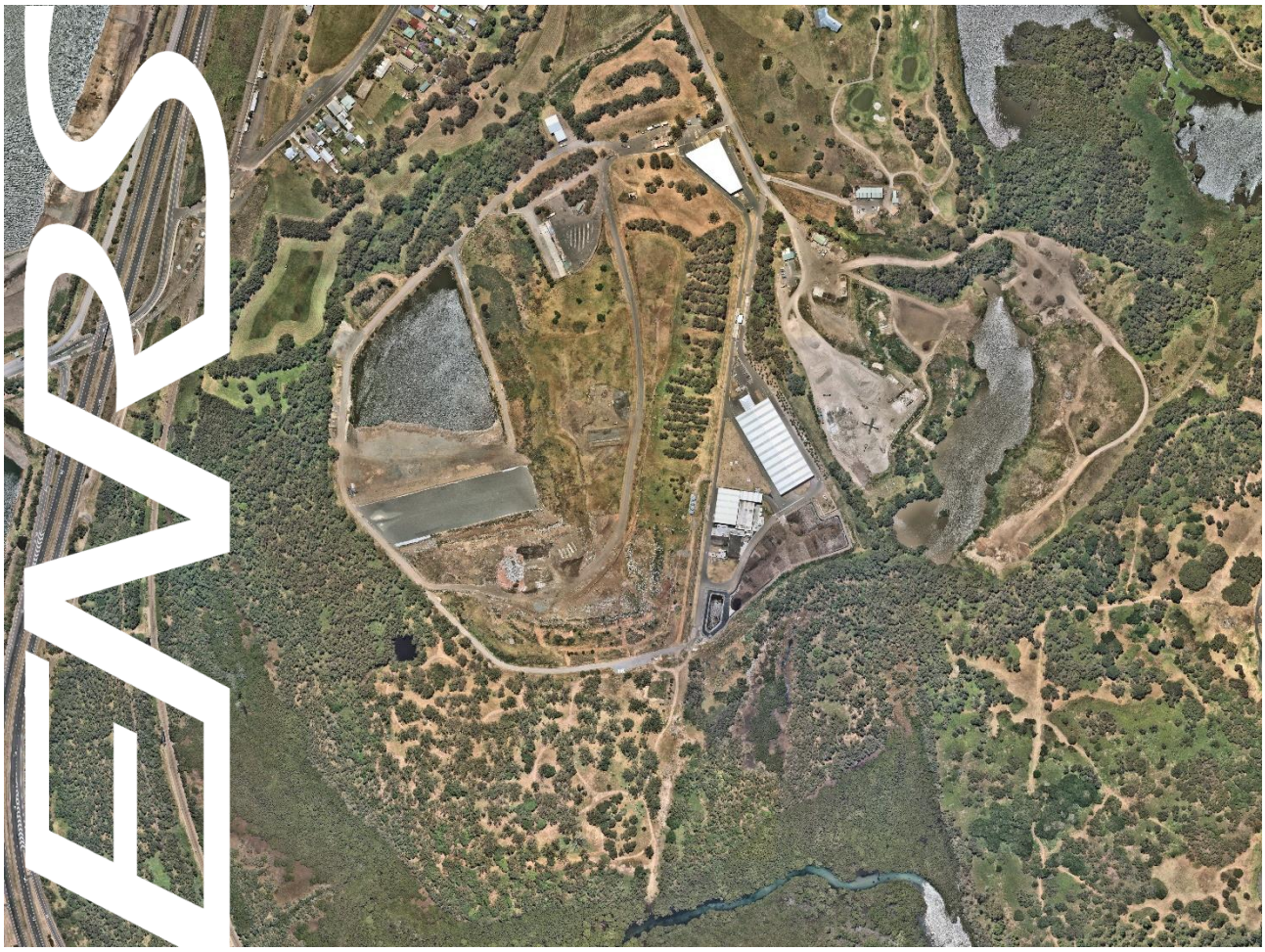

QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) JUNE 2021

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

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

Prepared For: **Shellharbour City Council**

Project Number: **ENRS0033**

Date: **June 2021**

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ACKNOWLEDGEMENTS

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

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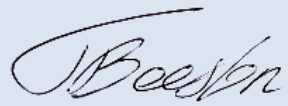 **Taite Beeston (BSc.)** *Geologist & Environmental Consultant*	 **Rohan Last (BSc. MSc)** *Hydrogeologist & Environmental Scientist*

Record of Distribution

Copies	Report No. & Title	Status	Date	Prepared for:
1 x PDF	202106_ENRS0033r2e1_SCC Dunmore QEMR	Rev.1	6th August 2021	ALS c/- Shellharbour City Council (SCC)

EXECUTIVE SUMMARY

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

This report summarises the results of field testing and laboratory analysis conducted by ALS for the June 2021 quarterly monitoring period. This Quarterly Report provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

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

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

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

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

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

The objectives of this Quarterly Environmental Monitoring Report 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 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 Quarterly Environmental Monitoring Report comprised the collation, assessment and reporting of Site data made available to ENRS from the quarterly June 2021 monitoring period in regard to the following tasks:

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

- 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 2021 quarterly 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 reported exceedances of the assessment criteria for; ammonia, nitrate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-14, BH-15, BH-19r, BH-21 and BH-22. This is consistent with previous monitoring events;
- Onsite surface water samples (SWP-1) reported no exceedances to the ANZECC (2000) trigger values for 95% marine/freshwater;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were within the adopted Site Assessment Criteria;
- The existing monitoring locations and sampling regime (specified in EPL 5984) is generally considered to provide a suitable assessment of surface water, leachate and groundwater conditions;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all buildings within 250m of deposited waste;

  Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Flare temperature data indicated a downward trend in operating temperatures throughout the quarter.
- Average weekly operating temperatures at the Flare fell below the EPL Lower Limit of 760 degrees on six (6) occasions, once (1) in April, twice (2) in May and three times (3) in June.
- Based on this review of the quarterly June 2021 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

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

This report summarises the results of field testing and laboratory analysis conducted by ALS for the June 2021 quarterly monitoring period. This Quarterly Report provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

1.1 PROJECT BACKGROUND

1.1.1 Site History

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

1.1.2 EPL Requirements

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

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

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

1.2 OBJECTIVES

The objectives of this Quarterly Environmental Monitoring Report 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 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.

1.3 SCOPE OF WORK

The scope of work for this Quarterly Environmental Monitoring Report comprised the collation, assessment and reporting of Site data made available to ENRS from the quarterly December 2019 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, landfill surface gas and flare);
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2.0 SITE DESCRIPTION

2.1 LOCATION

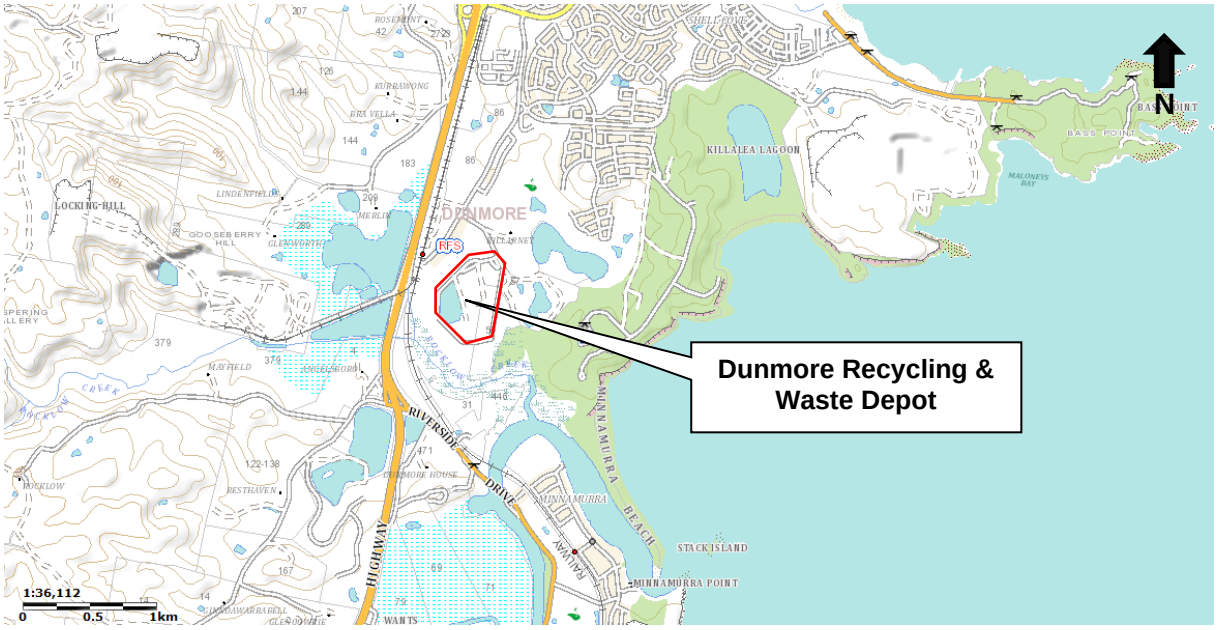
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 1** below. Details of the Site boundary and sampling points are provided in the Site Plan (see **Figure 2**). The key features required to identify the Site are summarised in **Table 1**.

Table 1: Site Identification

Aspect	Description
Site	Dunmore Recycling and Waste Depot
Street Address	44 Buckleys Road, Dunmore, NSW 2529
Site Area	72.36 hectares

Aspect	Description
Title Identifier	Lot 21 DP 653009, Lot 1 DP 419907
Zoning	RU1 Primary Production
Local Government Area	Shellharbour City Council

Figure 1: Site Location Map



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

2.2 SURROUNDING LANDUSE

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

Table 2: Surrounding Land use

Direction	Land Use
North:	Buckleys Road, commercial infrastructure and open grassland. Residential dwellings along the northwest border of the Site. Golf course further to the northeast.
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 2018 annual monitoring report (Environmental Earth Sciences 2018) reported the soil profile at the Site as organic, black, massive sandy loam topsoil overlying loose bleached light grey sand with iron staining in the subsoil.

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

2.5 GEOLOGY

A review of the Site geology was undertaken with reference to the Wollongong 1:250,000 geological series sheet (Si56.9) and the Shellharbour-Kiama area coastal quaternary 1:50,000 geology sheet. 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.

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 aquifer, the shallow groundwater flow is inferred to mimic topography with low to moderate hydraulic gradients flowing towards the south.

The Site and adjoining land, is 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 Error! Reference source not found..

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 ANZECC Guidelines

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

Table 4: Adopted Guideline Criteria

Parameter	Groundwater Guideline	Surface water Guideline
Ammonia	0.91 mg/L	1.88 mg/L
Nitrate	0.70 mg/L	0.70 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units
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	-

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: • 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/m^2/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.

4.0 SAMPLING METHODOLOGY

Field sampling was conducted by *ALS Environmental* (Wollongong) as commissioned by *SCC* in June 2021. ENRS understands that sampling was conducted in accordance with ALS sampling protocols with reference to current industry standards and Code of Practices. The following sub-sections provide a summary of the sampling methodologies.

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

4.1 WATER SAMPLING

4.1.1 Location of Water Monitoring Points

Groundwater and surface water monitoring requirements are defined by the EPL No. 5984, as provided in **Appendix A**. In summary the sampling regime collected samples from; five (5) surface waters; twelve (12) groundwater monitoring wells; and one (1) leachate points. Sampling locations are illustrated in **Figure 2** attached.

4.1.2 Depth to Water

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

4.1.3 Sample Collection

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

4.1.4 Groundwater Sampling

Groundwater Wells were sampled in order of distance from any areas of known contamination to ensure that lower contaminated Wells are sampled before likely higher contaminated Wells. Groundwater bores were purged prior to sampling by removing at least three (3) well volumes or low flow parameter stabilisation methods applied with field sheets provided to document pumping volumes and field parameters. Samples were collected using clear disposal bailers. and were sealed in laboratory-prepared sampling containers appropriate for the analysis. All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

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

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

- Minimal practical disturbance during sampling;
- Samples placed in sample containers as soon as possible;
- Sample containers contain zero headspace;

- Samples placed directly on ice and transported to the laboratory as soon as possible; and
- Employing the most appropriate analytical method to minimise volatile losses at the laboratory.

4.1.5 Field Testing

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

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

4.2 DUST DEPOSITION SAMPLING

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

Dust collection gauges were set up for a one (1) month period between the **14th May 2021** and **16th June 2021.** A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

4.3 SURFACE METHANE GAS MONITORING

The concentration of methane gas (in units of ppm) at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling the wind speed was below 10 km/hr. Testing was conducted using a calibrated *LaserOne* portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in Error! Reference source not found..

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. The concentration of methane gas was also recorded in any buildings located within a distance of 250 m of the deposited waste, and any depressions or surface fissures away from the sampling grid were also investigated.

4.4 FLARE MONITORING

Landfill gases 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, sulfides, 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 is monitored, maintained and operated by *LGI LTD.* Copies of LFG reports for the relevant reporting period are included as **Appendix F**.

4.5 LABORATORY ANALYSIS

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

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

5.1 DATA QUALITY OBJECTIVES

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

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

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

Table 5: Data Quality Objectives

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

DQO	Evaluation Criteria
Precision and accuracy for sampling and analysis	Use properly trained and qualified field personnel and achieve field and laboratory QA/ QC criteria.

5.2 QA/QC PROCEDURES

Data provided for the purpose of this report by SC was prepared by *ALS*. *ALS* is NATA accredited for the laboratory testing. The QA/QC indicators as provided to ENRS either all 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 is considered acceptable for use in this assessment.

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

5.3 EPL NON-COMPLIANCE

Monitoring requirements are defined by the EPL.

6.0 WATER QUALITY RESULTS

Laboratory results for groundwater and surface water were provided to ENRS for tabulation and comparison with relevant EPL assessment criteria. A summary of results is provided in **Table** with comparison against the relevant Site Assessment Criteria (SAC). Exceedances of relevant guidelines are also summarised in **Table 6**. The laboratory certificates of analysis are provided in Appendix B.

6.1 OVERFLOW RESULTS

ENRS understand no overflow events were recorded during the ***June 2021*** quarterly monitoring period. Hence, no water samples were collected by *ALS* and no results are presented for this reporting period.

6.2 FIELD TESTING

Field testing is 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

6.3 PHYSICAL INDICATORS

6.3.1 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 for 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 - 2,200 µS/cm (~1,500 mg/L).

Groundwater

Salinity in groundwater is typically higher than surface water due to mineral dissolution. Groundwater salinity at the Site was generally reported above the freshwater SAC of 2,200 µS/cm. Elevated results were reported in four (4) groundwater bores ranging between; **2,550 µS/cm (BH-12r)** and **7,300 µS/cm (BH-1c)**. Results are consistent with the previous quarterly monitoring events.

Leachate

Leachate salinity for the ***March*** Quarterly 2021 monitoring period was reported to be **15,700 µS/cm** (LP1) and **15,900 µS/cm** (Sump) which is above the TV.

6.3.2 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 sulfide 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.

Dissolved Oxygen was recorded for Leachate only, at **0.98 mg/L** (Sump) and **1.26 mg/L** (LP1).

6.3.3 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).

Surface Water

Surface water reported pH values of between **pH 7.2** (SWP1) and **pH 8.5** (SWP-4).

Groundwater

Groundwater pH was reported between **pH 6.7** (BH-14) and **pH 7.3** (BH-3). All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0. The results are largely within the historical range of values.

6.3.4 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 were reported between **<5 mg/L** (SWC-down2 and SWC2) and **46 mg/L** (SWC-up).

6.4 INORGANIC ANALYTES

6.4.1 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.

Ammonia

Ammonia was measured within groundwater monitoring bores between **0.36 mg/L** (BH-14) and **340 mg/L** (BH-1c). Eight (8) out of the nine (9) groundwater wells reported exceedances over the adopted trigger value of 0.91 mg/L. This is consistent with historical values.

Ammonia in leachate was reported at **1960 mg/L** (LP1) and **1960 mg/L** (Sump). High ammonia concentrations are expected in untreated leachate.

