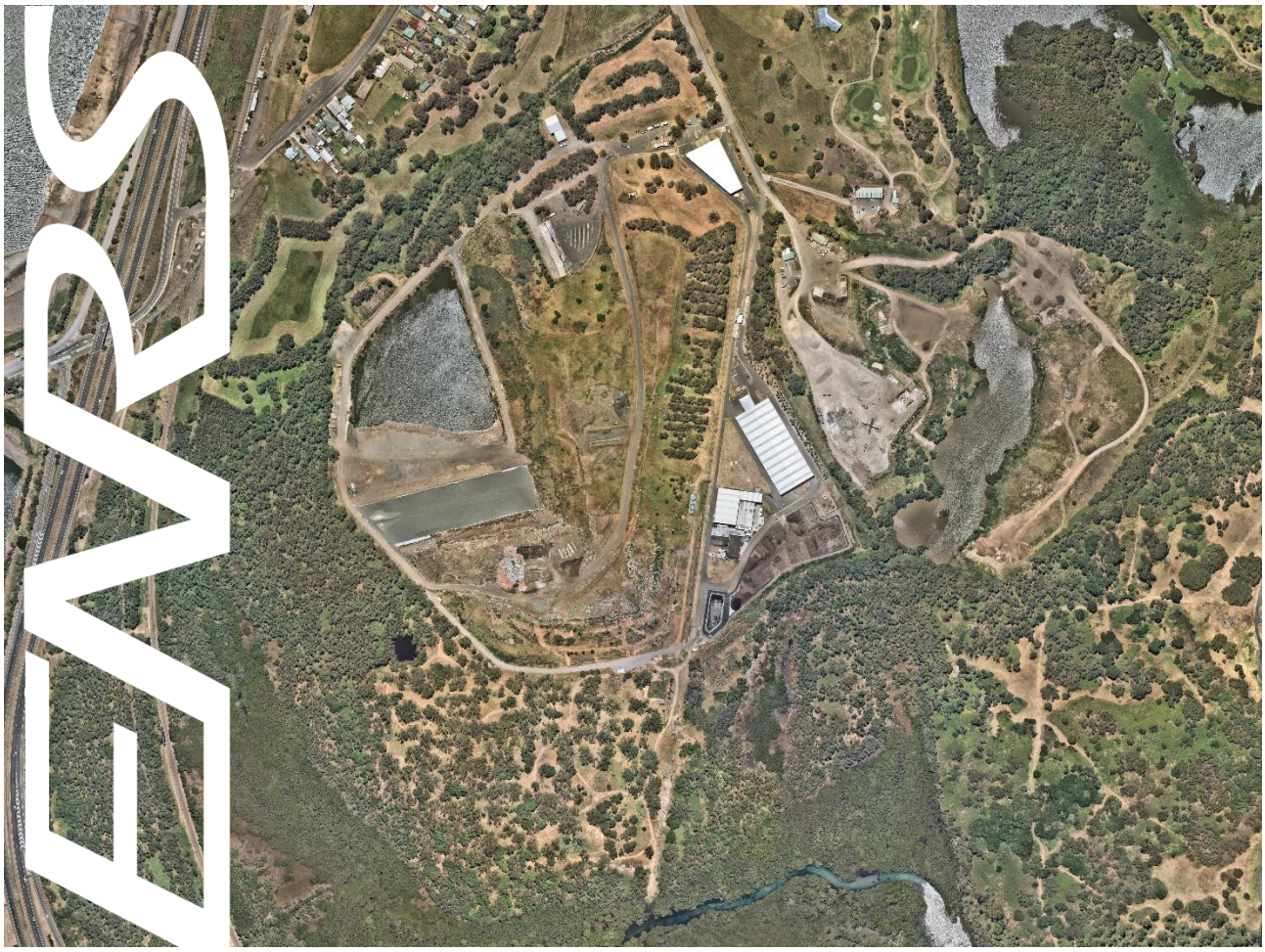

QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) DECEMBER 2020

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

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

Prepared For: **Shellharbour City Council**

Project Number: **ENRS0033**

Date: **January 2021**

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

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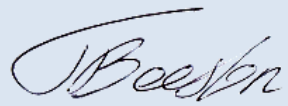 **Taite Beeston (BSc.)** *Geologist & Environmental Consultant*	 **Rohan Last (BSc. MSc)** *Hydrogeologist & Environmental Scientist*

