



QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) JUNE 2023

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

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

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

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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 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 third quarter July 2023 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.

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.

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 June 2023 monitoring period in regard to the following tasks:

- Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by ALS as required by the EPLs for the respective reporting period.
- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);
- Review all quarterly environmental monitoring reports from the 2021-2023 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 June 2023 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 all groundwater bores. This was considered to be consistent with historical values;
- All surface water samples of Rocklow Creek reported for ammonia above the ecological stressor values of 0.2mg/L;
- Flare operating temperatures were generally below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;

- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the June 2023 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.

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1.0 INTRODUCTION

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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.

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1.1.2 EPL Requirements

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1.2 OBJECTIVES

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1.3 SCOPE OF WORK

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- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2.0 SITE DESCRIPTION

2.1 LOCATION

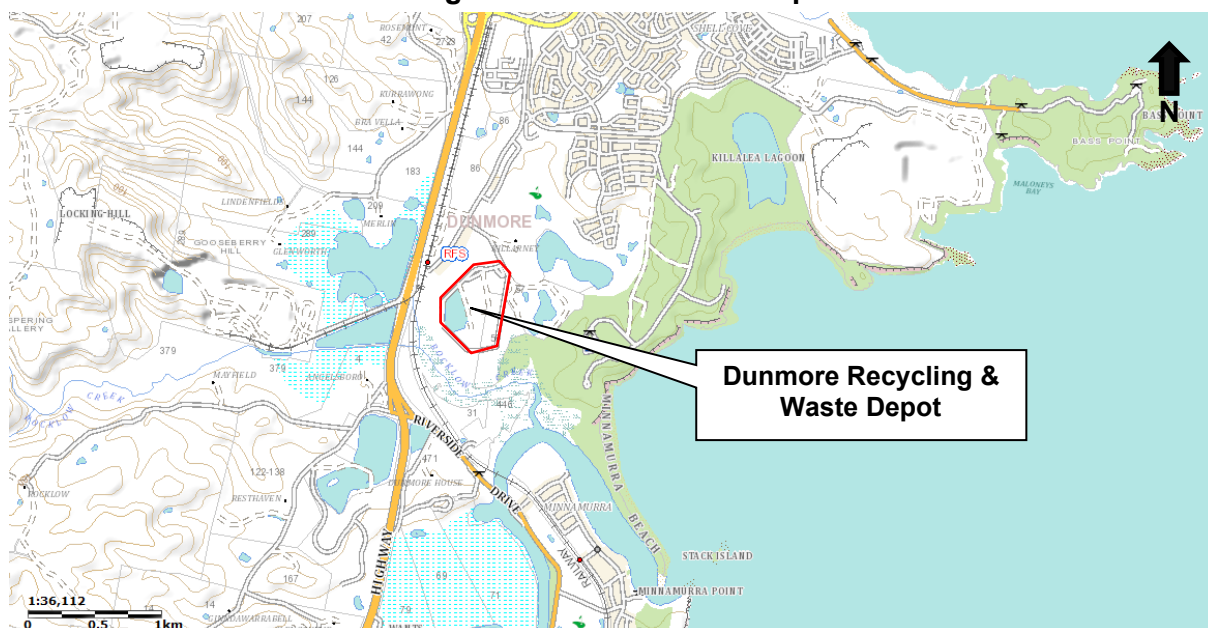
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure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

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

Table 1: Site Identification

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

Figure 1: Site Location Map



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

2.2 SURROUNDING LAND USE

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

Table 2: Surrounding Land use

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

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

2.2.1 Sensitive Receptors

The nearest sensitive receptors are likely to include:

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

2.3 TOPOGRAPHY & DRAINAGE

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

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

2.4 SOIL LANDSCAPE

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

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

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 DGVs 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 (pH 8)	0.9 mg/L (pH 8)
Nitrate	10.6 mg/L	10.6 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units

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

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

Additional pH dependant trigger values for total ammonia were also adopted when water was outside of 8 pH units in accordance with Table 8.3.7 of the ANZECC (2000). Criteria and results are presented in **Table 10** attached.

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 DATA QUALITY OBJECTIVES (DQO)

If sampling is conducted, 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 in the National Environment Protection (Assessment of Site Contamination) Measure (NEPC;2013).

4.1 STEP 1: STATE THE PROBLEM

The Site is currently operating as an active landfill and requires regular environmental monitoring in accordance with the EPL 5984.

4.2 STEP 2: IDENTIFY THE DECISION/GOAL OF THE STUDY

The primary goals / objectives of the investigation program were 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;

4.3 STEP 3: IDENTIFY THE INFORMATION INPUTS

The sample results for the Potential Contaminants of Concern (PCoC) shall be used to inform decisions regarding the Site suitability for the proposed land use, and the requirement for any further investigation, remediation or site management works, as necessary. The following inputs are required:

- Representative environmental samples;
- Measurements of environmental parameters;
- Comparison of the parameter results against the adopted Site Assessment Criteria (SAC);
- Record of sampling methods, observations and field screening results and ground investigation logs; and
- The completion of a Quarterly Environmental Monitoring Report.

4.4 STEP 4: DEFINE THE STUDY BOUNDARIES

The assessment was limited to sampling locations listed in EPL 5984. As listed in Appendix A and depicted in Figure 2 and Figure 3.

4.5 STEP 5: DEVELOP THE ANALYTICAL APPROACH (DECISION RULE)

The site information and results obtained from this assessment scope will be compared against the NSW EPA endorsed criteria in Section 3.0 for monitoring purposes.

4.6 STEP 7: DEVELOP THE PLAN FOR OBTAINING DATA

The seventh and final step involves identifying the most effective sampling and analysis design for generating the data that is required to satisfy the data quality objectives. It was understood that the ALS sampling program was based on and accounts for the following key points:

- The monitoring requirements of the EPLs;
- The results will be compared against NSW EPA endorsed assessment criteria;
- The indicators (DQI) used to identify that data obtained during the scope of works has been done so in a way which meets project data quality objectives (DQO) summarised below.

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.

DQO	Evaluation Criteria
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 (AECs) at the Site, and selection of representative samples.
Precision and accuracy for sampling and analysis	Use properly trained and qualified field personnel and achieve laboratory QC criteria. Blind field duplicates to be collected at a minimum rate of 1 in 20 samples. RPD's to be less than 30% for inorganic and 50% for organic analyses. Rinsate samples not considered necessary as all PCoC measured by the lab were assumed to be present at the site. Disposable single use items used for the collection of samples.

5.0 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.

5.1 WATER SAMPLING

5.1.1 Location of Water Monitoring Points

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

5.1.2 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 reported on field sheets provided by ALS.**

5.1.3 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.

5.1.4 Groundwater Sampling

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

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

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

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

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

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

5.1.5 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).

5.2 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; **4th May** and **1st June 2023**. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

5.3 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.

5.4 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

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

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

5.5 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.

5.6 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**.

5.7 QA/QC PROCEDURES & ANALYSIS

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

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

Relative Percent Difference (RPD) analysis of all duplicate and triplicate samples(s) results was performed by ENRS and is included in the report as **Table 11** and **Table 12**. 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.

5.8 EPL NON-COMPLIANCE

Based on the information provided to ENRS, no non-compliances were noted during the June 2023 quarterly monitoring period.

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 one (1) occasion during Q2 monitoring period. Summary results are included in **Table 6** and were consistent with EPA guidelines. Laboratory certificates of analysis are provided in Appendix B and are discussed in detail within the relevant sections of this report.

Table 6: Summary Table of Overflow Events

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
1/05/2023	7.6	9	19.5	-

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 **0.68 mbgl** (BH-15) to **4.64 mbgl** (BH-14). Across the Site groundwater levels were generally consistently with historical data sets.

6.3.2 Temperature

Groundwater

Temperature of groundwater in the June 2023 monitoring period ranged between **17.1°C** (BH-15) and **25.9°C** (BH-3).

Results were consistent with historical data.

Surface Waters

Surface water temperature at SWP-1 was **13.4°C**. Results were consistent with historical data.

Leachate

Leachate Temperature at the leachate Tank (LP-1) was **13.8°C**.

Results were 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 (µS/cm). Table 3.3.3 of the ANZECC (2000) guidelines document default TV for EC in lowland freshwater rivers between 125 µS/cm and 2,200 µS/cm (~1,500 mg/L).

Groundwater

During the June 2023 monitoring period, salinity ranged between; **511 µS/cm** (BH-18) and **7,945 µS/cm** (BH-1C). Four (4) monitoring points reported salinity values in excess of

freshwater SAC of 2,200 $\mu\text{S/cm}$ being **7,945 $\mu\text{S/cm}$** (BH-1c), **4,120 $\mu\text{S/cm}$** (BH-9), **2,260 $\mu\text{S/cm}$** (BH-15), **2,550 $\mu\text{S/cm}$** (BH-21).

EC readings were generally consistent with historical data.

Surface Waters

Electrical Conductivity results for onsite surface water (SWP-1) was **1,080 $\mu\text{S/cm}$** . The result was below the TV of 2,200 $\mu\text{S/cm}$.

Electrical conductivity for offsite surface waters ranged between **17,400 $\mu\text{S/cm}$** (SWC_2) to **32,600 $\mu\text{S/cm}$** (SWC-Down).

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

Leachate

Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution. Leachate salinity for June 2023 monitoring was **7,380 $\mu\text{S/cm}$** (LP1,) which was above the freshwater TV. Results are consistent with previous 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 **5.9 mg/L**. 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 **6.05 mg/L** (SWC-Down) to **6.71 mg/L** (SWC-Up). Results were generally consistent with a tidal creek passing through a mangrove swamp.

Leachate

Dissolved oxygen at LP1 (Leachate Tank) was **6.22 mg/L**. 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 6.8** (BH-12r, BH-13, BH-18) and **pH 7.5** (BH-3). All groundwater results were reported within the SAC range of pH 6.5-8.0 and were generally consistent with historical data.

Surface Water

The pH of the onsite surface water for the June 2023 monitoring period was reported at **pH 7.7** (SWP-1).

The pH of the offsite surface waters ranged between **pH 7.2**, (SWC_UP, SWC_2, SWC_Down) and **pH 7.3**, (SWC_Down_2) for sample locations associated with Rocklow Creek.

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

Leachate

Leachate pH was as reported as **pH 9.3** (LP-1). Results were reported above the SAC. Leachate pH has generally been elevated since September 2021.

6.3.6 Total Suspended Solids (TSS)

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

TSS was reported for surface water only.

Concentrations for onsite surface waters was reported as **<5 mg/L** (SWP_1).

Concentrations for offsite surface waters in Rocklow Creek were reported between **<5 mg/L** (SWC_Down, SWC_Down 2) and **7 mg/L** (SWC_2).

The results were below the SAC of 50mg/L TV and are generally consistent with historical results.

6.4 INORGANIC ANALYTES

Nutrients

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

6.4.1 Ammonia

A separate summary table for ammonia with a comparison against pH modified 95% trigger value is provided within **Table 10** attached.

Groundwater

Ammonia was measured within groundwater monitoring bores between **1.05 mg/L** (BH18) and **298 mg/L** (BH-1c). All groundwater wells exceeded the site assessment criteria for the June 2023 monitoring period. Results were generally consistent with historical values.

Surface Water

Ammonia in onsite surface water samples was reported as **0.96 mg/L** (SWP-1).

Ammonia in offsite surface water samples associated with Rocklow Creek ranged from **0.2 mg/L** (SWC_UP) to **0.69 mg/L** (SWC_DOWN). All results were above the ecological stressor value of 0.2 mg/L.

Leachate

Ammonia in leachate was reported between **344mg/L** (LP1). Although high ammonia concentrations are expected in untreated leachate ammonia concentrations continue to trend down since the implementation of the new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021.

6.4.2 Nitrate

Groundwater

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **5.94 mg/L** (BH-14). BH3 and BH14 exceeded the SAC.

Surface Water

The nitrate concentration of the onsite surface water SWP-1 in the June 2023 monitoring period was **<0.01 mg/L** (SWP-1).

Nitrate concentration for Rocklow Creek surface water samples ranged between **<0.01 mg/L** (SWC-2, SWC-DOWN, SWC-DOWN_2) and **0.14 mg/L** (SWC_UP).

All sites returned results below the 95% TV of 0.7mg/L.

Leachate

The June 2023 Nitrate result of **0.1mg/L** was reported in sample LP1.

6.4.3 Nitrite

Groundwater

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **0.13 mg/L** (BH-3). Results generally continue to trend downward. No exceedances to the TV of 0.7mg/L were reported.

Surface Water

Onsite SWP-1 was reported **0.04 mg/L**. Rocklow Creek samples reported results **0.02 mg/L** in all samples. Results were generally consistent with previous data and below the accepted TV.

Leachate

Leachate tank sample LP1 reported a result of **6.96 mg/L** indicating an upward trend since September 2022.

Anions

6.4.4 Chloride

Groundwater

Results for Chloride in groundwater were reported between **16 mg/L** in (BH-18) and **970 mg/L** (BH-1c). The results are consistent with historical data.

Surface Water

Chloride results for surface water SWP-1 was **173 mg/L**. The results are below the accepted TV and are generally consistent with historical data. Rocklow Creek samples reported results between **6,870 mg/L** (SWC_2) and **12,100 mg/L** (SWC_Down).

Leachate

Chloride at the Leachate Tank (LP-1) was **1,810 mg/L**. Results were generally consistent with previous data.

6.4.5 Fluoride

Groundwater

Results for Fluoride in groundwater were reported between **0.1 mg/L** (BH-4) and **0.8 mg/L** (BH-22). Results were consistent with historical data.

Surface Water

Fluoride result for Onsite surface water was **0.3 mg/L** (SWP-1). The result was generally consistent with historical data.

Offsite surface water results ranged from of **0.6 mg/L** (SWC_2) and **0.9 mg/L** (SWC_Down). Results were generally consistent with historical data.

Leachate

The fluoride result at the Leachate tank (LP-1) was **0.3 mg/L**.

6.4.6 Sulphate

Groundwater

Results for Sulphate in groundwater were reported between **10 mg/L** (BH-1C and BH-18) and **366 mg/L** (BH-15). Results were generally consistent with previous data.

Surface Water

Sulphate in onsite surface water was **39 mg/L** (SWP-1). Levels were consistent with previous data.

Sulphate in offsite surface water associated with Rocklow Creek ranged from **908 mg/L** (SWC_2) and **2,000 mg/L** (SWP_Down). Sulphate levels are generally consistent with previous data.

Leachate

Sulphate level at the leachate tank (LP-1) was **50 mg/L**. Results are generally consistent with historical data.

6.4.7 Total Alkalinity

Surface Water

Total Alkalinity at SWP-1 was **431 mg/L**. Historical data indicates Alkalinity has been stable.

Leachate

Total Alkalinity in Leachate (LP-1) was **2,780 mg/L**. Results were consistent with historical data.

6.4.8 Bicarbonate Alkalinity

Groundwater

Bicarbonate in groundwaters ranged from **267 mg/L** (BH-18) to **2,600 mg/L** (BH-1C). Results were 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 leachate sampling points. Concentrations of dissolved manganese in groundwater were reported between **0.06 mg/L** (BH-19r) and **0.71 mg/L** (BH-9). Results were generally consistent with historical data.

Surface Water

The total manganese concentration at SWP-1 was from **0.12 mg/L**. Results were consistent with historical data.

Leachate

Total Manganese concentrations in leachate was reported as **0.1 mg/L** (Leachate Tank LP-1). Manganese concentrations for all samples are below the adopted TV (1.9 mg/L 95% of Species - freshwater).

6.4.10 Iron (Total Fe)

Iron was measured as total Iron in surface water samples and Leachate Tank.

Surface Water

Concentrations of total iron for onsite surface water LP1 was reported as **0.16 mg/L**.

Rocklow Creek samples reported results between **0.34 mg/L** (SWC_Down) and **0.88 mg/L** (SWC_2).

Leachate

Concentration of iron at the leachate Tank (LP-1) was reported between **1.29 mg/L**.

6.4.11 Iron (Dissolved Fe)

Groundwater

Dissolved iron was measured within groundwater and surface water sampling points. Groundwater results were reported between **0.05 mg/L** (BH14) and **11.6 mg/L** (BH1C).

6.4.12 Calcium

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

Groundwater

Groundwater results were reported between **60mg/L** (BH-18) and **213 mg/L** (BH13).

Surface Water

Calcium in onsite surface was measured at **73 mg/L** (SWP-1).

Calcium in offsite surface waters ranged from **155 mg/L** (SWC_2) to **288 mg/L** (SWC_Down).

Leachate

Calcium concentration in Leachate (LP-1) was **39 mg/L**.

6.4.13 Potassium

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

Groundwater

Groundwater results were reported between **10 mg/L** (BH-18) and **207 mg/L** (BH1c). The potassium levels for groundwaters were generally consistent with historical data.

Surface Water

Potassium levels for the offsite groundwaters in Rocklow Creek ranged from **122 mg/L** (SWC_2) and **244 mg/L** (SWC_Down).

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 June 2023 monitoring period at the following concentrations:

Groundwater

TOC levels ranged between **10 mg/L** (BH-4) and **186 mg/L** (BH-1c). Results were consistent with historical data.

Surface Water

TOC levels in the onsite surface waters were determined as **25 mg/L** (SWP-1).

TOC levels in the offsite surface waters ranged between **8 mg/L** (SWC-DOWN_2) and **10 mg/L** (SWC_2).