Ammonium

Ammonium was measured at Rocklow Creek surface water monitoring locations between **0.16 mg/L** (SWC-down 2) and **0.24 mg/L** (SWC-2 and SWC-down). All results are below the adopted trigger value of 0.91 mg/L.

Nitrate

Results for Nitrate in groundwater were reported between **<.01 mg/L** in multiple bores and **17.4 mg/L** (BH-15). A total of four (4) exceedances in groundwater were reported above the TV of 0.7mg/L including: **17.4 mg/L** (BH-15), **17.2 mg/L** (BH-14), **2.01 mg/L** (BH-13) and 1**.49 mg/L** (BH-3).

Nitrate in Rocklow Creek surface water samples were all reported below the TV of 0.7mg/L. The results are considered satisfactory.

Nitrate in leachate was reported at **11.1 mg/L** (Leachate Sump), **<0.10 mg/L** (Leachate Tank LP1).

6.4.2 Metals & Metalloids

Magnesium (Total Mg)

Magnesium was analysed in selected surface water samples. Concentrations of magnesium in surface water were reported between **18 mg/L** (SWP-1) and **1,100 mg/L** (SWC-down).

Manganese (Total Mn)

Manganese was analysed in groundwater and leachate sampling points. Concentrations of Manganese in groundwater were reported between **0.102 mg/L** (BH-1c) and **0.685 mg/L** (BH-9). Leachate concentrations were reported as **0.448 mg/L** (Sump) and **0.513 mg/L** (Tank). These values are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable. Concentrations of Manganese should continue to be reviewed during subsequent monitoring events.

6.5 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 monitoring period at the following concentrations:

- Groundwater; between **16 mg/L** (BH-4) and **219 mg/L** (BH-1c); and
- Leachate; **3080 mg/L** (Sump) and **3540 mg/L** (LP1).

6.6 SUMMARY OF WATER QUALITY EXCEEDANCES

The following table provides a summary of exceedances above the ANZECC (2000) guidelines for the protection of 95% of fresh water and marine species for the collected water samples.

Table 6: Summary of Quarterly Water Monitoring Exceedances

Sample ID	EPA Point No.	Exceedances	Comments	
		Results	Guideline	
BH-1c	**3**	Ammonia 318 mg/L EC 7,080 µS/cm	0.91 mg/L 125-2200 µS/cm	Exceedances of Ammonia, Nitrate, pH and Salinity (EC) were encountered in multiple wells at the Site. Concentrations are elevated and within range of historical data sets. Exceedances of Ammonia and Electrical Conductivity were encountered
BH-3	**5**	Ammonia 15.6 mg/L Nitrate 11.6 mg/L	0.91 mg/L 0.7 mg/L	
BH-4	**6**	Ammonia 10.8 mg/L	0.91 mg/L	
BH-9	**18**	Ammonia 98.8 mg/L EC 5,000 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-12r	**17**	Ammonia 6.68 mg/L EC 2,270 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-13	**3**	Ammonia 1.48 mg/L Nitrate 5.20 mg/L	0.91 mg/L 0.7 mg/L	
BH-14	**11**	Nitrate 32.0mg/L	0.7mg/L	
BH-15	**7**	Ammonia 20.40 mg/L EC 3260 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-18	**25**	No exceedances		
BH-19r	**16**	Ammonia 4.77mg/L	0.9 mg/L	
BH-21	**23**	Ammonia 4.28 mg/L EC 2,570 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-22	**24**	Ammonia 1.38 mg/L	0.91 mg/L	
SWP-1	**1**	No exceedances	-	-
SWC-up	**20**	No exceedances	-	-
SWC-2	**19**	No exceedances		
SWC-down	**21**	No exceedances		
SWC-down 2	**22**	No exceedances		
Leachate Tank LP1	**2**	Ammonia 1610 mg/L DO 46.6% EC 16,700 µS/cm	0.91 mg/L 85-100% 125-2,200 µS/cm	Elevated levels of Ammonia and EC considered to be characteristic of untreated leachate material.

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 15th May and 17th June 2021, in general accordance with AS3580.10.1.

Table 7: Summary of Dust Gauge Results

Sample ID	Guideline Criteria (g/m^2/month)	Total Insolvable Matter (g/m^2/month)	Comments
DDG1	4	**<0.1**	Satisfactory
DDG2		**0.1**	Satisfactory
DDG3		**0.4**	Satisfactory
DDG4		**0.2**	Satisfactory

Results for depositional dust during the June 2021 quarterly monitoring period reported levels of dust between below the adopted assessment criteria of **4 g/m^2/month**. The results are therefore considered satisfactory. Dust gauge locations are provided in **Figure 2** attached. It is recommended that monitoring is continued as part of the quarterly regime.

8.0 FLARE MONITORING

Table 8: Summary of Flare Operating Temperatures

Monitoring Period	Month	Date	Average Flare Temp
Qtr3	April	6-Apr	794
		9-Apr	836
		14-Apr	827
		19-Apr	820
		29-Apr	807
		30-Apr	744
	Mean April Temp		**804.6**
	May	1-May	893
		7-May	634
		14-May	792
		25-May	823
		27-May	751
		31-May	802
	Mean May Temp		**782.5**
	June	7-Jun	758
		14-Jun	769
		18-Jun	755
		24-Jun	778
		29-Jun	719
	Mean June Temp		**755.8**
Mean Quarterly Flare Temp			**782.4**

Weekly average operating temperatures supplied by LGI displayed typical variation associated with a continuous process but generally trended downward over the quarter.

Weekly operating temperatures at the Flare fell below the Lower Limit of 760 degrees on six (6) occasions, once (1) in April, twice (2) in May and three times (3) in June.

9.0 SURFACE METHANE GAS RESULTS

The surface gas monitoring from the June 2021 quarterly monitoring period reported levels of methane between 1.4 ppm and 36.9 ppm which is below the EPA license limits of 500 ppm. The results are considered satisfactory. A table of results is provided in **Appendix D**.

10.0 ENVIRONMENTAL ASSESSMENT

10.1 MONITORING POINT SUMMARY

Field measurements and laboratory water quality results from the ***June 2021*** quarterly monitoring period reported concentrations analytes generally within the range historical values. Groundwater water within the Site boundary reported high levels of analytes in exceedance of the SAC, considered to be characteristic of landfill and leachate.

Offsite sample locations within Rocklow Creek reported satisfactory results.

All dust gauges were reported below the site assessment criteria which was considered satisfactory.

Results of surface methane gas monitoring recorded satisfactory results. The landfill surface cap is therefore considered intact and effective.

Results of flare monitoring reported exceedances for temperature on six (6) occasions.

11.0 CONCLUSION AND RECOMMENDATIONS

Based on the findings obtained during the ***June 2021*** quarterly 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 reported exceedances of the assessment criteria for; ammonia, nitrate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-

12r, BH-13, BH-14, BH-15, BH-19r, BH-21 and BH-22. This is consistent with previous monitoring events;

- Onsite surface water samples (SWP-1) reported no exceedances to the ANZECC (2000) trigger values for 95% marine/freshwater;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria. Concentrations of key leachate indicators including ammonium and nitrate were below the ANZECC (2000) trigger values for marine waters in all Rocklow Creek sample locations;
- The existing monitoring locations and sampling regime (specified in EPL 5984) is generally considered to provide a suitable assessment of surface water, leachate and groundwater conditions;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all buildings within 250m of deposited waste;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Flare temperature data indicated a downward trend in operating temperatures throughout the quarter.
- Average weekly operating temperatures at the Flare fell below the EPL Lower Limit of 760 degrees on six (6) occasions, once (1) in April, twice (2) in May and three times (3) in June.
- Based on this review of the quarterly June 2021 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.

12.0 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.

13.0 REFERENCES

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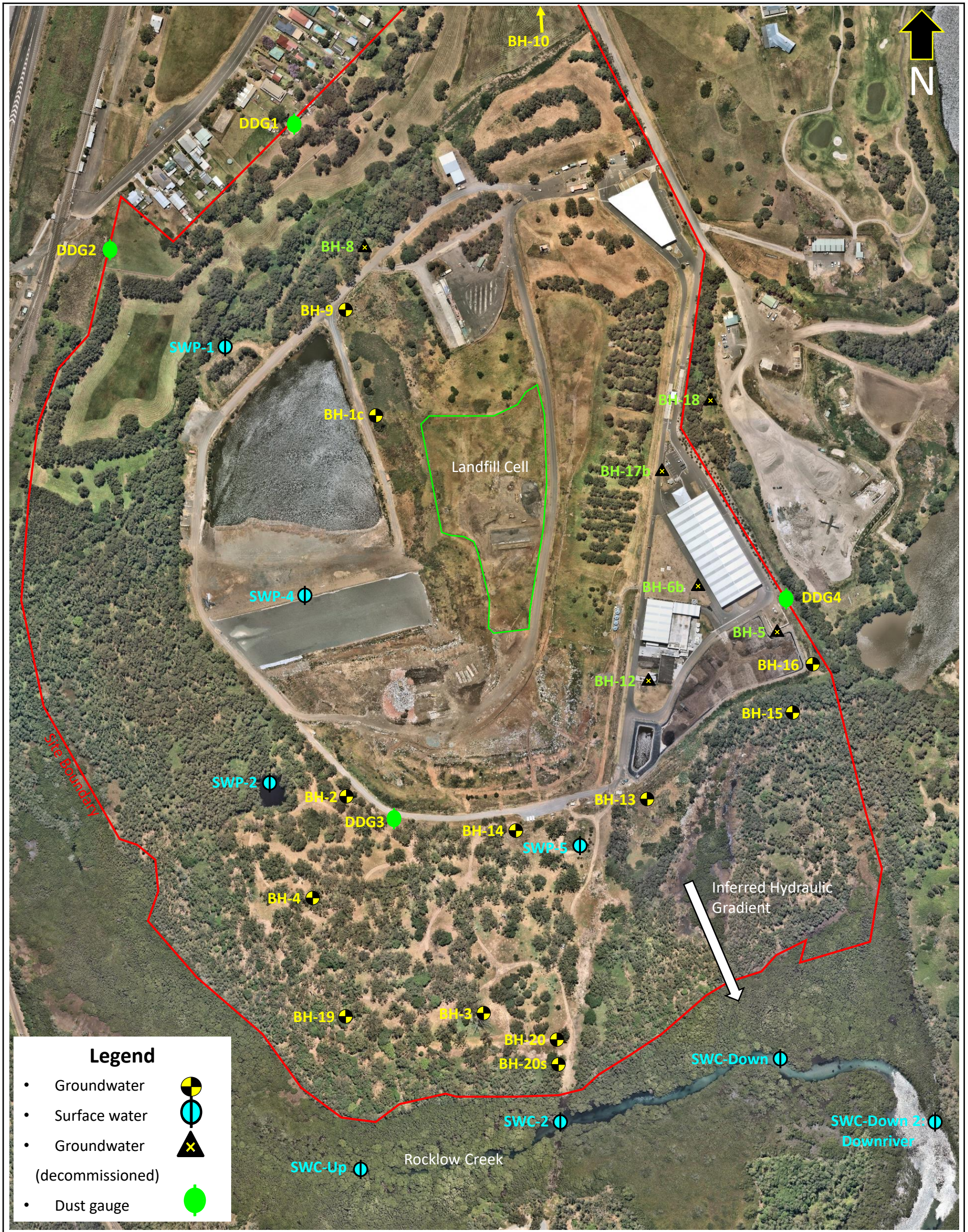
FIGURES

Figure 2: Sampling Points & Site Plan



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Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**2**
Project:	**ENRS0033**	Source:	**NearMaps**	Date:	**4/02/2020**
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	**NA**	Title:	**Site Plan**
		Status:	**Rev 1**		

Figure 3: Surface Methane Gas Sample Transects

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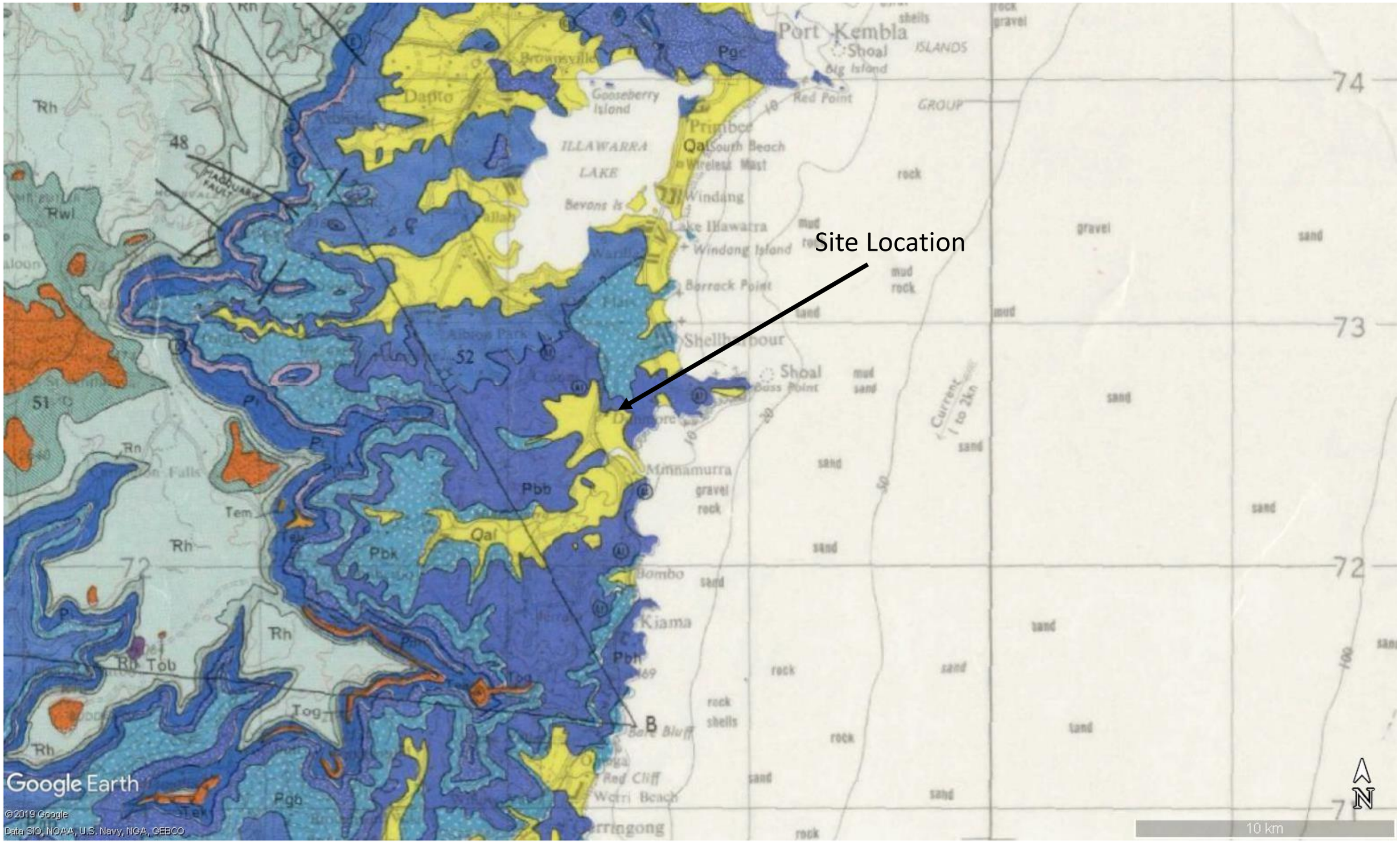
Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**3**
Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/01/2020**
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	**NA**	Title:	**Surface Gas Sample transects**
		Status:	**Rev 1**		