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EXECUTIVE SUMMARY

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

This report summarises the results of field testing and laboratory analysis conducted by ALS for the December 2020 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 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 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 December 2020 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, heavy metals, 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. This is consistent with previous monitoring events;
- Onsite surface water samples (SWP-1, SW-2 and SWP-4) reported two (2) minor exceedances for pH above the ANZECC (2000) trigger values for 95% marine/freshwater. The remaining chemical leachate indicators were reported below the assessment criteria. Sample point SWP-5 was dry, consistent with previous monitoring events;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were generally reported within the adopted Site Assessment Criteria. A single exceedance above the ANZECC (2000) guidelines for Nitrate was reported in SWC-Up;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Dust deposition gauges generally recorded satisfactory results below the guidelines provided in AS3580.10.1. A single exceedance was recorded in the December 2020 monitoring period. Monitoring should continue in accordance with EPL 5984 requirements;
- No non-compliances with the EPL were reported during the December 2020 quarterly monitoring period;
- Based on this review of the quarterly December 2020 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 December 2020 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.

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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.

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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
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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 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.

2.0 SITE DESCRIPTION

2.1 LOCATION

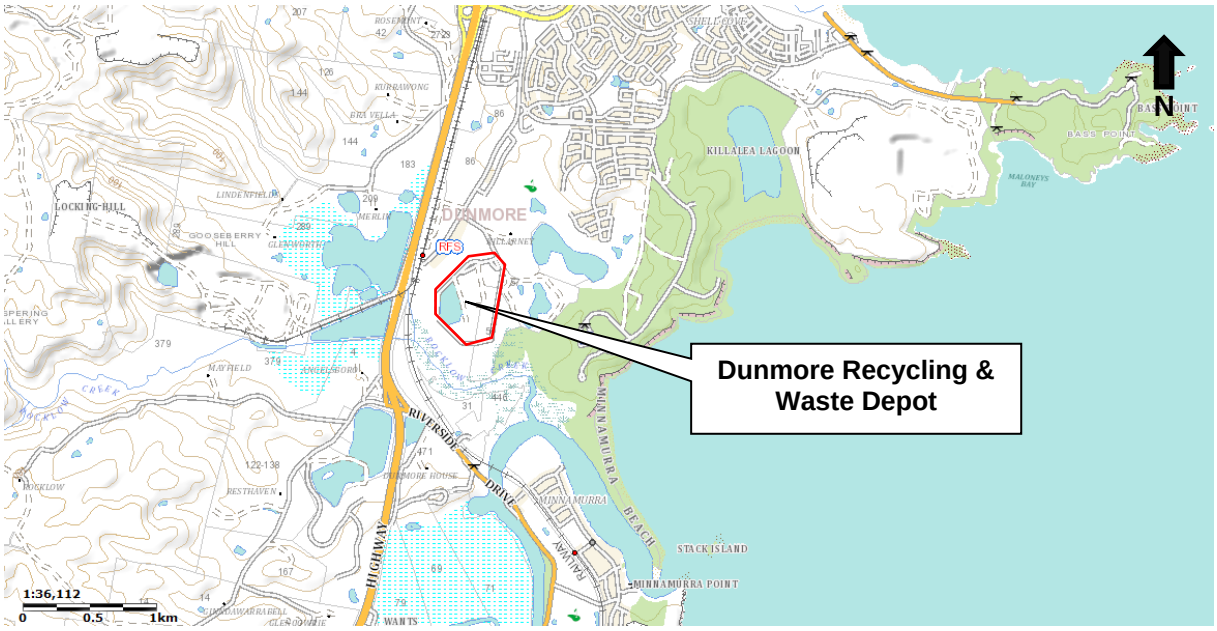
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure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

Table 1: Site Identification

Aspect	Description
Site	Dunmore Recycling and Waste Depot
Street Address	44 Buckleys Road, Dunmore, NSW 2529
Site Area	72.36 hectares
Title Identifier	Lot 21 DP 653009, Lot 1 DP 419907

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

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

2.5 GEOLOGY

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

3.2 WATER QUALITY GUIDELINES

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

Table 3: Groundwater Assessment Criteria

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

3.2.1 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	10.6 mg/L	10.6 mg/L
pH	6.5-8.0 pH units	6.5-8.0 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 2020. 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; eight (8) surface waters; nine (9) groundwater monitoring wells; and two (2) 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 ***13th November*** and ***15th December 2020***. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

4.3 SURFACE METHANE GAS MONITORING

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

Calibration Certificates

Appendix F.

