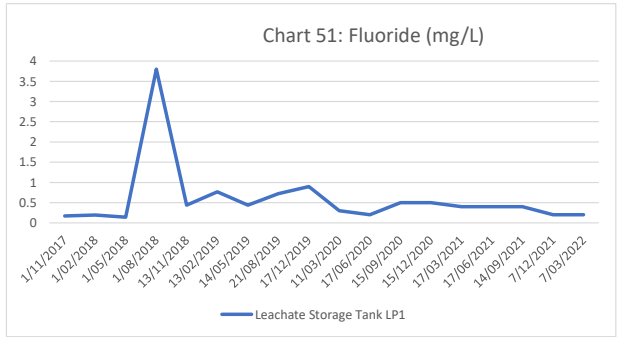
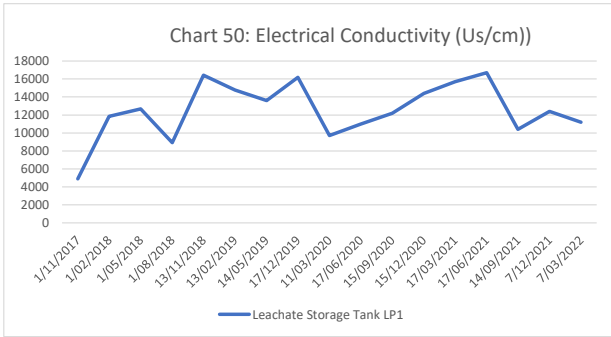
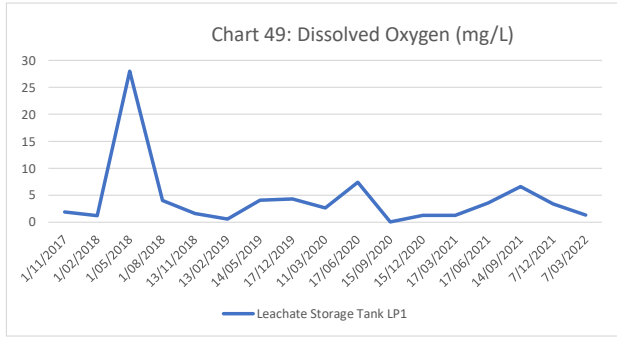
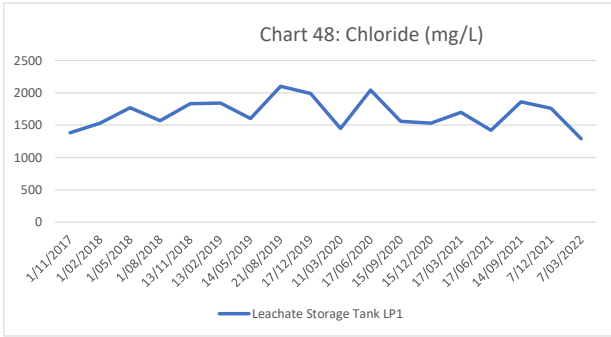
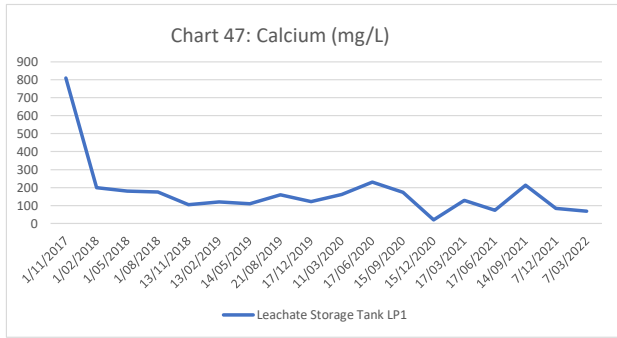
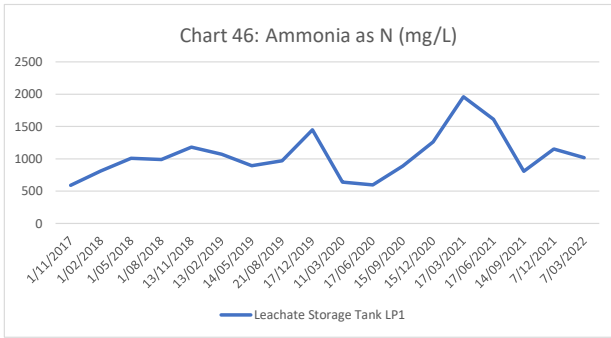


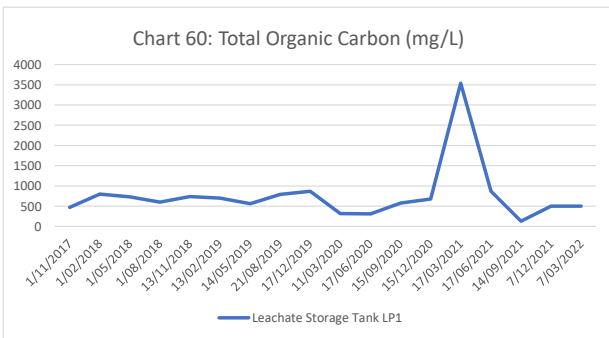
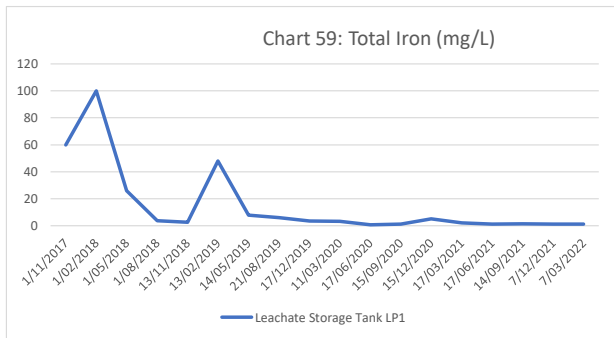
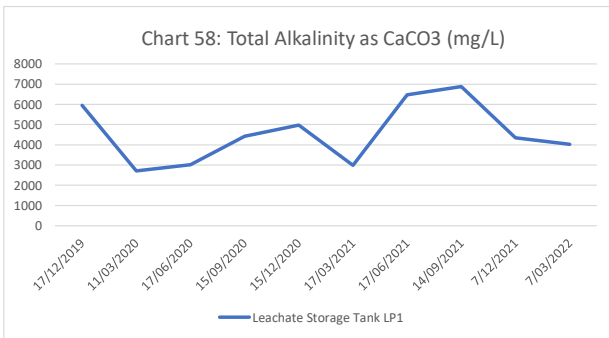
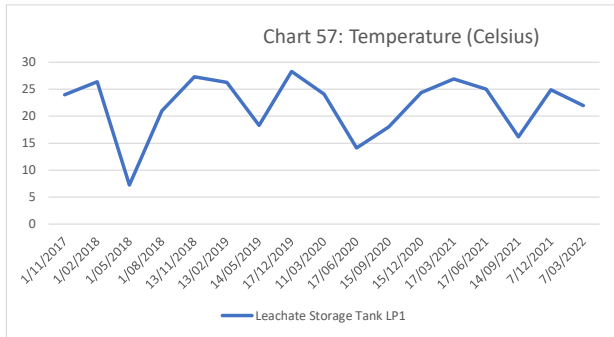
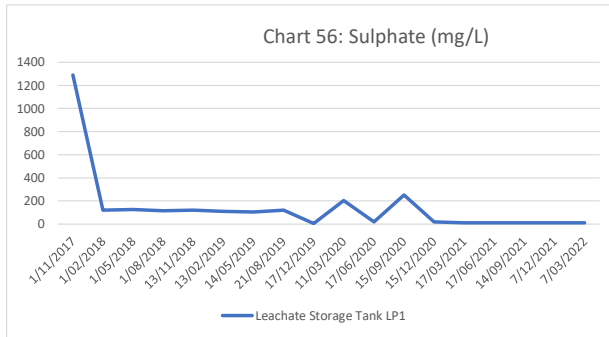
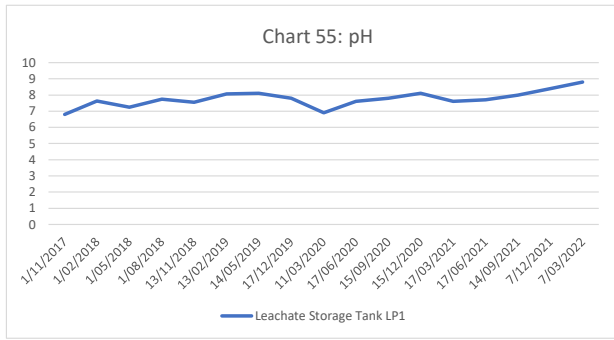
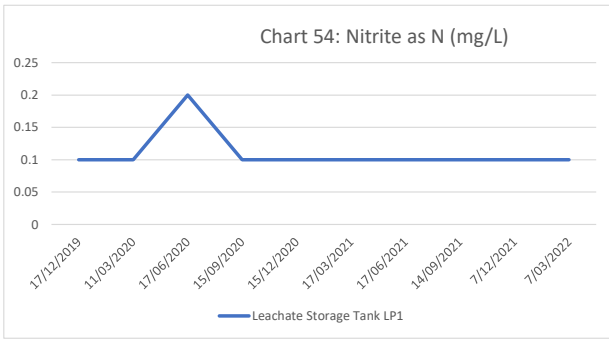
Charts 33-44: Rocklow Creek Surface Water Charts





Charts 45-59 Leachate Water Quality Charts





APPENDICES

Appendix A

EPL 5984 Sampling Point Summary (NSW EPA, 10/05/2021)

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 Waukapark Rd, Bundamba NSW 2178
 Ph: 02 9794 9535 E: samples@als.com.au
 Newcastle: 5 Russett Rd, Warerook NSW 2303
 Ph: 02 4968 9455 E: samples.newcastle@als.com.au

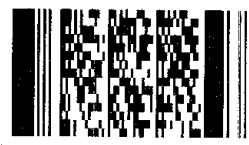
Brisbane: 32 Shand St, Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@als.com.au
 Townsville: 14-16 Deema Ct, Bohle QLD 4815
 Ph: 07 4798 2600 E: samples.townsville@als.com.au