Figure 4: Regional Geology



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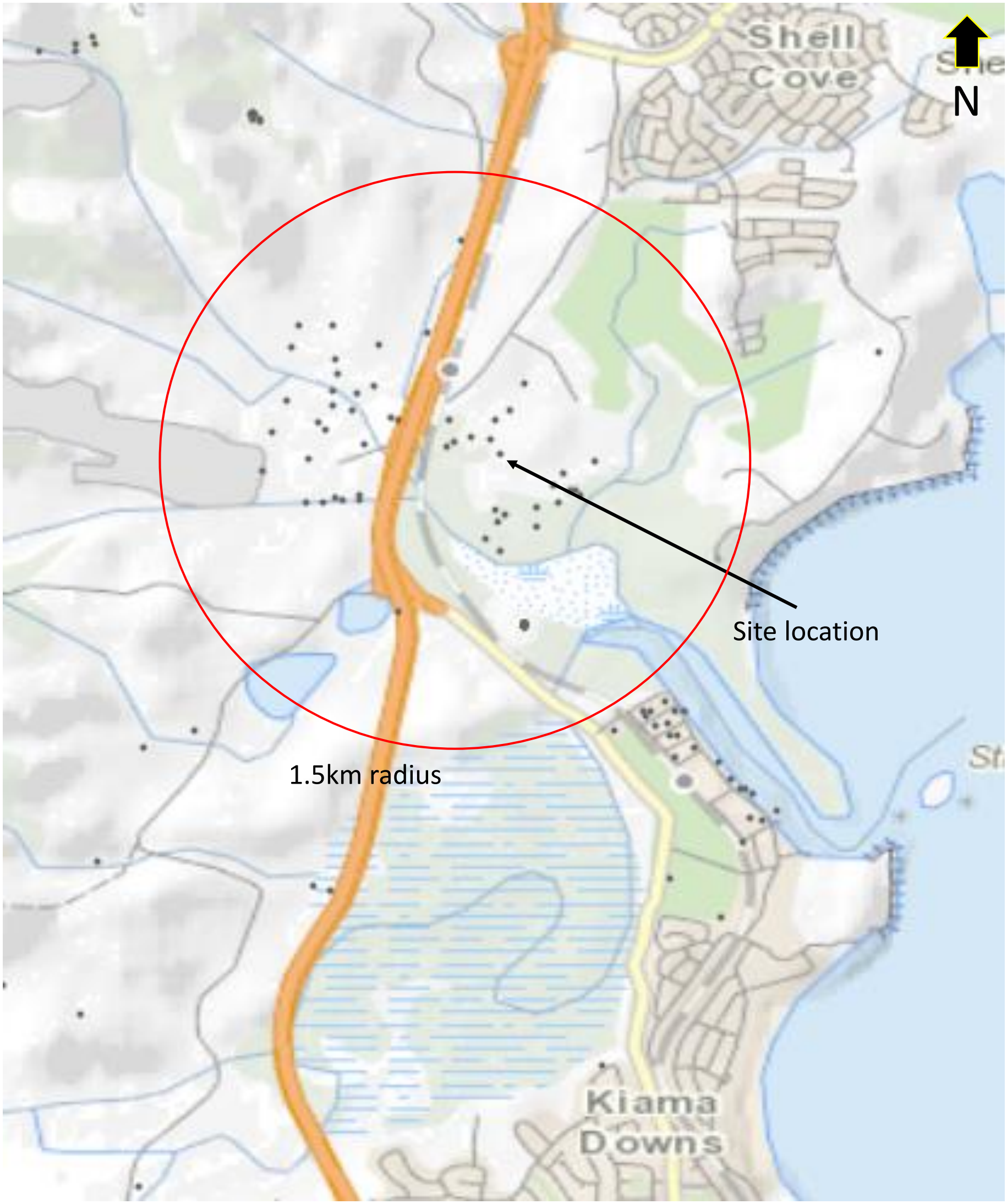
Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**4**
Project:	**ENRS0033**	Source:	**Geological Survey of NSW**	Date:	**16/01/2020**
Location:	**Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529**	Scale:	**See figure**	Title:	**Site Geology**
		Status:	**Rev 1**		

Figure 5: Registered Bores



ENRS Environment & Natural Resource Solutions 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**4**
	Project:	**ENRS0033**	Source:	**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: Water Quality Results

Comparison of Quarterly Monitoring Results Against Site Assessment Criteria

TABLE 8: Total Concentration Results

Quarterly Water Monitoring Results - June 2021: Dunmore Recycling and Waste Depot

GILs -Trigger Values for Freshwater (Protection of 95% of Species) [A]			-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	0.9 (pH 8)	-	0.7	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-		
GILs -Trigger Values for Marine Water (Protection of 95% of Species) [A]			-	-	-	-	-	-	-	-	-	0.91 (pH 8)	0.91 (pH 8)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Australian Drinking Water Guidelines (2018)[C]		Health	-	-	-	-	-	0.5	-	-	1.5	-	-	3	50	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-		
		Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	0.5	-	-	-	-	-	-	-	-	-	-	250	-	-	-	5	-	-	-	6.5 - 8.5	-	-		
Sample No.		Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Ammonium as N	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Total Organic Carbon	Biochemical Oxygen Demand	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	Total Anions	Total Cations	Ionic Balance	pH	Electrivcal Conductivity	Temperature	Depth to Water (mbgl TOC)	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	mg/L	mg/L	mg/L	mg/L	%	mg/L	NTU	meq/L	meq/L	meq/L	pH	µS/cm	°C	mbgl				
EPA No.		Laboratory PQL	1	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	0.01	0.01	1	2	1	1	1	1	1	0.01	0.1	5	0.1	0.01	0.01	0.01	0.01	1	0.1	-	-		
Groundwater	BH-1c	3	16/03/2021	865	143	-	-	207	0.118	-	13.10	0.2	318.00	-	<0.01	<0.01	<0.10	168	-	<1	<1	1630	1630	<10	-	-	-	-	-	-	-	7.00	7080	24	2.93	-		
	BH-3	5	16/03/2021	155	156	-	-	32	0.098	-	0.29	0.2	15.60	-	0.08	11.60	11.70	11	-	<1	<1	259	259	97	-	-	-	-	-	-	-	7.20	1430	18.7	3.01	-		
	BH-4	6	16/03/2021	227	233	-	-	17	0.223	-	5.22	<0.1	10.80	-	<0.01	<0.01	<0.01	21	-	<1	<1	411	411	172	-	-	-	-	-	-	-	7.60	2090	19	4.21	-		
	BH-9	18	16/03/2021	630	285	-	-	74	0.467	-	5.30	0.4	98.80	-	<0.01	<0.01	<0.01	91	-	<1	<1	1050	1050	98	-	-	-	-	-	-	-	6.90	5000	17.3	2.86	-		
	BH-12r	17	16/03/2021	275	239	-	-	84	0.527	-	11.20	0.2	6.68	-	<0.01	0.49	0.49	24	-	<1	<1	351	351	185	-	-	-	-	-	-	-	6.70	2270	21.8	4.19	-		
	BH-13	10	16/03/2021	118	174	-	-	18	0.146	-	1.10	0.2	1.48	-	<0.01	5.20	5.20	18	-	<1	<1	369	369	139	-	-	-	-	-	-	-	6.70	1490	20.7	4.17	-		
	BH-14	11	16/03/2021	102	102	-	-	24	0.062	-	0.09	0.5	0.12	-	0.20	32	32.20	35	-	<1	<1	190	190	134	-	-	-	-	-	-	-	6.40	1320	21.4	4.58	-		
	BH-15	7	16/03/2021	527	83	-	-	232	0.248	-	6.34	0.2	20.40	-	<0.01	0.01	0.01	34	-	<1	<1	187	187	434	-	-	-	-	-	-	-	6.90	3260	15.78	0.7	-		
	BH-18	25	16/03/2021	10	33	-	-	4	0.051		0.96	0.1	0.16	-	<0.01	<0.01	<0.01	2	-	<1	<1	78	78	4	-	-	-	-	-	-	-	6.70	259	20.7	2.03	-		
	BH-19	16	16/03/2021	200	166	-	-	25	0.120	-	1.05	0.2	4.77	-	<0.01	0.05	0.05	18	-	<1	<1	285	285	200	-	-	-	-	-	-	-	7.10	1830	18.8	4.39	-		
	BH-21	23	16/03/2021	338	127	-	-	20	0.321		0.93	0.3	4.28	-	<0.01	0.01	0.01	31	-	<1	<1	315	315	346	-	-	-	-	-	-	-	7.10	2570	21.9	1.81				
	BH-22	24	16/03/2021	234	138	-	-	26	0.096		0.71	0.3	1.38	*	<0.01	<0.01	<0.01	23	-	<1	<1	356	356	222	-	-	-	-	-	-	-	7.40	2070	19.1	2.46				
Surface Water	SWP-1	1	17/03/2021	352	32	53	314	14	-	0.29	0.22	0.4	0.22	0.22	<0.01	<0.01	<0.01	16	-	<1	<1	256	256	234	-	-	<5	2.7	19.90	21.50	3.76	7.40	-	-	-	-		
Rocklow Creek	SWC-up	20	17/03/2021	2230	81	143	1180	45	-	0.80	<0.05	0.3	0.14	0.14	<0.01	0.29	0.29	5	-	<1	<1	85	85	358	-	-	14	14.0	72.00	68.30	2.68	7.40	-	-	-	-		
	SWC-2	19	17/03/2021	2270	89	170	1410	54	-	0.75	0.10	0.3	0.14	0.14	<0.01	0.28	0.28	6	-	<1	<1	92	92	411	-	-	<5	-	87.10	81.10	3.55	7.50	-	-	-	-		
	SWC-down	21	17/03/2021	2900	91	177	1480	57	-	0.66	<0.05	0.3	0.18	0.18	<0.01	0.28	0.28	7	-	<1	<1	82	82	419	-	-	<5	12.8	92.20	84.50	4.08	7.50	-	-	-	-		
	SWC-down 2	22	17/03/2021	3320	91	206	1740	66	-	0.65	<0.05	0.3	0.11	0.11	<0.01	0.26	0.26	3	-	<1	<1	102	102	476	-	-	15	12.3	106.00	99.30	3.07	7.50	-	-	-	-		
Leachate	Leachate Tank LP1	2	17/03/2021	1420	73	-	-	525	0.476	1.25	-	0.4	1610	-	<0.10	<0.10	<0.10	869	-	<1	<1	6470	6470	<10	3.56	46.6	-	-	-	-	-	7.70	16700	25	-	-		
Notes:	MIN		10.0	32.0	53.0	314.0	4.0	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	2.0	0.0	0.0	15.0	78.0	78.0	4.0	1.0	11.8	13.0	2.7	19.9	21.5	2.7	6.4	259.0	15.8	0.7				
	MAX		3320	285	206	1740	525	1	2	13	1	1960	0	28	32	39	3080	0	0	15	6470	6470	476	4	47	15	14	106	99	4	9	16700	26	5				
	Mean		912.1	130.2	134.8	1080.3	100.6	0.2	0.8	3.3	0.3	213.3	0.2	9.4	5.1	7.5	234.8	#DIV/0!	#DIV/0!	15.0	951.4	952.2	248.2	2.3	29.2	14.0	9.6	67.0	62.9	3.5	7.3	4519.2	20.7	3.1				

[A] Investigation levels apply to typical slightly-moderately disturbed systems. Trigger Levels for 95% of species. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions. Also the sames as the NEPM (2013) EILs.
[B] ANZG 2018 - pH Upper and Lower Limit for NSW Lowland Rivers (Table 3.3.2).
[C] Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2018).
[D] NEPM (2013 Table 1A(4) Groundwater HSLs for vapour intrusion (Sand 2m-4m)
[E] Netherlands (2000) Circular on Target Values and Intervention Values for Soil Remediation. Ministry of Housing, Spatial Planning and the Environment, Netherlands Government (Dutch Intervention Value/Indicative of Serious Contamination).
[F] Former NSW EPA (1994) Guidelines for Assessing Service Station Sites. Replaced by the Technical Note for Investigation of Service Station Sites (EPA;2014).

APPENDICES

Appendix A

EPL 5984 Sampling Point Summary (NSW EPA, 27/11/2020)

Water & Land

EPA Point	Type	Site ID	Description
1	Overflow drain	SWP1	Catch drain collecting overflows from Sediment Dams 1 & 2 and labelled SWP1 on the drawing titled "Shellharbour City Council - "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
2	Leachate monitoring	LP1	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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).

Air

EPA Point	Type	Site ID	Description
12	Surface Gas Monitoring	General Site	Above areas where intermediate or final cover has been placed
13	Gas Accumulation Monitoring	Buildings	Inside all buildings within 250 metres of deposited waste
14	Discharge to air Air emissions monitoring	Flare	Landfill Gas Flare as shown on Drawing No. M7494-02-E1, dated 15 October 2015 (EPA Reference DOC15/415378)

Appendix B

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

CLIENT: Shellharbour City Council
PROJECT: Dunmore Quarterly Ground Waters EPL

ALS

Ground and Surface Water Field Sheet

Sample ID	EPA Points	Sampling Date	Sample Time	Bottle Type	pH	EC us/cm	SWL - M	Temp - degrees C	Bore Hole Purge Date	Volume removed before sampling (L)	Sampling Device Rinsed Before Use	Comments
BH1C	Point 3	17.6.21	9.00		7.02	7080	2.93	24.04		20		
BH3	Point 5	↓	11:50		7.24	1428	3.01	18.72		20		
BH4	Point 6	↓	12:10		6.98	2090	4.21	19.02		20		
BH9	Point 18	~~8:25~~	8:25		6.92	5000	2.86	17.34		15.		
BH12R	Point 17	RNC	10:20		6.70	2269	4.19	21.75		20.		
BH13	Point 10	↓	10:35		6.72	1490	4.17	20.71		20		
BH14	Point 11	↓	11:10		6.42	1316	4.58	21.35		20		
BH15	Point 7	↓	10:00		6.92	3260	0.70	15.69		15.		
BH19R	Point 16	↓	11:30		7.14	1830	4.39	18.81		20.		
BH18	Point 25	↓	12:55		6.74	259	2.03	20.72		20		
BH21	Point 23	↓	9:30		7.08	2573	1.81	21.94		20		
BH22	Point 24	↓	9:20		7.38	2067	2.46	19.14		20		
Field Duplicate		↓	8:25		6.93	5006	2.86	17.29				
Rinsate Blank ~~DI Water~~	RNC	↓	8:50		7.02	2	-	15.93				102.1% 9.84
Field Blank		↓	8:20		7.03	1	-	15.87				102. % 9.84
Trip Blank		↓	13:20		7.06	1	-	17.80				

Testing Equipment Used

Test Name		Equip No.	Cal Date	Cal By
EC	ALXW0073Q		16.6.21	RNC
pH	↓		↓	↓
Temp - degrees C	" 61Q		4/21	↓
SWL				

CLIENT: Shellharbour City Council
PROJECT: Dunmore Quarterly Ground Waters

Ground and Surface Water Field Sheet

Sample ID	Sampling Date	Sample Time	Bottle Type	pH	EC - us/cm	SWL - M	Temp degrees C	Bore Hole Purge Date	Volume removed before sampling (L)	Sampling Device Rinsed Before Use	Comments
~~BHA~~ * BH2	15.6.21	10:38		7.01	2760	3.67	22.27		20.		
~~BH2~~ * BHA	RM.	12:05		6.76	1044	2.79	21.16		20.		
BH10		13:15		7.26	2209	0.64	17.86.		5.		
BH16		14:00		7.07	544	0.56	15.94		5.		(orp. → -130.6).
BH17R		11:40		6.81	2433	3.19	~~23~~ 19.99		20		
BH18R		13:40		7.49	3438	2.65	18.25		7.		
BH20		9:30		7.38	1683	2.27	18.17		20		
BH20s		9:40		7.46	1034	2.28	18.29		15		
duplicate		9:30		7.37	1688	2.28.	18.53				
~~DI Water~~ Field blank	RM.	8:00		7.08	1	—	14.89				
~~Field Blank~~ Rinsate blank		9:00.		7.10.	1	—.	14.43				
Trip Blank		15:00		7.03	1	—	19.08				

Testing Equipment Used

Test Name	Equip No.	Cal Date	Cal By
EC	Aquaw20736	15.6.21	RM.
pH	1	1	1
Temp degrees C	GIR.	4/21.	1.
SWL			

CHAIN OF CUSTODY

ALS Laboratory: *please tick →*

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph. 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 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 : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Surface Waters EPL	ALS QUOTE NO.:	WO/030/19 TENDER
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle)	COC: 1 2 3 4 5 6 7 / OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dolcio	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to :			
Email Invoice to :			

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert	[signature]		
DATE/TIME: 16.6.21 15:20	DATE/TIME: 16.6.21 15:20	DATE/TIME:	DATE/TIME:

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

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).