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

ALS, a NATA accredited laboratory, was contracted by *SC* 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.

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

5.2 QA/QC PROCEDURES

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. ENRS understand the December 2020 quarterly monitoring results identified no non-compliance with the terms of 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 8** 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

One (1) overflow event was recorded over the 2020 reporting period on the ***6th November 2020***. Climate data taken from Albion Park (Shellharbour Airport) (068241) weather station recorded a total rainfall of 22mm over two (2) days leading up the event (5-6/11/2020). Overflow was subsequently sampled by *ALS* at two (2) locations SWP1 and SPW2 and analysed for total suspended solids and pH. Laboratory certificates of analysis are provided in Appendix F. Results for total suspended solids (TSS) were reported between <5 mg/L

(SWP2) and 11mg/L (SWP1). pH recorded relatively neutral results of 7.1 (SWP1) and 7.9 (SWP2).

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 six (6) groundwater bores ranging between; **1,770 µS/cm (BH-3)** and **7,360 µS/cm (BH-1)**. Results are consistent with the previous quarterly monitoring events.

Leachate

Leachate salinity for the quarterly June 2020 monitoring period was reported to be **13,100 µS/cm** (Sump) and **14,400 µS/cm** (LP1) 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 **1.0 mg/L** (LP1) and **3.0 mg/L** (Sump).

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 7.5** (SWP-1) and **pH 8.2** (SWP-2 & SWP-4).

Groundwater

Groundwater pH was reported between **pH 6.6** (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 the laboratory lower limit of reporting of <5mg/L and **17 mg/L** (SWP-2).

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 **0.3 mg/L** (BH-14) and **338 mg/L** (BH-1c). Seven (7) 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 **1,240 mg/L** (Sump) and **1,260 mg/L** (LP1). High ammonia concentrations are expected in untreated leachate.

Ammonium

Ammonium was measured at Rocklow Creek surface water monitoring locations between **<0.01 mg/L** (SWC-up) and **0.1 mg/L** (SWC-down). The results were reported below the adopted guidelines of 0.91mg/L.

Nitrate

Results for Nitrate in groundwater were reported between **<.01 mg/L** in multiple bores and **14.9 mg/L** (BH-13). A total of three (3) exceedances in groundwater were reported above the TV of 0.7mg/L including; **14.9 mg/L** (BH-13), **11.1 mg/L** (BH-3) and **3.76 mg/L** (BH-14).

Nitrate in Rocklow Creek surface water samples reported a single elevated exceedance of 2.58 mg/L (SWC-UP). The remainder of the Rocklow Creek samples were all reported below the TV of **0.7mg/L**. The results are considered satisfactory.

Nitrate in leachate was reported below the laboratory lower limit of detection of <0.2mg/L.

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 **34 mg/L** (SWP-1) and **1,220 mg/L** (SWC-down 2).

Manganese (Total Mn)

Manganese was analysed in groundwater and leachate sampling points. Concentrations of Manganese in groundwater were reported between **0.093 mg/L** (BH-1c) and **0.628 mg/L** (BH-9). Leachate concentrations were reported at **0.422 mg/L** (LP1) and **5.68 mg/L** (Sump). The leachate Sump reported the only exceedance above the adopted TV of 1.9 mg/L.

Iron (Total Fe)

Total iron was measured in selected surface water samples. Concentrations of total iron within onsite surface water were reported at **0.24 mg/L** (SWP-1). Concentrations of total iron within Rocklow creek sample locations were all reported between the laboratory lower limit of detection of <0.5 mg/L. Concentration of iron with leachate samples was reported between **5.06 mg/L** (LP1) and **199 mg/L** (Sump).

Iron (Dissolved Fe)

Dissolved iron was measured within selected groundwater and surface water sampling points. Groundwater results were reported between the laboratory lower limit of detection of **<0.05 mg/L** (BH-14) and **10.0 mg/L** (BH15). Surface water reported concentrations of dissolved iron generally below the laboratory lower limit of detection. A single minor detection of **0.12 mg/L** (SWP-1) was reported.