Leachate

TOC concentration in leachate was **403 mg/L** (LP-1 Leachate Storage Tank 01/03/2023). The results are generally consistent with previous data

7.0 DUST GAUGE RESULTS

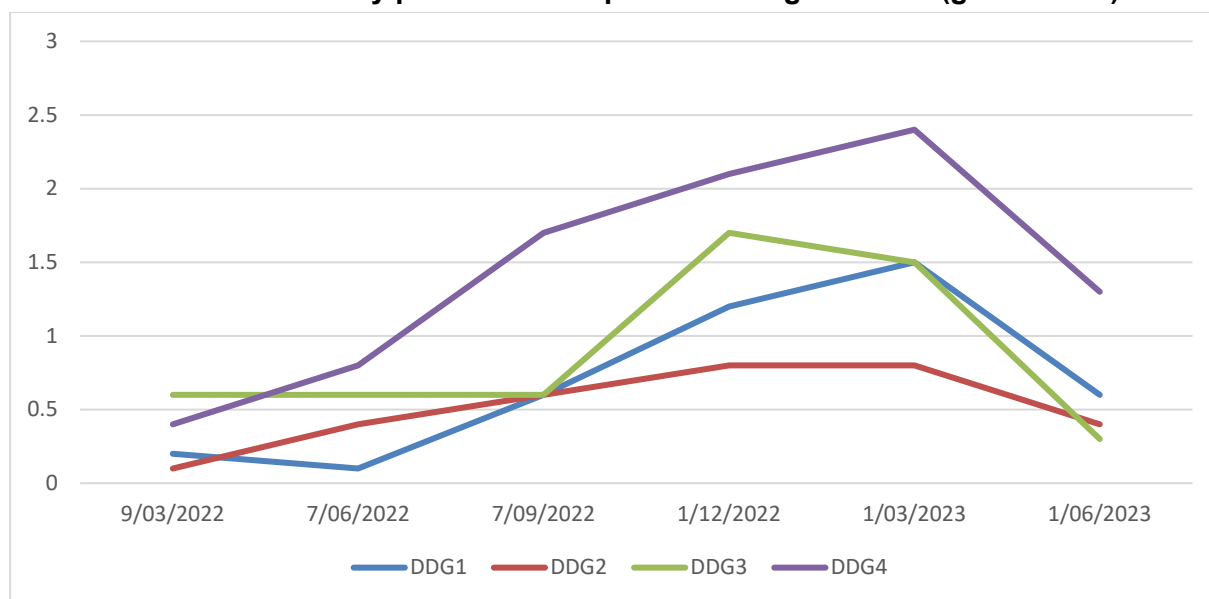
The below table provides the results of the dust depositions results. A total of four (4) dust collectors were onsite for one (1) month between **4th May 2023** and **1st June 2023**, in general accordance with AS3580.10.1. A summary of results is provided in **Table 7** below.

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	0.6	Satisfactory
DDG2		0.4	Satisfactory
DDG3		0.3	Satisfactory
DDG4		1.3	Satisfactory

Results for depositional dust during the June 2023 quarterly monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m²/month**.

Chart 1: Monthly plot of Dust Deposition Gauge Results (g.m².month)



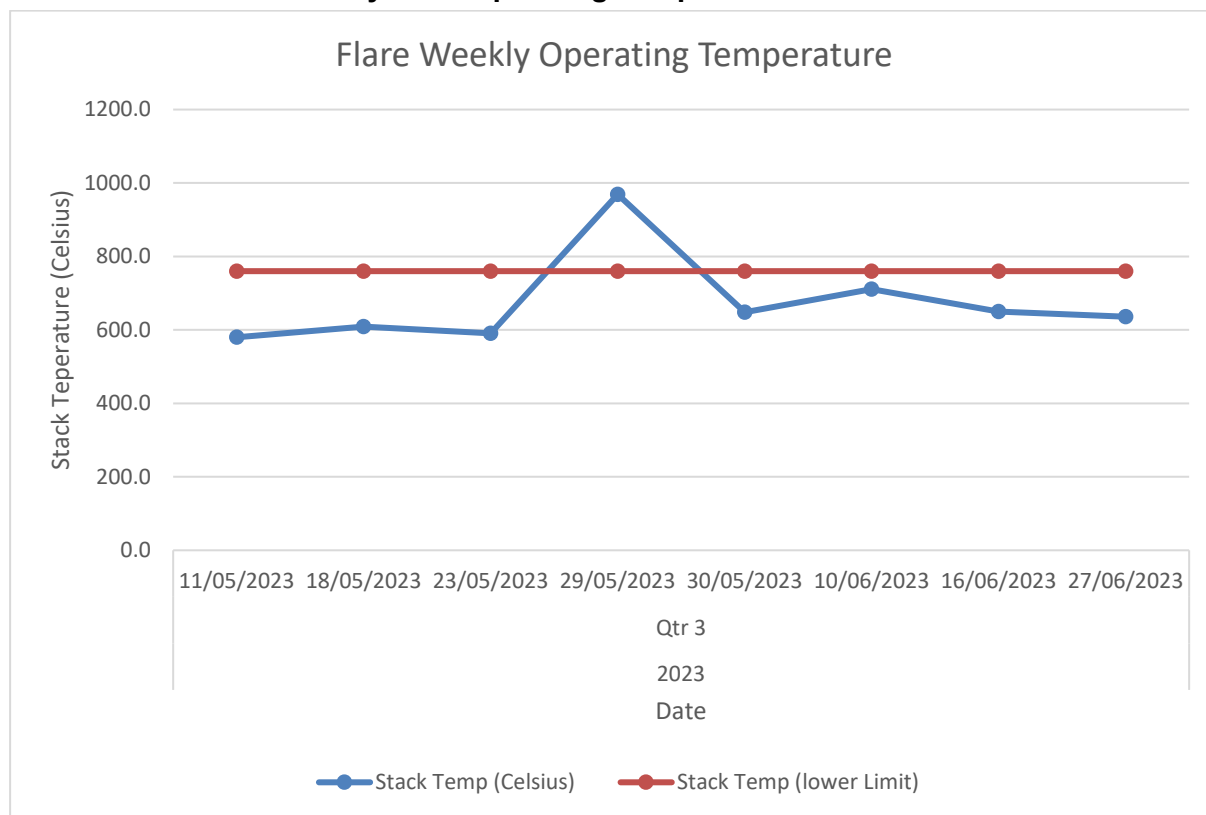
The results were considered satisfactory. Dust gauge locations are provided in **Figure 2** attached. It is recommended that monitoring is continued in accordance with EPL 5984.

Table 8: Summary of Flare Operating Temperatures

Years	Quarter	Date	Stack Temp (Celsius)	Stack Temp (lower Limit)
2023	Qtr 3	11/05/2023	580	760
		18/05/2023	609	760
		23/05/2023	591	760
		29/05/2023	969	760
		10/06/2023	711	760
		16/06/2023	650	760
		27/06/2023	636	760
		30/05/2023	648	760
2023 Q3 Average			674.25	-

Data source: LGI (May-June, 2023). Biogas Monthly Reports – Dunmore.

Chart 2: Weekly Flare Operating Temperatures June Quarter 2023



Data source: LGI (May-June 2023). Biogas Monthly Reports – Dunmore.

Weekly average operating temperatures supplied by LGI displayed typical variation associated with a continuous process. Weekly operating temperatures at the Flare were generally below the Operational temperature lower limit of 760 degrees.

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

8.0 METHANE MONITORING

8.1 SURFACE GAS METHANE

The surface gas monitoring for the June 2023 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 June 2023 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 June 2023 monitoring period reported satisfactory results. Water results including leachate, groundwater, onsite and offsite surface water reported concentrations of analytes within the range historical values.

Data from the last four (4) years have been tabulated and presented **Charts 3-61** attached.

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

All dust gauges reported satisfactory results over the June 2023 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 temperatures below the minimum operating temperature throughout the June 2023 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 June 2023 monitoring results indicated generally consistent results with no significant change in environmental conditions at the Site during the past 3 months. The monitoring period reported continued elevated results above the criteria for; ammonia, heavy metals, nitrate, sulphate and salinity (EC) within all groundwater bores. Future sampling events should continue to monitor the key indicators of leachate within surface and groundwaters, especially concentration of ammonia and nitrate in accordance with the EPL.

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 June 2023 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 all groundwater bores. This was considered to be consistent with historical values;
- All surface water samples of Rocklow Creek reported for ammonia above the ecological stressor values of 0.2mg/L;
- Flare operating temperatures were generally below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the June 2023 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.

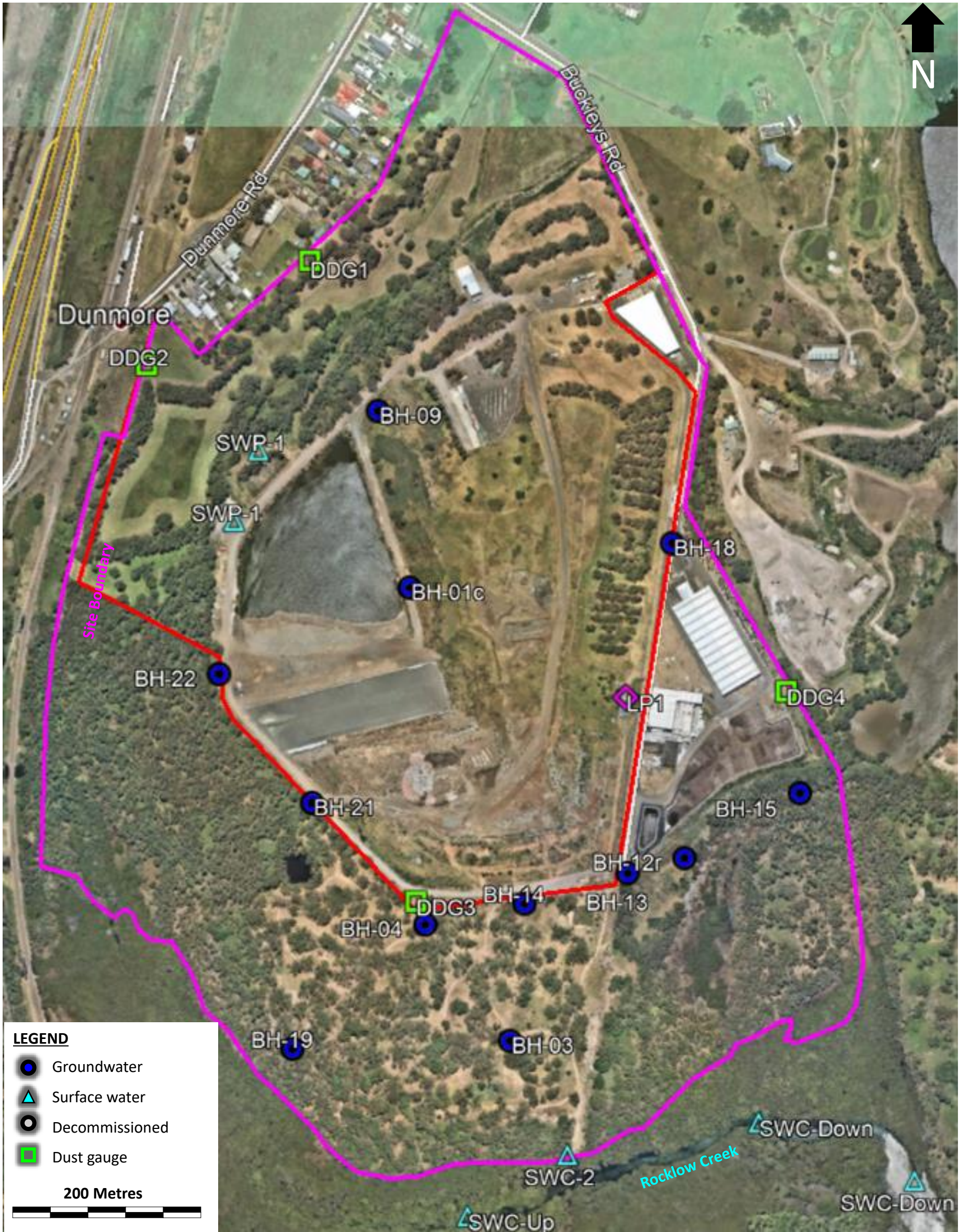
This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between ENRS and the Client. ENRS accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in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

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		

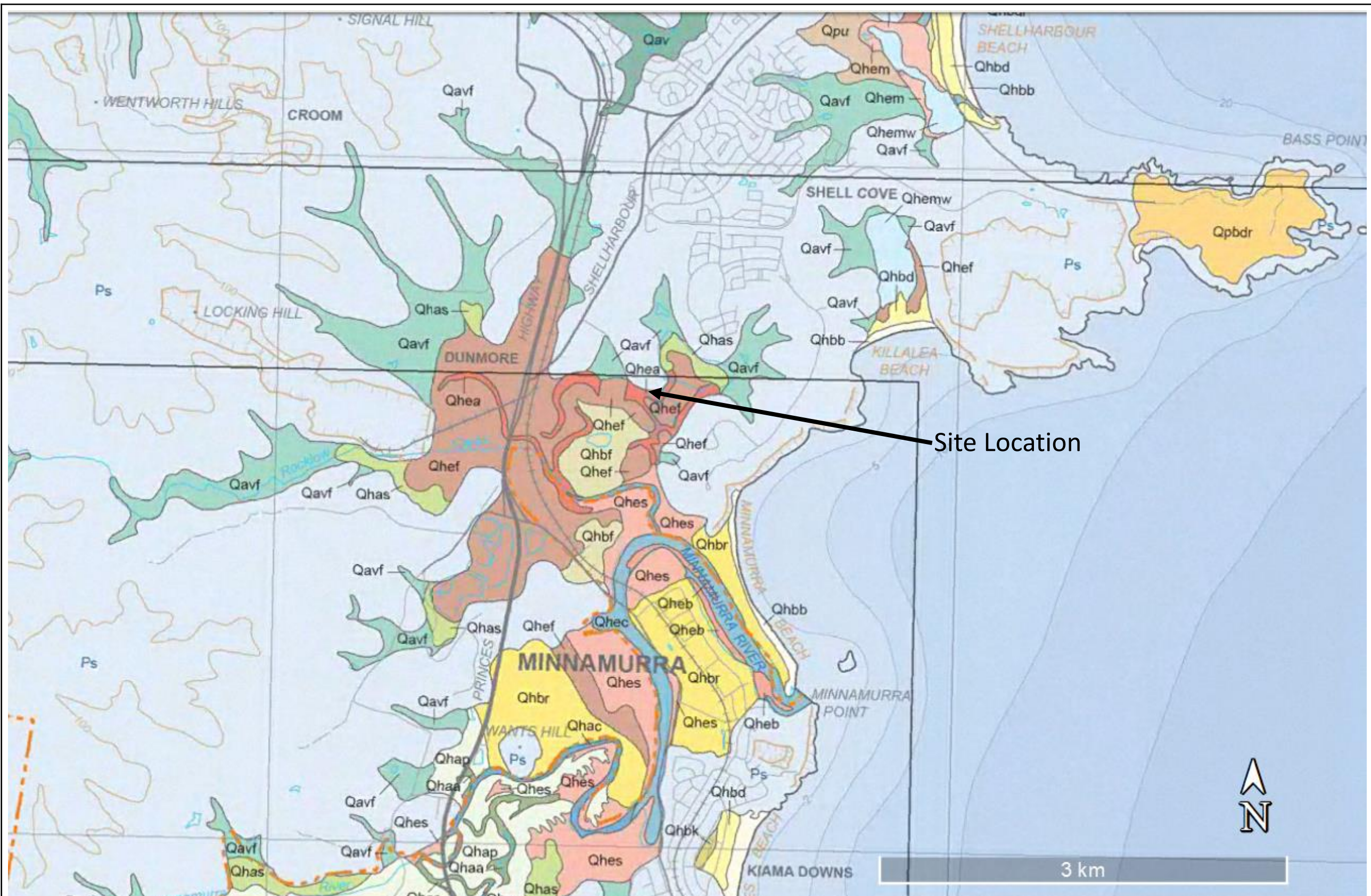


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Client:	Shellharbour City Council	Drawn:	PL	Figure:	3
Project:	ENRS0033	Source:	SixMaps	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	NA	Title:	Surface Gas Sample transects
		Status:	Rev 1		