Melbourne: 24 Waverley Rd, Springvale VIC 3171
 Ph: 03 9549 9600 E: samples.melbourne@als.com.au
 Adelaide: 2-11 Bamba Rd, Pinnaroo SA 5005
 Ph: 08 8509 0800 E: samples.adelaide@als.com.au

Perth: 10 Hoi Way, Malaga WA 6060
 Ph: 08 9269 1365 E: samples.perth@als.com.au
 Launceston: 27 Wellington St, Launceston TAS 7250
 Ph: 03 8331 2155 E: samples.launceston@als.com.au

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)		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500	<input type="checkbox"/> Non Standard or urgent TAT (List due date):		Customary Seal Intact? <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	
PROJECT: Dunmore Quarterly Ground Waters EPL	ALS QUOTE NO.: WO/030/19 TENDER	COC SEQUENCE NUMBER (Circle)		Fresh Ice / frozen ice bricks present upon receipt? <input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 6.4 °C	Other comment:
PROJECT MANAGER: Joel Culton		OF: 1 2 3 4 5 6 7		
SAMPLER: Robert Dal.	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dal.	RECEIVED BY: Aneta	RELINQUISHED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 10.3.22 16:30	DATE/TIME: 10.3.22	DATE/TIME:
Email Reports to :				
Email Invoice to :				

Environmental Division
 Wollongong
 Work Order Reference
EW2201094



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 allow Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle)						
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	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)	Send to Eurofins	
	BH1C	10.3.22 13:35	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH3	10:25	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH4	10:45	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH9	14:10	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH12R	12:15	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH13	12:35	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH14	11:20	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH15	11:50	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH19R	10:00	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH18	8:00	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH21	12:55	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	BH22	13:15	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	Duplicate	8:00	W			✓	✓	✓	✓	✓		Field Tests - pH, EC, Temp & SWL
	Triplicate	8:00	W								✓	
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 : **EW2201094**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Quarterly Groundwaters EPL
Order number : 138956
C-O-C number : ----
Sampler : ----
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 : 10-Mar-2022 16:54
Date Analysis Commenced : 10-Mar-2022
Issue Date : 31-Mar-2022 09:17



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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	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 Contact for details.

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate on sample no: 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.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling High Flow Method.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- 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				10-Mar-2022 13:35	10-Mar-2022 10:25	10-Mar-2022 10:45	10-Mar-2022 14:10	10-Mar-2022 12:15	
Compound	CAS Number	LOR	Unit	EW2201094-001	EW2201094-002	EW2201094-003	EW2201094-004	EW2201094-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.0	7.2	7.0	7.0	6.7	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7420	1060	831	4360	2460	
EA116: Temperature									
Temperature	----	0.1	°C	23.0	18.9	19.5	18.6	21.1	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2330	280	252	1630	465	
Total Alkalinity as CaCO3	----	1	mg/L	2330	280	252	1630	465	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	104	58	73	240	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	855	82	86	484	405	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	124	115	80	215	229	
Potassium	7440-09-7	1	mg/L	205	27	7	69	50	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.122	0.005	0.065	0.540	0.516	
Iron	7439-89-6	0.05	mg/L	12.2	<0.05	0.54	5.15	11.4	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.2	<0.1	<0.1	0.3	0.2	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	347	2.56	2.77	76.8	4.98	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.03	0.03	<0.01	0.10	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	10.2	0.63	0.01	5.20	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	10.2	0.66	0.01	5.30	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	182	16	12	63	25	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time				10-Mar-2022 13:35	10-Mar-2022 10:25	10-Mar-2022 10:45	10-Mar-2022 14:10	10-Mar-2022 12:15	
Compound	CAS Number	LOR	Unit	EW2201094-001	EW2201094-002	EW2201094-003	EW2201094-004	EW2201094-005	
				Result	Result	Result	Result	Result	
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD	2.47	1.42	2.83	2.32	3.58	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time				10-Mar-2022 12:35	10-Mar-2022 11:20	10-Mar-2022 11:50	10-Mar-2022 10:00	10-Mar-2022 08:00	
Compound	CAS Number	LOR	Unit	EW2201094-006	EW2201094-007	EW2201094-008	EW2201094-009	EW2201094-010	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	6.6	6.0	7.0	7.2	6.9	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	727	796	2140	924	236	
EA116: Temperature									
Temperature	----	0.1	°C	21.0	21.0	18.5	19.4	20.1	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	297	76	317	258	113	
Total Alkalinity as CaCO3	----	1	mg/L	297	76	317	258	113	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	46	85	261	98	4	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	28	18	296	91	7	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	101	75	59	83	30	
Potassium	7440-09-7	1	mg/L	6	41	152	22	3	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.038	0.071	0.185	0.043	0.055	
Iron	7439-89-6	0.05	mg/L	0.33	0.09	6.12	0.48	0.81	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.6	0.2	0.1	0.2	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.22	0.29	9.17	1.67	0.20	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.09	0.01	0.02	0.05	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	4.00	46.1	0.10	0.52	<0.01	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	4.09	46.1	0.12	0.57	<0.01	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	13	43	34	27	6	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					10-Mar-2022 12:35	10-Mar-2022 11:20	10-Mar-2022 11:50	10-Mar-2022 10:00	10-Mar-2022 08:00
Compound	CAS Number	LOR	Unit		EW2201094-006	EW2201094-007	EW2201094-008	EW2201094-009	EW2201094-010
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		2.93	2.85	0.49	3.43	1.52



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time				10-Mar-2022 12:55	10-Mar-2022 13:15	10-Mar-2022 08:00	----	----	
Compound	CAS Number	LOR	Unit	EW2201094-011	EW2201094-012	EW2201094-013	-----	-----	
				Result	Result	Result	----	----	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.2	7.1	6.9	----	----	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2460	1740	236	----	----	
EA116: Temperature									
Temperature	----	0.1	°C	21.2	18.6	20.1	----	----	
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	502	428	114	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	502	428	114	----	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	332	230	4	----	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	349	186	7	----	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	125	129	30	----	----	
Potassium	7440-09-7	1	mg/L	18	22	3	----	----	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.442	0.077	0.056	----	----	
Iron	7439-89-6	0.05	mg/L	0.39	0.41	0.80	----	----	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.3	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	2.60	2.13	0.19	----	----	
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	28	21	6	----	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----		
Sampling date / time				10-Mar-2022 12:55	10-Mar-2022 13:15	10-Mar-2022 08:00	----	----			
Compound	CAS Number	LOR	Unit	EW2201094-011	EW2201094-012	EW2201094-013	-----	-----			
				Result	Result	Result	----	----			
QWI-EN 67.11 Sampling of Groundwaters											
Standing Water Level				----	0.01	m AHD	2.39	2.13	1.52	----	----

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) 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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

Sydney: 277 Woodpark Rd, Smithfield NSW 2170
Ph: 02 8744 9558 E: samples.syd@alsenviro.com

Newcastle: 8 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4989 9433 E: samples.newcastle@alsenviro.com

Brisbane: 37 Strand St, St. Andrew QLD 4000
Ph: 07 3249 7322 E: samples.brisbane@alsenviro.com

Townsville: 14-16 Deane Ct, Brisbane QLD 4815
Ph: 07 4706 0400 E: townsville.environment@alsenviro.com

Melbourne: 241 Warrall Rd, Springvale VIC 3171
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Adelaide: 2-1 Burma Rd, Poonaka SA 5095
Ph: 08 8359 0800 E: adelaide@alsenviro.com

Perth: 10 Hind Wly, Mayag WA 6050
Ph: 08 9209 7855 E: samples.perth@alsenviro.com

Launceston: 17 Wellington St, Launceston TAS 7250
Ph: 03 6331 2198 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 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):	Custody Seal Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Free ice / frozen ice blocks present upon receipt? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Random Sample Temperature on Receipt: 6.5 °C Other comment:								
PROJECT: Dunmore Quarterly Leachate	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: Robert Dalis	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dalis	RECEIVED BY: Aneta								
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 7.3.22 13:40	DATE/TIME: 7/3/22								
Email Reports to :		RELINQUISHED BY:	RECEIVED BY:								
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 Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	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	TOC	Total Fe & Mn	NT-4 (NO2, NO3)	
	Leachate Storage Tank - LP1	7.3.22 8:35	W				✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & DO
TOTAL						10						

Environmental Division
Wollongong
Work Order Reference
EW2201037



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 : **EW2201037**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Quarterly Leachate Tank EPL
Order number : 138956
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 : 07-Mar-2022 14:26
Date Analysis Commenced : 07-Mar-2022
Issue Date : 15-Mar-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	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 Contact for details.

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G:LOR raised due to sample matrix.
- ED041G:LOR raised due to sample matrix.
- EK059G:LOR raised 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.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				Leachate Storage Tank LP1	----	----	----	----
				Sampling date / time	07-Mar-2022 08:33	----	----	----
Compound	CAS Number	LOR	Unit	EW2201037-001	-----	-----	-----	-----
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	8.8	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	11200	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5660	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	22.0	----	----	----	----
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	409	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3620	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	4030	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1290	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	69	----	----	----	----
Potassium	7440-09-7	1	mg/L	367	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.129	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.08	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	1020	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
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				07-Mar-2022 08:33	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2201037-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	498	----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	1.32	----	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation	15.7	----	----	----	----	----

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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

Sydney 377 Woodperk Rd. Smithfield NSW 2178
Ph: 02 8754 9555 E: samples_sydney@alsenviro.com

Brisbane 32 Shane St. Stafford QLD 4053
Ph: 07 3243 7332 E: samples_brisbane@alsenviro.com

Melbourne 2-4 Westall Rd. Springvale VIC 3171
Ph: 03 8559 9500 E: samples_melbourne@alsenviro.com

Perth 10 Hind Way Malaga WA 6050
Ph: 08 9206 7880 E: samples_perth@alsenviro.com

Newcastle 5 Rossylen Rd. Warminster NSW 2304
Ph: 02 4693 0443 E: samples_newcastle@alsenviro.com

Townsville 14-15 Cassina Ct. Bohle QLD 4810
Ph: 07 4796 0800 E: townsville.environmental@alsenviro.com

Adelaide 2-1 Burma Rd. Plympton SA 5095
Ph: 08 6359 0990 E: adelaide@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="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A Random Sample Temperature on Receipt: <input type="checkbox"/> C <input checked="" type="checkbox"/> F 6.5 Other comment:										
OFFICE: 41 Burrelli 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 Leachate		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: Robert Dalis		SAMPLER MOBILE:		RELINQUISHED BY: Robert Dalis		RECEIVED BY: Anets								
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME: 7.3.22 13:4		DATE/TIME: 7.3.22								
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	Ammonia	NT-2A (Alka, So4, Cl, F) Filtered Ca, K	TOC	Total Fe & Mn	NT-4 (NO2, NO3)								
	Leachate Sump		7.3.22 8.40	W			✓	✓	✓	✓	✓								Field Tests - pH, EC, Temp & DO
						TOTAL	10												

Environmental Division
Wollongong
Work Order Reference
EW2201034



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 : **EW2201034**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Quarterly Leachate
Order number : 138956
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 : 07-Mar-2022 14:25
Date Analysis Commenced : 07-Mar-2022
Issue Date : 15-Mar-2022 17:36



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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	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 Contact for details.