ALS USE ONLY: LAB ID	SAMPLE DETAILS MATRIX: Solid(S) Water(W): SAMPLE ID	DATE / TIME	MATRIX	CONTAINER INFORMATION: 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		Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SWP1	16.6.21 11:10	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
2	SWC_2	8:15	W				✓		✓		✓	✓		Field Tests - pH, EC, DO & Temp
3	SWC_UP	8:03	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
4	SWC_DOWN	8:10	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
5	SWC_DOWN_2	8:25	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2102627

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 ... eserved Glass;
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
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ENFM204

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102627**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 16-Jun-2021 15:20
Order number	: 130985	Date Analysis Commenced	: 16-Jun-2021
C-O-C number	: ----	Issue Date	: 24-Jun-2021 08:56
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 5		
No. of samples analysed	: 5		

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	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- TDS by method EA-015 may bias high for various samples 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.
- Temperature performed by ALS Wollongong via in-house method EA016 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

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

Compound	CAS Number	LOR	Unit	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	16-Jun-2021 11:10	16-Jun-2021 08:15	16-Jun-2021 08:00	16-Jun-2021 08:20	16-Jun-2021 08:25
					EW2102627-001	EW2102627-002	EW2102627-003	EW2102627-004	EW2102627-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.4**	**7.5**	**7.4**	**7.5**	**7.5**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**2070**	**8630**	**7330**	**9030**	**7560**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**----**	**5270**	**4460**	**5460**	**6370**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	**14**	<5	**15**
EA045: Turbidity									
Turbidity	----	0.1	NTU		**2.7**	**----**	**14.0**	**12.8**	**12.3**
EA116: Temperature									
Temperature	----	0.1	°C		**11.4**	**10.5**	**10.9**	**10.4**	**10.4**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**256**	**92**	**85**	**82**	**102**
Total Alkalinity as CaCO3	----	1	mg/L		**256**	**92**	**85**	**82**	**102**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**234**	**411**	**358**	**419**	**476**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**352**	**2720**	**2230**	**2900**	**3320**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**62**	**89**	**81**	**91**	**100**
Magnesium	7439-95-4	1	mg/L		**53**	**170**	**143**	**177**	**206**
Sodium	7440-23-5	1	mg/L		**314**	**1410**	**1180**	**1480**	**1740**
Potassium	7440-09-7	1	mg/L		**14**	**54**	**45**	**57**	**66**
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.22**	**0.10**	<0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.29**	**0.75**	**0.80**	**0.66**	**0.65**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.3**	**0.3**	**0.3**	**0.3**
EK055G: Ammonia as N by Discrete Analyser									

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	16-Jun-2021 11:10	16-Jun-2021 08:15	16-Jun-2021 08:00	16-Jun-2021 08:20	16-Jun-2021 08:25
Compound	CAS Number	LOR	Unit	EW2102627-001	EW2102627-002	EW2102627-003	EW2102627-004	EW2102627-005
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser - Continued								
Ammonia as N	7664-41-7	0.01	mg/L	0.22	0.14	0.14	0.18	0.11
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	0.01	mg/L	0.22	0.14	0.14	0.18	0.11
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.28	0.29	0.28	0.26
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.28	0.29	0.28	0.26
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	19.9	87.1	72.0	92.2	106
ø Total Cations	----	0.01	meq/L	21.5	81.1	68.3	84.9	99.3
ø Ionic Balance	----	0.01	%	3.76	3.55	2.68	4.08	3.07
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	16	6	5	7	3
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	2.88	8.90	9.00	9.20	9.01

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2102627**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 16-Jun-2021
Order number	: 130985	Date Analysis Commenced	: 16-Jun-2021
C-O-C number	: ----	Issue Date	: 24-Jun-2021
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3748552)									
EW2102627-002	SWC_2 Point 19	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5270	5290	0.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3748551)									
EW2102627-002	SWC_2 Point 19	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	6	0.0	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3748562)									
ES2122614-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5	5	0.0	No Limit
ES2122961-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	8	9	15.4	No Limit
EA045: Turbidity (QC Lot: 3742480)									
ES2121822-001	Anonymous	EA045: Turbidity	----	0.1	NTU	7.8	8.2	5.3	0% - 20%
ES2122225-013	Anonymous	EA045: Turbidity	----	0.1	NTU	1.0	1.1	0.0	0% - 50%
EA045: Turbidity (QC Lot: 3742481)									
EW2102627-003	SWC_UP Point 20	EA045: Turbidity	----	0.1	NTU	14.0	14.0	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3747673)									
ES2122840-015	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ES2122840-011	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3740060)									
ES2122494-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	7	7	0.0	No Limit
EW2102629-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	17	17	0.0	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED045G: Chloride by Discrete Analyser (QC Lot: 3740061)									
ES2122494-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	9	9	0.0	No Limit
EW2102629-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	97	98	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3743300)									
ES2122303-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	27	27	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	23	23	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	38	38	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	3	3	0.0	No Limit
ES2122499-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	302	302	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3743304)									
EW2102627-005	SWC_DOWN_2 Point 22	ED093F: Calcium	7440-70-2	1	mg/L	100	89	12.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	206	182	12.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1740	1550	11.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	66	60	9.9	0% - 20%
EW2102639-008	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3743301)									
ES2122389-002	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.45	0.46	2.5	No Limit
ES2122499-004	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.34	0.33	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3743305)									
EW2102627-005	SWC_DOWN_2 Point 22	EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EW2102639-008	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.09	0.09	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3743614)									
EW2102628-003	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	2.36	2.29	3.1	0% - 20%
ES2122455-001	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	1.45	1.45	0.0	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 3747675)									
ES2122840-015	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
ES2122840-011	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3747072)									
ES2122455-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	62.2	59.8	3.8	0% - 20%
ES2122500-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.36	1.35	0.7	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3740062)									
ES2122494-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2102629-004	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3747071)									
ES2122348-017	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.28	0.28	0.0	0% - 20%
EW2102627-003	SWC_UP Point 20	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.29	0.29	0.0	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 3742808)									
ES2122340-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	2	86.8	No Limit
ES2122634-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	2	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3748552)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	96.6	87.0	109
				<10	293 mg/L	109	75.2	126
				<10	2835 mg/L	102	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3748551)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	96.0	83.0	129
				<5	1000 mg/L	96.7	82.0	110
				<5	463 mg/L	104	83.0	118
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3748562)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	114	83.0	129
				<5	1000 mg/L	101	82.0	110
				<5	463 mg/L	108	83.0	118
EA045: Turbidity (QCLot: 3742480)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	102	91.0	105
EA045: Turbidity (QCLot: 3742481)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	102	91.0	105
ED037P: Alkalinity by PC Titrator (QCLot: 3747673)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	109	81.0	111
				----	50 mg/L	100	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3740060)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	82.0	122
				<1	500 mg/L	105	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 3740061)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	103	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 3743300)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.8	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.4	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.1	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.4	85.0	113
ED093F: Dissolved Major Cations (QCLot: 3743304)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.9	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.6	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.7	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.8	85.0	113

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3743301)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	99.0	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 3743305)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	98.0	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 3743614)								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.5	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 3747675)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	99.8	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3747072)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	105	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3740062)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.4	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3747071)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 3742808)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	90.3	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3740060)							
ES2122494-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	113	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3740061)							
ES2122494-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	104	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 3747675)							
ES2122840-005	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	78.0	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3747072)							
ES2122455-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	# Not Determined	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3740062)							
ES2122494-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	106	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3747071)							
ES2122348-017	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	112	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP005: Total Organic Carbon (TOC) (QCLot: 3742808)							
ES2122394-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	99.4	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2102627**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 16-Jun-2021
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 24-Jun-2021
Sampler	: Robert DaLio	No. of samples received	: 5
Order number	: 130985	No. of samples analysed	: 5

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK055G: Ammonia as N by Discrete Analyser	ES2122455--001	Anonymous	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	35	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**22-Jun-2021**	23-Jun-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**22-Jun-2021**	23-Jun-2021	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
SWP1 - Point 1, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**17-Jun-2021**	18-Jun-2021	✓
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	30-Jun-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	14-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	14-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	14-Jul-2021	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	13-Dec-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**18-Jun-2021**	13-Dec-2021	✓	**18-Jun-2021**	13-Dec-2021	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	14-Jul-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	14-Jul-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	18-Jun-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	14-Jul-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	14-Jul-2021	✓
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	----	----

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	24	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	24	**25.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	5	**60.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	35	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	19	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ammonium as N	EK055G-NH4	WATER	Ammonium in the sample is reported as the ionised / unionised fractions by the use of a nomograph and the initial pH and Temperature. Ammonia is determined by direct colorimetry by Discrete Analyser according to APHA 4500-NH3 G. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 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 : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	ALS QUOTE NO.:	WO/030/19 TENDER
PROJECT:	Dunmore Quarterly Surface Waters		
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert DaLio	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert.			
DATE/TIME: 16.6.21 15:20	DATE/TIME: 16.6.21 15:20	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS (MATRIX: Solid(S) Water(W))			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2 (Ionic Balance)	TOC & BOD	Dissolved and Total Fe	Turbidity	NH4 & NO3	Alkalinity		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SWP2	16/6/21 10:30	W			✓	✓		✓	✓				Field Tests - pH
2	SWP4 - Sand Mine Dam	" 10:55	W			✓	✓	✓	✓	✓				Field Tests - pH
3	SWP5	" 10:20	W			✓	✓	✓	✓	✓				Field Tests - pH
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2102628

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 Unpres
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;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Glass;

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102628**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water	Date Samples Received	: 16-Jun-2021 15:20
Order number	: 130985	Date Analysis Commenced	: 16-Jun-2021
C-O-C number	: ----	Issue Date	: 24-Jun-2021 08:56
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 3		
No. of samples analysed	: 3		

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	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EN055: Ionic Balance out of acceptable limits for sample EW2102628-#003 due to analytes not quantified in this report.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- 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	SWP2	SWP4 - Sand Mine Dam	SWP5	----	----
			Sampling date / time	16-Jun-2021 10:30	16-Jun-2021 10:55	16-Jun-2021 10:00	----	----
Compound	CAS Number	LOR	Unit	EW2102628-001	EW2102628-002	EW2102628-003	--------	--------
				Result	Result	Result	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.9	7.8	8.4	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	66	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	3.2	13.7	53.5	----	----
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	741	390	2140	----	----
Total Alkalinity as CaCO3	----	1	mg/L	741	390	2140	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	212	277	74	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	363	372	662	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	131	50	103	----	----
Magnesium	7439-95-4	1	mg/L	56	55	57	----	----
Sodium	7440-23-5	1	mg/L	310	344	468	----	----
Potassium	7440-09-7	1	mg/L	37	10	325	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.27	<0.05	1.20	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.39	0.40	2.36	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	29.4	24.0	63.0	----	----
ø Total Cations	----	0.01	meq/L	25.6	22.2	38.5	----	----
ø Ionic Balance	----	0.01	%	7.05	3.92	24.1	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	18	290	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	----	<2	30	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

(WATER) EN055: Ionic Balance

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EP030: Biochemical Oxygen Demand (BOD)

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2102628**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water	Date Samples Received	: 16-Jun-2021
Order number	: 130985	Date Analysis Commenced	: 16-Jun-2021
C-O-C number	: ----	Issue Date	: 24-Jun-2021
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3747058)									
ES2122454-022	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	16	10	47.6	No Limit
ES2122485-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	148	162	8.9	0% - 20%
EA045: Turbidity (QC Lot: 3742481)									
EW2102627-003	Anonymous	EA045: Turbidity	----	0.1	NTU	14.0	14.0	0.0	0% - 20%
EA045: Turbidity (QC Lot: 3745404)									
ES2122462-002	Anonymous	EA045: Turbidity	----	0.1	NTU	22.7	22.7	0.0	0% - 20%
EW2102656-001	Anonymous	EA045: Turbidity	----	0.1	NTU	<0.1	<0.1	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3747673)									
ES2122840-015	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ES2122840-011	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3747676)									
EW2102629-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	479	512	6.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	479	512	6.6	0% - 20%
EW2102634-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	351	387	9.7	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 3747676) - continued									
EW2102634-005	Anonymous	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	351	387	9.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3740060)									
ES2122494-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	7	7	0.0	No Limit
EW2102629-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	17	17	0.0	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 3740061)									
ES2122494-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	9	9	0.0	No Limit
EW2102629-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	97	98	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3743304)									
EW2102627-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	100	89	12.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	206	182	12.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1740	1550	11.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	66	60	9.9	0% - 20%
EW2102639-008	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3743305)									
EW2102627-005	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EW2102639-008	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.09	0.09	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3743614)									
EW2102628-003	SWP5	EG020A-T: Iron	7439-89-6	0.05	mg/L	2.36	2.29	3.1	0% - 20%
ES2122455-001	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	1.45	1.45	0.0	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 3742808)									
ES2122340-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	2	86.8	No Limit
ES2122634-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	2	0.0	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 3742040)									
EW2102628-002	SWP4 - Sand Mine Dam	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	5	85.7	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3747058)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	110	83.0	129
				<5	1000 mg/L	96.0	82.0	110
				<5	463 mg/L	97.7	83.0	118
EA045: Turbidity (QCLot: 3742481)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	102	91.0	105
EA045: Turbidity (QCLot: 3745404)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	99.5	91.0	105
ED037P: Alkalinity by PC Titrator (QCLot: 3747673)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	109	81.0	111
				----	50 mg/L	100	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 3747676)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	108	81.0	111
				----	50 mg/L	104	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3740060)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	82.0	122
				<1	500 mg/L	105	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 3740061)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	103	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 3743304)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.9	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.6	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.7	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.8	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 3743305)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	98.0	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 3743614)								
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.5	85.0	117
EP005: Total Organic Carbon (TOC) (QCLot: 3742808)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	90.3	72.0	120
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 3742040)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	200 mg/L	82.5	74.0	112

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3740060)							
ES2122494-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	113	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3740061)							
ES2122494-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3742808)							
ES2122394-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	99.4	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2102628**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water	Date Samples Received	: 16-Jun-2021
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 24-Jun-2021
Sampler	: Robert DaLio	No. of samples received	: 3
Order number	: 130985	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	15	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	23-Jun-2021	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**17-Jun-2021**	18-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**21-Jun-2021**	30-Jun-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	14-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) SWP2, SWP5 — SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**16-Jun-2021**	14-Jul-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)								
SWP2, SWP5	SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	14-Jul-2021	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)								
SWP2, SWP5	SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	13-Dec-2021	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)								
SWP2, SWP5	SWP4 - - Sand Mine Dam,	**16-Jun-2021**	**18-Jun-2021**	13-Dec-2021	✓	**18-Jun-2021**	13-Dec-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
SWP4 - - Sand Mine Dam,	SWP5	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	14-Jul-2021	✓
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
SWP4 - - Sand Mine Dam,	SWP5	**16-Jun-2021**	**----**	----	----	**17-Jun-2021**	18-Jun-2021	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	3	18	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	18	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Biochemical Oxygen Demand (BOD)	EP030	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	18	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	15	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	19	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM Schedule B(3).