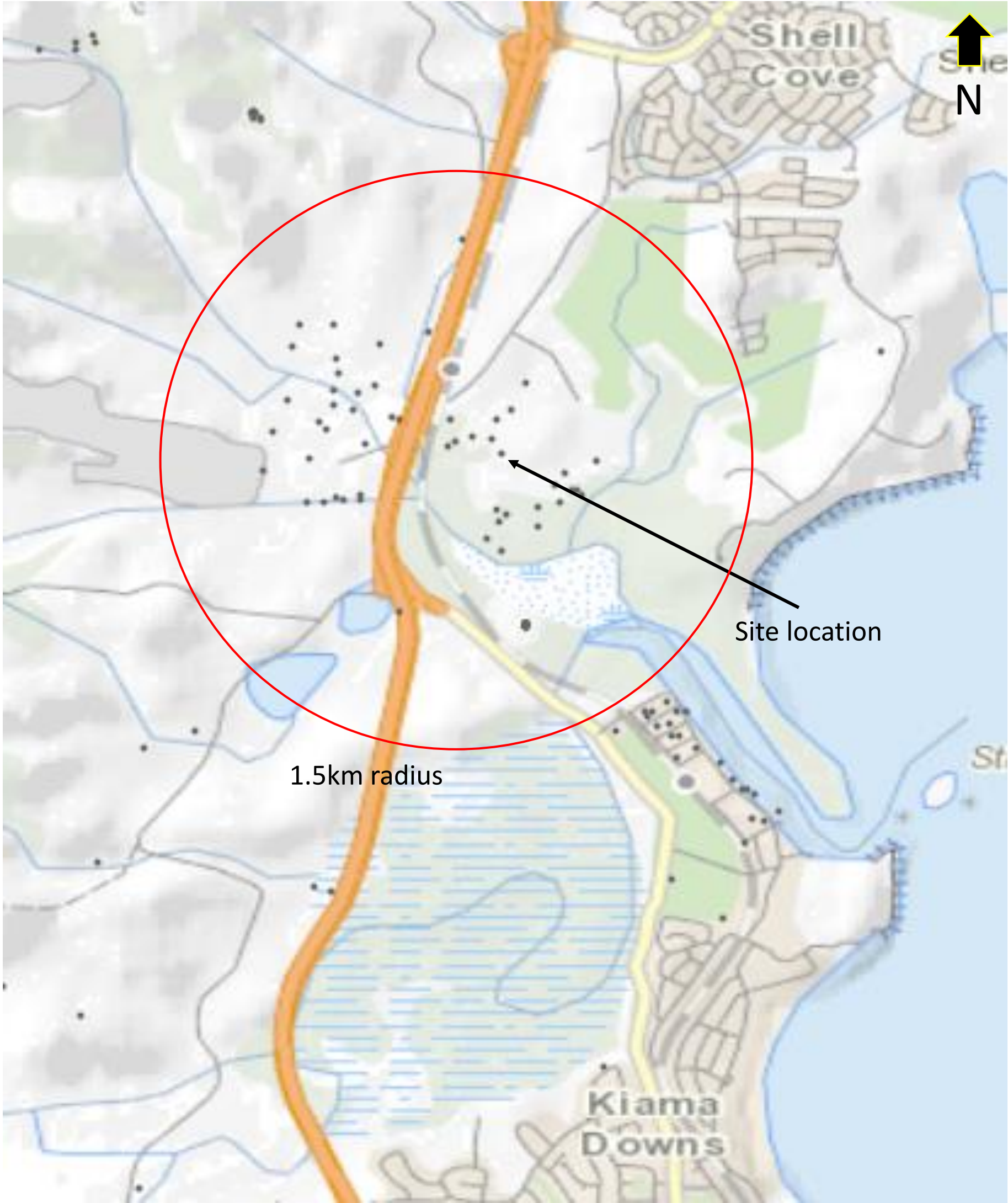


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Client:	Shellharbour City Council	Drawn:	PL	Figure:	4
Project:	ENRS0033	Source:	Geological Survey of NSW	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	See figure	Title:	Site Geology
		Status:	Rev 1		



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

TABLES

TABLE 9: Total Concentration Results
Quarterly Water Monitoring Results - June 2023: Dunmore Recycling and Waste Depot

GILs - Trigger Values for Freshwater (Protection of 95% of Species) ^A					-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	-	0.7	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-	-	-	-
GILs - Trigger Values for Marine Water (Protection of 95% of Species) ^A					-	-	-	-	-	-	-	-	-	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Australian Drinking Water Guidelines (2018) ^C				Health	-	-	-	-	-	0.5	-	-	1.5	-	3	50	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-	-	-	-
				Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	-	-	-	-	-	250	-	-	-	5	6.5 - 8.5	-	-	-	-	-
Lab Report No.	Sample No.	Sample type	EPA No.	Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Nitrite as N	Nitrate as N	Total Organic Carbon	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	pH	Electrical Conductivity (Non Compensated)	Temperature	Standing Water Level	Total Insoluble Matter	Comments
Units					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	NTU	pH	µS/cm	°C	mbgl	mbgl	-
Laboratory PQL					1	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	1	1	1	1	0.01	0.1	5	0.1	0.01	1	0.1	0.01	0.1	-
EW2302416001	BH1c	Groundwater	3	Jun 2023	970	116			207	0.10		11.60	0.5	298.00	< 0.01	< 0.01	186	2,600	2,600	< 10					7.00	7,945		3.09		-
EW2302416002	BH3	Groundwater	5	Jun 2023	123	101			31	0.08		0.27	0.2	12.30	0.13	1.37	22	370	370	146					7.50	1,200	25.9	3.08		-
EW2302416003	BH4	Groundwater	6	Jun 2023	35	94			16	0.10		2.59	0.1	2.04	< 0.01	< 0.01	10	310	310	70					7.40	751	18.9	4.28		-
EW2302416004	BH9	Groundwater	18	Jun 2023	516	181			76	0.71		0.89	0.6	141.00	< 0.01	0.03	76	1,790	1,790	50					7.20	4,120	18.0	3.86		-
EW2302416005	BH12r	Groundwater	17	Jun 2023	246	185			27	0.53		9.38	0.3	3.59	0.07	0.39	24	571	571	178					6.80	1,930	21.1	4.25		-
EW2302416006	BH13	Groundwater	10	Jun 2023	308	213			29	0.41		3.40	0.2	9.59	0.02	0.37	38	812	812	67					6.80	2,260	21.9	4.22		-
EW2302416007	BH14	Groundwater	11	Jun 2023	36	106			12	0.12		0.05	0.7	1.40	0.06	5.94	12	422	422	50					6.90	958	21.1	4.64		-
EW2302416008	BH15	Groundwater	7	Jun 2023	340	112			138	0.26		9.12	0.2	8.74	< 0.01	0.01	39	507	507	366					7.00	2,250	17.1	0.68		-
EW2302416010	BH18	Groundwater	25	Jun 2023	16	60			10	0.07		1.31	0.2	1.05	< 0.01	< 0.01	14	267	267	< 10					6.80	511	20.7	2.26		-
EW2302416009	BH19r	Groundwater	16	Jun 2023	38	74			49	0.06		1.06	0.2	1.85	< 0.01	< 0.01	14	336	336	39					7.40	731	18.9	4.54		-
EW2302416011	BH21	Groundwater	23	Jun 2023	353	125			16	0.47		0.76	0.4	3.60	< 0.01	< 0.01	38	854	854	114					7.20	2,550	22.6	3.01		-
EW2302416012	BH22	Groundwater	24	Jun 2023	183	87			18	0.07		0.96	0.8	4.11	< 0.01	< 0.01	26	424	424	224					7.30	1,580	19.2	2.40		-
EW2302415001	SWP1	Surfacewater	1	Jun 2023	173	73	33	156	17	0.12	0.16	< 0.05	0.3	0.96	0.04	< 0.01	25	431	431	39	5.90		< 5	1.40	7.70	1,080	13.4			-
EW2302415003	SWC_up	Surfacewater	20	Jun 2023	7,090	180	465	3,840	145	0.07	0.79	< 0.05	0.7	0.20	0.02	0.14	9	139	139	968	6.71		5	7.40	7.20	18,800	15.4			-
EW2302415002	SWC_2	Surfacewater	19	Jun 2023	6,870	155	380	3,280	122	0.07	0.88	< 0.05	0.6	0.29	0.02	0.13	10	141	141	908	6.32		7	8.00	7.20	17,400	15.0			-
EW2302415004	SWC_down	Surfacewater	21	Jun 2023	12,100	288	765	6,440	244	0.05	0.34	< 0.10	0.9	0.69	0.02	0.05	7	151	151	2,000	6.05		< 5	4.00	7.20	32,600	16.9			-
EW2302415005	SWC_down_2	Surfacewater	22	Jun 2023	9,680	229	592	5,000	210	0.06	0.53	< 0.10	0.8	0.28	0.02	0.08	8	144	144	1,560	6.55		< 5	5.10	7.30	25,000	15.9			-
EW2302414001	Leachate Storage Tank LP1	Leachate	2	Jun 2023	1,810	39			375	0.10	1.29		0.3	344.00	6.96	< 0.10	407	1,840	2,780	< 50	6.22	60.0			9.30	7,380	13.8			-

TABLE 10: Ammonia Results
March 2023 Quarter: Dunmore Recycling and Waste Depot

Ammonia Results compared against the pH Modified Trigger Values - ANZACC (2000) Table 8.3.7				pH	Assessment Criteria		Result	Comment
				pH (tab)	pH Modified Trigger Values - 95% Freshwater	pH Modified Trigger Values - 95% Marine Water	Ammonia As N	
Total Concentrations - PQL				0.1	-	-	0.01	
Lab Report No.		Sample ID.	Date	pH	mg/L	mg/L	mg/L	
EW2300850001	Groundwater	BH1c	2/03/2023	7.00	2.180	3.560	298	> TV
EW2300850002		BH3	2/03/2023	7.50	1.161	2.150	12	> TV
EW2300850003		BH4	2/03/2023	7.40	1.750	2.490	2	> TV
EW2300850004		BH9	2/03/2023	7.20	1.990	3.200	141	> TV
EW2300850005		BH12r	2/03/2023	6.80	2.330	4.550	4	> TV
EW2300850006		BH13	2/03/2023	6.80	2.330	4.550	10	> TV
EW2300850007		BH14	2/03/2023	6.90	2.260	4.240	1	< TV
EW2300850008		BH15	2/03/2023	7.00	2.180	3.560	9	> TV
EW2300850010		BH18	2/03/2023	6.80	2.330	4.550	1	< TV
EW2300850009		BH19r	2/03/2023	7.40	1.750	2.490	2	> TV
EW2300850011		BH21	2/03/2023	7.20	1.990	3.200	4	> TV
EW2300850012		BH22	2/03/2023	7.30	1.880	2.840	4	> TV
EW2300849001	Rocklow Creek Surface Water	SWP1	2/03/2023	7.70	1.320	1.560	1	< TV
EW2300849003		SWC_up	2/03/2023	7.20	1.990	3.200	0	< TV
EW2300849002		SWC_2	2/03/2023	7.20	1.990	3.200	0	< TV
EW2300849004		SWC_down	2/03/2023	7.20	1.990	3.200	1	< TV
EW2300849005		SWC_down_2	2/03/2023	7.30	1.880	2.840	0	< TV

TABLE 11: Duplicate Groundwater Sample Results and QC Data

Lab Report No.				EW2302416010	EW2302416013	RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				2/06/2023	2/06/2023	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	16	16	✓ 0.00
Calcium	mg/L	1	5	60	61	✓ 1.65
Potassium	mg/L	1	5	10	10	✓ 0.00
Manganese	mg/L	0.001	0.005	0.067	0.068	✓ 1.48
Dissolved Iron	mg/L	0.05	0.25	1.31	1.33	✓ 1.52
Fluoride	mg/L	0.1	0.5	0.20	0.20	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	1.05	1.06	✓ 0.95
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	14	14	✓ 0.00
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	5	267	268	✓ 0.37
Total Alkalinity as CaCO ₃	mg/L	1	5	267	268	✓ 0.37
Sulfate as SO ₄ - Turbidimetric	mg/L	1	5	< 10	< 10	✓ 0.00
pH	pH	0.01	0.05	6.80	6.80	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	511	511	✓ 0.00
Temperature	°C	0.1	0.5	20.7	20.7	✓ 0.00
Standing Water Level	mbgl	-		2.26	2.26	✓ 0.00

TABLE 12: Duplicate Surface Water Results and QC Data

Lab Report No.				EW2302415001	EW2302415006	RPD
Sample No.				SWP1	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				1	QC2	
Date Sampled				2/06/2023	2/06/2023	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	173	6,790	✗ 190.06
Calcium	mg/L	1	5	73	172	✗ 80.82
Potassium	mg/L	1	5	17	140	✗ 156.69
Manganese	mg/L	0.001	0.005	0.116	0.077	✗ 40.41
Total Iron	mg/L	0.05	0.25	0.16	0.93	✗ 141.28
Dissolved Iron	mg/L	0.05	0.25	< 0.05	< 0.05	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.3	0.6	✗ 66.67
Ammonia as N	mg/L	0.01	0.05	0.96	0.32	✗ 100.00
Nitrite as N	mg/L	0.01	0.05	0.04	0.03	✓ 28.57
Nitrate as N	mg/L	0.01	0.05	< 0.01	0.11	✗ 166.67
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.03	0.14	✗ 129.41
Total Organic Carbon	mg/L	1	5	25	8	✗ 103.03
Bicarbonate Alkalinity as CaCO ₃	mg/L	1	5	431	141	✗ 101.40
Total Alkalinity as CaCO ₃	mg/L	1	5	431	141	✗ 101.40
Sulfate as SO ₄ - Turbidimetric	mg/L	1	5	39	915	✗ 183.65
Dissolved Oxygen	mg/L	0.01	0.05	5.90	6.32	✓ 6.87
pH	pH	0.01	0.05	7.70	7.20	✓ 6.71
Electrical Conductivity (Non Compensated)	µS/cm	1	5	1,080	17,400	✗ 176.62
Temperature	°C	0.1	0.5	13.4	15.0	✓ 11.27

CHARTS

Charts 3-18: Groundwater Charts

Chart 3: Ammonia as N (mg/L)

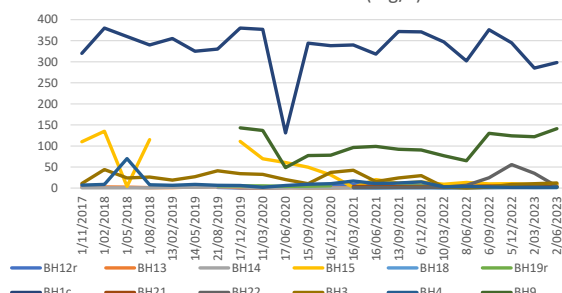


Chart 4: Bicarbonate Alkalinity as CaCO3 (mg/L)

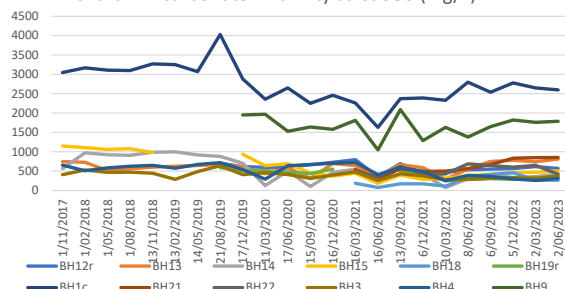


Chart 7: Calcium (mg/L)

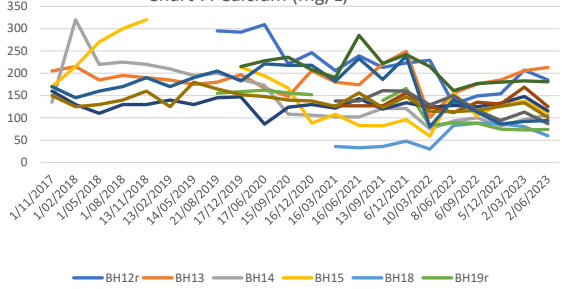


Chart 8: Chloride (mg/L)

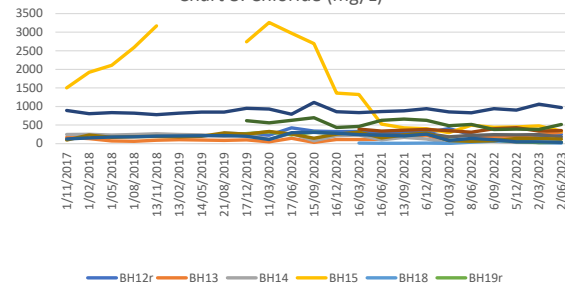


Chart 6: Depth to Water (mbgl TOC)

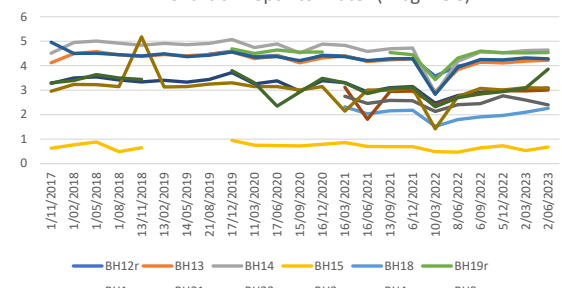


Chart 7: Dissolved Iron (mg/L)

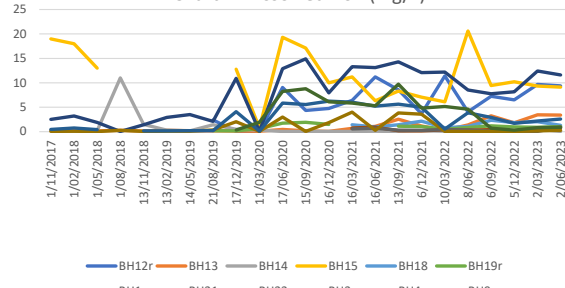


Chart 9: Electrical Conductivity (Us/cm)