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G:LOR raised due to sample matrix.
- ED041G:LOR raised due to sample matrix.
- EK059G:LOR raised 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.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		Leachate Sump	----	----	----	----
		Sampling date / time		07-Mar-2022 08:40	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2201034-001	-----	-----	-----	-----
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	8.8	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	11300	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5570	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	22.0	----	----	----	----
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	1380	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2790	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	4170	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1500	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	54	----	----	----	----
Potassium	7440-09-7	1	mg/L	375	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.144	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.15	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	1050	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Leachate Sump	----	----	----	----
Sampling date / time				07-Mar-2022 08:40	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2201034-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	502	----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	0.93	----	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation	11.0	----	----	----	----	----

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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

Sydney: 277 Woodpark Rd. Smithfield NSW 2176
Ph: 02 8794 8555 E: samples.sydney@alsenviro.com

Brisbane: 32 Shand St. St. Johns QLD 4053
Ph: 07 3243 7232 E: samples.brisbane@alsenviro.com

Melbourne: 2-4 Westall Rd. Springvale VIC 3171
Ph: 03 8549 9000 E: samples.melbourne@alsenviro.com

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

Newcastle: 3 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4968 9133 E: samples.newcastle@alsenviro.com

Townsville: 14-15 Dasma Ct. Bohle QLD 4818
Ph: 07 4790 0600 E: samples.townsville@alsenviro.com

Adelaide: 2-1 Bruma Rd, Pooraka SA 5095
Ph: 08 8359 0590 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) Custody Seal Intact? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A Random Sample Temperature on Receipt: <input type="checkbox"/> C Other comment: 6.4							
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:	COC SEQUENCE NUMBER (Circle)								
PROJECT MANAGER: Joel Culton	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			
SAMPLER: Robert Dalvo	SAMPLER MOBILE:	RECEIVED BY: Anely							
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	RECEIVED BY:							
Email Reports to:	RELINQUISHED BY: Robert Dalvo	DATE/TIME: 10.3.22 16:00							
Email Invoice to:	DATE/TIME: 10.3.22	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
	SWP1		10.3.22 8:40W				✓	✓	✓	✓				Field Tests - pH, EC, DO & Temp
	SWC_2		9:15 W					✓		✓		✓	✓	Field Tests - pH, EC, DO & Temp
	SWC_UP		9:00 W					✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp
	SWC_DOWN		9:25 W					✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp
	SWC_DOWN_2		9:35 W					✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp
	Duplicate		9:00 W					✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp
TOTAL						10								

Environmental Division
Wollongong
Work Order Reference
EW2201068



Telephone : 02 42253125

= Formaldehyde Preserved Glass:

CERTIFICATE OF ANALYSIS

Work Order : **EW2201068**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Quarterly Surface Water EPL
Order number : 138956
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 : 10-Mar-2022 16:57
Date Analysis Commenced : 10-Mar-2022
Issue Date : 18-Mar-2022 09:05



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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	Client Liaison Officer	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 Contact for details.

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- 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				10-Mar-2022 08:40	10-Mar-2022 09:15	10-Mar-2022 09:00	10-Mar-2022 09:25	10-Mar-2022 09:35	
Compound	CAS Number	LOR	Unit	EW2201068-001	EW2201068-002	EW2201068-003	EW2201068-004	EW2201068-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.6	7.1	7.2	7.2	7.1	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1470	1620	2360	555	642	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	888	914	1320	350	388	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	11	10	11	10	12	
EA045: Turbidity									
Turbidity	----	0.1	NTU	10.6	----	14.3	15.0	14.8	
EA116: Temperature									
Temperature	----	0.1	°C	18.1	17.0	16.6	15.4	17.4	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	276	135	148	67	70	
Total Alkalinity as CaCO3	----	1	mg/L	276	135	148	67	70	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	192	84	123	29	34	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	184	362	564	110	135	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	42	33	39	15	16	
Magnesium	7439-95-4	1	mg/L	32	31	44	11	13	
Sodium	7440-23-5	1	mg/L	187	218	317	70	82	
Potassium	7440-09-7	1	mg/L	8	18	18	6	7	
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L	<0.05	0.80	0.86	0.32	0.30	
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.180	0.291	0.680	0.085	0.098	
Iron	7439-89-6	0.05	mg/L	0.49	1.53	1.73	1.32	1.39	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.4	0.2	0.2	0.1	0.1	



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				10-Mar-2022 08:40	10-Mar-2022 09:15	10-Mar-2022 09:00	10-Mar-2022 09:25	10-Mar-2022 09:35	
Compound	CAS Number	LOR	Unit	EW2201068-001	EW2201068-002	EW2201068-003	EW2201068-004	EW2201068-005	
				Result	Result	Result	Result	Result	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	2.21	1.95	2.69	0.36	0.32	
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L	2.18	1.94	2.68	0.36	0.32	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.08	<0.01	<0.01	<0.01	0.02	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.05	0.06	<0.01	0.17	0.22	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.13	0.06	<0.01	0.17	0.24	
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	14.7	14.6	21.4	5.04	5.91	
∅ Total Cations	----	0.01	meq/L	13.1	14.1	19.8	4.85	5.61	
∅ Ionic Balance	----	0.01	%	5.88	1.79	3.91	1.95	2.61	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	20	27	28	14	15	
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	3.33	3.34	2.43	7.17	6.46	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		Duplicate	----	----	----	----
		Sampling date / time		10-Mar-2022 09:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2201068-006	-----	-----	-----	-----
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.1	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2350	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	13	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	17.2	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	16.7	----	----	----	----
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	147	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	147	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	117	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	563	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	38	----	----	----	----
Magnesium	7439-95-4	1	mg/L	45	----	----	----	----
Sodium	7440-23-5	1	mg/L	324	----	----	----	----
Potassium	7440-09-7	1	mg/L	18	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.86	----	----	----	----
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	0.2	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	2.75	----	----	----	----
EK055G-NH4: Ammonium as N by DA								



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time				10-Mar-2022 09:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2201068-006	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
EK055G-NH4: Ammonium as N by DA - Continued									
Ammonium as N	14798-03-9_N	0.01	mg/L	2.74	----	----	----	----	----
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	<0.01	----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	21.2	----	----	----	----	----
∅ Total Cations	----	0.01	meq/L	20.2	----	----	----	----	----
∅ Ionic Balance	----	0.01	%	2.66	----	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	31	----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	1.84	----	----	----	----	----



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 SO₄²⁻ 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

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 8754 8555 E: samples.sydney@alsenviro.com

Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4968 8433 E: samples.newcastle@alsenviro.com

Brisbane: 32 Shang St, Stafford QLD 4050
Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com

Townsville: 14-15 Deanna Ct, Bahra QLD 4878
Ph: 07 4798 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 5005
Ph: 08 8350 0800 E: adelaide@alsenviro.com

Perth: 10 Rod Way, Malaga WA 6090
Ph: 08 9209 7855 E: samples.perth@alsenviro.com

Launceston: 27 Wallington 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? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: C Other comment: 8
OFFICE: Dunmore	(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 Dust	ALS QUOTE NO.: WO/030/19 TENDER	
ORDER NUMBER:		
PROJECT MANAGER: Joel Culton		
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: 9.3.22, 15:00	
	RECEIVED BY: Aneta	
	DATE/TIME: 9.3.22	
	RELINQUISHED BY:	
	RECEIVED BY:	

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	
	DDG1	9.3.22 11:50	AIR		✓	
	DDG2	↓ 12:00	AIR		✓	
	DDG3	↓ 13:40	AIR		✓	
	DDG4	↓ 8:00	AIR		✓	
TOTAL					10	

Environmental Division
Wollongong
Work Order Reference
EW2201084



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 : **EW2201084**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Landfill Dust
Order number : 138956
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 : 09-Mar-2022 15:22
Date Analysis Commenced : 14-Mar-2022
Issue Date : 22-Mar-2022 17:10



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
Thomas Regan	Laboratory Technician	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 Contact for details.