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

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 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 Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council
OFFICE:	41 Burelli St WOLLONGONG NSW 2500
PROJECT:	Dunmore Quarterly Ground Waters EPL
ORDER NUMBER:	
PROJECT MANAGER:	Joel Culton
SAMPLER:	Robert Dakic
SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)	
EDD FORMAT (or default):	
Email Reports to :	
Email Invoice to :	
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:	CC reports to:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: WO/030/19 TENDER

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random			
Other con			

RELINQUISHED BY: Robert
DATE/TIME: 17.6.21

RECEIVED BY: Anete
DATE/TIME: 17.6.21

RELINQUISHE
DATE/TIME:

Environmental Division
Wollongong
Work Order Reference
EW2102634

Telephone : 02 42253125

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered								
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So4, Cl, Fl) Filtered Ca, K	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)				
1	BH1C	17.6.21 9:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
2	BH3	11:50	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
3	BH4	12:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
4	BH9	8:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
5	BH12R	10:20	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
6	BH13	10:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
7	BH14	11:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
8	BH15	10:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
9	BH19R	11:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
10	BH18	12:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
11	BH21	9:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
12	BH22	9:20	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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102634**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 17-Jun-2021 14:47
Order number	: 130985	Date Analysis Commenced	: 17-Jun-2021
C-O-C number	: ----	Issue Date	: 25-Jun-2021 08:40
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate on sample 1 due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling.
- Temperature performed by ALS Wollongong via in-house method EA016 and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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	17-Jun-2021 09:00	17-Jun-2021 11:50	17-Jun-2021 12:10	17-Jun-2021 08:25	17-Jun-2021 10:20
Compound	CAS Number	LOR	Unit	EW2102634-001	EW2102634-002	EW2102634-003	EW2102634-004	EW2102634-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.0	7.2	7.0	6.9	6.7
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7080	1430	2090	5000	2270
EA116: Temperature								
Temperature	----	0.1	°C	24.0	18.7	19.0	17.3	21.8
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	1630	259	411	1050	351
Total Alkalinity as CaCO3	----	1	mg/L	1630	259	411	1050	351
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	127	136	163	220
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	865	155	227	630	275
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	143	156	233	285	239
Potassium	7440-09-7	1	mg/L	207	32	17	74	84
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.118	0.098	0.223	0.467	0.527
Iron	7439-89-6	0.05	mg/L	13.1	0.29	5.22	5.30	11.2
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	<0.1	0.4	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	318	15.6	10.8	98.8	6.68
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.08	<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	11.6	<0.01	<0.01	0.49
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	11.7	<0.01	<0.01	0.49
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	168	11	21	91	24

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	BH1C	BH3	BH4	BH9	BH12R
			Sampling date / time	17-Jun-2021 09:00	17-Jun-2021 11:50	17-Jun-2021 12:10	17-Jun-2021 08:25	17-Jun-2021 10:20
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102634-001**	**EW2102634-002**	**EW2102634-003**	**EW2102634-004**	**EW2102634-005**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**2.93**	**3.01**	**4.21**	**2.86**	**4.19**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	BH13	BH14	BH15	BH19R	BH18
				Sampling date / time	17-Jun-2021 10:35	17-Jun-2021 11:10	17-Jun-2021 10:00	17-Jun-2021 11:30	17-Jun-2021 12:55
					EW2102634-006	EW2102634-007	EW2102634-008	EW2102634-009	EW2102634-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**6.7**	**6.4**	**6.9**	**7.1**	**6.7**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1490**	**1320**	**3260**	**1830**	**259**
EA116: Temperature									
Temperature	----	0.1	°C		**20.7**	**21.4**	**15.7**	**18.8**	**20.7**
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		**369**	**190**	**187**	**285**	**78**
Total Alkalinity as CaCO3	----	1	mg/L		**369**	**190**	**187**	**285**	**78**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**139**	**134**	**434**	**200**	**4**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**118**	**102**	**527**	**215**	**10**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**174**	**102**	**83**	**166**	**33**
Potassium	7440-09-7	1	mg/L		**18**	**24**	**232**	**25**	**4**
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.146**	**0.062**	**0.248**	**0.120**	**0.051**
Iron	7439-89-6	0.05	mg/L		**1.10**	**0.09**	**6.34**	**1.05**	**0.96**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.4**	**0.2**	**0.1**	**0.2**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**1.48**	**0.12**	**20.4**	**4.77**	**0.16**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	**0.20**	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**5.20**	**32.0**	**0.01**	**0.05**	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**5.20**	**32.2**	**0.01**	**0.05**	<0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**18**	**35**	**34**	**18**	**2**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**BH13**	**BH14**	**BH15**	**BH19R**	**BH18**
			Sampling date / time	17-Jun-2021 10:35	17-Jun-2021 11:10	17-Jun-2021 10:00	17-Jun-2021 11:30	17-Jun-2021 12:55
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102634-006**	**EW2102634-007**	**EW2102634-008**	**EW2102634-009**	**EW2102634-010**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**4.17**	**4.58**	**0.70**	**4.39**	**2.03**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH21	BH22	----	----	----
			Sampling date / time	17-Jun-2021 09:30	17-Jun-2021 09:20	----	----	----
Compound	CAS Number	LOR	Unit	EW2102634-011	EW2102634-012	--------	--------	--------
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.1**	**7.4**	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**2570**	**2070**	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**21.9**	**19.1**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**315**	**356**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**315**	**356**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**346**	**222**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**338**	**234**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**154**	**182**	----	----	----
Potassium	7440-09-7	1	mg/L	**20**	**26**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.321**	**0.096**	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.83**	**0.71**	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.3**	**0.3**	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**4.28**	**1.38**	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<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	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.01**	<0.01	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**31**	**23**	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**BH21**	**BH22**	**----**	**----**	**----**
			Sampling date / time	17-Jun-2021 09:30	17-Jun-2021 09:20	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102634-011**	**EW2102634-012**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**1.81**	**2.46**	**----**	**----**	**----**

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2102634**	Page	: 1 of 6
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 17-Jun-2021
Order number	: 130985	Date Analysis Commenced	: 17-Jun-2021
C-O-C number	: ----	Issue Date	: 25-Jun-2021
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3747676)									
EW2102629-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	479	512	6.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	479	512	6.6	0% - 20%
EW2102634-005	BH12R	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	351	387	9.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	351	387	9.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3747678)									
EW2102634-010	BH18	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	78	81	3.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	78	81	3.6	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3742703)									
ES2122482-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1720	1720	0.2	0% - 20%
EW2102632-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	<10	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3742706)									
EW2102634-010	BH18	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	4	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3742702)									
ES2122482-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	206	206	0.0	0% - 20%
EW2102632-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1420	1440	1.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3742705)									
EW2102634-010	BH18	ED045G: Chloride	16887-00-6	1	mg/L	10	10	0.0	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 3747025)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3747025) - continued									
ES2122529-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	22	23	5.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	11	11	0.0	0% - 50%
ES2122643-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3747029)									
EW2102634-007	BH14	ED093F: Calcium	7440-70-2	1	mg/L	102	105	2.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	24	24	0.0	0% - 20%
ME2100999-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	53	54	2.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	11	11	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3747026)									
ES2122607-003	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.012	0.011	0.0	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EW2102634-003	BH4	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.223	0.190	16.1	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	5.22	4.51	14.5	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 3747677)									
EW2102629-006	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.6	0.6	0.0	No Limit
EW2102634-005	BH12R	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3748924)									
EW2102634-004	BH9	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	98.8	89.2	10.2	0% - 20%
ES2122549-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3742701)									
ES2122482-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2102632-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.10	<0.10	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3742704)									
EW2102634-010	BH18	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3748923)									
EW2102634-001	BH1C	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2122549-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.33	0.34	0.0	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3748925)									
EW2102634-012	BH22	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3742814)									
EW2102634-001	BH1C	EP005: Total Organic Carbon	----	1	mg/L	168	167	0.0	0% - 20%
EW2102634-011	BH21	EP005: Total Organic Carbon	----	1	mg/L	31	32	0.0	0% - 20%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 3747676)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	108	81.0	111
				----	50 mg/L	104	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 3747678)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	108	81.0	111
				----	50 mg/L	100	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742703)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	82.0	122
				<1	500 mg/L	104	82.0	122
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742706)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	82.0	122
				<1	500 mg/L	105	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 3742702)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	102	80.9	127
				<1	1000 mg/L	97.0	80.9	127
ED045G: Chloride by Discrete Analyser (QCLot: 3742705)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	101	80.9	127
				<1	1000 mg/L	96.7	80.9	127
ED093F: Dissolved Major Cations (QCLot: 3747025)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	109	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.0	85.0	113
ED093F: Dissolved Major Cations (QCLot: 3747029)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	111	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.3	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 3747026)								
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	90.4	82.0	110
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	106	82.0	112
EK040P: Fluoride by PC Titrator (QCLot: 3747677)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	98.4	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3748924)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	97.8	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742701)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742704)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742704) - continued								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.2	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748923)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748925)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	106	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 3742814)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	99.1	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742703)							
ES2122482-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742706)							
EW2102634-010	BH18	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	119	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3742702)							
ES2122482-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3742705)							
EW2102634-010	BH18	ED045G: Chloride	16887-00-6	50 mg/L	108	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 3747026)							
ES2122607-006	Anonymous	EG020A-F: Manganese	7439-96-5	1 mg/L	98.3	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 3747677)							
EW2102629-006	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	105	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3748924)							
ES2122549-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	116	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742701)							
ES2122482-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	120	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742704)							
EW2102634-010	BH18	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	104	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748923)							
ES2122549-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	120	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748925)							
EW2102634-012	BH22	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	111	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3742814)							
EW2102634-002	BH3	EP005: Total Organic Carbon	----	100 mg/L	110	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2102634**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 17-Jun-2021
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 25-Jun-2021
Sampler	: Robert DaLio	No. of samples received	: 12
Order number	: 130985	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2122482--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	ES2122482--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005FD: Field pH								
Field Test Dummy Bottle (EN67 PK)								
BH1C,	BH3,	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
BH4,	BH9,							
BH12R,	BH13,							
BH14,	BH15,							
BH19R,	BH18,							
BH21,	BH22							
EA010FD: Field Conductivity								
Field Test Dummy Bottle (EN67 PK)								
BH1C,	BH3,	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
BH4,	BH9,							
BH12R,	BH13,							
BH14,	BH15,							
BH19R,	BH18,							
BH21,	BH22							

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	01-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	15-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	15-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	15-Jul-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	14-Dec-2021	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	15-Jul-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**22-Jun-2021**	15-Jul-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	19-Jun-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**22-Jun-2021**	15-Jul-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**18-Jun-2021**	15-Jul-2021	✓
QWI-EN 67.11 Sampling of Groundwaters							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	29	**13.79**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	20	**15.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	23	**17.39**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	23	**17.39**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	23	**17.39**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 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 :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Leachate	**ALS QUOTE NO.:**	WO/030/19 TENDER
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt		°C	
Other comment:			

SAMPLER: Robert Dubois	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert	**RECEIVED BY:** Aneta
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to :		**DATE/TIME:** 17.6.21 14:30	**DATE/TIME:** 17-6-21
Email Invoice to :		**RELINQUISHED BY:**	**RECEIVED BY:**
		DATE/TIME:	**DATE/TIME:**

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So4, Cl, Fl) Filtered Ca, K	TOC	Total Fe & Mn	NT-4 (NO2, NO3)				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	Leachate Sump	17.6.21 13:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2102633

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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102633**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate	Date Samples Received	: 17-Jun-2021 14:49
Order number	: 130985	Date Analysis Commenced	: 17-Jun-2021
C-O-C number	: ----	Issue Date	: 25-Jun-2021 08:40
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER LEACHATE		
No. of samples received	: 1		
No. of samples analysed	: 1		

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	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA016 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.10 Wastewaters
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Leachate Sump	----	----	----	----
			Sampling date / time	17-Jun-2021 13:05	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2102633-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**8.5**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**16000**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**18.9**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	**30**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**6150**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**6180**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1460**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**73**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**516**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.426**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.15**	----	----	----	----
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	**1620**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**1.13**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.88**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**2.01**	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**852**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Leachate Sump	----	----	----	----
				Sampling date / time	17-Jun-2021 13:05	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2102633-001	--------	--------	--------	--------
					Result	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**1.46**	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**16.9**	----	----	----	----

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) 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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2102633**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate	Date Samples Received	: 17-Jun-2021
Order number	: 130985	Date Analysis Commenced	: 17-Jun-2021
C-O-C number	: ----	Issue Date	: 25-Jun-2021
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER LEACHATE		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3747676)									
EW2102629-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	479	512	6.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	479	512	6.6	0% - 20%
EW2102634-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	351	387	9.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	351	387	9.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3742703)									
ES2122482-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1720	1720	0.2	0% - 20%
EW2102632-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	<10	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3742702)									
ES2122482-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	206	206	0.0	0% - 20%
EW2102632-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1420	1440	1.4	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3747025)									
ES2122529-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	22	23	5.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	11	11	0.0	0% - 50%
ES2122643-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3748745)									
WN2106068-002	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.405	0.409	1.1	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	5.63	5.74	1.8	0% - 20%
ES2122966-001	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.043	0.044	3.2	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.86	0.93	7.8	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK040P: Fluoride by PC Titrator (QC Lot: 3747677)									
EW2102629-006	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.6	0.6	0.0	No Limit
EW2102634-005	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3748924)									
EW2102634-004	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	98.8	89.2	10.2	0% - 20%
ES2122549-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3742701)									
ES2122482-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2102632-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.10	<0.10	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3748923)									
EW2102634-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2122549-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.33	0.34	0.0	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 3742810)									
ES2122475-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	10	15	37.6	0% - 50%
ES2122485-009	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	5	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 3747676)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	108	81.0	111
				----	50 mg/L	104	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742703)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	82.0	122
				<1	500 mg/L	104	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 3742702)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	102	80.9	127
				<1	1000 mg/L	97.0	80.9	127
ED093F: Dissolved Major Cations (QCLot: 3747025)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	109	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.0	85.0	113
EG020T: Total Metals by ICP-MS (QCLot: 3748745)								
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.2	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	100	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 3747677)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	98.4	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3748924)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	97.8	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742701)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748923)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 3742810)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	91.5	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742703)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3742703) - continued							
ES2122482-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3742702)							
ES2122482-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 3748745)							
ES2122966-002	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	97.9	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 3747677)							
EW2102629-006	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	105	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3748924)							
ES2122549-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	116	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3742701)							
ES2122482-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	120	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3748923)							
ES2122549-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	120	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3742810)							
ES2122478-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	99.4	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2102633**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate	Date Samples Received	: 17-Jun-2021
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 25-Jun-2021
Sampler	: Robert DaLio	No. of samples received	: 1
Order number	: 130985	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2122482--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	ES2122482--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / *Container* / Client Sample ID(s)	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK) Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK) Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK) Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) Leachate Sump	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	01-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	15-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	15-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) Leachate Sump	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	24-Jun-2021	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
Leachate Sump	**17-Jun-2021**	**22-Jun-2021**	14-Dec-2021	✓	**22-Jun-2021**	14-Dec-2021	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**21-Jun-2021**	15-Jul-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**22-Jun-2021**	15-Jul-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	19-Jun-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**22-Jun-2021**	15-Jul-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**18-Jun-2021**	15-Jul-2021	✓
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
Leachate Sump	**17-Jun-2021**	**----**	----	----	**17-Jun-2021**	----	----

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Appendix C

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney**: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle**: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville**: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 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 :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	Dunmore		
PROJECT:	Dunmore Dust	**ALS QUOTE NO.:** WO/030/19 TENDER	
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dalio	**SAMPLER MOBILE:**	
COC emailed to ALS?	(YES / NO)	**EDD FORMAT (or default):**	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert	[signature]		
DATE/TIME: 16.6.21 15:2	DATE/TIME: 16.6.21 15:20	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 (Ash, CM, TIS)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	DDG1	16.6.21 13:10	AIR			✓								
2	DDG2	13:00	AIR			✓								
3	DDG3	10:35	AIR			✓								
4	DDG4	11:35	AIR			✓								
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2102631

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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102631**	Page	: 1 of 2
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 16-Jun-2021 15:20
Order number	: 130985	Date Analysis Commenced	: 18-Jun-2021
C-O-C number	: ----	Issue Date	: 23-Jun-2021 12:30
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Newcastle.**
- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation is not held for results reported in g/m².mth.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Deposition Gauges.
- Sample exposure period is 33 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)			Sample ID	**DDG1 14/05/2021 - 16/06/2021**	**DDG2 14/05/2021 - 16/06/2021**	**DDG3 14/05/2021 - 16/06/2021**	**DDG4 14/05/2021 - 16/06/2021**	**----**
			Sampling date / time	16-Jun-2021 13:10	16-Jun-2021 13:00	16-Jun-2021 10:30	16-Jun-2021 11:30	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102631-001**	**EW2102631-002**	**EW2102631-003**	**EW2102631-004**	**--------**
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	<0.1	**0.1**	**0.3**	**0.1**	**----**
Ash Content (mg)	----	1	mg	<1	**1**	**5**	**2**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	<0.1	<0.1	**0.1**	**0.1**	**----**
Combustible Matter (mg)	----	1	mg	<1	<1	**2**	**1**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	<0.1	**0.1**	**0.4**	**0.2**	**----**
Total Insoluble Matter (mg)	----	1	mg	<1	**1**	**7**	**3**	**----**

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2102631**	Page	: 1 of 3
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 16-Jun-2021
Order number	: 130985	Date Analysis Commenced	: 18-Jun-2021
C-O-C number	: ----	Issue Date	: 23-Jun-2021
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

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

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

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

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

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

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

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2102631**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 16-Jun-2021
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 23-Jun-2021
Sampler	: Robert DaLio	No. of samples received	: 4
Order number	: 130985	No. of samples analysed	: 4

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **AIR**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA120: Ash Content							
Dust Gauge (Bottle) - Copper Sulfate (EA120)							
DDG1 - 14/05/2021 - 16/06/2021, DDG2 - 14/05/2021 - 16/06/2021, DDG3 - 14/05/2021 - 16/06/2021, DDG4 - 14/05/2021 - 16/06/2021	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	13-Dec-2021	✓
EA125: Combustible Matter							
Dust Gauge (Bottle) - Copper Sulfate (EA125)							
DDG1 - 14/05/2021 - 16/06/2021, DDG2 - 14/05/2021 - 16/06/2021, DDG3 - 14/05/2021 - 16/06/2021, DDG4 - 14/05/2021 - 16/06/2021	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	13-Dec-2021	✓
EA141: Total Insoluble Matter							
Dust Gauge (Bottle) - Copper Sulfate (EA141)							
DDG1 - 14/05/2021 - 16/06/2021, DDG2 - 14/05/2021 - 16/06/2021, DDG3 - 14/05/2021 - 16/06/2021, DDG4 - 14/05/2021 - 16/06/2021	**16-Jun-2021**	**----**	----	----	**18-Jun-2021**	13-Dec-2021	✓

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Ash Content (AC)	EA120	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Ash content in deposited dust.
Combustible Matter (CM)	EA125	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Combustible Matter in deposited dust.
Total Insoluble Matter (TIM)	EA141	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Total Insoluble solids in deposited dust.