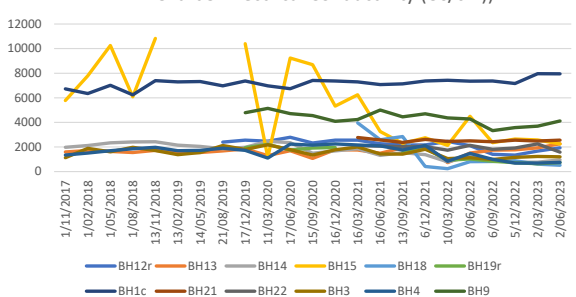
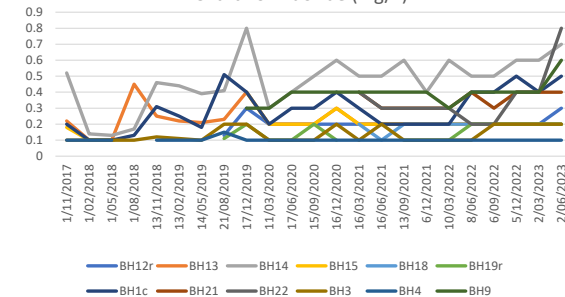
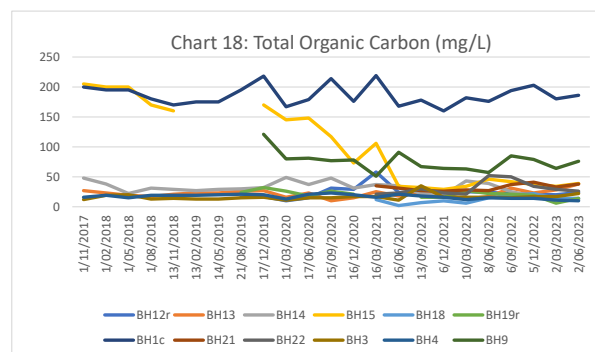
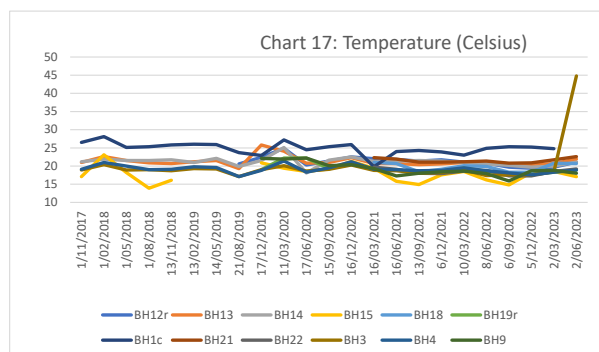
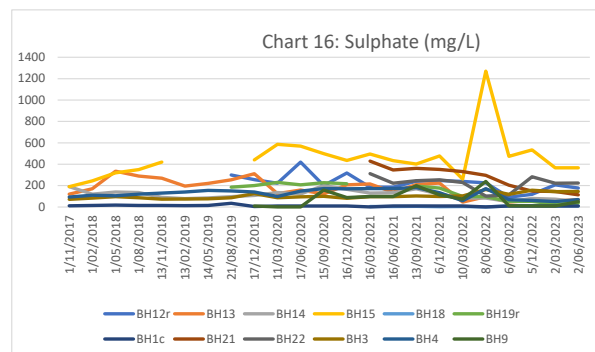
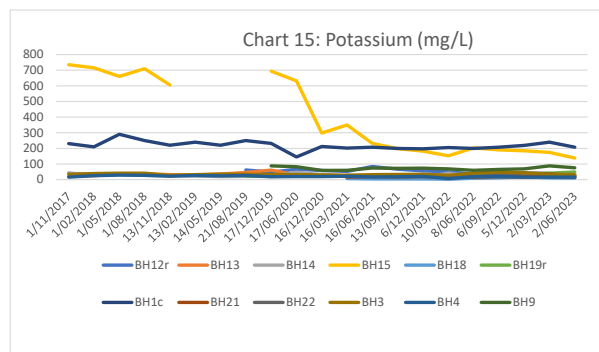
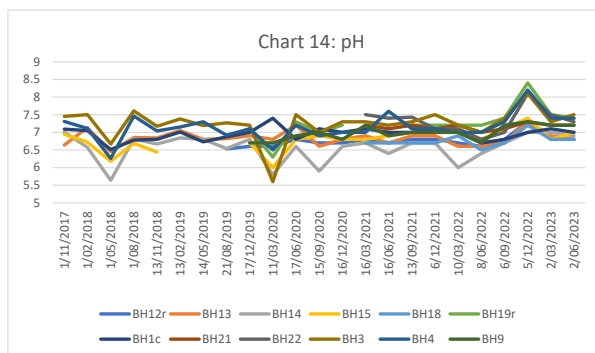
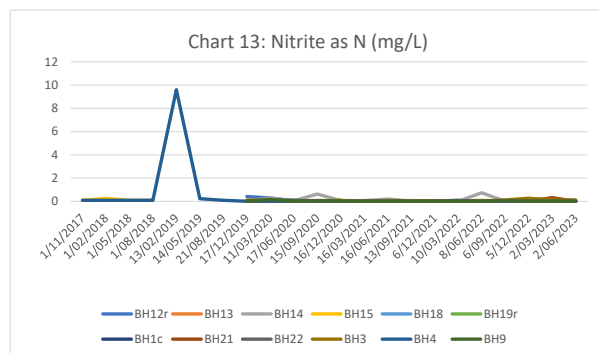
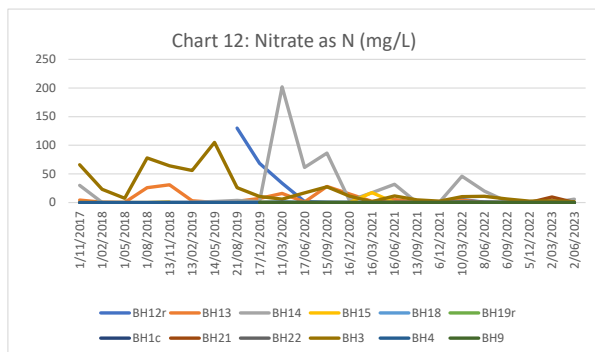
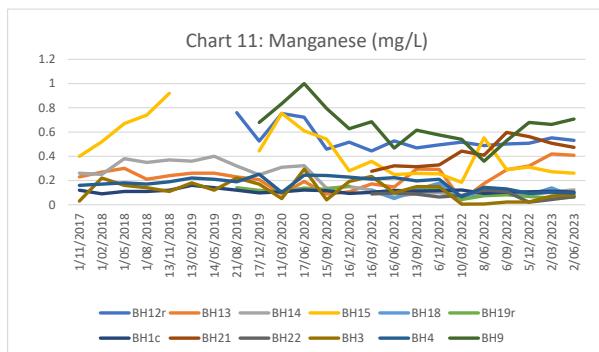


Chart 10: Fluoride (mg/L)





Charts 19-34: Onsite Surface Water Charts

Chart 19: Ammonia as N (mg/L)

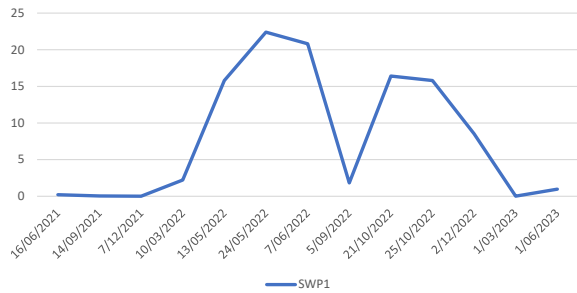


Chart 20: Calcium (mg/L)

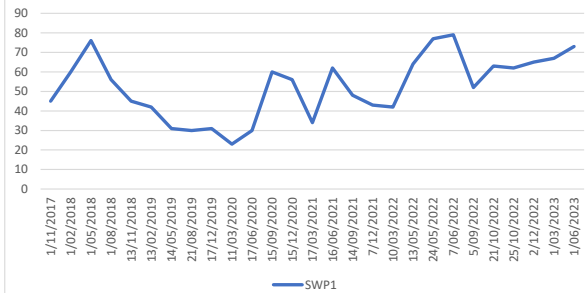


Chart 21: Chloride (mg/L)

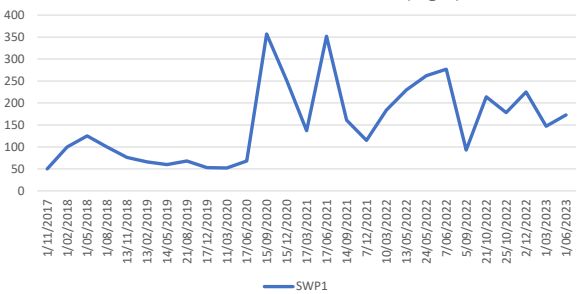


Chart 22: Fluoride (mg/L)

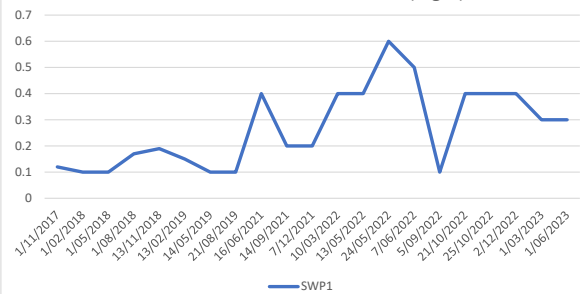


Chart 23: Dissolved Oxygen (mg/L)

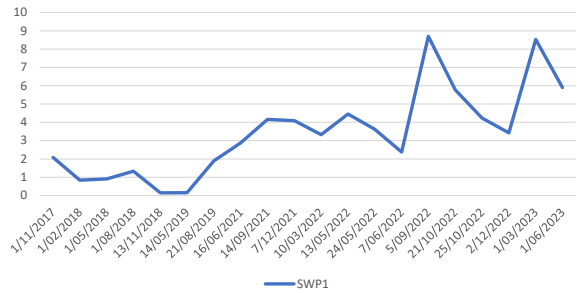


Chart 24: Electrical Conductivity (Us/cm)

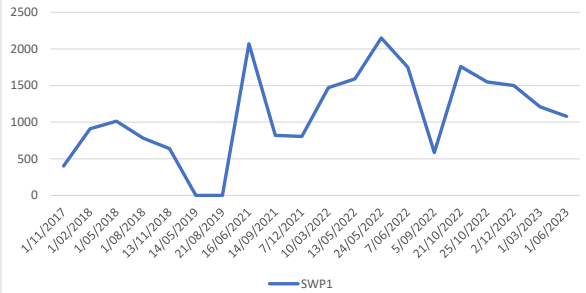


Chart 25: Manganese (mg/L)

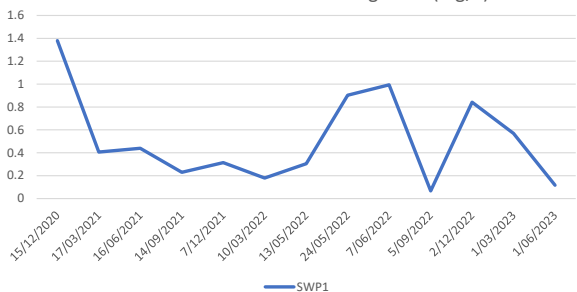
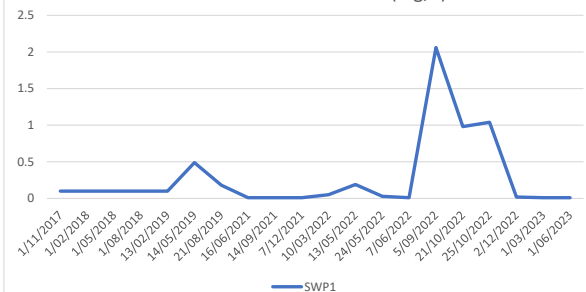
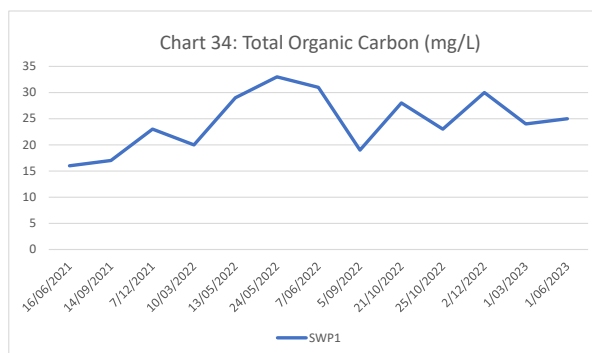
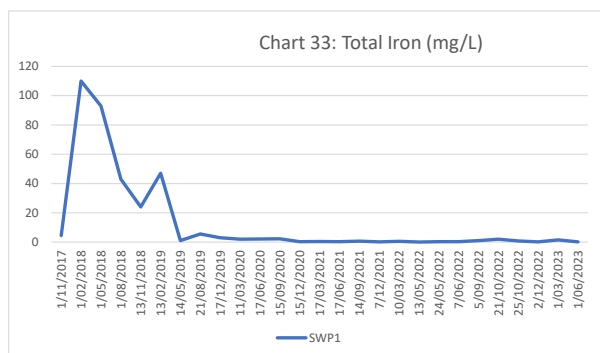
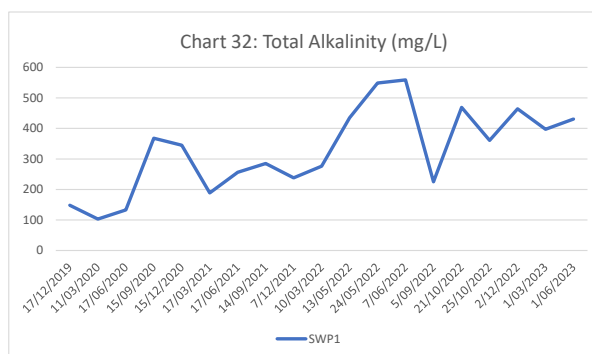
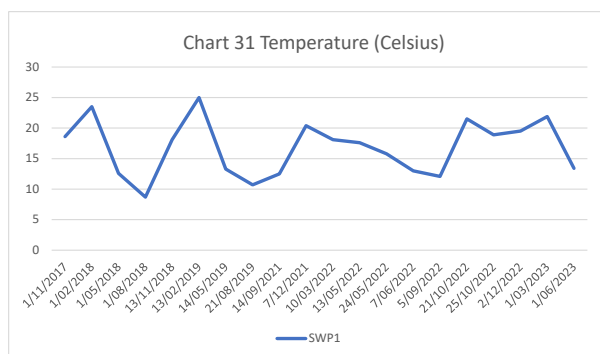
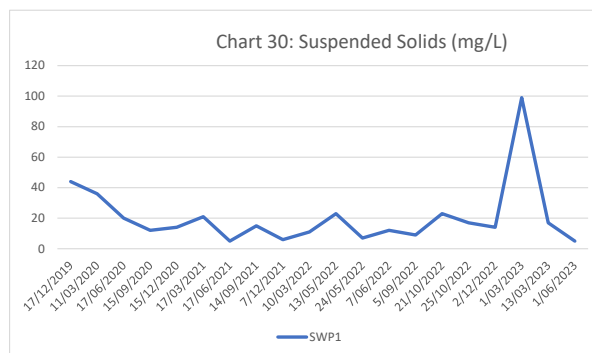
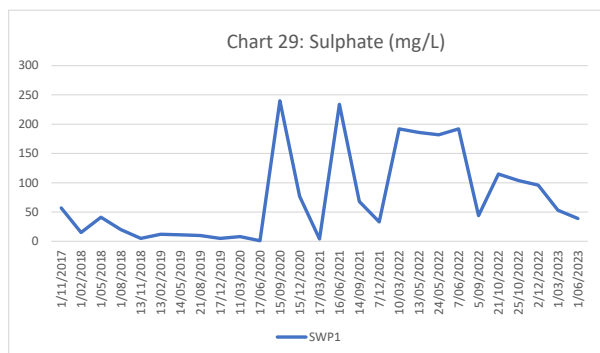
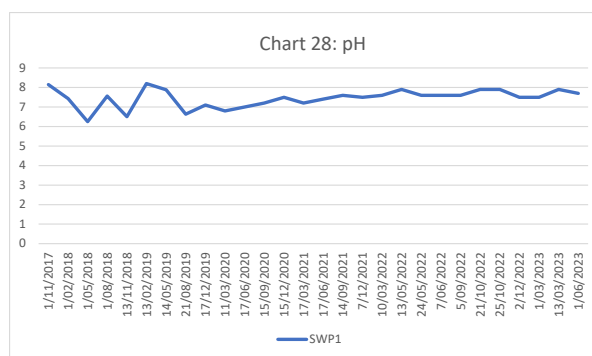
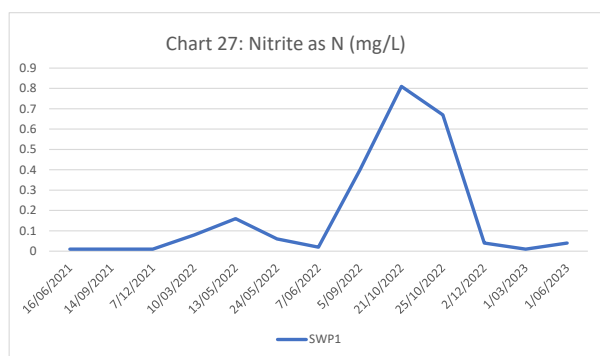


Chart 26: Nitrate as N (mg/L)





Charts 35-46: Rocklow Creek Surface Water Charts

Chart 35: Ammonia as N (mg/L)

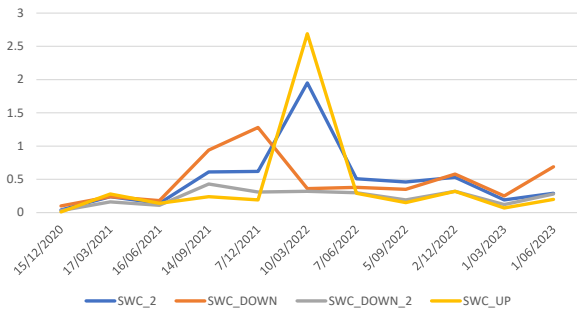


Chart 36: Calcium (mg/L)

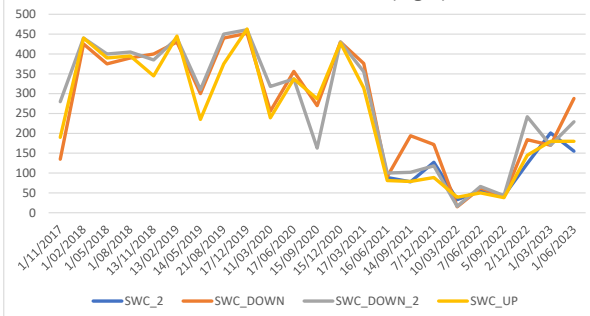


Chart 37: Dissolved Oxygen (mg/L)