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

- **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.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- The dust gauges for all samples were full when received by the laboratory. They may have overflowed in the field. Results for these gauges are thus reported on an 'as received' basis.
- 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 08/02/2022 - 09/03/2022	DDG2 08/02/2022 - 09/03/2022	DDG3 08/02/2022 - 09/03/2022	DDG4 08/02/2022 - 09/03/2022	----
Sampling date / time				09-Mar-2022 11:50	09-Mar-2022 12:00	09-Mar-2022 13:40	09-Mar-2022 08:00	----
Compound	CAS Number	LOR	Unit	EW2201084-001	EW2201084-002	EW2201084-003	EW2201084-004	-----
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	0.1	0.1	0.3	0.1	----
Ash Content (mg)	----	2	mg	2	2	5	2	----
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.1	<0.1	0.3	0.3	----
Combustible Matter (mg)	----	2	mg	<2	<2	6	4	----
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	0.2	0.1	0.6	0.4	----
Total Insoluble Matter (mg)	----	2	mg	3	2	11	6	----

Page : 3 of 3
Work Order : EW2201084
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

ALS Landfill Emissions Report



Client: Shellharbour City Council Date: 22/03/2022
 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 215	302 432	2.5	
B	2	6168 245	302 437	2.7	Methane Cage
B	3	6168 264	302 437	2.5	
B	4	6168 284	302 436	2.8	
B	5	6168 310	302 433	2.7	
B	6	6168 339	302 430	3.0	
B	7	6168 367	302 429	2.7	
C	1	6168 438	302 375	2.5	
C	2	6168 380	302 390	2.6	
C	3	6168 322	302 405	2.6	
C	4	6167 256	302 419	2.8	
C	5	6167 218	302 423	6.2	
C	6	6168 147	302 417	2.4	
C	7	6168 061	302 406	2.5	
C	8	6168 018	302 394	2.5	
D	1	6168 139	302 392	2.6	
D	2	6168 144	302 391	2.7	
D	3	6168 153	302 391	2.7	
D	4	6168 165	302 388	2.9	
D 5-9					No Further Access, Very Overgrown and rubble
E	1	6168 199	302 344	2.7	
E	2	6168 188	302 353	2.6	
E	3	6168 158	302 365	2.7	
E	4	6168 148	302 370	2.5	
E	5	6168 138	302 373	2.5	
F	1	6168 139	302 350	2.7	
F	2	6168 158	302 348	2.6	
F	3	6168 171	302 344	2.7	
F	4	6168 182	302 339	2.6	
F	5	6168 195	302 333	2.7	

G	1	6168 413	302 254	2.7	
G	2	6168 414	302 274	2.8	
G	3	6168 427	302 296	2.5	
G	4	6168 446	302 323	2.5	
G	5	6168 461	302 348	2.6	
G	6	6168 468	302 360	2.5	
G	7	6168 476	302 370	2.5	
H	1	6168 401	302 560	2.4	
H	2	6168 350	302 566	2.4	
H	3	6168 291	302 540	2.4	Weigh Bridge
H	4	6168 224	302 560	2.4	
H	5	6168 117	302 629	2.3	
H	6	6168 081	302 626	2.3	
H	7	6168 077	301 581	2.3	
H	8	6168 121	301 557	2.3	
H	9	6168 165	302 531	2.3	
H	10	6168 192	302 520	2.3	
H	11	6168 242	302 526	2.2	
H	12	6168 372	302 543	2.3	
H	13	6168 435	302 511	2.3	
H	14	6168 482	302 324	2.2	
H	15	6168 450	302 278	2.2	
H	16	6168 418	302 249	2.2	
H	17	6168 380	302 211	2.2	
H	18	6168 171	302 061	2.5	
H	19	6168 219	302 67	2.5	
H	20	6168 264	302 85	2.5	
H	21	6168 303	302 122	2.5	
H	22	6168 338	302 152	2.5	
H	23	6168 384	302 199	2.5	
H	24	6168 412	302 230	2.5	
H	25	6167 905	302 486	7.1	
H	26	6168 881	302 417	5.1	
H	27	6168 870	302 327	3.5	
H	28	6168 887	302 243	3.8	
H	29	6168 944	301 183	5.5	
H	30	6168 010	302 130	9.7	
H	31	6168 123	302 063	2.9	
I	1	6168 122	302 243	10.3	
I	2	6168 126	302 201	2.3	
I	3	6168 126	302 166	2.3	

I	4	6168 127	302 134	2.3	
I	5	6168 127	302 104	2.3	
J	1	6168 336	302 200	2.2	
J	2	6168 301	302 213	2.2	
J	3	6168 241	302 233	2.2	
J	4	6167 189	302 253	2.3	
J	5	6167 132	302 266	18.1	
K	1	6168 524	302 392	2.3	
K	2	6168 540	302 434	2.3	
K	3	6168 561	302 462	2.3	
K	4	6168 589	302 432	3.0	
K	5	6168 585	302 403	2.3	
K	5	6168 585	302 375	2.3	
L	1	6168 767	302 333	2.4	
L	2	6168 731	302 315	2.4	
L	3	6168 695	302 288	2.4	
L	4	6168 667	302 263	2.4	
L	5	6168 649	302 247	2.6	
L	6	6168 587	302 211	2.4	
Compressor Shed	1			5.4	
Office	1			2.4	
Community Recycling Centre	1			2.2	
OLD Weighbridge	1			2.3	
OLD Weighbridge Toilet	1			6.8	
Revolve Shop	1			2.5	
Building Truckwash	1			2.2	
New Weighbridge	1			2.4	
Methane Blank (Pre testing)				2.5	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				2.6	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 2178
Ph: 02 8784 8585 E:samples.sydney@alsenviro.com

☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4988 9430 E:samples.newcastle@alsenviro.com

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

☐ Townsville: 14-15 Deema Ct, Bohle QLD 4818
Ph: 07 4766 0600 E:townsville.environmental@alsenviro.com

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

☐ Adelaide: 2-1 Burma Rd, Poracra SA 5009
Ph: 08 9350 0800 E:adelaide@alsenviro.com

☐ Perth: 10 Hed Way, Mataga WA 6090

Ph: 08 9209 7655 E:samples.perth@alsenviro.com

☐ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 9331 2158 E:launceston@alsenviro.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:	ALS QUOTE NO.: WO/030/19 TENDER	COC SEQUENCE NUMBER (Circle)	Castody Seal intact?	No N/A
PROJECT: Dunmore Landfill Overflows	ORDER NUMBER:	OF: 1 2 3 4 5 6 7	Freeze / frozen ice bricks present upon receipt?	No N/A
PROJECT MANAGER: Joel Culton	SAMPLER: Robert Delis	RELINQUISHED BY: Robert Delis	Random Sample Temperature on Receipt:	5.6 °C
SAMPLER MOBILE:	EDD FORMAT (or default):	RECEIVED BY: Aneta	Other comment:	
COC emailed to ALS? (YES / NO)	DATE/TIME: 29.3.22	DATE/TIME: 29.3.22		
Email Reports to :				
Email Invoice to :				

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	pH			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SWP1	30.3.22	W			✓	✓			
2	SWP2	↓ 11:45	W			✓	✓			
					TOTAL	10				

Environmental Division
Wollongong
Work Order Reference
EW2201499



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 : **EW2201499**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Landfill Overflows
Order number : 138956
C-O-C number : ----
Sampler : Robert DaLio
Site : ----
Quote number : WO/030/19 TENDER OVERFLOW DISCHARGE
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 2
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 : 30-Mar-2022 15:22
Date Analysis Commenced : 30-Mar-2022
Issue Date : 06-Apr-2022 14:26



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	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 Contact for details.

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

- Analytical work for this work order will be conducted at ALS Sydney.
- Sample site SWP1 - Flowing

Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWP2 Point 1	----	----	----
Sampling date / time				30-Mar-2022 11:30	30-Mar-2022 11:45	----	----	----
Compound	CAS Number	LOR	Unit	EW2201499-001	EW2201499-002	-----	-----	-----
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.8	7.5	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	12	27	----	----	----

Inter-Laboratory Testing

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

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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2178
Ph: 02 3784 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4568 9430 E: samples.newcastle@alsenviro.com

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

☐ Melbourne: 2-4 Wastall Rd, Springvale VIC 3171
Ph: 03 8540 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Postrika SA 5095
Ph: 08 8359 0850 E: adelaide@alsenviro.com

☐ Perth: 10 Hed Way, Malaga WA 6080
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="checkbox"/> No <input checked="" type="checkbox"/> NA Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> NA Random Sample Temperature on Receipt: 6.4 °C Other comment:							
OFFICE:	(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 Landfill Overflows	ALS QUOTE NO.: WO/030/19 TENDER								
ORDER NUMBER:	COC SEQUENCE NUMBER (Circle) 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: Robert Datio	SAMPLER MOBILE:	RELINQUISHED BY: Robert Datio							
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	RECEIVED BY: Aneta							
Email Reports to :		DATE/TIME: 10/3/22, 16:30							
Email Invoice to :		DATE/TIME: 10/3/22							
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:	CC reports to:	RELINQUISHED BY:							
		RECEIVED BY:							
		DATE/TIME:							

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 Comments on likely contaminant levels, dilutions, or samples requiring specific CC analysis etc.		
	LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	pH							
	SWP1		10/3/22 8:40 W				✓	✓							
	SWP2		11:05 W				✓	✓							
TOTAL:						10									

Environmental Division
Wollongong
Work Order Reference
EW2201197



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 : **EW2201197**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Landfill Overflows
Order number : 138956
C-O-C number : ----
Sampler : ----
Site : ----
Quote number : WO/030/19 TENDER OVERFLOW DISCHARGE
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 2
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 : 10-Mar-2022 16:51
Date Analysis Commenced : 10-Mar-2022
Issue Date : 17-Mar-2022 17:09



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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	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 Contact for details.

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

- Analytical work for this work order will be conducted at ALS Sydney.
- Site SWP1 Overflowing at time of sampling.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- 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.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs

Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWP2 Point 1	----	----	----
Sampling date / time				10-Mar-2022 08:40	10-Mar-2022 11:05	----	----	----
Compound	CAS Number	LOR	Unit	EW2201197-001	EW2201197-002	-----	-----	-----
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.6	7.4	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	8	26	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	18.0	19.5	----	----	----

Inter-Laboratory Testing

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

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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodbark Rd, Smithfield NSW 2176
Ph: 02 8784 8555 E: samples.syd@alsenviro.com

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

☐ Melbourne: 2-4 Wastall Rd, Springvale VIC 3171
Ph: 03 8545 9600 E: samples.melbourne@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090
Ph: 08 2209 7685 E: samples.perth@alsenviro.com

☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4968 8410 E: samples.newcastle@alsenviro.com

☐ Townsville: 14-16 Deanna Ct, Bottle QLD 4816
Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ Adelaide: 2-1 Burma Rd, Ponreka SA 5095
Ph: 08 8350 0990 E: adelaide@alsenviro.com

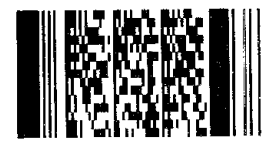
☐ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 8331 2158 E: launceston@alsenviro.com

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:	ALS QUOTE NO.: WO/030/19 TENDER	COC SEQUENCE NUMBER (Circle)	Custody Seal Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA								
PROJECT: Dunmore Landfill Overflows	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	Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	
1	2	3	4	5	6	7					
PROJECT MANAGER: Joel Culton	EDD FORMAT (or default):	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	Random Sample Temperature on Receipt: 5.2 °C	
1	2	3	4	5	6	7					
SAMPLER: Robert Dabio	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dabio	RECEIVED BY: Aneta	RELINQUISHED BY:							
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 3.3.22	DATE/TIME: 12:35 3.3.22	RECEIVED BY:							
Email Reports to :				DATE/TIME:							
Email Invoice to :				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 Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	pH						
	SWP1		3/3/22	9:07 W			✓	✓						
	SWP2		↓	8:46 W			✓	✓						
						TOTAL	10							

Environmental Division
Wollongong
Work Order Reference
EW2200987



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; VS = 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 : **EW2200987**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Joel Coulton
Address : LAMERTON HOUSE, LAMERTON CRESCENT
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

Telephone : ----
Project : Dunmore Landfill Overflows
Order number : 138956
C-O-C number : ----
Sampler : Robert DaLio
Site : ----
Quote number : WO/030/19 TENDER OVERFLOW DISCHARGE
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 2
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 : 03-Mar-2022 12:50
Date Analysis Commenced : 03-Mar-2022
Issue Date : 10-Mar-2022 12:58



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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	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 Contact for details.