Appendix D

Surface Gas (Methane) Field Sheets

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samplec.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-4 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**	
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT:	Dunmore Quarterly Methane Testing	**ALS QUOTE NO.:**	WO/030/19 TENDER	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER:				Random Sample Temperature on Receipt	°C
PROJECT MANAGER:	Joel Culton			Other comment:	

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

SAMPLER:	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert	**RECEIVED BY:** Anela	**RELINQUISHED BY:**
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**	DATE/TIME: 8/6/21	DATE/TIME: 8/6/21	DATE/TIME:
Email Reports to :				**RECEIVED BY:**
Email Invoice to :				DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	Surface Methane Testing								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Methane	~~7/6/21~~ 8/6/21 11/6/21	W			✓	✓							
					TOTAL	10								

Environmental Division Wollongong
Work Order Reference
EW2102617

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.

ALS Landfill Emissions Report

Client:	Shellharbour City Council	Date:	8/06/2021
Site:	Dunmore	Sampler(s)	Robert DaLio, Megan Gould

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A	1	6168 179	302 344	7.7	
A	2	6168 151	302 344	6.4	
A	3	6168 120	302 343	9.9	
A	4	6168 103	302 343	4.8	
B	1	6168 029	302 330	3.2	
B	2	6168 055	302 333	3.9	Methane Cage
B	3	6168 086	302 333	8.9	
B	4	6168 119	302 331	4.4	
B	5	6168 142	302 332	4.2	
B	6	6168 168	302 332	4.1	
B	7	6168 187	302 335	5.7	
B	8	6167 997	302 324	3.1	
B	9	6167 972	302 323	3.1	

C	1	6168 268	302 271	3.1	
C	2	6168 224	302 277	3.9	
C	3	6168 179	302 289	4.5	
C	4	6168 116	302 306	4.0	
C	5	6168 049	302 316	4.4	
C	6	6167 980	302 318	3.1	
C	7	6167 912	302 311	3.2	
C	8	6167 865	302 304	3.2	
C	9	6167 936	302 299	3.5	
D	1	6167 942	302 286	3.2	
D	2	6167 985	302 280	4.0	
D	3	6168 030	302 271	3.2	
D	4	6168 044	302 271	3.4	
D	5	6168 055	302 270	3.7	
D	6	6168 071	302 268	3.6	
E	1	6168 079	302 239	3.8	
E	2	6168 050	302 249	3.8	
E	3	6168 021	302 250	3.9	
E	4	6167 987	302 261	4.0	
E	5	6167 914	302 271	3.2	

F	1	6167 904	302 261	3.1	Methane Cage
F	2	6167 933	302 247	2.9	
F	3	6167 966	302 233	3.2	
F	4	6168 011	302 221	3.0	
F	5	6168 036	302 218	3.3	
F	6	6168 069	302 209	2.9	
G	1	6168 217	302 149	3.6	
G	2	6168 224	302 184	3.8	
G	3	6168 246	302 218	3.3	
G	4	6168 269	302 254	3.2	
H	1	6168 220	302 455	3.0	
H	2	6168 172	302 451	3.0	
H	3	6168 103	302 440	3.1	
H	4	6168 060	302 442	3.1	
H	5	6168 023	301 467	3.1	
H	6	6167 997	301 478	3.1	
H	7	6167 967	301 499	3.1	
H	8	6167 933	302 522	3.1	
H	9	6167 889	302 514	3.1	
H	10	6167 919	302 438	3.0	
H	11	6167 892	302 474	3.0	

H	12	6167 938	302 452	2.9	
H	13	6167 974	302 427	2.7	
H	14	6167 998	302 391	2.1	
H	15	6167 840	302 397	1.8	
H	16	6167 926	302 406	1.7	
H	17	6167 996	302 411	1.6	
H	18	6168 028	302 419	1.5	
H	19	6168 228	302 427	1.6	
H	20	6168 270	302 375	2.0	
H	21	6168 300	302 270	2.4	
H	22	6168 280	302 199	2.2	
H	23	6168 228	302 139	2.1	
H	24	6168 161	302 083	2.1	
H	25	6168 111	302 28	2.0	
H	26	6168 060	301 984	1.9	
H	27	6167 959	302 969	2.0	
H	28	6167 900	301 970	2.0	
H	29	6167 842	301 996	18.3	Freshly excavated top soil
H	30	6167 808	301 034	32.7	Freshly excavated top soil
H	31	6167 778	301 063	33.2	Freshly excavated top soil
H	32	6167 710	302 125	15.6	
H	33	6167 676	301 211	24.6	
H	34	6167 695	302 311	36.9	

H	35	6167 710	302 361	11.7	
H	36	6167 723	302 384	3.9	
H	37	6167 775	302 390	4.7	
I	1	6167 947	301 980	5.6	
I	2	6167 947	302 020	3.3	
I	3	6167 941	302 077	2.9	
I	4	6167 935	301 134	3.4	
J	1	6167 955	302 157	9.3	
J	2	6168 004	302 145	3.1	
J	3	6168 049	302 129	5.0	
J	4	6168 104	302 109	3.9	
J	5	6167 150	302 092	3.1	
K	1	6168 315	302 269	2.5	
K	2	6168 327	302 295	2.6	
K	3	6168 338	302 325	2.5	
K	4	6168 353	302 357	2.7	
K	5	6168 404	302 328	2.6	
K	6	6168 387	302 274	2.6	

K	7	6168 363	302 272	2.5	
K	8	6168 376	302 316	2.8	
L	1	6168 558	302 226	1.4	
L	2	6168 493	302 188	1.5	
L	3	6168 450	302 145	1.5	
L	4	6168 399	302 117	1.5	
L	5	6168 348	302 69	1.6	
L	6	6168 300	302 026	1.6	
Compressor Shed	1			15.6	Surrounded by freshly dug topsoil
Office	1			1.6	
Community Recycling Centre	1			2.5	
OLD Weighbridge	1			2.1	
OLD Weighbridge Toilet	1			18.2	
Revolve Shop	1			1.8	
Building Truckwash	1			2.3	
New Weighbridge	1			2.4	
Methane Blank (Pre testing)				2.9	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				2.8	Taken at entrance to Dunmore site before main gate

Comments:

Sampling performed in accordance to EPA Environmental Guidelines Solid Waste Landfills, Second Edition, 2016
Gas concentrations are reported as raw values without correction for background concentration.

Appendix E

Calibration Certificates

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Kalibrierzertifikat Nummer -Calibration Certificate number: 16233 H-02188

Instrument: Laser One **Seriennummer - Serial number** 16233

Beschreibung des Kalibriervorgangs:

Die Kalibrierung des Gerätes erfolgt durch Messung der Reaktionszeit des Sensors unter Beaufschlagung von geeichten Prüfgasen. Der angewandte Kalibriervorgang entspricht der Arbeitsweise des Gerätes. Der maximale Messfehler des Messgerätes wie im Datenblatt angegeben.

Description of the calibration procedure:

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

Überprüfung des Messgerätes im Messbereich - Gas verification from 0 - 1000 ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response 1 (ppm)	Response 2 (ppm)	Response 3 (ppm)	Average response (ppm)	Maximum error (ppm)	Maximum error (% F.s.)	Maximum error %
1000	2.7	2.3	2.3	2.4	2.33	0.40	0.04	0.04
1000	3.1	3.1	3.1	3.1	3.10	0.00	0.00	0.00
1000	10.3	10.5	10.4	10.4	10.43	0.20	0.02	0.02
1000	107	107	108	107	107.33	1.00	0.10	0.10
1000	1000	1000	1000	1000	1000.00	0.00	0.00	0.00

Unsicherheit - Uncertainty	0.10		%
Maximaler Fehler % - Max % error	0.10		% FS

Überprüfung des Messgerätes im Messbereich – Gas verification from 0 - 100 % vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Maximum error (%vol)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00
10.00	2.20	2.20	2.20	2.20	2.20	0.00	0.00	0.00
10.00	5.00	4.90	4.90	4.90	4.90	0.10	1.00	1.00
100.00	15.00	14.90	14.90	14.90	14.90	0.10	0.10	0.10
100.00	50.00	49.70	49.50	49.80	49.67	0.50	0.50	0.50
100.00	100.00	97.90	98.00	98.00	97.97	2.10	2.10	2.10

Unsicherheit - Uncertainty	2.10		%
Maximaler Fehler % - Max % error	2.10		% FS

Überprüfung des Messgerätes im Messbereich – Gas verification from 0 - 100% CH4 LEL (0 - 4.4% vol)

Full scale (%vol)	Gas concentration (LEL%)	Response 1 (LEL%)	Response 2 (LEL%)	Response 3 (LEL%)	Average response (%vol)	Maximum error (LEL%)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00
100.00	50.00	50.00	50.00	50.00	50.00	0.00	0.00	0.00

Incertezza - Uncertainty	0.00		%
Massimo errore % - Max % error	0.00		% FS

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Umgebungsbedingungen für die Kalibrierung - Environmental conditions during calibration

Temperature	21	C
Pressure	987	mBar

Gasflaschen zur Kalibrierung - Gas bottles used for calibration

Gas	Cylinder number	Expiry date	Gas
Synthetic Air	S1624403EE	19/05/2023	Synthetic Air
3 ppm	143123SG	11/04/2024	CH4
10 ppm	114031SG	11/04/2024	CH4
100 ppm	S1145642R	20/10/2024	CH4
1000 ppm	S1100299S	10/04/2024	CH4
1.0 vol	S1198415S	10/04/2024	CH4
2.2% vol	SP1230777S	29/10/2024	CH4
5% vol	220622	15/01/2022	CH4
15% vol	220594	15/01/2022	CH4
50% vol	232920	08/11/2021	CH4
100% vol	S1260447	05/07/2023	CH4

Kalibrierungsergebnisse / Calibration results: Pass

Nächste geplante Kalibrierung / Next scheduled calibration: 25/02/2021

Kalibrierungsdatum / Calibration date: 25/02/2020

Kalibrierungsmanager / Calibration done by: Laura McBride

Field Calibration Form

SIN, DIN or Batch number		S21/007	S21/006	S21/008	S21/007				S21/017		S2/009												
Operational Limits		+/- 0.02	+/- 0.02	+/- 0.05	pH 7 + (0.15 - 0.25)	Chk Std/CRM	79 - 88	139 - 154	1341 - 1482	9500 - 10500	12236 - 13524	112100 - 123900	Chk Std/CRM	<0.2	95% - 105%	217 - 240				+/- 0.09	+/- 0.10	+/- 0.14	Operational Limits
Certified Value		7.00	4.00	10.00	pH Junction		84	146.9	1412	10000	12880	118000		0.0mg/L	100%	229	NTU	NTU	NTU	0.22	0.85	1.5	Certified Value
Meter ID	Date	pH					EC (µS/cm)							DO (% or mg/L)		ORP (mV)	Turbidity (NTU)			Chlorine (mg/L)			Analyst/ Comments
ADSWOL036Q	9.6.21	7.02	4.02	10.04																			RM
LSWOL066Q	10.6.21	7.02	4.01	10.03	7.16		11.3°C																MG
LSWOL036Q	10.6.21	7.03	4.03	10.05					1436		13200												RM
LSWOL026Q	11.6.21	7.01	3.99	10.03																			MG
LSWOL002Q	11.6.21								1385		12830												MG
LSWOL036Q	11.6.21	7.03	4.03	[illegible]					1412		12860												RM
LSWOL036Q	15.6.21	7.03	4.04	10.07	7.21																		RM
LSWOL073Q	15.6.21	6.99	4.01	10.07	7.16				1396		12850			<0.2	103.1								RM
LSWOL066Q	16.6.21	7.06	4.01	10.04	7.18		12.3°C																MG
LSWOL073Q	16.6.21	7.04	4.03	9.99					1406		12880			<0.2	104.1								RM
ALSWOL066Q	16.6.21	7.02	3.98	9.98																			[illegible]
ALSWOL066Q	16.6.21								1441		12460												[illegible]
LSWOL073Q	17.6.21	7.04	4.03	10.07					1408		13030			<0.2	103								RM
LSWOL036Q	21.6.21	7.05	4.01	10.07	7.15																		RM
LSWOL073Q	21.6.21	7.02	4.03	10.10	7.15				1395		12870			<0.2									RM
LSWOL002Q	21.6.21								1463		13260				103.6								MG
LSWOL026Q	21.6.21	6.99	4.00	9.97			17.1°C																MG
LSWOL002Q	22.6.21								1448		13180				104.9								MG
LSWOL026Q	22.6.21	6.98	4.02	9.98			19.8°C																MG
LSWOL026Q	23.6.21	7.01	4.02	10.02			15.1°C																MG
LSWOL066Q	24.6.21	7.03	4.01	10.09	7.15																		RM
LSWOL026Q	24.6.21	7.02	4.01	10.04			11.8°C																MG