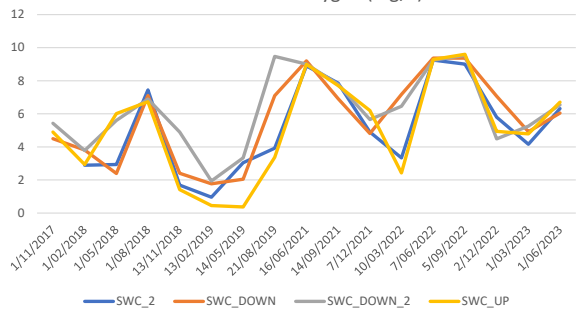


Chart 38: Electrical Conductivity (Us/cm)

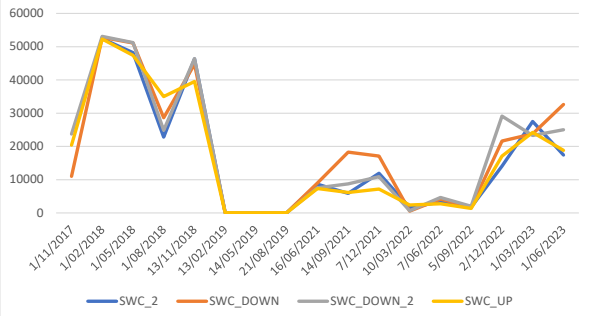


Chart 39: Fluoride (mg/L)

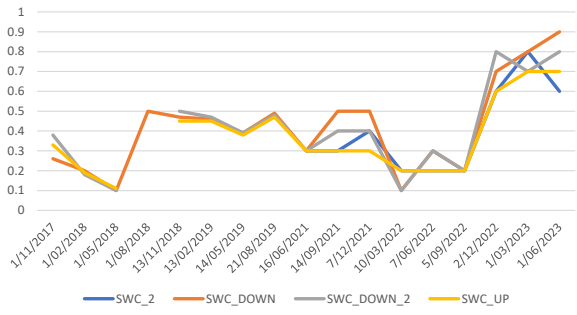


Chart 40: Nitrate as N (mg/L)

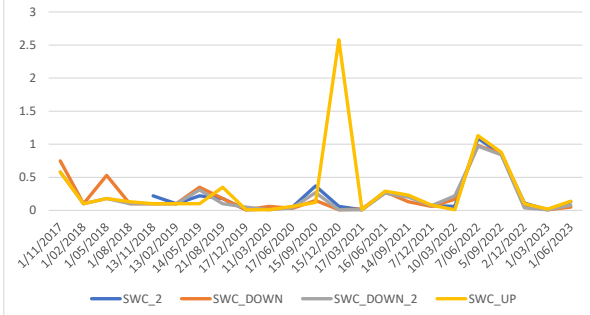


Chart 41: pH

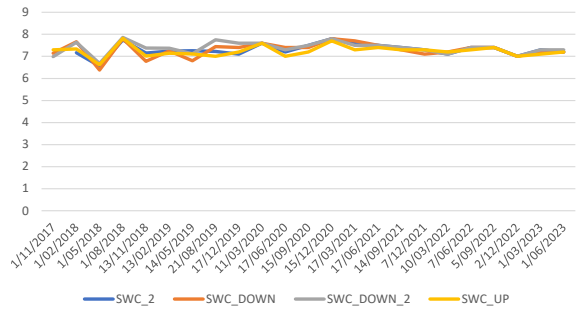
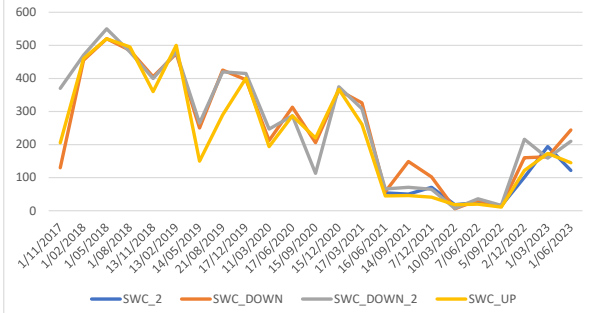
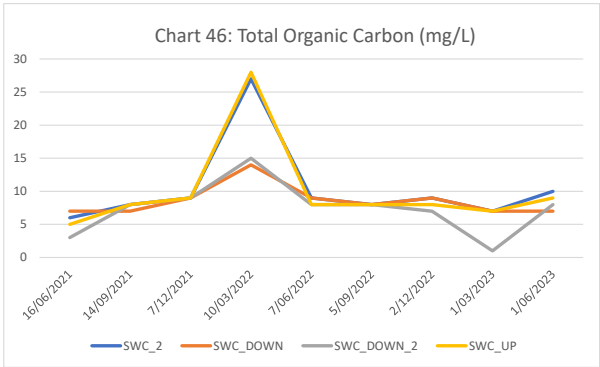
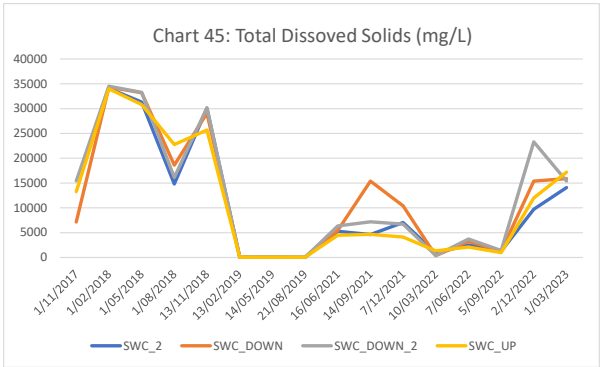
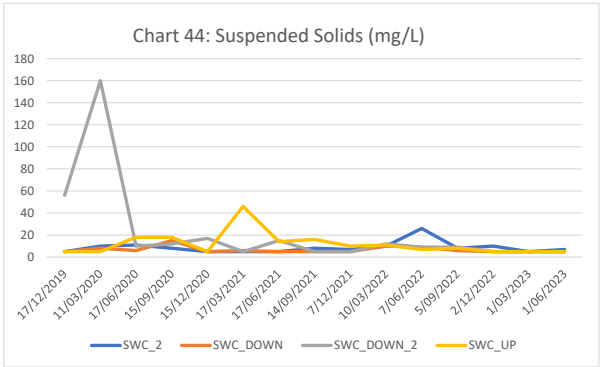
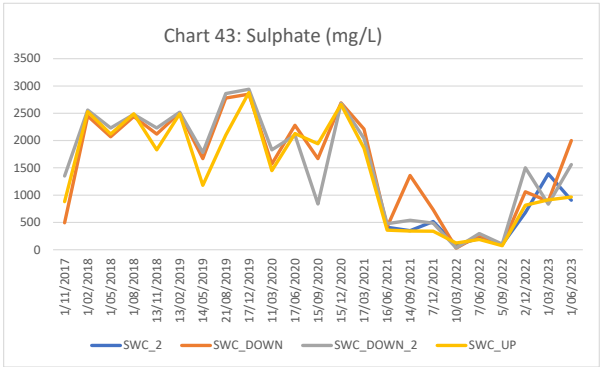


Chart 42: Potassium (mg/L)





Charts 47-61 Leachate Water Quality Charts

Chart 47: Ammonia as N (mg/L)

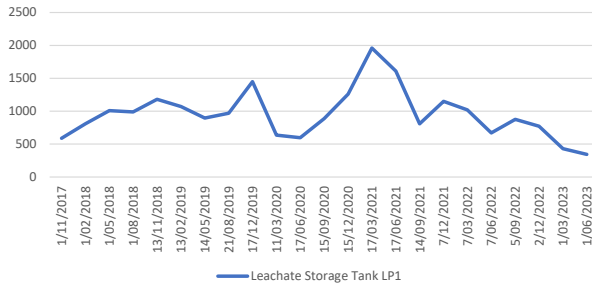


Chart 48: Calcium (mg/L)

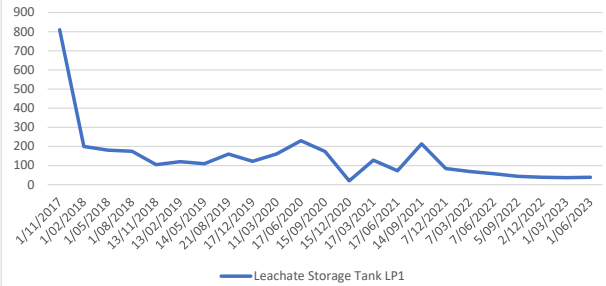


Chart 49: Chloride (mg/L)

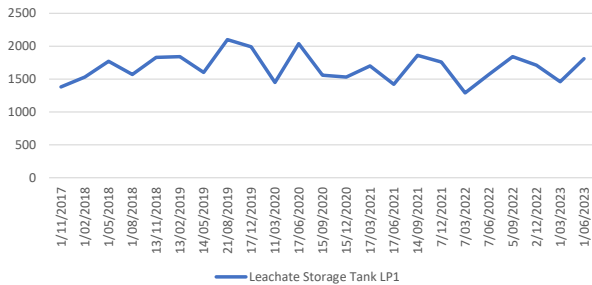


Chart 50: Dissolved Oxygen (mg/L)

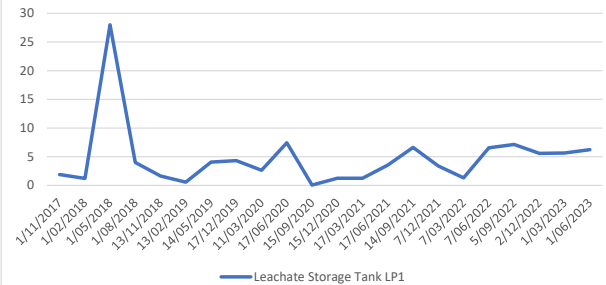


Chart 51: Electrical Conductivity (Us/cm)

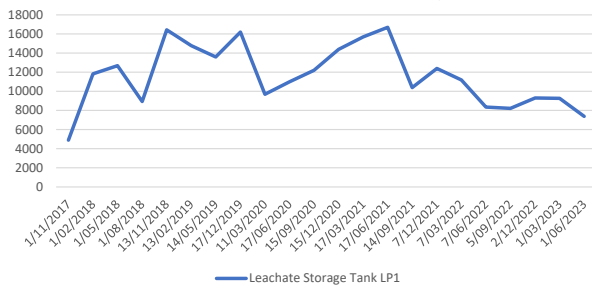


Chart 52: Fluoride (mg/L)

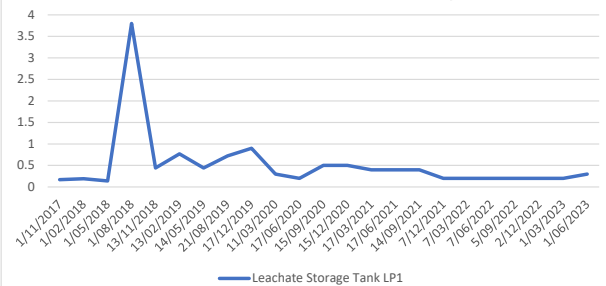


Chart 53: Manganese (mg/L)

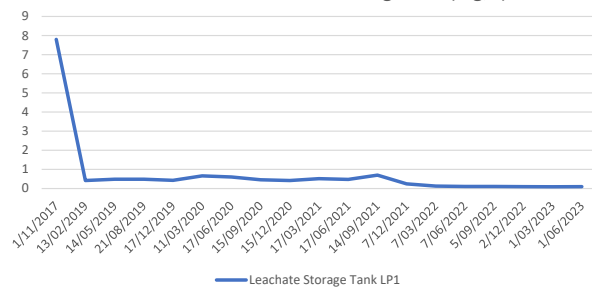
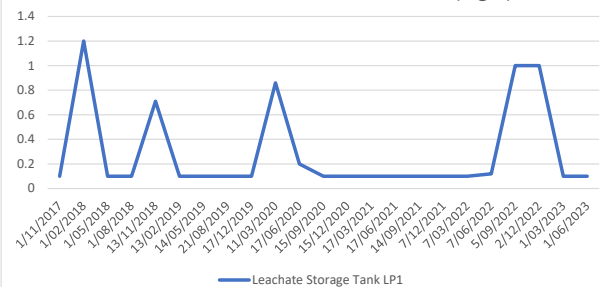
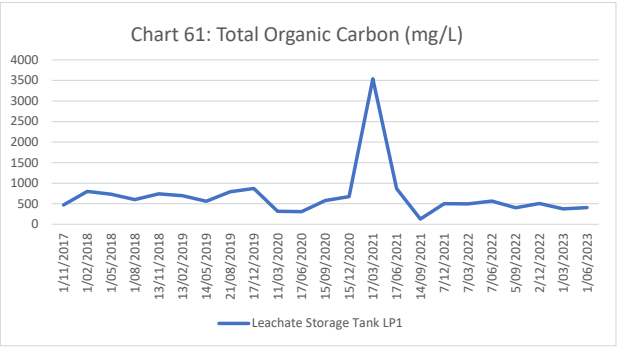
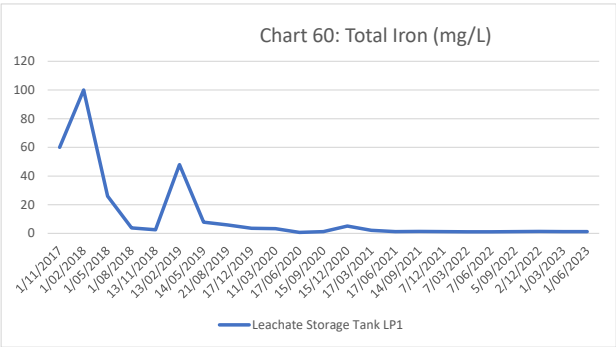
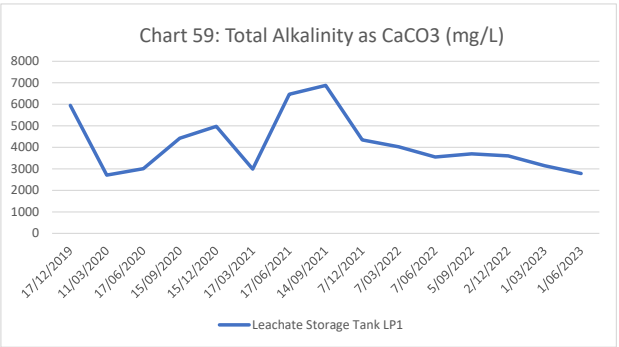
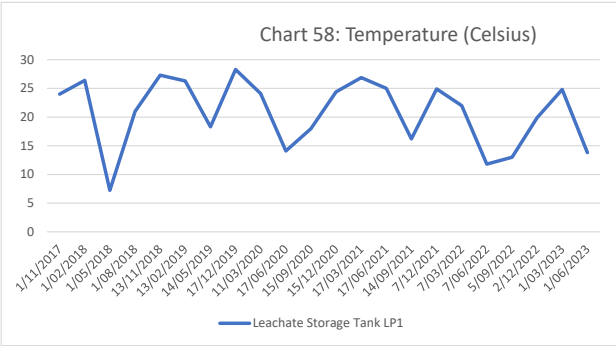
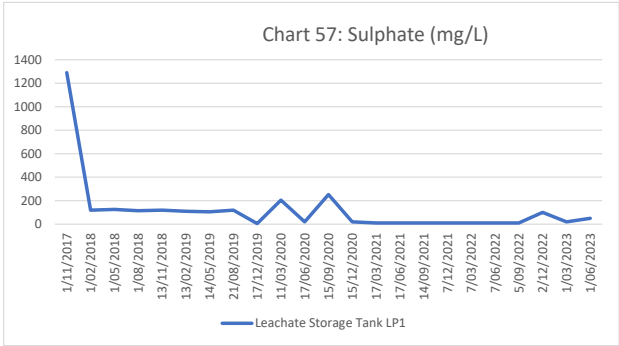
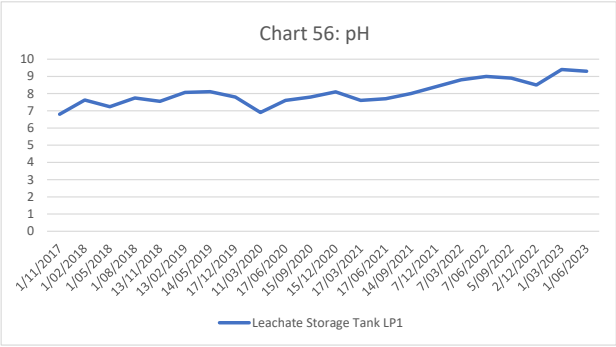
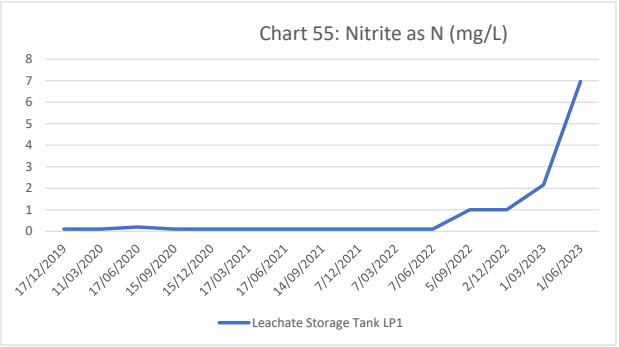


Chart 54: Nitrate as N (mg/L)





APPENDICES

Appendix A

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

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

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

Appendix B

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



CHAIN OF CUSTODY

ALS Laboratory: please tick →

□ Sydney: 277 Woodpark Rd, Smithfield NSW 2176
Ph: 02 3784 9595 E: samples.syd@alsenviro.com
□ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304
Ph: 02 4908 0433 E: samples.newcastle@alsenviro.com


□ Brisbane: 32 Shand St, Stafford QLD 4053
Ph: 07 3243 7322 E: samples.brisbane@alsenviro.com
□ Townsville: 14-15 Desma Ct, Bohle QLD 4818
Ph: 07 4706 0400 E: townsville.environmentals@alsenviro.com