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

- Analytical work for this work order will be conducted at ALS Sydney.
- Sample points overflowing.
- pH performed by ALS Wollongong via in-house method EA005FD 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

Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWP2 Point 1	----	----	----
Sampling date / time				03-Mar-2022 09:07	03-Mar-2022 08:46	----	----	----
Compound	CAS Number	LOR	Unit	EW2200987-001	EW2200987-002	-----	-----	-----
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	8.1	7.6	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	17	72	----	----	----

Inter-Laboratory Testing

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

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

Appendix F

Calibration Certificates

CERTIFICATION OF CALIBRATION



Issued by: QED Environmental Systems Ltd.

Calibration certificate number **19255 H-06648**
 Instrument **Laser One** Serial Number **19255**

Description of the calibration procedure:

The calibration is verified with certified gas bottle. The maximum error of the instrument as specified in the datasheet.

Gas verification from **0-1000ppm CH4**

Full scale (ppm)	Gas concentration (ppm)	Response 1 (ppm)	Response 2 (ppm)	Response 3 (ppm)	Average response (ppm)	Maximum error (ppm)	Maximum error (% F.s.)	Maximum error %
1000	0.0	0	0	0	0.00	0.00	0.00	0.00
1000	3.5	3.4	3.4	3.4	3.40	0.10	0.01	0.01
1000	10.3	10.4	10.4	10.4	10.40	0.10	0.01	0.01
1000	102.0	103	103	103	103.00	1.00	0.10	0.10
1000	1001	1015	1015	1015	1015.00	14.00	1.40	1.40

Uncertainty	1.40	%
Max % error	1.40	% FS

Gas verification from **0-100% vol CH4**

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Maximum error (%vol)	Maximum error (% F.s.)	Maximum error %
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	2.20	2.20	2.20	2.20	2.20	0.00	0.00	0.00
100.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00
100.00	15.00	15.00	15.00	15.00	15.00	0.00	0.00	0.00
100.00	50.00	49.80	49.80	49.80	49.80	0.20	0.20	0.20
100.00	100.00	99.80	99.80	99.80	99.80	0.20	0.20	0.20

Uncertainty	0.20	%
Max % error	0.20	% FS

Gas verification from **0-100% CH4 LEL (0-4.4% VOL)**

Full scale (%vol)	Gas concentration (LEL%)	Response 1 (LEL%)	Response 2 (LEL%)	Response 3 (LEL%)	Average response (%vol)	Maximum error (LEL%)	Maximum error (% F.s.)	Maximum error %
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	2.00	0.00	2.03	2.03	1.35	2.00	2.00	2.00
100.00	50.00	0.00	0.00	0.00	0.00	50.00	50.00	50.00

Uncertainty	50.00	%
Max % error	50.00	% FS

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park- Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

Issued by: QED Environmental Systems Ltd.

Environmental conditions during calibration

Temp.	21.6	C
Pressure	1013	mBar

Gas bottles used for calibration

Gas	Cylinder number	Expiry date	Gas
N2	S1261680T	16/05/2024	N2
3 ppm	129726SG	11/04/2024	CH4
10 ppm	119779SG	11/04/2024	CH4
100 ppm	S1385429W	18/01/2026	CH4
1000 ppm	1490137	23/08/2026	CH4
1.0% Vol	S1198415S	10/04/2024	CH4
2.2% vol	S1672767FF	18/07/2026	CH4
5.0% vol	217147	03/12/2024	CH4
15% vol	269223	07/11/2023	CH4
50% vol	189051SG	23/02/2024	CH4
100% vol	S1182097S	15/11/2025	CH4

Calibration results: Pass

Next scheduled calibration: 21/12/2022

Calibration date: 21/12/2021

Issued by: Laura McBride



Instrument Service Report

<u>Unit Type:</u> Laser One	<u>Part Number:</u>	<u>Date:</u> 22-Dec-2021	<u>Next Service Due:</u> 21-Dec-2022	<u>Customer Name:</u> Air-Met Scientific Pty Ltd
<u>Serial Number:</u> 19255				
Actions/Investigation Description			Result	Comments
Serial Number Check			Yes	
Battery Requires Replacing			No	
Service history of instrument reviewed			Yes	
Instrument turns on			Pass	
Backlight operates correctly			Yes	
External visual inspection performed			Pass	
Internal visual inspection performed			Pass	
Case assembly closed and screws tightened to correct torque			Yes	
Check instrument for visible damages /defects			Pass	
Inwards assessment stage reviewed			Yes	
Buzzer working correctly			Pass	
Software version correct			Fail	upgraded to 6.02
Functionality check e.g. LEDs, , Keypad, Display and Buzzer test			Pass	
Flow is > 0.6 L/min			Pass	
Flow fail test			Pass	
Rattle Test			Pass	
Change external anti-water filter			Complete	

Instrument Service Report

<u>Unit Type:</u> Laser One		<u>Part Number:</u>		<u>Date:</u> 22-Dec-2021		<u>Next Service Due:</u> 21-Dec-2022		<u>Customer Name:</u> Air-Met Scientific Pty Ltd	
<u>Serial Number:</u> 19255									
Actions/Investigation Description				Result	Comments				
Bluetooth				Pass					
Flow is > 0.6 L/min				Pass					
Instrument turns on				Pass					
As Received Gas Check Performed				Pass	synth air=2.9 3ppm=3.5 10ppm=10.5 100ppm=103 1000ppm=985 1%=9900 2.2%=2.15% 5%=4.92 15%=14.6 50%=49.2 100%=98.1				
Keypad/dial test				Pass					
Cable Comms test				Pass					
LEDs checked				Pass					
Laser Bench Realignment & Optimization									
Full Calibration				Pass	Instrument passed calibration. Next calibration date 21/12/2022				
Customer Comments									
for annual calibration and update of firmware									

Instrument Service Report

Unit Type: Laser One Part Number: Date: 22-Dec-2021 Next Service Due: 21-Dec-2022 Customer Name: Air-Met Scientific Pty Ltd
Serial Number: 19255

Service Details: Service Scheme Service Engineer: Sabin Neagu Calibration Engineer: Sabin Neagu Approved By: *Laura McBride* Signature:
Standard Service



Appendix G

Gas Flare Reports



PROJECT PROFILE

DUNMORE, NSW

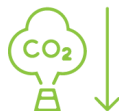
We are **people engineering a clean energy, zero carbon future**, achieving our mission of **expediting the transformation to renewables by delivering clean energy and lower carbon solutions, reliability, effectively, commercially for our customers.**

To achieve our vision and mission we put people first and this makes us different from all the rest.



BIOGAS CAPTURED

21.1 million m3



CARBON ABATEMENT

201 thousand tonnes
(T CO2e abated in total)



SEEDLINGS PLANTED

3.3 million seedlings planted
for 10 years.



CARS OFF THE ROAD

7,200 (for the last 12 months of
carbon abatement)

BIOGAS CAPTURE AND ABATEMENT FROM LANDFILL PROJECT

- Long-term contract with Shellharbour City Council to recover and beneficially reuse biogas.
- LGI 1000 ERF compliant biogas flare and gas extraction infrastructure installed in 2013.
- Council benefits from a bespoke biogas management system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation and expansion of the biogas collection and management system.
- LGI supplies operations & maintenance, monitoring and reporting of the biogas collection and management systems to provide the best environmental outcome for Council from the landfill at their Dunmore Waste Management Facility.

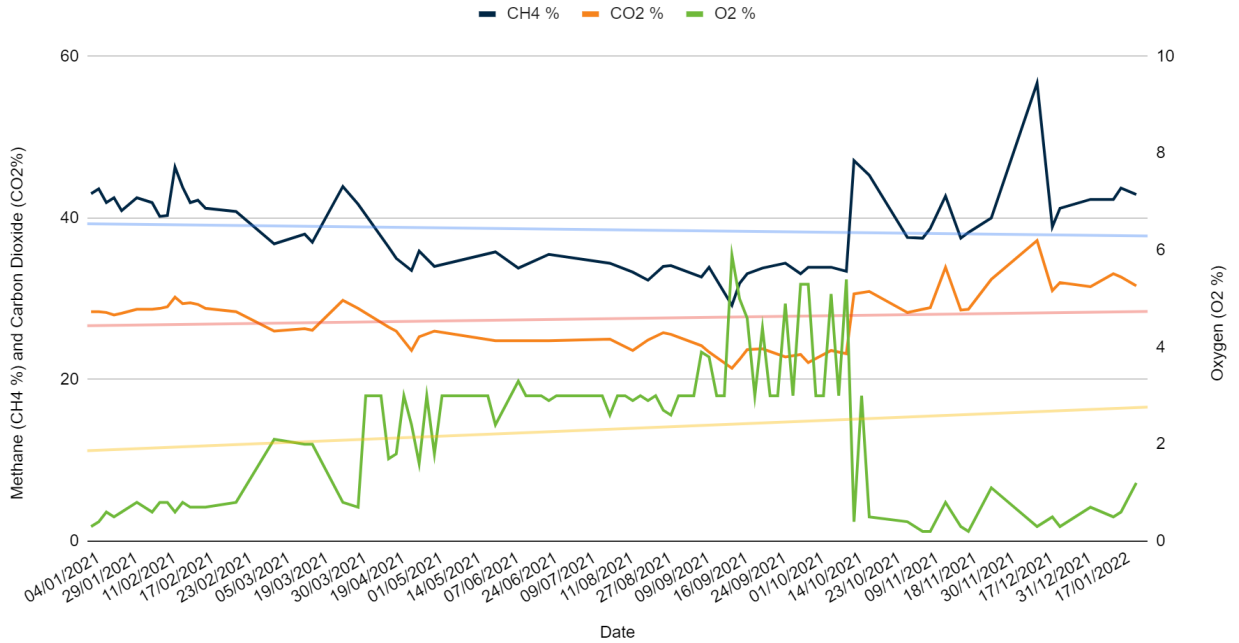
Site:	Dunmore	Report issue date:	09/02/2022
Report month:	January 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Jessica North