Appendix F

Flare monitoring Reports

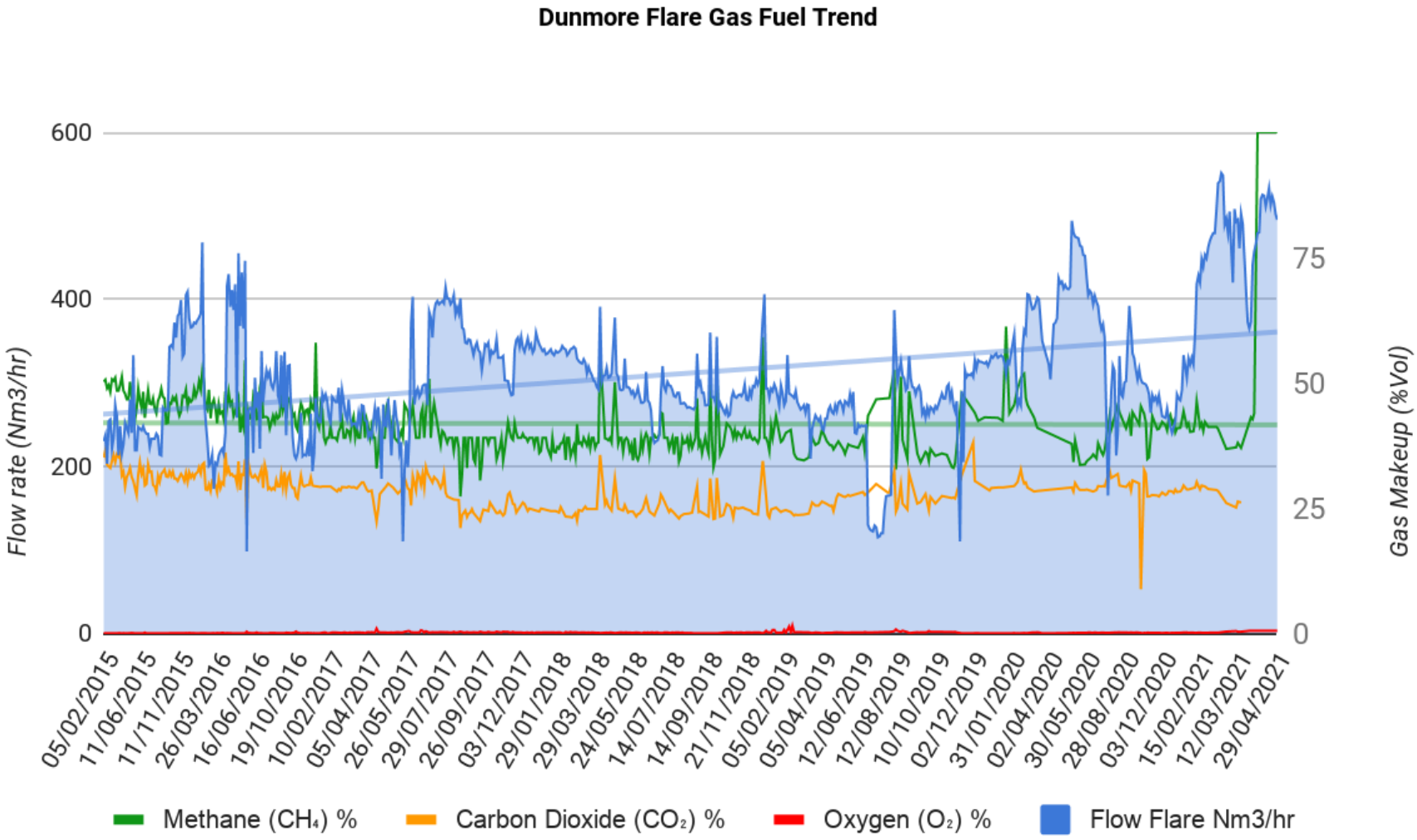
Site:	Dunmore Road Landfill	**Report issue date:**	**19-05-2021**
Report month:	April 2021	**Prepared by:**	Matthew Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Thomas McWilliam

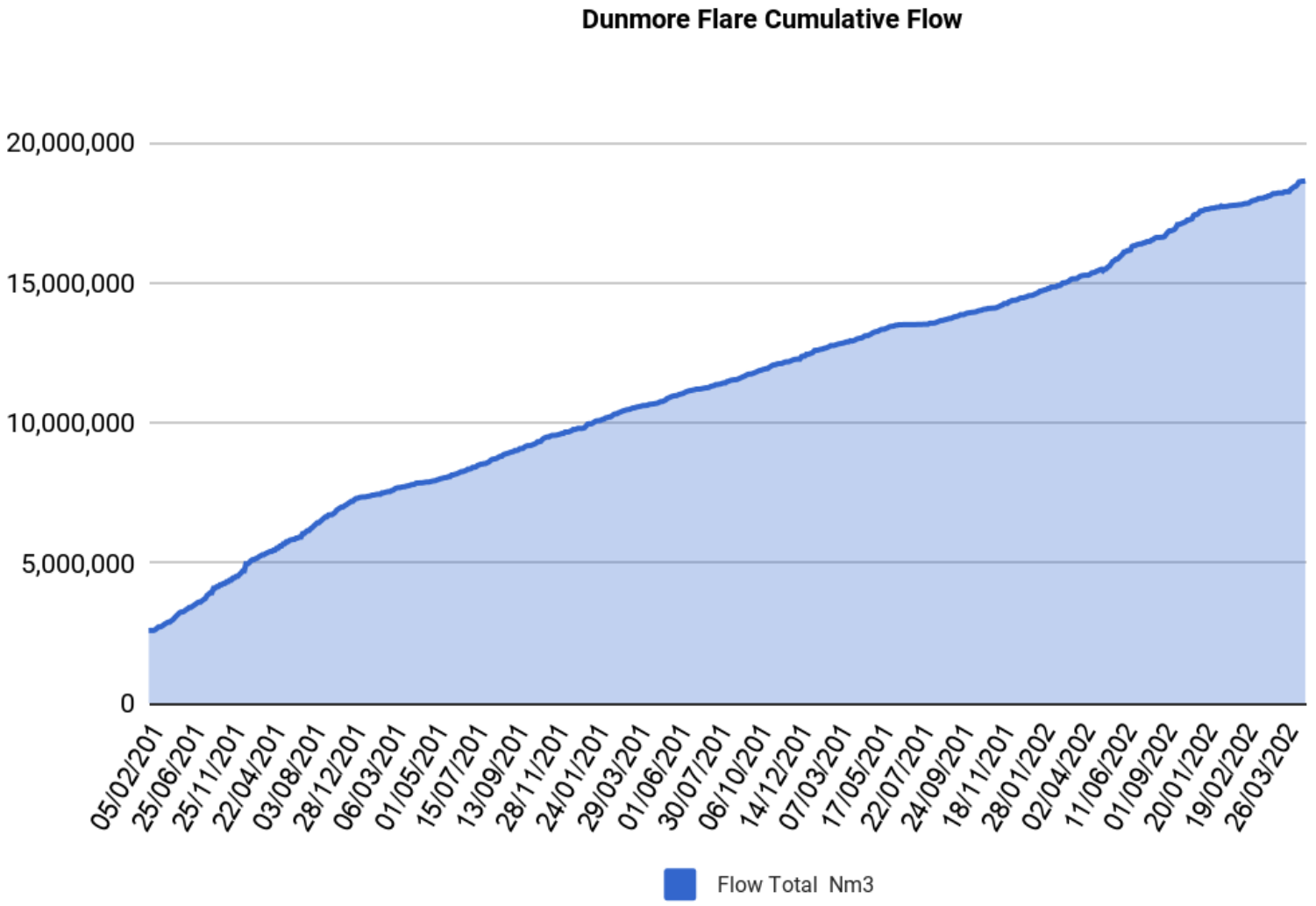
Comments on changes to existing system:	Jan 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. Apr 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. June 2016 - LGI disconnected the extended gas capture system to assist the council. Sep 2016 - LGI disconnected the extended gas capture system to fassist council. Nov 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 160mm leachate riser. April 2020 - LGI installed flowline to sump 6 after earlier disconnection. February 2021: LGI installed 13 new vertical wells, including a new submain.
Comments on flare operation / maintenance:	April 2021: Normal operation was observed throughout the reporting period. Intermittent planned shutdowns occured due to field upgrades, resulting in 2 hours of down time. LGI installed 13 new wells within the recently completed cell, increasing the average flow from ~320m3/hr to ~500m3/hr. March 2021: LGI temporarily removed 5 flowlines to allow for final capping works to continue. The flowines were reinstalled into the final cap with assistance from the civil contractors.
Recommendations:	Drillings works highlighted the need for increased leachate management on site as there were multiple areas of overly wet, saturated waste. Drill logs will be provided upon completion of the construction project to verify this.

FLARE DATA RESULTS:

Date	CH4 %	CO2 %[1]	O2 %	STACK TEMP °C	CUMULATIVE FLOW m3[2]	FLOW m3/h
06/04/2021	-	-	-	794	18,327,404	525
09/04/2021	-	-	-	836	18,366,523	524
14/04/2021	36.4	26.5	1.7	827	18,428,411	521
19/04/2021	35.0	26	1.8	820	18,490,965	533
29/04/2021	35.9	25.3	1.6	807	18,616,946	502
30/04/2021	-	-	-	744	18,626,385[3]	495
Average	**36.0**	**26.0**	**1.7**	**804**		**516**

[1] Local LFG CO2% are recorded on site. An average value is generated remotely based on local CO2 recordings.
[2] Cumulative flow represents a snapshot recording, taken on the corresponding date. Please note that this value does not account for the volume of gas, which was combusted in the flare unit from 22 September 2014 to 30 January 2015 while the flow meter was removed for repair. LGI has provided an estimate of this additional volume to Council.
[3] 18,626,385m^3 of flared landfill gas up to the 30th of April 2021 represents carbon abatement of approximately 132,679 tonnes of CO2 equivalent (total methane abated by gas capture system to date).


Dunmore Flare Gas Fuel Trend
Flow rate (Nm3/hr)
Gas Makeup (%Vol)
600
400
200
0
75
50
25
0
05/02/2015
11/06/2015
11/11/2015
26/03/2016
16/06/2016
19/10/2016
10/02/2017
05/04/2017
26/05/2017
29/07/2017
26/09/2017
03/12/2017
29/01/2018
29/03/2018
24/05/2018
14/07/2018
14/09/2018
21/11/2018
05/02/2019
05/04/2019
12/06/2019
12/08/2019
10/10/2019
02/12/2019
31/01/2020
02/04/2020
30/05/2020
28/08/2020
03/12/2020
15/02/2021
12/03/2021
29/04/2021
Methane (CH₄) %
Carbon Dioxide (CO₂) %
Oxygen (O₂) %
Flow Flare Nm3/hr


Dunmore Flare Cumulative Flow
20,000,000
15,000,000
10,000,000
5,000,000
0
05/02/201
25/06/201
25/11/201
22/04/201
03/08/201
28/12/201
06/03/201
01/05/201
15/07/201
13/09/201
28/11/201
24/01/201
29/03/201
01/06/201
30/07/201
06/10/201
14/12/201
07/03/201
17/05/201
22/07/201
24/09/201
18/11/201
28/01/202
02/04/202
11/06/202
01/09/202
20/01/202
19/02/202
26/03/202
Flow Total Nm3

Please note:

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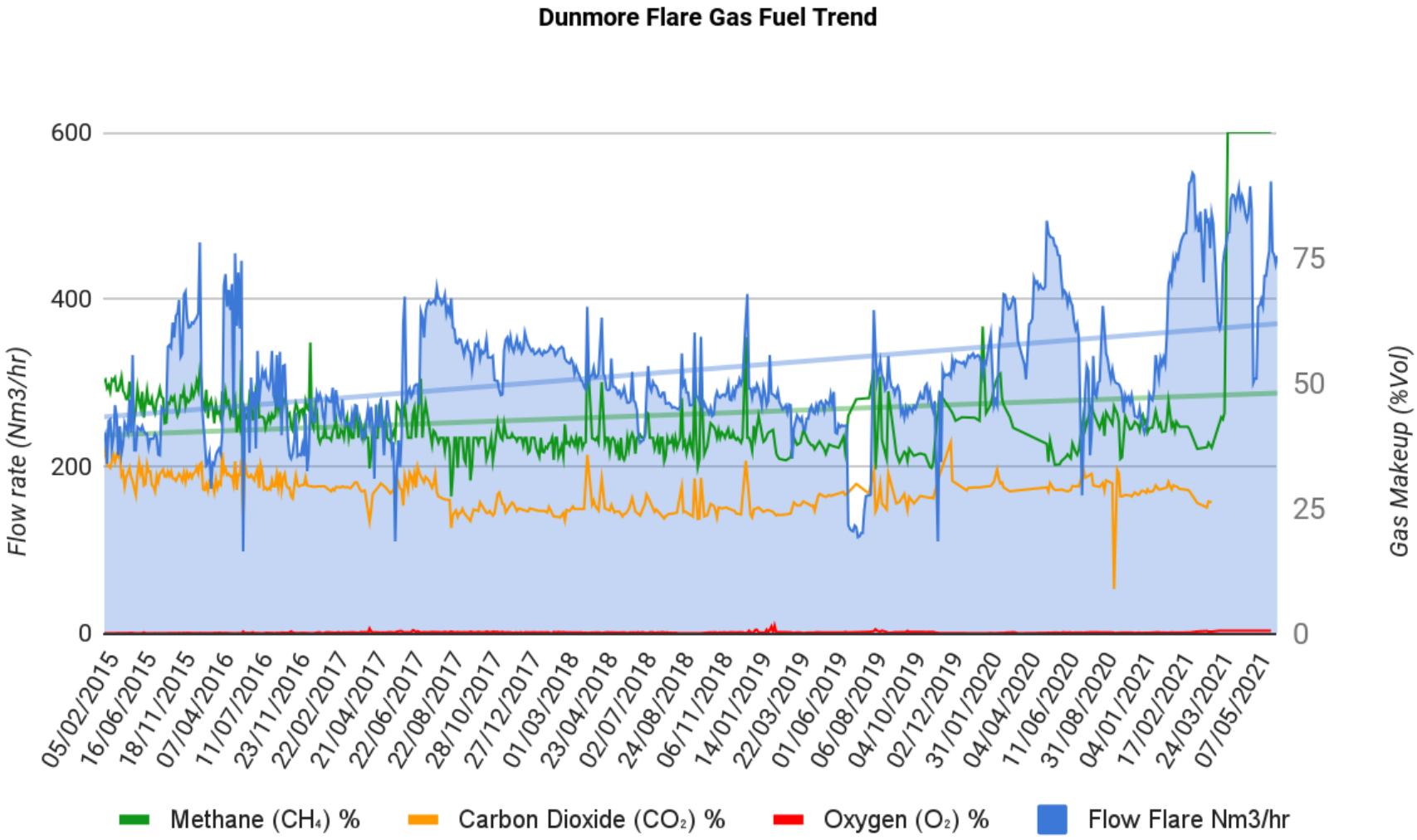
Site:	Dunmore Road Landfill	**Report issue date:**	**11-06-2021**
Report month:	May 2021	**Prepared by:**	Matthew Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Thomas McWilliam