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 **15 mg/L** (BH-13 & BH-12r) and **176 mg/L** (BH-1c); and
- Leachate; **673 mg/L** (Sump) and **712 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	Exceedances		Comments
	Results	Guideline	
BH-1c	Ammonia 338 mg/L EC 7,360 µS/cm	0.91 mg/L 125-2200 µS/cm	Exceedances of Ammonia, Nitrate and Salinity (EC) were encountered in multiple wells at the Site. Concentrations are elevated and within range of historical data sets.
BH-3	Ammonia 37.4 mg/L Nitrate 11.1 mg/L	0.91 mg/L 0.7 mg/L	
BH-4	Ammonia 10.3 mg/L EC 2,250 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-9	Ammonia 77.9 mg/L EC 4,090 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-12r	Ammonia 5.8 mg/L EC 2,560 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-13	Nitrate 14.9 mg/L	0.7 mg/L	
BH-14	Nitrate 3.44 mg/L	0.7 mg/L	
BH-15	Ammonia 31.3 mg/L EC 5,330 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-19r	Ammonia 5.7 mg/L	0.91 mg/L	
SWP-1	No exceedances		Minor exceedances for pH.
SWP-2	pH 8.2	6.5-8.0 pH units	
SWP-4	pH 8.4	6.5-8.0 pH units	
SWP-5	Dry		
SWC-up	Nitrate 2.58 mg/L	0.7 mg/L	A single exceedance for Nitrate in SWC-UP Rocklow Creek sample.
SWC-2	No exceedances		
SWC-down	No exceedances		
SWC-down 2	No exceedances		
Leachate Sump	Manganese 5.68 mg/L Ammonia 1,240 mg/L EC 13,100 µS/cm pH 8.8	1.9 mg/L 0.91 mg/L 125-2,200 µS/cm 6.5-8.0 pH units	Elevated levels of Ammonia, EC and pH considered to be characteristic of untreated leachate.
Leachate Tank LP1	Ammonia 1,260 mg/L EC 14,400 µS/cm pH 8.1	0.91 mg/L 125-2,200 µS/cm 6.5-8.0 pH units	

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 13th November and 15th December 2020, in general accordance with AS3580.10.1. Dust gauge locations are provided in **Figure 2** attached.

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	**0.8**	Satisfactory
DDG2		**0.7**	Satisfactory
DDG3		**2.6**	Satisfactory
DDG4		**5.5**	Satisfactory

Results for depositional dust during the December 2020 quarterly monitoring period reported levels of dust generally below the adopted assessment criteria of 4 g/m^2/month. A single exceedance was reported of **5.5 g/m^2/month** (DDG4). Review of the laboratory certificates of analysis (COA) reported elevated amounts of ash and combustible matter. Laboratory COA are provided in Appendix C.

8.0 SURFACE METHANE GAS RESULTS

The surface gas monitoring from the June 2020 quarterly monitoring period reported levels of methane between 2.1 ppm and 30.3 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.

9.0 ENVIRONMENTAL ASSESSMENT

9.1 MONITORING POINT SUMMARY

Field measurements and laboratory water quality results from the quarterly December 2020 quarterly monitoring period reported concentrations analytes generally within the range historical values. Groundwater and surface water within the Site boundary reported elevated levels of analytes considered to be characteristic of landfill and leachate. Offsite sample locations within Rocklow Creek generally reported satisfactory results. A single exceedance for Nitrate was recorded in Rocklow Creek upstream sample SWC-UP.

Dust gauges were generally reported below the site assessment criteria. A single exceedance was reported within sampling location DDG4.

Results of surface methane gas monitoring recorded satisfactory results.

10.0 CONCLUSIONS

Based on the findings obtained during the December 2020 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, heavy metals, 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. This is consistent with previous monitoring events;
- Onsite surface water samples (SWP-1, SW-2 and SWP-4) reported two (2) minor exceedances for pH above the ANZECC (2000) trigger values for 95% marine/freshwater. The remaining chemical leachate indicators were reported below the assessment criteria. Sample point SWP-5 was dry, consistent with previous monitoring events;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were generally reported within the adopted Site Assessment Criteria. A single exceedance above the ANZECC (2000) guidelines for Nitrate was reported in SWC-Up;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Dust deposition gauges generally recorded satisfactory results below the guidelines provided in AS3580.10.1. A single exceedance was recorded in the December 2020 monitoring period. Monitoring should continue in accordance with EPL 5984 requirements;
- No non-compliances with the EPL were reported during the December 2020 quarterly monitoring period;
- Based on this review of the quarterly December 2020 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and
- This report must be read in conjunction with the attached Statement of Limitations.