Comments on changes to existing system:	<p>January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells.</p> <p>April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells.</p> <p>June 2016 - LGI disconnected the extended gas capture system to assist council.</p> <p>September 2016 - LGI disconnected the extended gas capture system to assist council.</p> <p>November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016.</p> <p>May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system</p> <p>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 160mm leachate riser.</p> <p>April 2020 - LGI installed flowline to sump 6 after earlier disconnection.</p> <p>February 2021 - LGI installed 13 new vertical wells, including a new submain</p>
Comments on operation / maintenance:	<p>Availability - 95.97%</p> <p>Down Time: 30.00hrs</p> <p>- due to overheating resulting in damages to louvers. Louvers were replaced.</p> <p>Field Tuned:</p> <p>- 13/01/2022</p>
Recommendations:	<p>LGI and Council agree to progress with gas infrastructure improvements. LGI to propose a plan for a pumping trial to remove leachate from flooded wells and infrastructure.</p> <p>LGI is investigating a louver control system.</p>

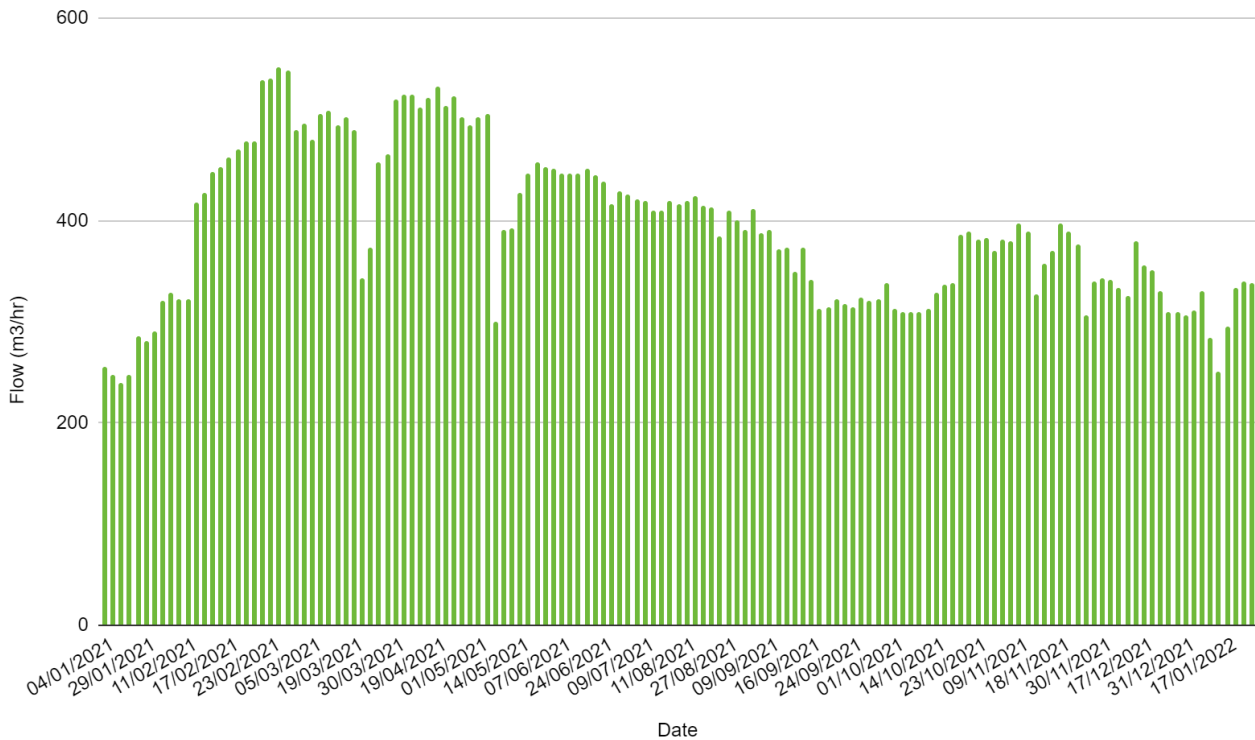
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	STACK TEMP C	CUMULATIVE FLOW m3	FLOW m3/h
04/01/2022	42.3	31.5	0.7	688	20,926,097	311
13/01/2022	42.3	33.1	0.5	573	20,989,628	250
21/01/2022	42.9	31.6	1.2	832	21,040,025	340
28/01/2022	-	-	-	840	21,097,209	338
Average	42.5	32.07	0.8	733	-	310

Dunmore- Methane, Carbon Dioxide & Oxygen

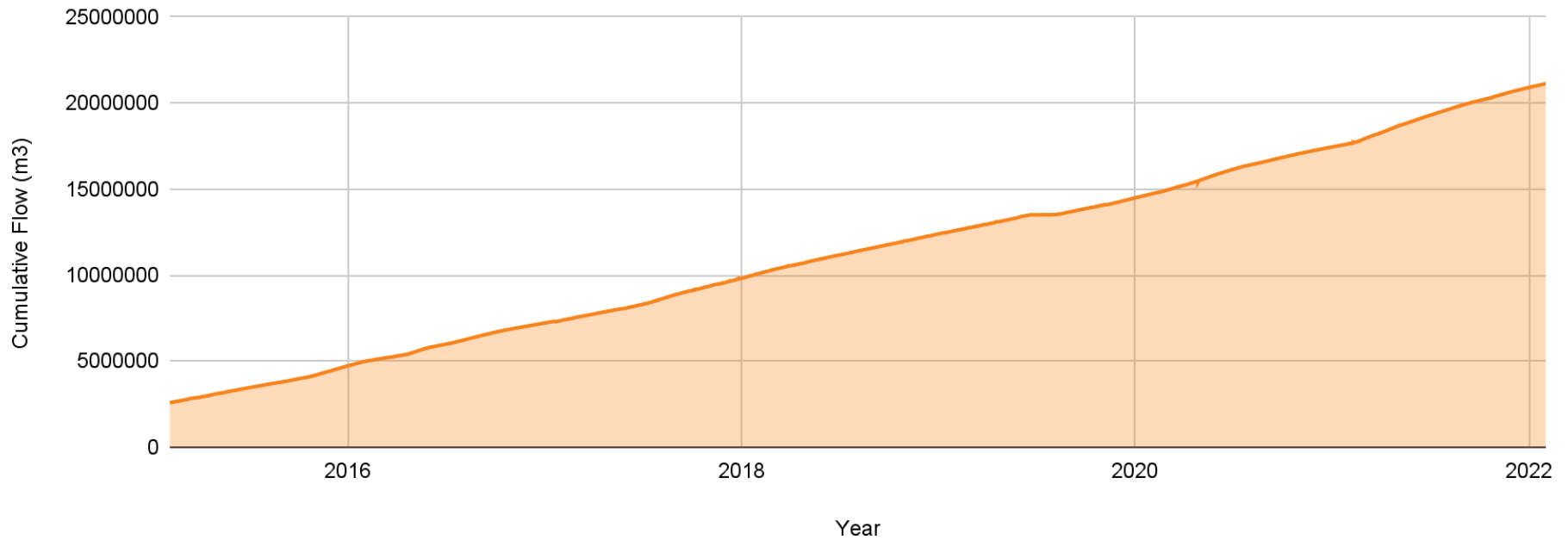


Dunmore - Flow Rate





Dunmore - Cumulative Flow



- 21,127,163 of flared landfill gas up to 1 February 2022, which represents;
 - 200,657 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
 - 3,344,289 seedlings planted for 10 years
 - 7,165 (cars off the road for the last 12 months)
- Biogas captured is the cumulative flow reading at the last day of the month.

Please note:

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PROJECT PROFILE

DUNMORE, NSW

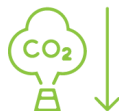
We are people engineering a clean energy, zero carbon future, achieving our mission of expediting the transformation to renewables by delivering clean energy and lower carbon solutions, reliability, effectively, commercially for our customers.

Results Achieved since the Project Commenced



BIOGAS CAPTURED

21.5 million m3



CARBON ABATEMENT

205 thousand tonnes
(T CO2e)



SEEDLINGS PLANTED

3.4 million seedlings planted
for 10 years.



CARS OFF THE ROAD

6,800 (for the last 12 months of
carbon abatement)

BIOGAS CAPTURE AND ABATEMENT FROM LANDFILL PROJECT

- Long-term contract with Shellharbour City Council to recover and beneficially reuse biogas.
- LGI 1000 ERF compliant biogas flare and gas extraction infrastructure installed in 2013.
- Council benefits from a bespoke biogas management system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation and expansion of the biogas collection and management system.
- LGI supplies operations & maintenance, monitoring and reporting of the biogas collection and management systems to provide the best environmental outcome for Council from the landfill at their Dunmore Waste Management Facility.