□ Melbourne: 2-4 Wattle Rd, Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com
□ Adelaide: 2-1 Burma Rd, Poonaka SA 5065
Ph: 08 8359 0300 E: adelaide@alsenviro.com

□ Perth: 10 Hed Way, Malaga WA 6060
Ph: 08 9209 7655 E: samples.perth@alsenviro.com
□ Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2159 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 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):	Custody Seal intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No N/A Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No N/A Random Sample Temperature on Receipt: 5.6 °C Other comment:															
PROJECT:	Dunmore Quarterly Ground Waters EPL	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> 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
1	2	3	4	5	6	7													
1	2	3	4	5	6	7													
PROJECT MANAGER:	Ryan Stirling																		
SAMPLER:	Robert Delio / M. Santos	SAMPLER MOBILE:		RELINQUISHED BY:	RECEIVED BY:														
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		Robert Delio	Aneta														
Email Reports to :				DATE/TIME:	DATE/TIME:														
Email Invoice to :				2.6.23	2/6/23 14:00														

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	Dissolved Fe & Mn	NT-4 (NO2, NO3)	Send to Eurofins			Comments on likely contaminant levels, dilutions or samples requiring specific QC analysis etc.	
	BH1C	2.6.23 9:40	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH3	12:50	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH4	12:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH9	8:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH12R	11:23	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH13	11:50	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH14	12:05	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH15	11:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH19R	13:05	W	Environmental Division Wollongong Work Order Reference EW2302416  Telephone : 02 42253125		✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH18	10:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH21	10:45	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	BH22	9:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	Duplicate	10:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL	
	TriPLICATE	10:25	W									✓			Field Tests - pH, EC, Temp & SWL
TOTAL					10										

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



CERTIFICATE OF ANALYSIS

Work Order : EW2302416
Client : SHELLHARBOUR CITY COUNCIL
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Groundwaters EPL
Order number : 147649
C-O-C number : ----
Sampler : Michael Santos, Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER GROUNDWATERS
No. of samples received : 14
No. of samples analysed : 13

Page : 1 of 8
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 02-Jun-2023 14:09
Date Analysis Commenced : 02-Jun-2023
Issue Date : 15-Jun-2023 17:48



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.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



General Comments

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

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

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

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

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

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate 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 Via High Flow and Bailer Method.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Sample collection of Ground Waters by in-house EN67 where the "surface layer of the aquifer was sampled".
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					02-Jun-2023 09:40	02-Jun-2023 12:50	02-Jun-2023 12:25	02-Jun-2023 08:55	02-Jun-2023 11:23
Compound	CAS Number	LOR	Unit		EW2302416-001	EW2302416-002	EW2302416-003	EW2302416-004	EW2302416-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.0	7.5	7.4	7.2	6.8
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		7945	1200	751	4120	1930
EA116: Temperature									
Temperature	----	0.5	°C		25.9	18.9	18.9	18.0	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		2600	370	310	1790	571
Total Alkalinity as CaCO3	----	1	mg/L		2600	370	310	1790	571
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<10	146	70	50	178
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		970	123	35	516	246
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		116	101	94	181	185
Potassium	7440-09-7	1	mg/L		207	31	16	76	27
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.103	0.082	0.097	0.708	0.532
Iron	7439-89-6	0.05	mg/L		11.6	0.27	2.59	0.89	9.38
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.5	0.2	0.1	0.6	0.3
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		298	12.3	2.04	141	3.59
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	0.13	<0.01	<0.01	0.07
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	1.37	<0.01	0.03	0.39
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	1.50	<0.01	0.03	0.46
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		186	22	10	76	24



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					02-Jun-2023 09:40	02-Jun-2023 12:50	02-Jun-2023 12:25	02-Jun-2023 08:55	02-Jun-2023 11:23
Compound	CAS Number	LOR	Unit		EW2302416-001	EW2302416-002	EW2302416-003	EW2302416-004	EW2302416-005
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	-----	0.01	m AHD		3.09	3.08	4.28	3.86	4.25



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					02-Jun-2023 11:50	02-Jun-2023 12:05	02-Jun-2023 11:10	02-Jun-2023 13:05	02-Jun-2023 10:25
Compound	CAS Number	LOR	Unit		EW2302416-006	EW2302416-007	EW2302416-008	EW2302416-009	EW2302416-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.8	6.9	7.0	7.4	6.8
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2260	958	2250	731	511
EA116: Temperature									
Temperature	----	0.5	°C		21.9	21.1	17.1	18.9	20.7
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		812	422	507	336	267
Total Alkalinity as CaCO ₃	----	1	mg/L		812	422	507	336	267
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		67	50	366	39	<10
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		308	36	340	38	16
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		213	106	112	74	60
Potassium	7440-09-7	1	mg/L		29	12	138	49	10
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.409	0.123	0.260	0.063	0.067
Iron	7439-89-6	0.05	mg/L		3.40	0.05	9.12	1.06	1.31
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.2	0.7	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		9.59	1.40	8.74	1.85	1.05
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.02	0.06	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.37	5.94	0.01	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NO_x) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.39	6.00	0.01	<0.01	<0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		38	12	39	14	14



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					02-Jun-2023 11:50	02-Jun-2023 12:05	02-Jun-2023 11:10	02-Jun-2023 13:05	02-Jun-2023 10:25
Compound	CAS Number	LOR	Unit		EW2302416-006	EW2302416-007	EW2302416-008	EW2302416-009	EW2302416-010
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	-----	0.01	m AHD		4.22	4.64	0.68	4.54	2.26



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					02-Jun-2023 10:45	02-Jun-2023 09:25	02-Jun-2023 10:25	----	----
Compound	CAS Number	LOR	Unit		EW2302416-011	EW2302416-012	EW2302416-013	-----	-----
					Result	Result	Result	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.2	7.3	6.8	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2550	1580	511	----	----
EA116: Temperature									
Temperature	----	0.5	°C		22.6	19.2	20.7	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		854	424	268	----	----
Total Alkalinity as CaCO3	----	1	mg/L		854	424	268	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		114	224	<10	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		353	183	16	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		125	87	61	----	----
Potassium	7440-09-7	1	mg/L		16	18	10	----	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.473	0.067	0.068	----	----
Iron	7439-89-6	0.05	mg/L		0.76	0.96	1.33	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.8	0.2	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		3.60	4.11	1.06	----	----
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		38	26	14	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					02-Jun-2023 10:45	02-Jun-2023 09:25	02-Jun-2023 10:25	----	----
Compound	CAS Number	LOR	Unit		EW2302416-011	EW2302416-012	EW2302416-013	-----	-----
					Result	Result	Result	----	----
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level				-----	0.01	m AHD	3.01	2.40	2.26
								----	----

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 2176
Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
□ Newcastle: 5 Rosagum Rd, Warabrook NSW 2304
Ph: 02 4968 0433 E: samples.newcastle@alsenviro.com

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

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

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

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle) 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: 4.5 °C Other comment:													
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	<input type="checkbox"/> Non Standard or urgent TAT (List due date):														
PROJECT:	Dunmore Quarterly Surface Waters EPL	ALS QUOTE NO.:	WO/030/19 TENDER														
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle)	COC: <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table> OF: <table><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
1	2	3	4	5	6	7											
1	2	3	4	5	6	7											
PROJECT MANAGER:	Ryan Stirling	SAMPLER:	R. DALIO / M. Santoro	RECEIVED BY:	Aneka	RELINQUISHED BY:		RECEIVED BY:									
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME:	1/6/23	DATE/TIME:		DATE/TIME:									
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	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
	SWP1	5/16/23 9:40	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp	
	SWC_2	11:00	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp	
	SWC_UP	10:45	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp	
	SWC_DOWN	11:10	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp	
	SWC_DOWN_2	11:20	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp	
	Duplicate	11:00	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp	
TOTAL					10										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved
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 pres
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division
Wollongong
Work Order Reference
EW2302415



Formaldehyde Preserved Glass;

Telephone : 02 42253125



CERTIFICATE OF ANALYSIS

Work Order : **EW2302415**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Surface Water EPL
Order number : 147649
C-O-C number : ----
Sampler : ----
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 : 01-Jun-2023 15:14
Date Analysis Commenced : 01-Jun-2023
Issue Date : 08-Jun-2023 16:58



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.

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



General Comments

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

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

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

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

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

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- EG020: LORs have been raised for some samples due to matrix interference (High sample salinity)
- It has been noted that Nitrite is greater than NO_x, however this difference is within the limits of experimental variation.
- TDS by method EA-015 may bias high for sample 4 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EP025FD 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				01-Jun-2023 09:40	01-Jun-2023 11:00	01-Jun-2023 10:45	01-Jun-2023 11:10	01-Jun-2023 11:20
Compound	CAS Number	LOR	Unit	EW2302415-001	EW2302415-002	EW2302415-003	EW2302415-004	EW2302415-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.7	7.2	7.2	7.2	7.3
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1080	17400	18800	32600	25000
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	13600	13800	26100	19200
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	7	5	<5	<5
EA045: Turbidity								
Turbidity	----	0.1	NTU	1.4	8.0	7.4	4.0	5.1
EA116: Temperature								
Temperature	----	0.5	°C	13.4	15.0	15.4	16.9	15.9
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	431	141	139	151	144
Total Alkalinity as CaCO3	----	1	mg/L	431	141	139	151	144
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	39	908	968	2000	1560
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	173	6870	7090	12100	9680
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	73	155	180	288	229
Magnesium	7439-95-4	1	mg/L	33	380	465	765	592
Sodium	7440-23-5	1	mg/L	156	3280	3840	6440	5000
Potassium	7440-09-7	1	mg/L	17	122	145	244	210
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.10	<0.10
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.116	0.074	0.074	0.052	0.055
Iron	7439-89-6	0.05	mg/L	0.16	0.88	0.79	0.34	0.53
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.6	0.7	0.9	0.8



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
Sampling date / time				01-Jun-2023 09:40	01-Jun-2023 11:00	01-Jun-2023 10:45	01-Jun-2023 11:10	01-Jun-2023 11:20
Compound	CAS Number	LOR	Unit	EW2302415-001	EW2302415-002	EW2302415-003	EW2302415-004	EW2302415-005
				Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator - Continued								
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.96	0.29	0.20	0.69	0.28
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	0.01	mg/L	0.95	0.29	0.20	0.69	0.28
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.04	0.02	0.02	0.02	0.02
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.13	0.14	0.05	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.15	0.16	0.07	0.10
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	14.3	216	223	386	308
∅ Total Cations	----	0.01	meq/L	13.6	185	218	364	283
∅ Ionic Balance	----	0.01	%	2.60	7.67	1.12	2.97	4.30
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	25	10	9	7	8
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	5.90	6.32	6.71	6.05	6.55



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time					01-Jun-2023 11:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2302415-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.2	----	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		17400	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		13100	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	----	----	----	----
EA045: Turbidity									
Turbidity	----	0.1	NTU		8.0	----	----	----	----
EA116: Temperature									
Temperature	----	0.5	°C		15.0	----	----	----	----
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		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		141	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		141	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		915	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		6790	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		172	----	----	----	----
Magnesium	7439-95-4	1	mg/L		435	----	----	----	----
Sodium	7440-23-5	1	mg/L		3650	----	----	----	----
Potassium	7440-09-7	1	mg/L		140	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.077	----	----	----	----
Iron	7439-89-6	0.05	mg/L		0.93	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.6	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time				01-Jun-2023 11:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2302415-006	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.32	----	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L	0.32	----	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.03	----	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.11	----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.14	----	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L	213	----	----	----	----	----
∅ Total Cations	----	0.01	meq/L	207	----	----	----	----	----
∅ Ionic Balance	----	0.01	%	1.59	----	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	8	----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L	6.32	----	----	----	----	----



Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

☐ **Brisbane:** 32 Shand St. Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@aisensiro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4798 0600 E: townsville-enquiries@aisensiro.com

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


☐ **Perth:** 10 Rod Way, Malaga WA 6090
 Ph: 08 9209 7655 E: samples.perth@alfsenwiro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
 Ph: 03 9331 2158 E: launceston@alfsenwiro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		Custody Seal Intact? Yes No	
PROJECT: Dunmore Quarterly Surface Waters SWP01 Overflow full Testing		ALS QUOTE NO.: WO/030/19 TENDER		Free ice / frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER:				Random Sample Temperature on Receipt: 52 °C	
PROJECT MANAGER: Joel Culton				Other comment:	
SAMPLER: Michael Santos		SAMPLER MOBILE: 0400520891		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		RECEIVED BY:	
Email Reports to :		DATE/TIME:		DATE/TIME:	
Email Invoice to :		01-05-23 13:35		1/5/23	

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					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SWP1	1-5-23 12:47	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
TOTAL					10									

Environmental Division
Wollongong
Work Order Reference
EW2301940



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; EC = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



CERTIFICATE OF ANALYSIS

Work Order : EW2301940
Client : SHELLHARBOUR CITY COUNCIL
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Surface Water SWP01 Overflow
Order number : 147649
C-O-C number : ----
Sampler : Michael Santos
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER SURFACE WATER
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 5
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 01-May-2023 13:38
Date Analysis Commenced : 01-May-2023
Issue Date : 08-May-2023 10:48



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.

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



General Comments

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

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

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

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

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

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- Sample site SWP1 was not discharging at time of sampling.
- 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 EP025FD 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	----	----	----	----
Sampling date / time				01-May-2023 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2301940-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.6	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1240	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	654	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	9	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	4.5	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	19.5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	354	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	354	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	43	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	168	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	59	----	----	----	----
Magnesium	7439-95-4	1	mg/L	27	----	----	----	----
Sodium	7440-23-5	1	mg/L	135	----	----	----	----
Potassium	7440-09-7	1	mg/L	14	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.06	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.184	----	----	----	----
Iron	7439-89-6	0.05	mg/L	0.32	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
Sampling date / time					01-May-2023 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2301940-001	-----	-----	-----	-----
				Result		----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.04	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		0.04	----	----	----	----
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		12.7	----	----	----	----
∅ Total Cations	----	0.01	meq/L		11.4	----	----	----	----
∅ Ionic Balance	----	0.01	%		5.44	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		281	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		6.77	----	----	----	----



Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
 Ph: 02 8784 8555 E: samples.sydney@aiserviro.com
☐ **Newcastle:** 5 Rosegem Rd, Warabrook NSW 2304
 Ph: 02 4963 9433 E: samples.newcastle@aiserviro.com

C. Brisbane: 32 Shand St. Stafford QLD 4053
 Ph:07 3243 7222 E:samples.brisbane@calenviro.com
D. Townsville: 14-15 Decma CL Bohle QLD 4918
 Ph:07 4796 0600 E:townsville.environmental@calenviro.com

Melbourne: 2-4 Westall Rd, Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@aisenviro.com
Adelaide: 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0800 E: adelaide@aisenviro.com

C. Perth: 10 Rod Way, Managa WA 6000
 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
 D. Launceston: 27 Wellington St, Launceston TAS 7250
 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS :		<input type="checkbox"/> Standard TAT (List due date): <input type="checkbox"/> Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)				Custody Seal intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Free ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Random Sample Temperature on Receipt: 4.5 °C Other comment:	
PROJECT:	Dunmore Quarterly Leachate	ALS QUOTE NO.:	WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)		
ORDER NUMBER:					COC:	1 2 3 4 5 6 7	
PROJECT MANAGER:	Ryan Stirling				OF:	1 2 3 4 5 6 7	
SAMPLER:	R. DALIO / M. Santoro	SAMPLER MOBILE:	RELINQUISHED BY:		RECEIVED BY:		
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	R. Dalio		Aneta		
Email Reports to :			DATE/TIME:		DATE/TIME:		
Email Invoice to :			1.6.23		1.6.23		
COMMENTS/SPECIAL HANDLING INSTRUCTIONS							

[illegible]

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

Telephone : 02 42253125



CERTIFICATE OF ANALYSIS

Work Order : EW2302414
Client : SHELLHARBOUR CITY COUNCIL
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Quarterly Leachate Tank EPL
Order number : 147649
C-O-C number : ----
Sampler : Michael Santos, 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 : 01-Jun-2023 15:16
Date Analysis Commenced : 01-Jun-2023
Issue Date : 07-Jun-2023 18:50



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.

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



General Comments

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

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

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

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate due to sample matrix
- EK057/EK059G: Nitrite and NOx results confirmed by re analysis.
- 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 EP025FD 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				01-Jun-2023 12:40	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2302414-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	9.3	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7380	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5290	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	13.8	----	----	----	----
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	946	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1840	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	2780	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<50	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1810	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	39	----	----	----	----
Potassium	7440-09-7	1	mg/L	375	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.096	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.29	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	344	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	6.96	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----



Analytical Results

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

Sample ID

				Leachate Storage Tank LP1	----	----	----	----
Sampling date / time				01-Jun-2023 12:40	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2302414-001	-----	-----	-----	-----
Result					----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	1.25	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	407	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	6.22	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation	60.0	----	----	----	----

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

Appendix C

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053
 Ph: 07 3243 7222 E: samples_brisbane@aiseenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4796 0600 E: townsville_environmental@aiseenviro.com

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

☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0900 E: Eadelaide@alsenviro.com

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


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

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 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):		Custody Seal intact? Yes No	
PROJECT: Dunmore Dust		ALS QUOTE NO.: WO/030/19 TENDER		Free ice / frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER:				Random Sample Temperature on Receipt: °C	
PROJECT MANAGER: Ryan Stirling				Other comment:	
SAMPLER: R. DALIO / M. Santos		SAMPLER MOBILE:		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		RECEIVED BY:	
Email Reports to :		DATE/TIME:		DATE/TIME:	
Email Invoice to :		DATE/TIME:		DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:	CC reports to: 1-6-23 <u>PNL</u>
--	----------------------------------

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	A04 (Ash, CM, TIS)									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	DDG1	1-6-23 8:30	AIR			✓									
2	DDG2	8:25	AIR			✓									
3	DDG3	10:05	AIR			✓									
4	DDG4	10:00	AIR			✓									
TOTAL					10										

Environmental Division
Wollongong
Work Order Reference
EW2302410



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 : **EW2302410**
Client : **SHELLHARBOUR CITY COUNCIL**
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Landfill Dust
Order number : 147649
C-O-C number : ----
Sampler : Michael Santos, Robert DaLio
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER DUST
No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 3
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 01-Jun-2023 15:11
Date Analysis Commenced : 06-Jun-2023
Issue Date : 13-Jun-2023 18:29



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.