11.0 LIMITATIONS

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

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

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

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

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

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

12.0 REFERENCES

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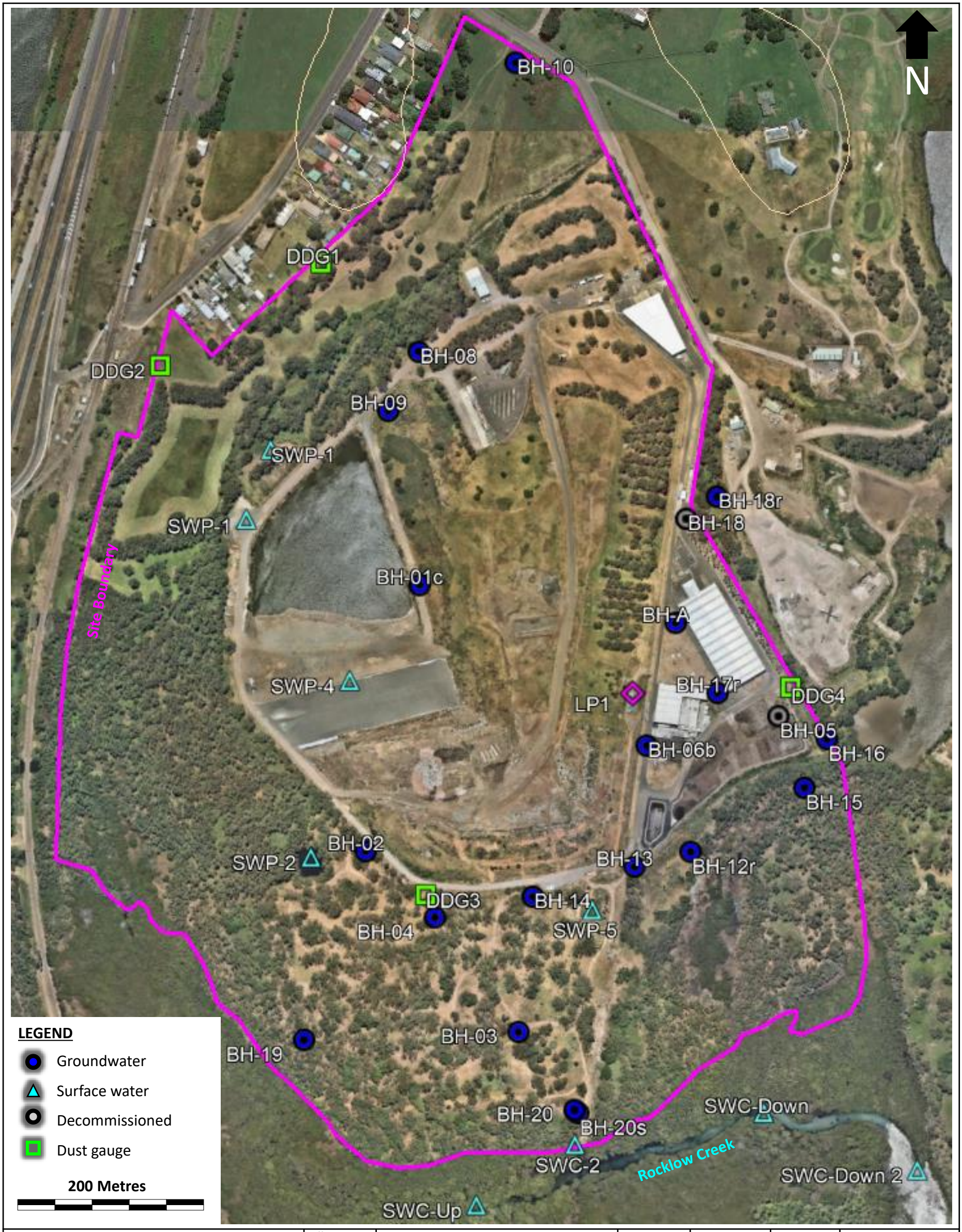
FIGURES