Site:	Dunmore	Report issue date:	13/04/2022
Report month:	March 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Jarryd Doran

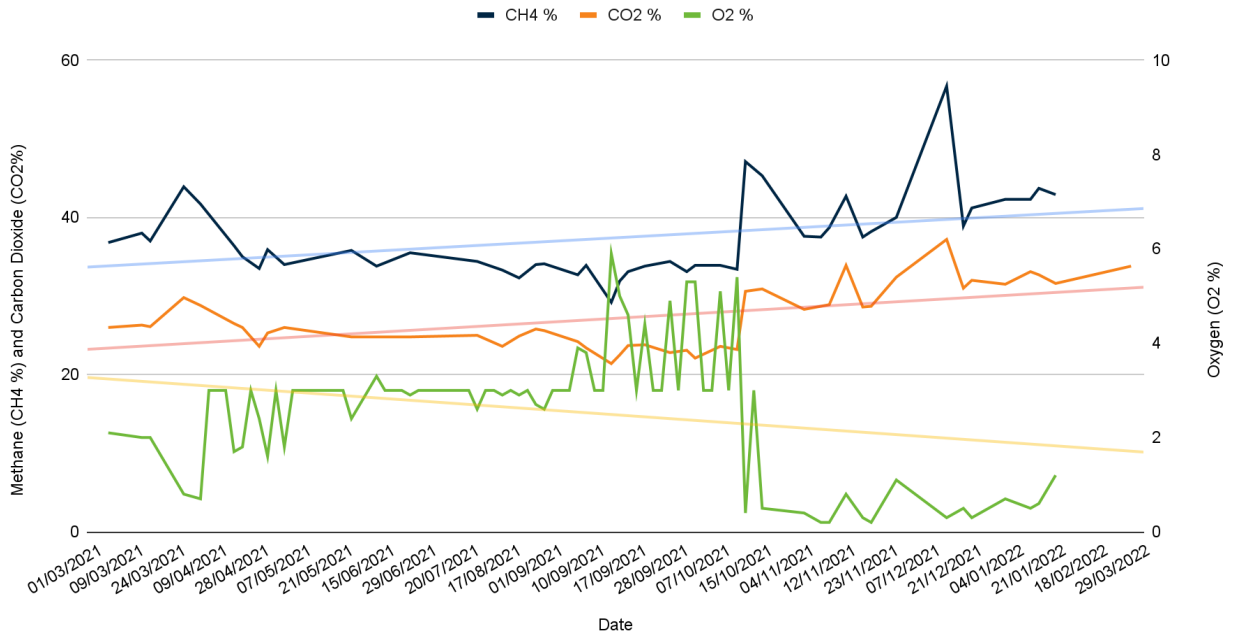
Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to 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
Comments on operation / maintenance:	Availability - 98.12% Down Time: 14.00hrs No CSV Data after 31/3 10am Field Tuned: - 10/3/2022
Recommendations:	LGI and Council agree to progress with gas infrastructure improvements. After discussion with Council, LGI will not implement any leachate pumping until the end of the current rainy season. The high moisture content within the waste is causing impeding the recovery of biogas. LGI is investigating an automated louver control system in order to optimise the stack temperature control.

Flare Operational Data:

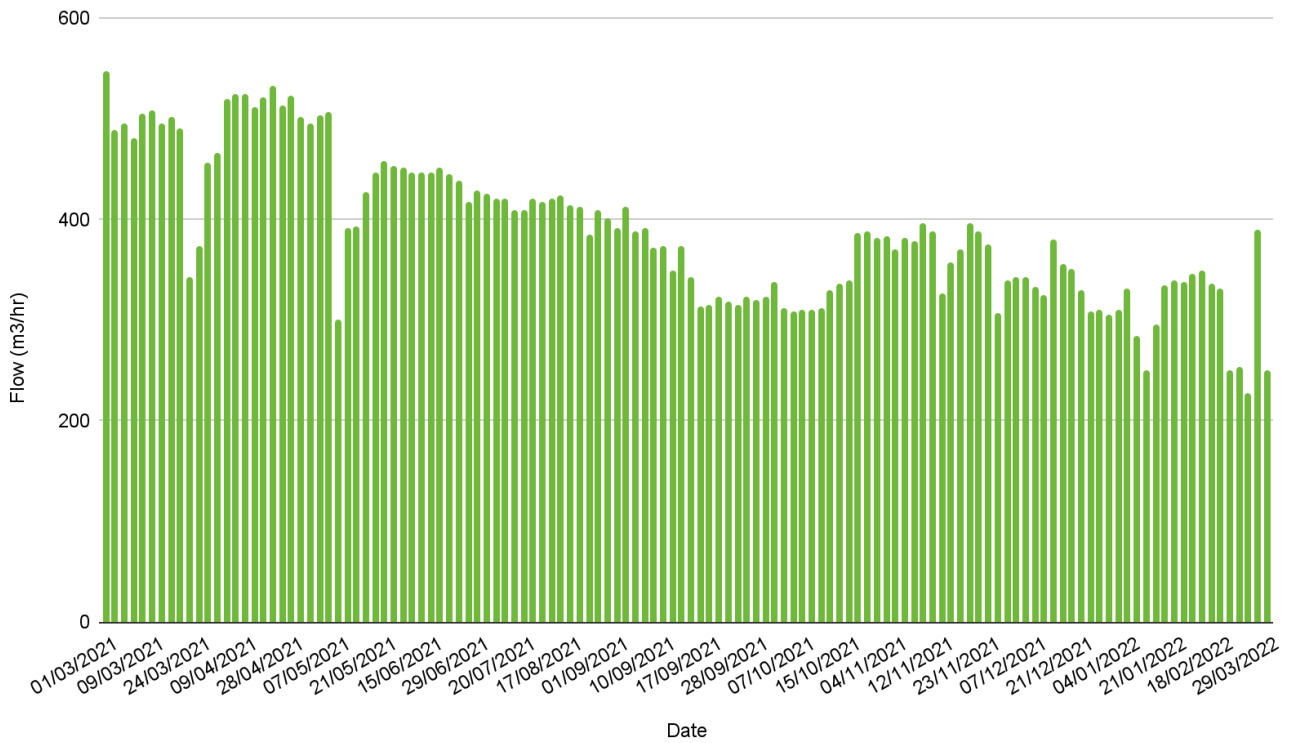
No gas makeup readings this month, as LGI Technicians unable to get to site for handheld readings and remote readings are not available until repairs can be completed.

Date	CH4 %	CO2 %	O2 %	STACK TEMP C	CUMULATIVE FLOW m3	FLOW m3/h
01/03/2022	-	-	-	765	21,345,889	253
10/03/2022	-	33.8	-	-	21,397,228	390
29/03/2022	-	-	-	549	21,560,209	250
31/03/2022	-	32.6	-	-	21,573,915	-
<i>Average</i>	-	33.2	-	657	-	298

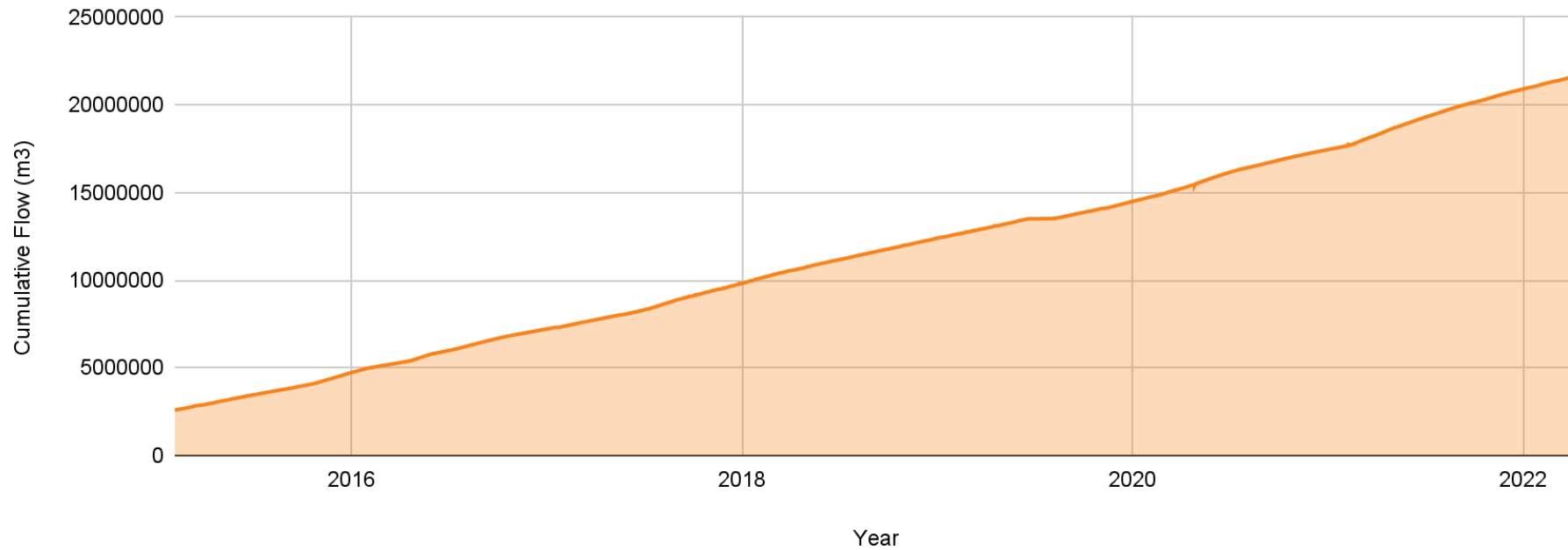
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 21,573,916 of flared landfill gas up to 1 April 2022, which represents;
 - 204,900 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
 - 3,415,007 seedlings planted for 10 years
 - 6,796 (cars off the road for the last 12 months)
- Biogas captured is the cumulative flow reading at the last day of the month.

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PROJECT PROFILE

DUNMORE, NSW

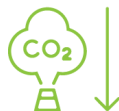
We are people engineering a clean energy, zero carbon future, achieving our mission of expediting the transformation to renewables by delivering clean energy and lower carbon solutions, reliability, effectively, commercially for our customers.

Results Achieved since the Project Commenced



BIOGAS CAPTURED

21.3 million m3



CARBON ABATEMENT

203 thousand tonnes
(T CO2e)



SEEDLINGS PLANTED

3.4 million seedlings planted
for 10 years.



CARS OFF THE ROAD

7,200 (for the last 12 months of
carbon abatement)

BIOGAS CAPTURE AND ABATEMENT FROM LANDFILL PROJECT

- Long-term contract with Shellharbour City Council to recover and beneficially reuse biogas.
- LGI 1000 ERF compliant biogas flare and gas extraction infrastructure installed in 2013.
- Council benefits from a bespoke biogas management system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation and expansion of the biogas collection and management system.
- LGI supplies operations & maintenance, monitoring and reporting of the biogas collection and management systems to provide the best environmental outcome for Council from the landfill at their Dunmore Waste Management Facility.