Signatories	Position	Accreditation Category
Zoran Grozdanovski	Team Leader - Chemistry	Newcastle - Inorganics, Mayfield West, NSW



General Comments

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

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

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

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

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

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

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

- Analytical work for this work order will be conducted at ALS Sydney.
- 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 as sampling data was provided by the client.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- For dust analysis, the Limit of Reporting (LOR) referenced in the reports for deposited matter parameters represents the reporting increment rather than reporting limit.

Analytical Results

Sub-Matrix: DEPOSITIONAL DUST
 (Matrix: AIR)

Sample ID

Sub-Matrix: DEPOSITIONAL DUST (Matrix: AIR)				Sample ID	DDG1 04/05/2023 - 01/06/2023	DDG2 04/05/2023 - 01/06/2023	DDG3 04/05/2023 - 01/06/2023	DDG4 04/05/2023 - 01/06/2023	----
Sampling date / time				01-Jun-2023 08:30	01-Jun-2023 08:25	01-Jun-2023 10:05	01-Jun-2023 10:00	-----	
Compound	CAS Number	LOR	Unit	EW2302410-001	EW2302410-002	EW2302410-003	EW2302410-004	-----	
				Result	Result	Result	Result	----	
EA120: Ash Content									
Ash Content	----	0.1	g/m².month	0.3	<0.1	<0.1	0.7	----	
Ash Content (mg)	----	2	mg	6	<2	<2	12	----	
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month	0.3	0.4	0.3	0.6	----	
Combustible Matter (mg)	----	2	mg	4	7	5	10	----	
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month	0.6	0.4	0.3	1.3	----	
Total Insoluble Matter (mg)	----	2	mg	10	7	5	22	----	

Page : 3 of 3
Work Order : EW2302410
Client : SHELLHARBOUR CITY COUNCIL
Project : Dunmore Landfill Dust



Inter-Laboratory Testing

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

(AIR) EA125: Combustible Matter

(AIR) EA120: Ash Content

(AIR) EA141: Total Insoluble Matter

Appendix D

Surface Gas (Methane) Field Sheets

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd. Smithfield NSW 2176
 Ph: 02 8784 8566 E: samples.sydney@aisenviro.com
☐ **Newcastle:** 5 Rosegum Rd. Warabrook NSW 2304
 Ph: 02 4968 6436 E: samples.newcastle@aisenviro.com

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

☐ Melbourne: 3-4 Westall Rd, Springvale VIC 3171
Ph: 03 8549 9800 E: samples.melbourne@aisenviro.com

☐ Adelaide: 2-1 Burma Rd, Pocraka SA 5095
Ph: 08 8359 5890 E: adelaide@aisenviro.com

☐ Perth: 10 Hed Way, Malaga WA 6009
Ph: 08 9209 7655 E: samples_perth@aiserviro.com

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

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):				FOR LABORATORY USE ONLY (Circle)			
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):				Custody Seal Intact? Yes No			
PROJECT: Dunmore Quarterly Methane Testing		ALS QUOTE NO.: WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)		Free ice / frozen ice blocks present upon receipt? Yes No			
ORDER NUMBER:				COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt: °C			
PROJECT MANAGER: Ryan Stirling				OF: 1 2 3 4 5 6 7		Other comment:			
SAMPLER:		SAMPLER MOBILE:		RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME:		DATE/TIME:		DATE/TIME:	
Email Reports to :				21/6/23		21/6/23			
Email Invoice to :									

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

[illegible]

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium 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

Environmental Division
Wollongong
Work Order Reference
EW2302814



Telephone : 02 42253125

ALS Landfill Emissions Report					
Client: Shellharbour City Council		Date: 21/06/2023			
Site: Dunmore		Sampler(s): Robert DaLo, Michael Santos			
Transect / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A					No Safe Access
B	1	6168 222	302 433	0.0	
B	2	6168 238	302 436	0.0	
B	3	6168 263	302 436	0.0	
B	4	6168 290	302 439	0.0	
C	1	6168 439	302 374	0.0	
C	2	6168 391	302 389	0.0	
C	3	6168 326	302 410	0.1	
C	4	6167 292	302 422	0.1	
C	5	6167 206	302 424	0.1	
C	6	6168 164	302 423	0.1	
C	7	6168 107	302 411	0.0	
C	8	6168 055	302 406	0.0	
D	1	6168 202	302 399	0.1	
D	2	6168 191	302 402	0.0	
D	3	6168 180	302 403	0.0	
D	4	6168 173	302 405	0.0	
D	5	6168 168	302 408	0.0	
D	6	6168 149	302 407	0.0	
D	7	6168 137	302 405	0.1	
E	1	6168 145	302 375	0.0	
E	2	6168 157	302 376	0.0	
E	3	6168 172	302 378	0.0	
E	4	6168 173	302 377	0.0	
E	5	6168 181	302 376	0.0	
F	1	6168 134	302 352	0.0	
F	2	6168 145	302 349	0.0	
F	3	6168 149	302 337	0.0	
F	4	6168 159	302 331	0.0	
F	5	6168 158	302 325	0.0	
F	6	6168 157	302 320	0.0	
G	1	6168 410	302 296	0.0	
G	2	6168 420	302 283	0.0	
G	3	6168 440	302 321	0.0	
G	4	6168 464	302 356	0.0	

H	1	6168_411	302_554	0.0	
H	2	6168_360	302_553	0.0	
H	3	6168_322	302_541	0.0	
H	4	6168_310	302_535	0.0	
H	5	6168_213	302_563	0.0	
H	6	6168_188	302_581	0.0	
H	7	6168_144	301_604	0.0	
H	8	6168_101	301_631	0.0	
H	9	6168_076	302_599	0.0	
H	10	6168_118	302_556	0.1	
H	11	6168_159	302_533	0.1	
H	12	6168_046	302_520	0.1	
H	13	6168_038	302_500	0.0	
H	14	6168_090	302_511	0.0	
H	15	6168_135	302_513	0.0	
H	16	6167_197	302_529	0.0	
H	17	6167_257	302_524	0.0	
H	18	6167_471	302_522	0.0	
H	19	6167_448	302_277	0.0	
H	20	6167_394	302_218	0.0	
H	21	6167_278	302_180	0.0	
H	22	6167_225	302_111	0.0	
H	23	6167_225	302_072	0.0	
H	24	6168_012	3021064	0.0	
H	25	6168_063	302_91	0.1	
H	26	6168_150	302_150	0.0	
H	27	6168_197	302_188	0.0	
H	28	6168_250	302_240	0.1	
H	29	6168_288	302_313	1.2	
H	30	6168_345	302_404	0.0	
H	31	6168_446	302_484	0.0	
J	1				NO ACCESS CONSTRUCTION
J	1	6168_347	302_198	0.0	
J	2	6168_324	302_207	0.0	
J	3	6168_306	302_216	0.0	
J	4	6167_284	302_225	0.0	
K	1	6168_523	302_366	0.0	
K	2	6168_540	302_446	0.0	
K	3	6168_581	302_448	0.0	
K	4	6168_580	302_387	0.0	
K	5	6168_546	302_376	0.0	
L	1	6168_740	302_559	0.0	
L	2	6168_702	302_303	0.0	
L	3	6168_683	302_279	0.0	
L	4	6168_655	302_248	0.0	
L	5	6168_607	302_228	0.0	
L	6	6168_557	302_179	0.0	
Compressor Shed	1			0.6	
Office	1			0.0	
Community Recycling Centre	1			0.0	
OLD Weighbridge	1			0.1	
OLD Weighbridge Toilet	1			10.1	
Revolve Shop	1			0.0	
Building Truckwash	1			0.0	
New Weighbridge	1			0.0	
Methane Blank (Erg. Injection)				0.0	Taken at entrance to Dumore site before main gate
Methane Blank (Post testing)				0.0	Taken at entrance to Dumore site before main gate
Comments:					
Sampling performed in accordance to EPA Environmental Guidelines Solid Waste Landfills, Second Edition, 2016					
Gas concentrations are reported as raw values without correction for background concentration.					

Appendix E

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

☐ **Brisbane:** 32 Shand St. Stafford QLD 4053
 Ph: 07 3243 7222 E: samples.brisbane@aisensiro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
 Ph: 07 4798 0600 E: townsville-enquiries@aisensiro.com

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


☐ **Perth:** 10 Rod Way, Malaga WA 6090
 Ph: 08 9209 7655 E: samples.perth@alfsonwiro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
 Ph: 03 8331 2158 E: launceston@alfsonwiro.com

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		Custody Seal Intact? Yes No	
PROJECT: Dunmore Quarterly Surface Waters SWP01 Overflow full Testing		ALS QUOTE NO.: WO/030/19 TENDER		Free ice / frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER:				Random Sample Temperature on Receipt: C	
PROJECT MANAGER: Joel Culton				Other comment: 52	
SAMPLER: Michael Santos		SAMPLER MOBILE: 0400520891		RELINQUISHED BY:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		RECEIVED BY:	
Email Reports to :		DATE/TIME:		DATE/TIME:	
Email Invoice to :		01-05-23 13:35		1/5/23	

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				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SWP1	1-5-23 12:47	W			✓	✓	✓	✓				Field Tests - pH, EC, DO & Temp
TOTAL					10								

Environmental Division
Wollongong
Work Order Reference
EW2301940



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 Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulfate Soils; B = Unpreserved Bag.



CERTIFICATE OF ANALYSIS

Work Order : EW2301940
Client : SHELLHARBOUR CITY COUNCIL
Contact : Ryan Stirling
Address : LAMERTON HOUSE, LAMERTON CRESCENT
SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529
Telephone : ----
Project : Dunmore Surface Water SWP01 Overflow
Order number : 147649
C-O-C number : ----
Sampler : Michael Santos
Site : DUNMORE LANDFILL TENDER
Quote number : WO/030/19 TENDER SURFACE WATER
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 5
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone : +61 2 4225 3125
Date Samples Received : 01-May-2023 13:38
Date Analysis Commenced : 01-May-2023
Issue Date : 08-May-2023 10:48



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.

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



General Comments

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

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

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

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

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

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

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H⁺ to the Cations and Nitrate, SiO₂ and Fluoride to the Anions.
- Sample site SWP1 was not discharging at time of sampling.
- 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 EP025FD 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	----	----	----	----
Sampling date / time				01-May-2023 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2301940-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.6	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1240	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	654	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	9	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	4.5	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	19.5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	354	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	354	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	43	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	168	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	59	----	----	----	----
Magnesium	7439-95-4	1	mg/L	27	----	----	----	----
Sodium	7440-23-5	1	mg/L	135	----	----	----	----
Potassium	7440-09-7	1	mg/L	14	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.06	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.184	----	----	----	----
Iron	7439-89-6	0.05	mg/L	0.32	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
Sampling date / time					01-May-2023 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2301940-001	-----	-----	-----	-----
				Result		----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.04	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		0.04	----	----	----	----
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		12.7	----	----	----	----
∅ Total Cations	----	0.01	meq/L		11.4	----	----	----	----
∅ Ionic Balance	----	0.01	%		5.44	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		281	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		6.77	----	----	----	----



Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

Appendix F

Calibration Certificates

Field Calibration Form

[illegible]

Appendix G

Gas Flare Reports



PROJECT PROFILE: **DUNMORE, NSW**

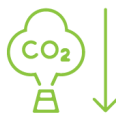
**We expedite the transition to renewables with clean energy and carbon abatement solutions.
Carbon credits enable a commercially viable project to create additional abatement.**

Results achieved since project commencement*



BIOGAS CAPTURED

25.2 million m³



CARBON ABATEMENT

239 thousand tonnes
(t CO₂e - environmental
benefit)



ACCUs CREATED

92 thousand
Australian Carbon Credit
Units (ACCUs)



SEEDLINGS PLANTED

4 million
seedlings planted for 10
years (t CO₂e)



CARS OFF THE ROAD

6,467
for the last 12 months
of carbon abatement
(t CO₂e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

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

P: +61 7 3711 2225 **E:** enquiries@lgi.com.au **in:** [linkedin.com/company/lgi-ltd](https://www.linkedin.com/company/lgi-ltd) | 57 Harvey Street N, Eagle Farm QLD 4009

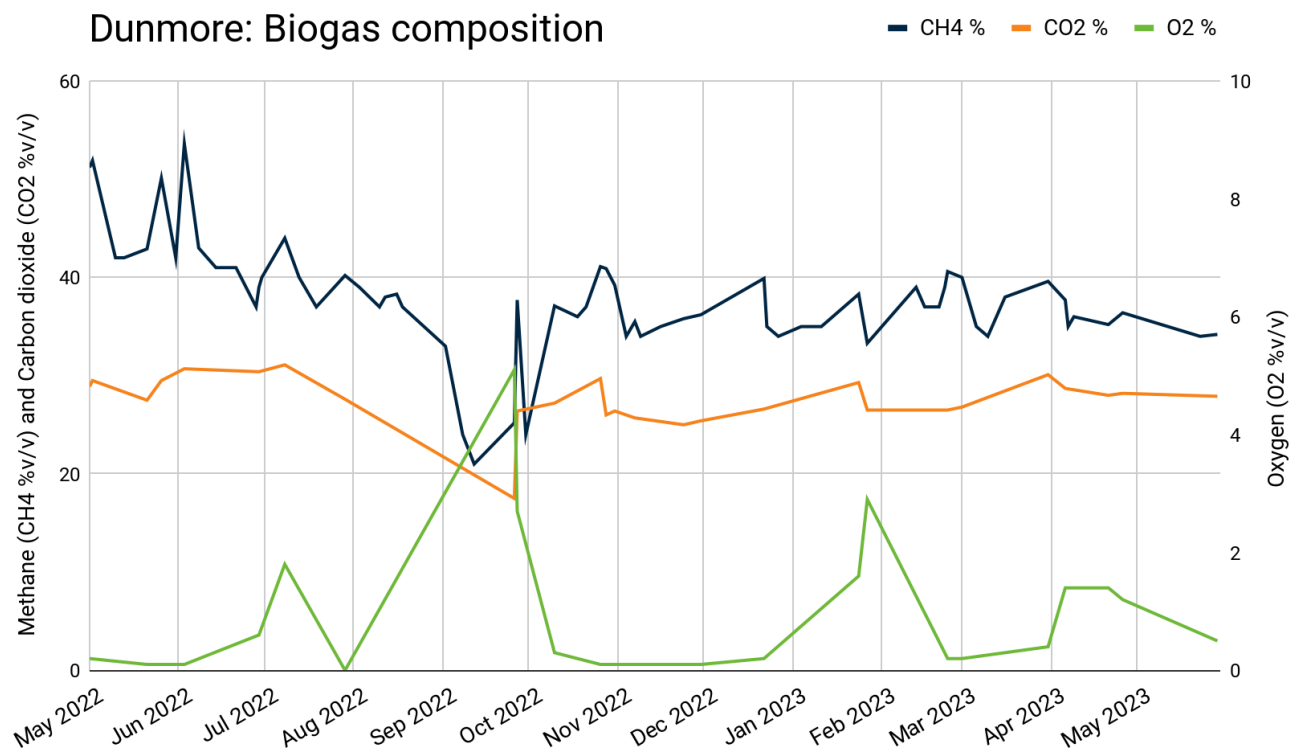
Saving the planet one landfill, one megawatt, one solar panel, one battery at a time

Site:	Dunmore	Report issue date:	14/06/2023
Report month:	May 2023	Prepared by:	V McKay
Prepared for:	Shellharbour City Council	Checked by:	T Schnatz

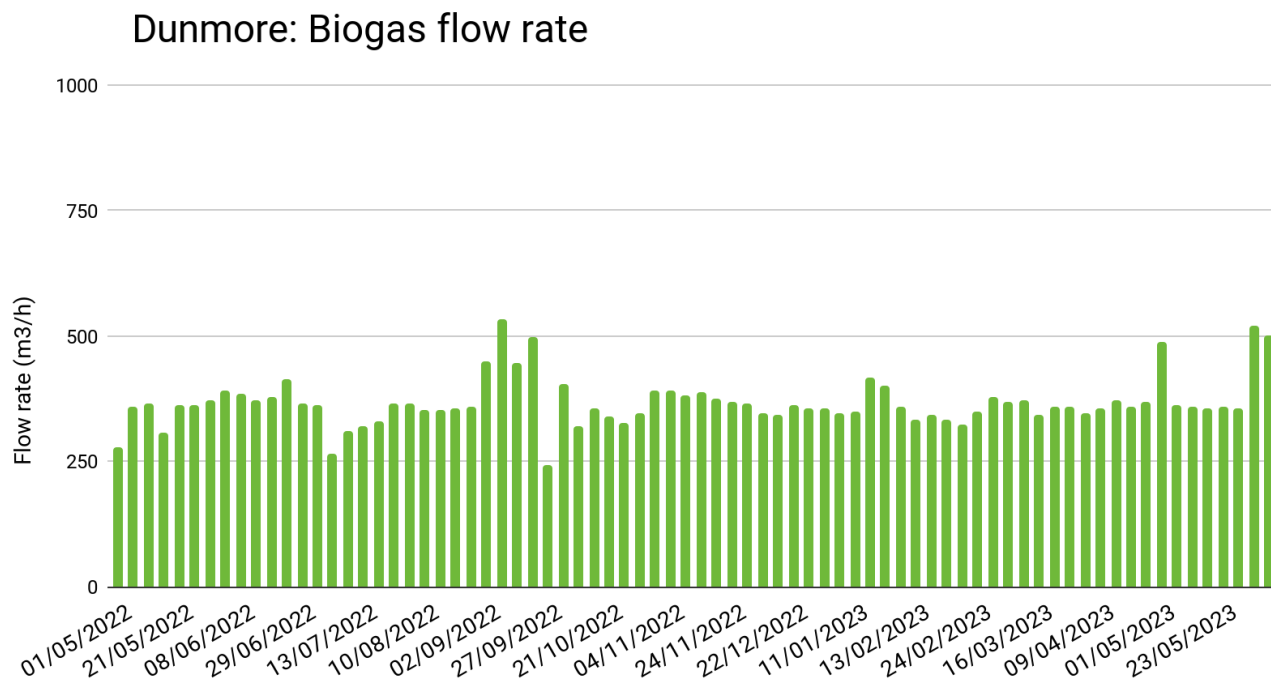
Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to assist Council. • September 2016 - LGI disconnected the extended gas capture system to assist Council. • November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system • November 2019 - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • April 2020 - LGI installed a flowline to sump 6 after earlier disconnection. • February 2021 - LGI installed 13 new vertical wells, including a new submain • March 2022 - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability • August 2022 - LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3 • December 2022 - LGI installed a pneumatic bore pump in a j-trap, allowing for greater reliability of condensate management in the main gas line. • May 2023 - LGI installed a series of 3 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5.
Comments on operation / maintenance:	Availability - 99.83 % Down Time: 1.25 h 1.25 h - Planned maintenance Field Tuned: - 30/05/2023
Recommendations:	LGI recommends continued regular communication with Council regarding leachate management, site performance, and future planning.