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Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**2**
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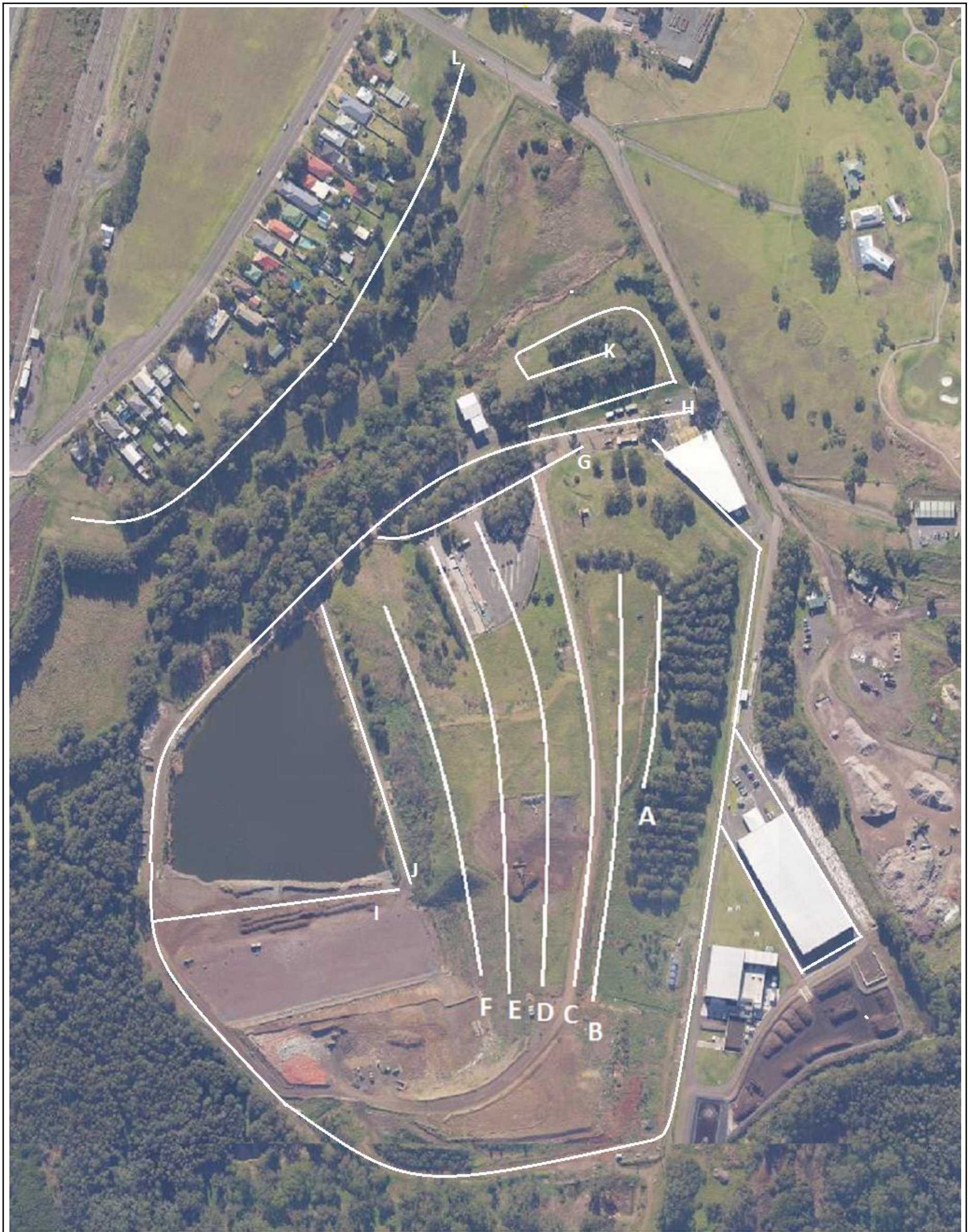