Site:	Dunmore	Report issue date:	15/03/2022
Report month:	February 2022	Prepared by:	Grace Tap
Prepared for:	Shellharbour City Council	Checked by:	Jarryd Doran

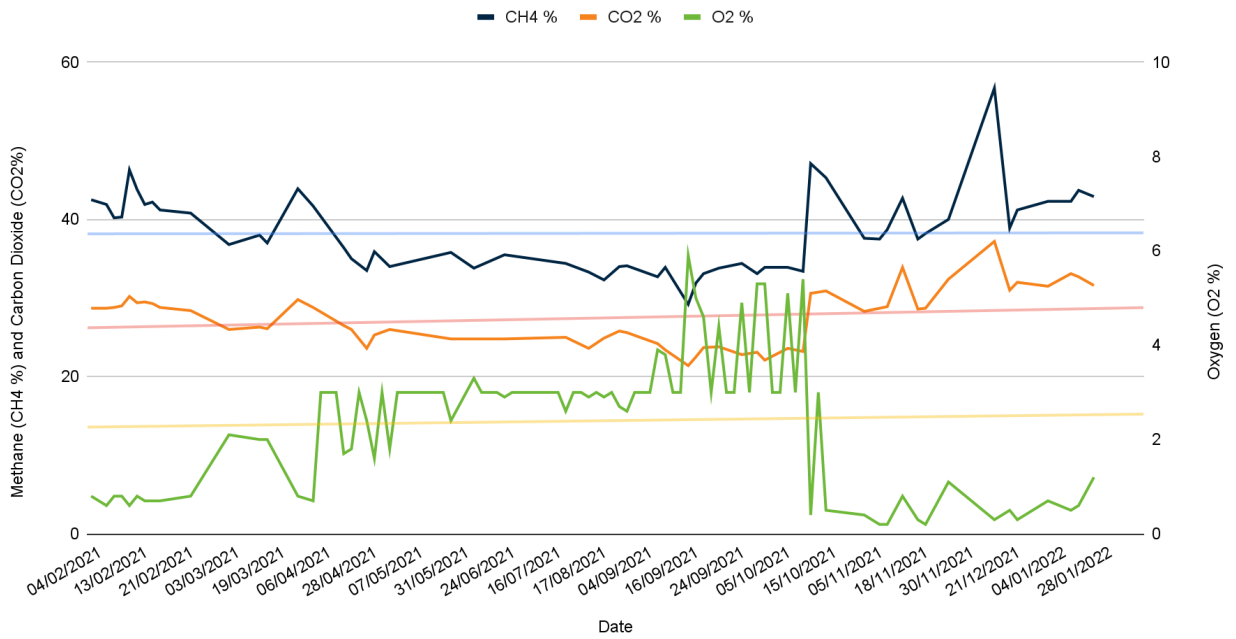
Comments on changes to existing system:	<p>January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells.</p> <p>April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells.</p> <p>June 2016 - LGI disconnected the extended gas capture system to assist the council.</p> <p>September 2016 - LGI disconnected the extended gas capture system to assist council.</p> <p>November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016.</p> <p>May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system</p> <p>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 160mm leachate riser.</p> <p>April 2020 - LGI installed flowline to sump 6 after earlier disconnection.</p> <p>February 2021 - LGI installed 13 new vertical wells, including a new submain</p>
Comments on operation / maintenance:	<p>Availability - 100.00%</p> <p>Down Time: 0.00hrs</p> <p>-site flooded restricting recovered biogas, was pumped out on the 25/2.</p>
Recommendations:	<p>LGI and Council agree to progress with gas infrastructure improvements. LGI to propose a plan for a pumping trial to remove leachate from flooded biogas wells and infrastructure into the Councils leachate management system.</p> <p>LGI is investigating an automated louver control system in order to optimise the stack temperature control.</p>

Flare Operational Data:

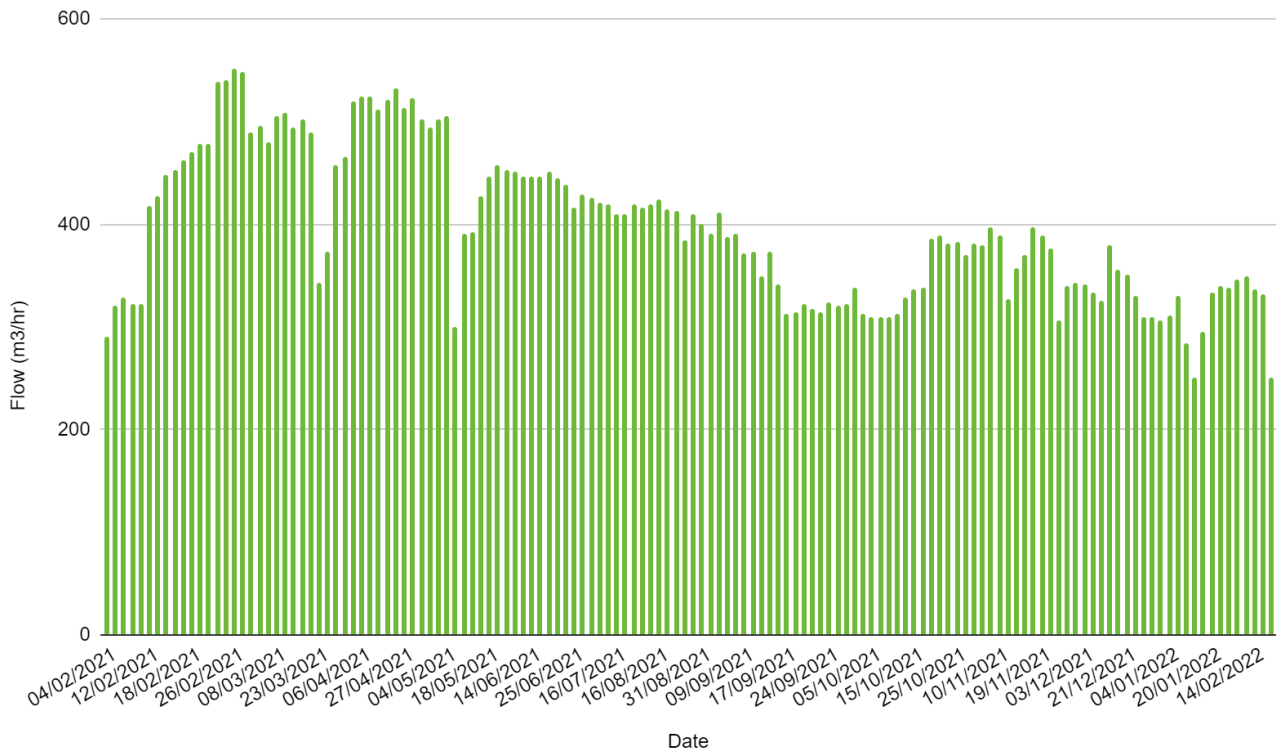
No gas makeup readings this month, as LGI Technicians unable to get to site for handheld readings and remote readings are not available until repairs can be completed.

Date	CH4 %	CO2 %	O2 %	STACK TEMP C	CUMULATIVE FLOW m3	FLOW m3/h
01/02/2022	-	-	-	850	21,129,485	346
08/02/2022	-	-	-	853	21,188,746	349
14/02/2022	-	-	-	833	21,238,466	337
25/02/2022	-	-	-	711	21,319,624	251
<i>Average</i>	-	-	-	812	-	321

Dunmore- Methane, Carbon Dioxide & Oxygen

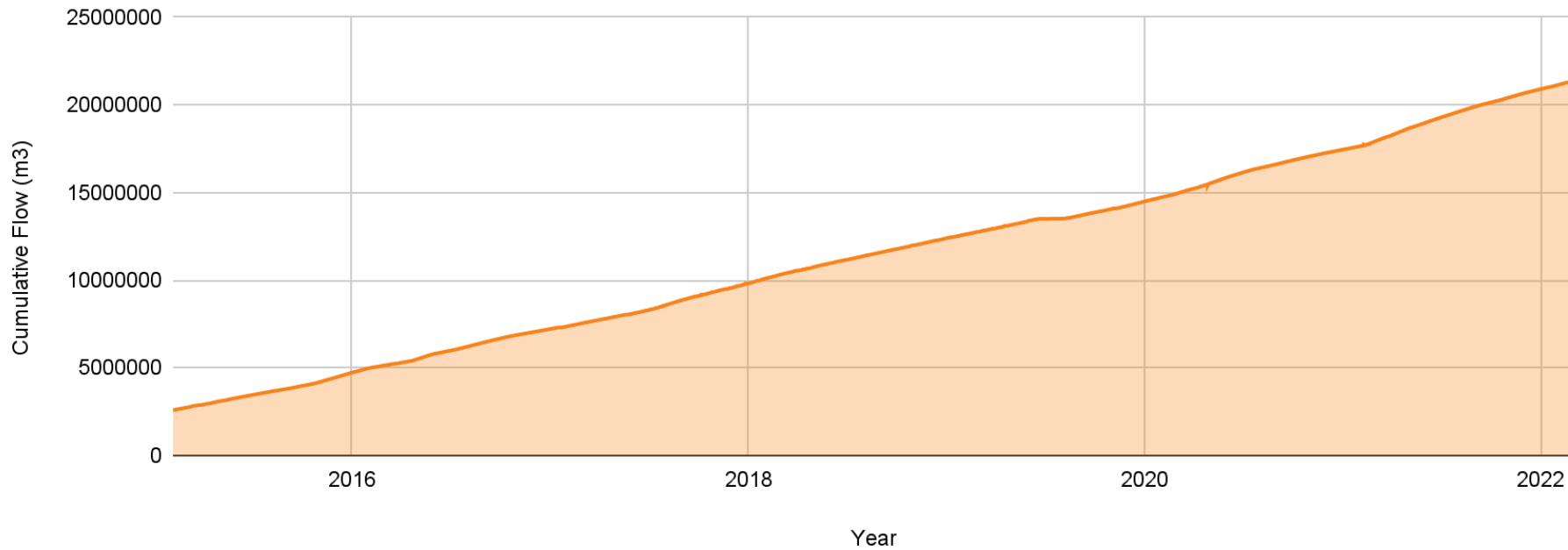


Dunmore - Flow Rate





Dunmore - Cumulative Flow



- 21,342,316 of flared landfill gas up to 1 March 2022, which represents;
 - 202,701 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
 - 3,378,346 seedlings planted for 10 years
 - 7,176 (cars off the road for the last 12 months)
- Biogas captured is the cumulative flow reading at the last day of the month.

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