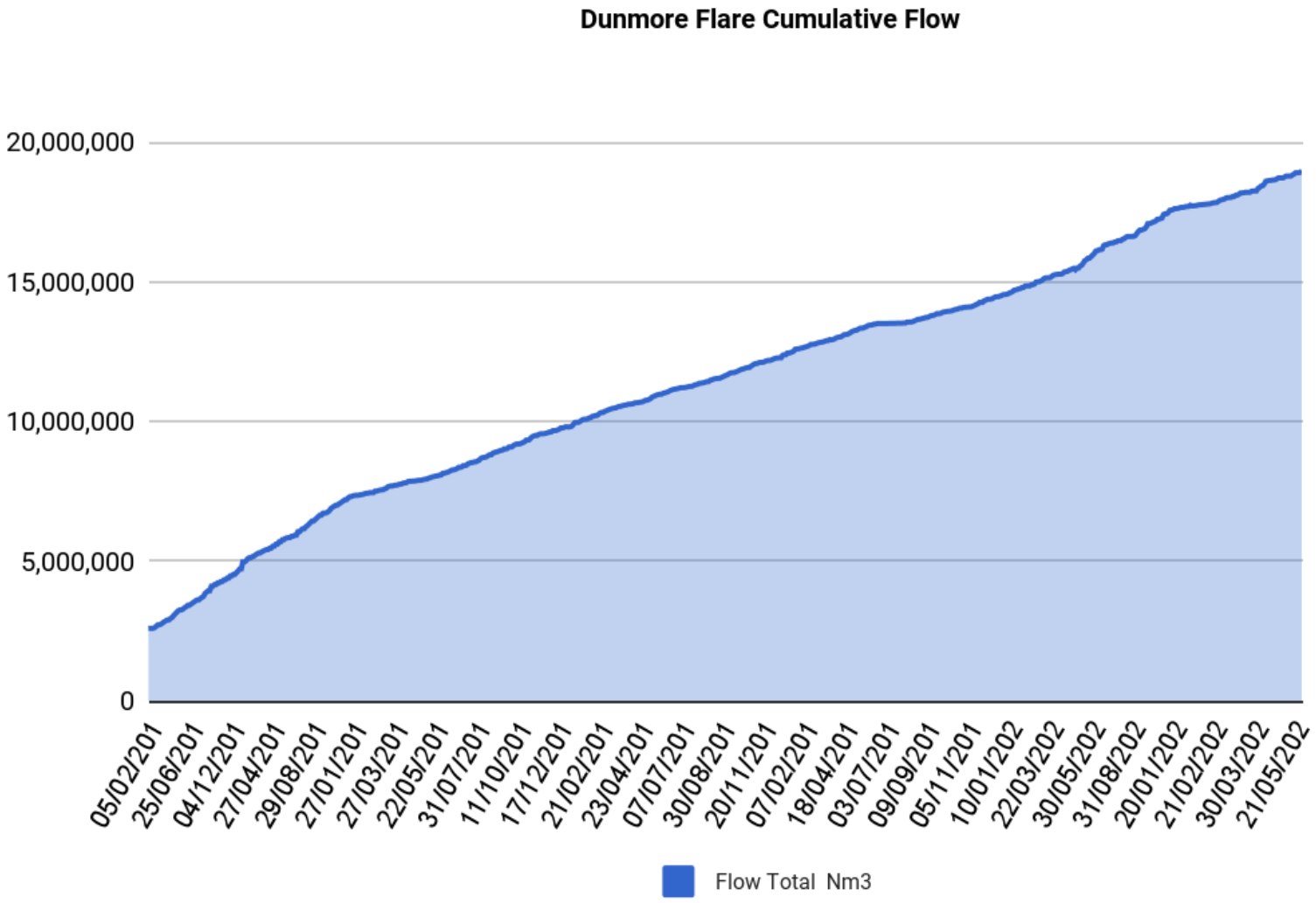
Comments on changes to existing system:	Jan 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. Apr 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. June 2016 - LGI disconnected the extended gas capture system to assist the council. Sep 2016 - LGI disconnected the extended gas capture system to fassist council. Nov 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 160mm leachate riser. April 2020 - LGI installed flowline to sump 6 after earlier disconnection. February 2021: LGI installed 13 new vertical wells, including a new submain.
Comments on flare operation / maintenance:	May 2021: Normal operation was observed throughout the reporting period.. LGI installed 13 new wells within the recently completed cell, increasing the average flow from ~320m3/hr to ~500m3/hr. In May, LGI made some minor repairs to the system including replacement of the footvalve of the CKV.
Recommendations:	Drilling works highlighted the need for increased leachate management on site as there were multiple areas of overly wet, saturated waste.

FLARE DATA RESULTS:

Date	CH4 %	CO2 %[1]	O2 %	STACK TEMP °C	CUMULATIVE FLOW m3[2]	FLOW m3/h
01/05/2021	35.1	26	1.6	893	18,640,190	535
07/05/2021	-	-	-	634	18,707,617	305
14/05/2021	-	-	-	792	18,776,748	428
25/05/2021	35.8	24.8	2.4	823	18,894,714	453
27/05/2021	37.7	25.5	3.0	751	18,913,683	442
31/05/2021	-	-	-	802	18,956,518[3]	452
Average	**36.2**	**25.4**	**2.3**	**783**		**436**

[1] Local LFG CO2% are recorded on site. An average value is generated remotely based on local CO2 recordings.
[2] Cumulative flow represents a snapshot recording, taken on the corresponding date. Please note that this value does not account for the volume of gas, which was combusted in the flare unit from 22 September 2014 to 30 January 2015 while the flow meter was removed for repair. LGI has provided an estimate of this additional volume to Council.
[3] 18,956,518m^3 of flared landfill gas up to the 31st of May 2021 represents carbon abatement of approximately 135,031 tonnes of CO2 equivalent (total methane abated by gas capture system to date).


Dunmore Flare Gas Fuel Trend
600
400
200
0
Flow rate (Nm3/hr)
75
50
25
0
Gas Makeup (%Vol)
05/02/2015
16/06/2015
18/11/2015
07/04/2016
11/07/2016
23/11/2016
22/02/2017
21/04/2017
22/06/2017
22/08/2017
28/10/2017
27/12/2017
01/03/2018
23/04/2018
02/07/2018
24/08/2018
06/11/2018
14/01/2019
22/03/2019
01/06/2019
06/08/2019
04/10/2019
02/12/2019
31/01/2020
04/04/2020
11/06/2020
31/08/2020
04/01/2021
17/02/2021
24/03/2021
07/05/2021
Methane (CH₄) %
Carbon Dioxide (CO₂) %
Oxygen (O₂) %
Flow Flare Nm3/hr


Dunmore Flare Cumulative Flow
20,000,000
15,000,000
10,000,000
5,000,000
0
05/02/201
25/06/201
04/12/201
27/04/201
29/08/201
27/01/201
27/03/201
22/05/201
31/07/201
11/10/201
17/12/201
21/02/201
23/04/201
07/07/201
30/08/201
20/11/201
07/02/201
18/04/201
03/07/201
09/09/201
05/11/201
10/01/202
22/03/202
30/05/202
31/08/202
20/01/202
21/02/202
30/03/202
21/05/202
Flow Total Nm3

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Dunmore Road Landfill - LFG REPORT JUNE 2021

Site:	Dunmore Road Landfill	**Report issue date:**	21-07-2021
Report month:	June 2021	**Prepared by:**	Matthew Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Brendan Fraser

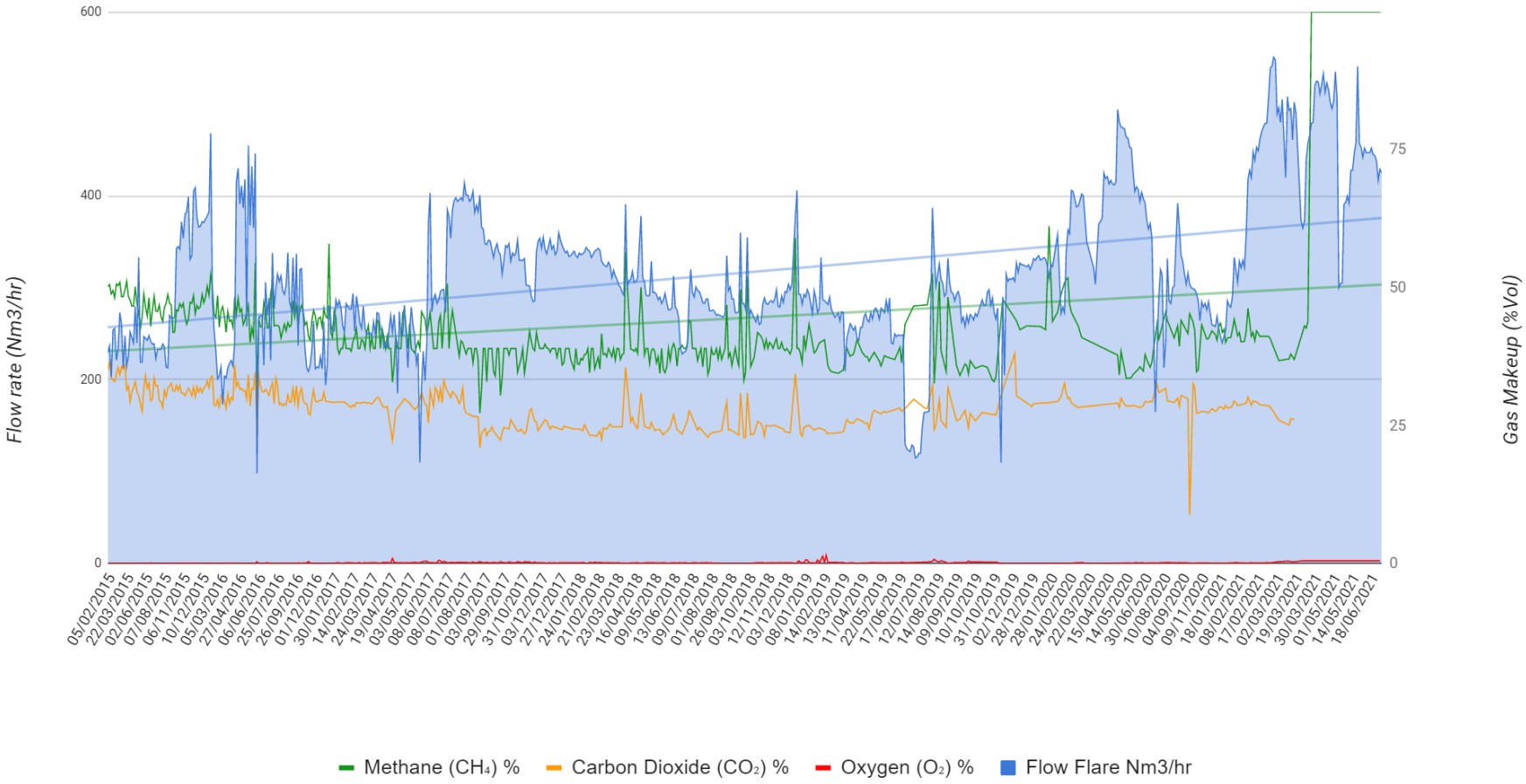
Comments on changes to existing system:	Jan 2016 - LGI disconnected the 4 lateral wells and 8 vertical wells. Apr 2016 - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. June 2016 - LGI disconnected the extended gas capture system to assist the council. Sep 2016 - LGI disconnected the extended gas capture system to fassist council. Nov 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 160mm leachate riser. April 2020 - LGI installed flowline to sump 6 after earlier disconnection. February 2021: LGI installed 13 new vertical wells, including a new submain.
Comments on flare operation / maintenance:	June 2021: Normal operation was observed throughout the reporting period, no shutdown occurred. LGI installed 13 new wells within the recently completed cell, increasing the average flow from ~320m3/hr to ~450m3/hr.
Recommendations:	Drilling works highlighted the need for increased leachate management on site as there were multiple areas of overly wet, saturated waste.

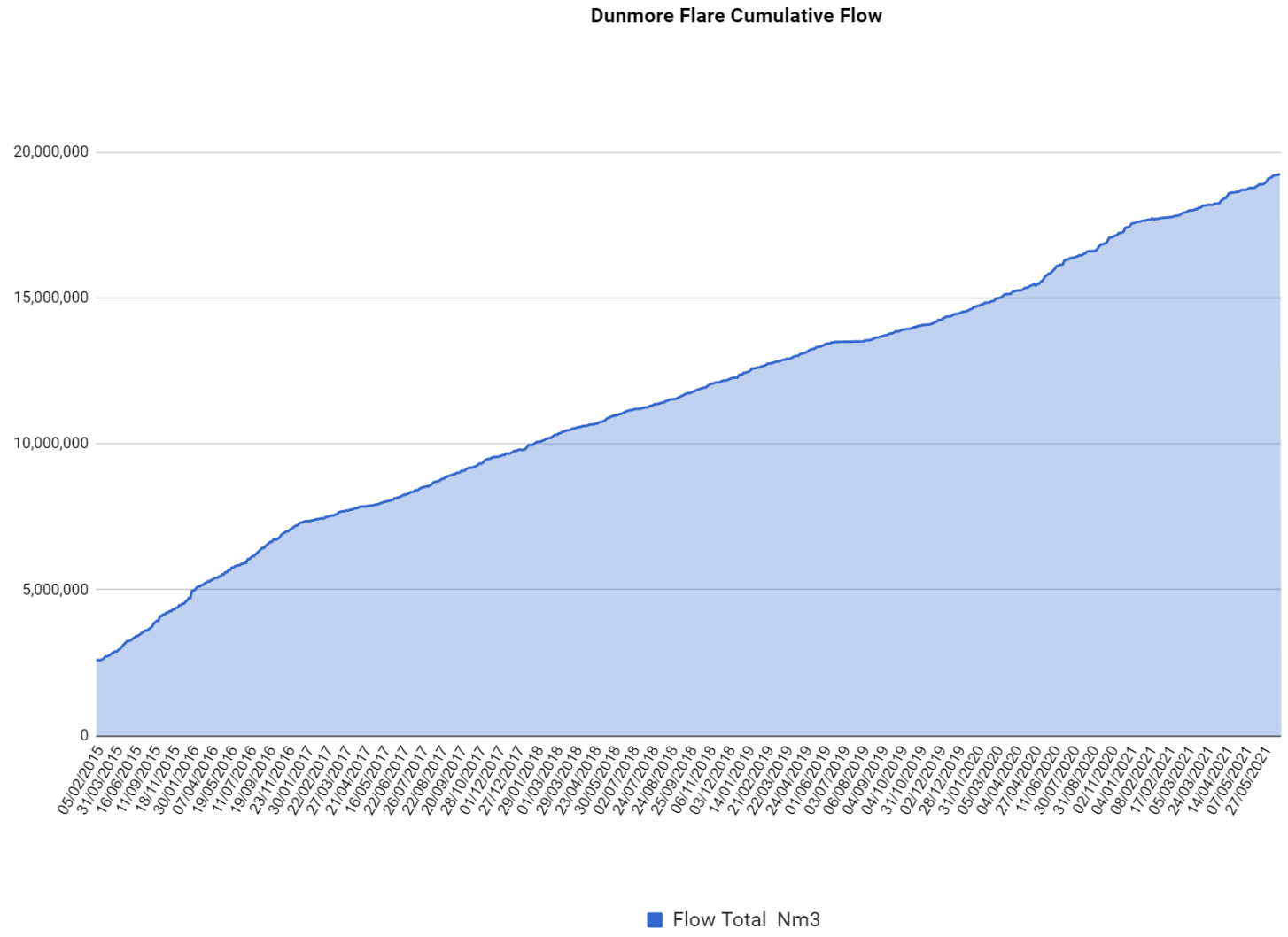
FLARE DATA RESULTS:

Date	CH4 %	CO2 %[1]	O2 %	STACK TEMP °C	CUMULATIVE FLOW m3[2]	FLOW m3/h
7/6/21	na	na	na	758	18,956,518	452
14/6/21	33.8	24.8	3.3	769	19,107,482	447
18/6/21	na	na	na	755	19,149,217	452
24/6/21	34	24.5	3.4	778	19,213,821	444
29/6/21	na	na	na	719	19,264,035[3]	429
Average	**33.9**	**25.6**	**3.35**	**755**		**444.8**

[1] Local LFG CO2% are recorded on site. An average value is generated remotely based on local CO2 recordings.
[2] Cumulative flow represents a snapshot recording, taken on the corresponding date. Please note that this value does not account for the volume of gas, which was combusted in the flare unit from 22 September 2014 to 30 January 2015 while the flow meter was removed for repair. LGI has provided an estimate of this additional volume to Council.
[3] 19264,035m^3 of flared landfill gas up to the 29th June 2021 represents carbon abatement of approximately 137,222 tonnes of CO2 equivalent (total methane abated by gas capture system to date).

Dunmore Flare Gas Fuel Trend




Dunmore Flare Cumulative Flow
20,000,000
15,000,000
10,000,000
5,000,000
0
05/02/2015
31/03/2015
16/06/2015
11/09/2015
18/11/2015
30/01/2016
07/04/2016
19/05/2016
11/07/2016
19/09/2016
23/11/2016
30/01/2017
22/02/2017
27/03/2017
21/04/2017
16/05/2017
22/06/2017
26/07/2017
22/08/2017
20/09/2017
28/10/2017
01/12/2017
27/12/2017
29/01/2018
01/03/2018
29/03/2018
23/04/2018
30/05/2018
02/07/2018
24/07/2018
24/08/2018
25/09/2018
06/11/2018
03/12/2018
14/01/2019
21/02/2019
22/03/2019
24/04/2019
01/06/2019
03/07/2019
06/08/2019
04/09/2019
04/10/2019
31/10/2019
02/12/2019
28/12/2019
31/01/2020
05/03/2020
04/04/2020
27/04/2020
11/06/2020
30/07/2020
31/08/2020
02/11/2020
04/01/2021
08/02/2021
17/02/2021
05/03/2021
24/03/2021
14/04/2021
07/05/2021
27/05/2021
Flow Total Nm3

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