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Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**3**
Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/03/2020**
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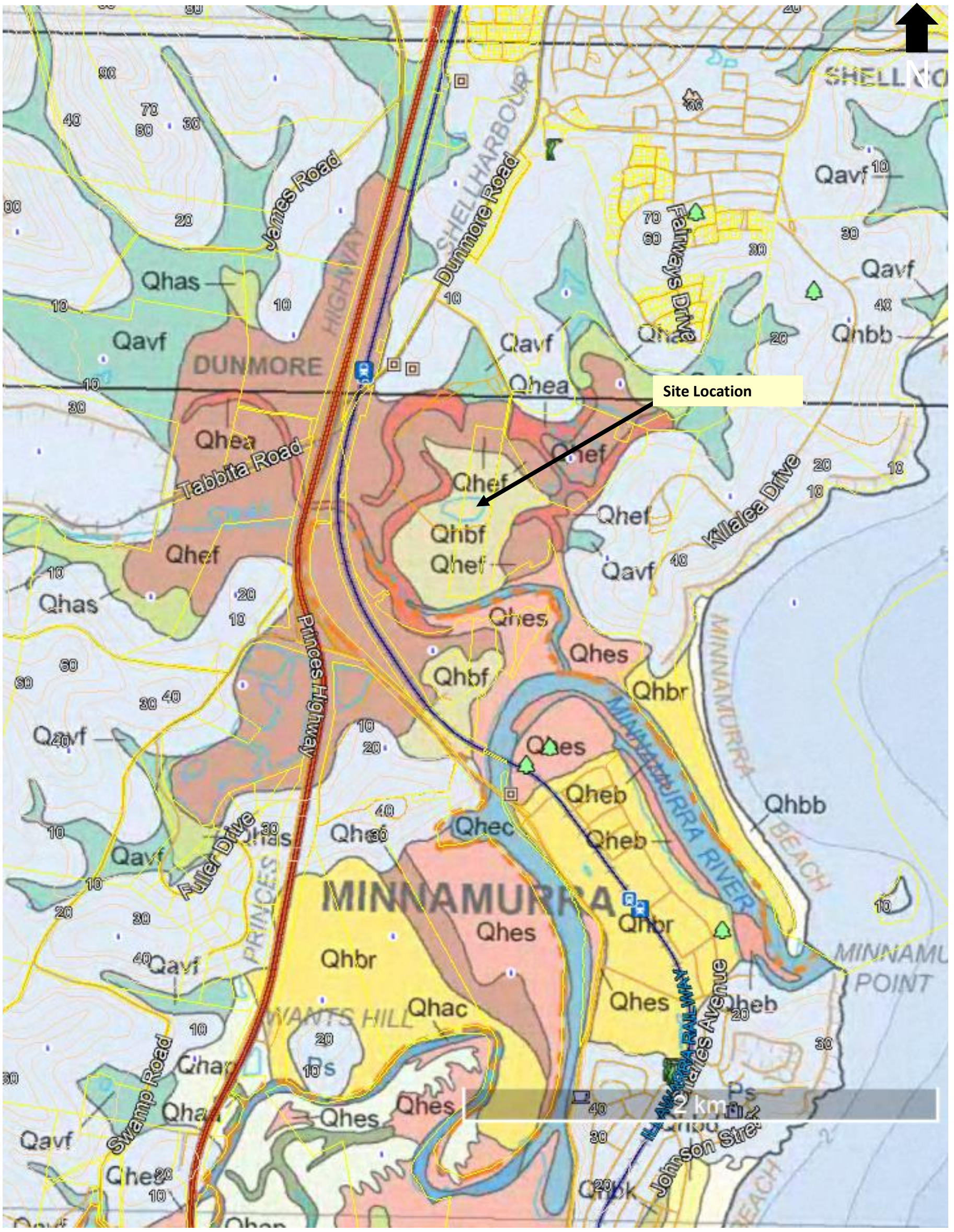
		Status:	**Rev 1**		