FLARE OPERATIONAL DATA (based upon on-site technical readings):

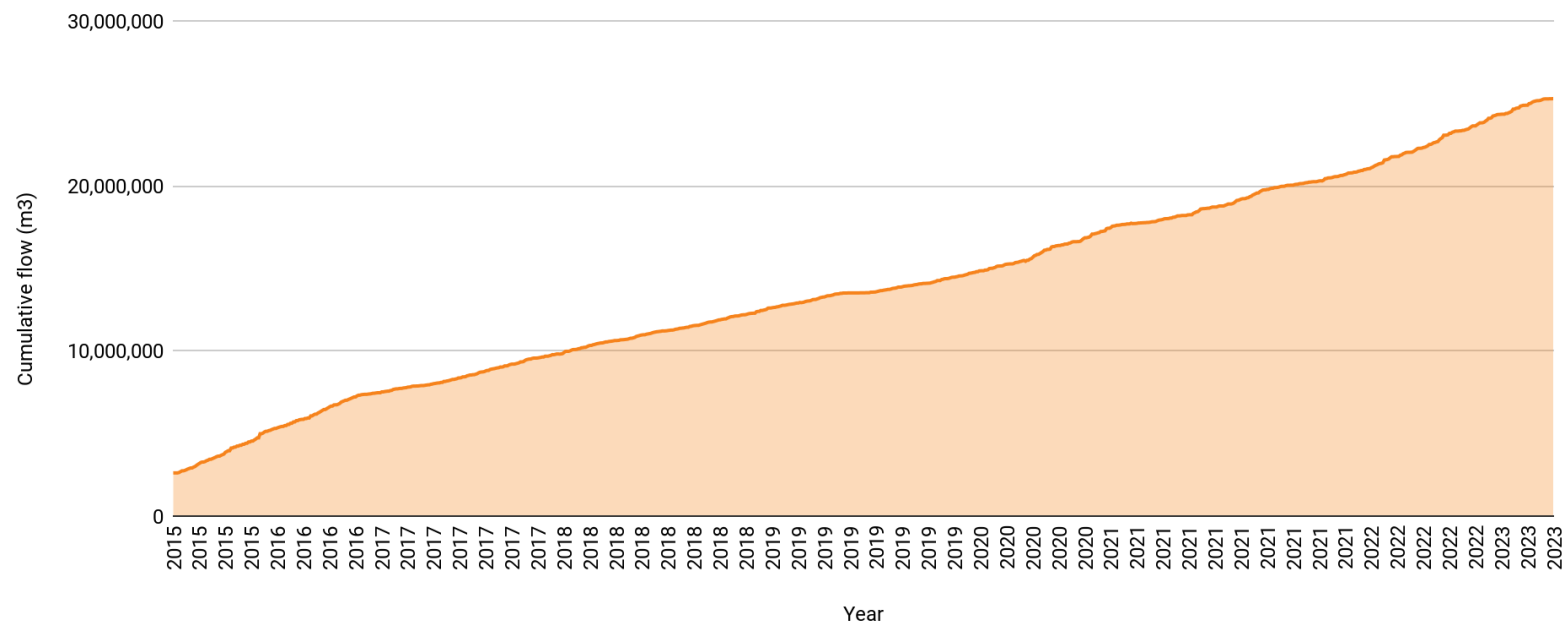
Date	CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	FLOW (m3/h)	STACK TEMP (°C)	CUMULATIVE FLOW (m3)
11/05/2023	-	-	-	360	580	24,991,860
18/05/2023	-	-	-	356.9	609	25,052,697
23/05/2023	34	-	-	359	591	25,099,144
29/05/2023	34.2	27.9	0.5	521	969	25,148,776
Average	34.1	27.9	0.5	399	687	-



Note: Infrastructure damage on 02/09/2022 resulted in oxygen ingress into the field



Dunmore: Biogas cumulative flow captured



25,176,026 m³ of combusted landfill gas up to 1 June 2023, which represents;

- 239,112 tonnes of CO₂ equivalent (total methane abated by gas capture system to date).
- 3,985,197 seedlings planted for 10 years
- 6,467 (cars off the road for the last 12 months)
- 92,714 Australian Carbon Credit Units (ACCUs)

Biogas captured is the cumulative flow reading at the last day of the month.

Please note:

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

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

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



PROJECT PROFILE: **DUNMORE, NSW**

We 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, reliably, effectively, commercially for our customers.

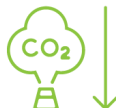
To achieve our vision and mission we put people first and this makes us different from all the rest.

Results achieved since project commencement*



BIOGAS CAPTURED

25.4 million m³



CARBON ABATEMENT

241 thousand tonnes
(t CO₂-e - environmental benefit)



ACCUs CREATED

92 thousand
Australian Carbon
Credit Units (ACCUs)



SEEDLINGS PLANTED

4 million
seedlings planted for
10 years (t CO₂-e)



CARS OFF THE ROAD

6,388
for the last 12 months
of carbon abatement
(t CO₂-e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

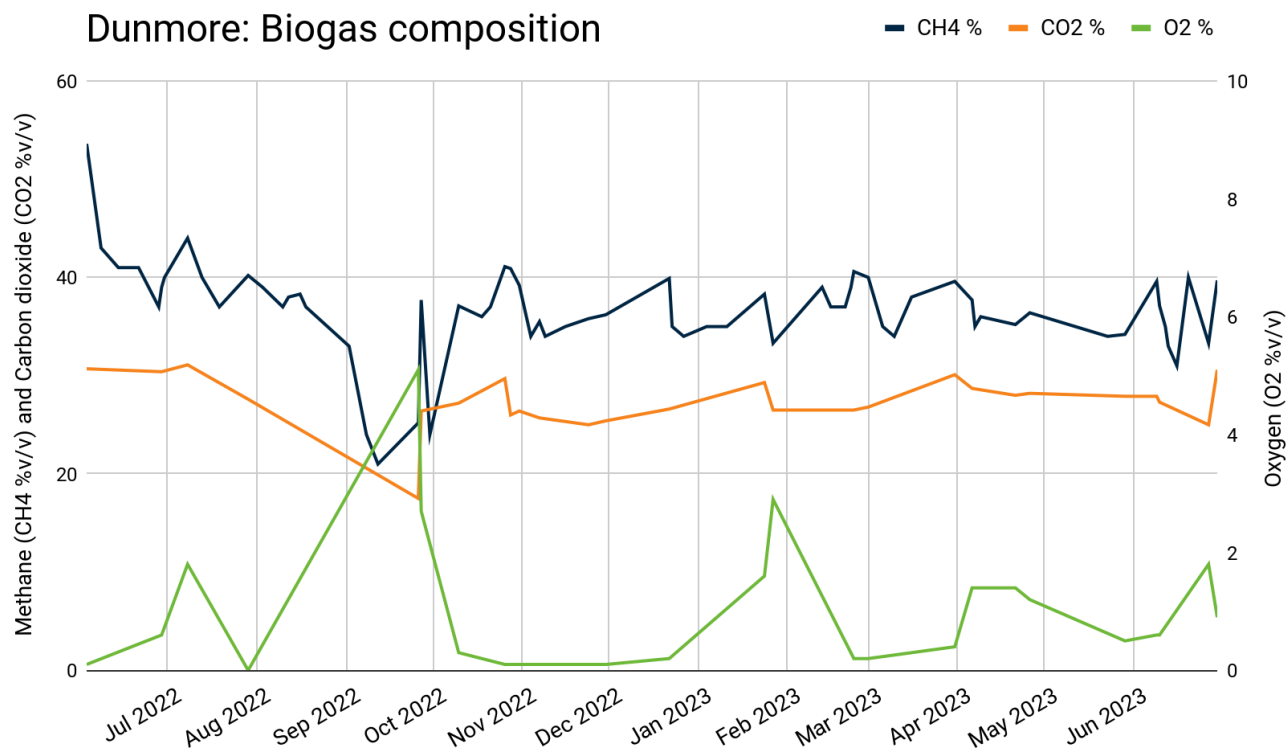
- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however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

Site:	Dunmore	Report issue date:	12/07/2023
Report month:	June 2023	Prepared by:	V McKay
Prepared for:	Shellharbour City Council	Checked by:	T Schnatz

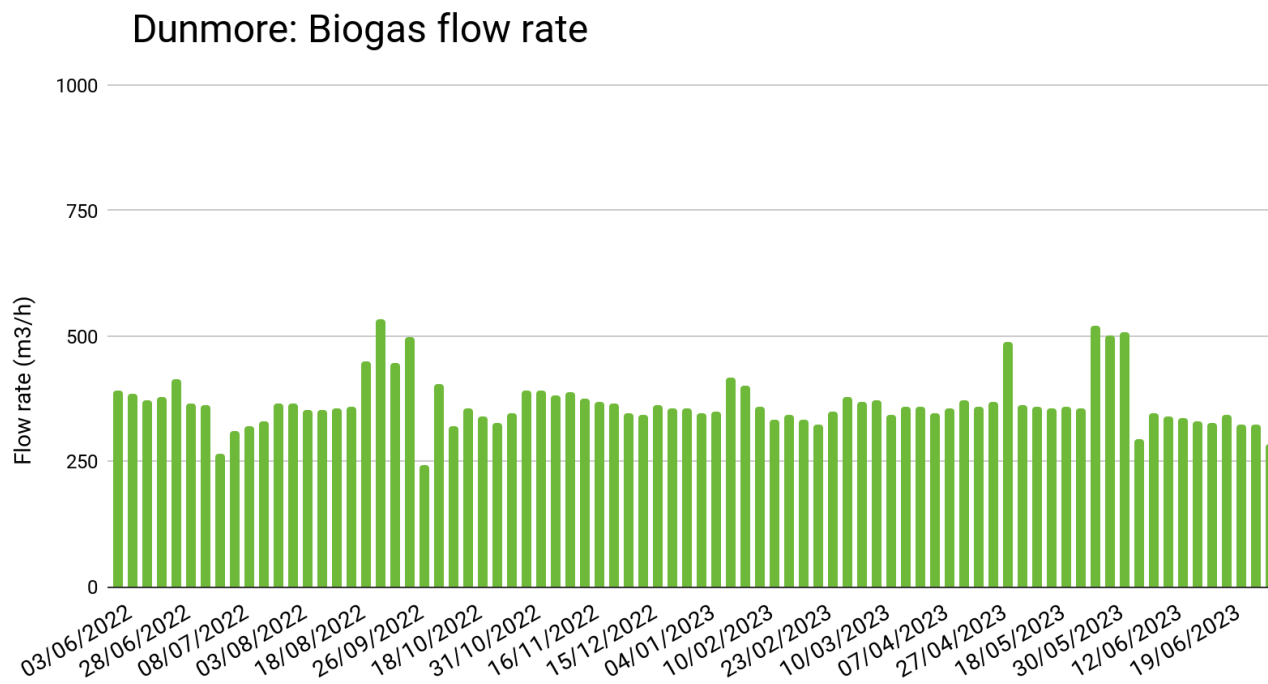
Comments on changes to existing system:	<ul style="list-style-type: none"> • January 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. • April 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • June 2016 - LGI disconnected the extended gas capture system to assist Council. • September 2016 - LGI disconnected the extended gas capture system to assist Council. • November 2016 - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • May 2017 - LGI installed an additional 10 vertical wells to the existing LFG system • November 2019 - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • April 2020 - LGI installed a flowline to sump 6 after earlier disconnection. • February 2021 - LGI installed 13 new vertical wells, including a new submain • March 2022 - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability • August 2022 - LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3 • December 2022 - LGI installed a pneumatic bore pump in a j-trap, allowing for greater reliability of condensate management in the main gas line. • May 2023 - LGI installed a series of 3 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5.
Comments on operation / maintenance:	Availability - 84.99 % Down Time: 108.08 h 0.17 h - Planned maintenance (attempted TC repair) 53.58 h - Forced outage external (mains failure) 54.33 h - Forced outage internal (TC fault) Field tuned: - 01/06/2023 - 10/06/2023 - 30/06/2023
Recommendations:	LGI recommends continued regular communication with Council regarding leachate management, site performance and future planning.

FLARE OPERATIONAL DATA (based upon on-site technical readings):

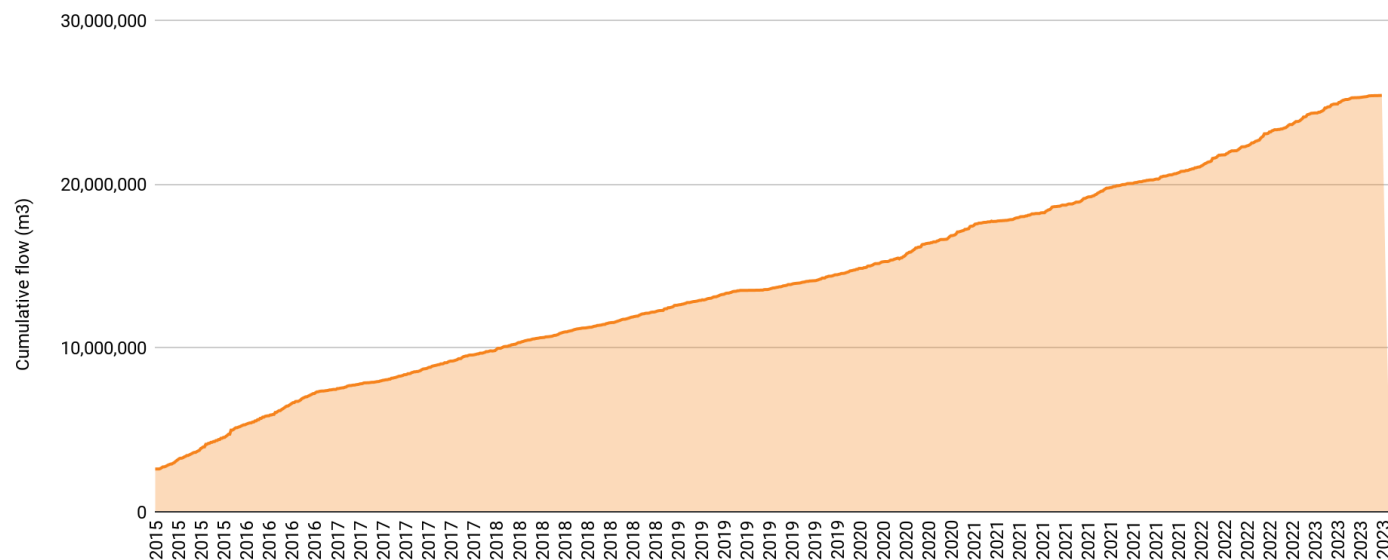
Date	CH ₄ (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	FLOW (m ³ /h)	STACK TEMP (°C)	CUMULATIVE FLOW (m ³)
10/06/2023	37.1	27.3	0.6	345	711	25,270,471
16/06/2023	31.0	-	-	328	650	25,314,777
27/06/2023	33.3	25.0	1.8	322	636	25,383,280
30/06/2023	39.7	30.6	0.9	284	648	25,396,318
Average	35.3	27.6	1.1	320	661	-



Note: Infrastructure damage on 02/09/2022 resulted in oxygen ingress into the field



Dunmore: Biogas cumulative flow captured



25,400,015 m³ of combusted landfill gas from the beginning of the project up to 1 July 2023 represents:

- 241,239 tonnes of CO₂ equivalent (total methane abated by gas capture system to date).
- 4,020,653 seedlings planted for 10 years
- 6,388 (cars off the road for the last 12 months)
- 92,714 Australian Carbon Credit Units (ACCUs)

Biogas captured is the cumulative flow reading at the last day of the month.

Total biogas captured in the 2023 financial year (23FY Qlfg): 3,114,331 m³

Total carbon abatement from biogas captured in the 2023 financial year (23FY): 29,579 t CO₂-e

Please note:

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