ENRS *Environment & Natural Resource Solutions* 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**4**
	Project:	**ENRS0033**	Source:	**DPI**	Date:	**16/01/2020**
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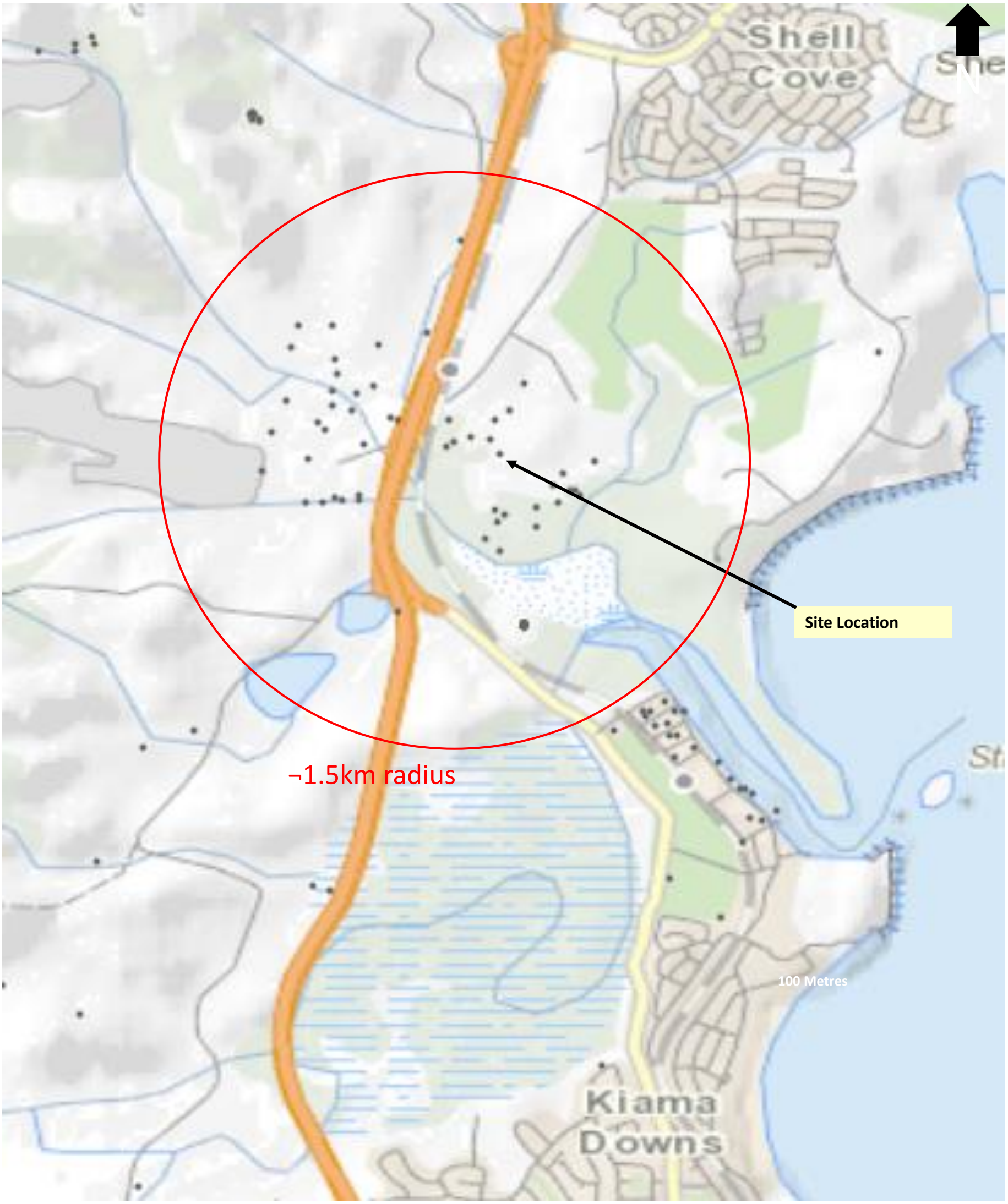

ENRS *Environment & Natural Resource Solutions* 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**5**
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	Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	**NA**	Title:	**Registered Bores**
			Status:	**Rev 1**		

TABLES

TABLE 8: Total Concentration Results

Quarterly Water Monitoring Results - December 2020: 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 - 8.0	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 - 8.0	-	-		
	Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	0.5	-	-	-	-	-	-	-	-	-	250	-	-	-	5	-	-	-	6.5 - 8.0	-	-		
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	-		
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	16/12/2020	861	130	-	-	212	0.093	-	7.96	0.4	338.0	-	0.03	<0.10	<0.10	176	-	<1	<1	2460	2460	<10	-	-	-	-	-	-	-	7	7360	25.9	3.39	-	
	BH-3	16/12/2020	255	138	-	-	30	0.193	-	1.85	0.2	37.4	-	0.06	11.10	11.20	17	-	<1	<1	399	399	82	-	-	-	-	-	-	-	7.3	1770	20.3	3.15	-	
	BH-4	16/12/2020	280	218	-	-	20	0.228	-	6.25	0.1	10.3	-	<0.01	<0.01	<0.01	20	-	<1	<1	706	706	170	-	-	-	-	-	-	-	7	2250	21.2	4.41	-	
	BH-9	16/12/2020	434	208	-	-	59	0.628	-	6.12	0.4	77.9	-	<0.01	<0.01	<0.01	78	-	<1	<1	1580	1580	88	-	-	-	-	-	-	-	6.8	4090	20.4	3.48	-	
	BH-12r	16/12/2020	325	246	-	-	59	0.516	-	4.75	0.2	5.8	-	0.04	0.28	0.32	29	-	<1	<1	729	729	318	-	-	-	-	-	-	-	6.7	2560	22.5	4.43	-	
	BH-13	16/12/2020	113	206	-	-	31	0.106	-	0.06	0.3	0.3	-	0.04	14.90	14.90	15	-	<1	<1	697	697	208	-	-	-	-	-	-	-	6.8	1790	22.3	4.32	-	
	BH-14	16/12/2020	215	106	-	-	32	0.150	-	<0.05	0.6	0.3	-	0.06	3.44	3.50	31	-	<1	<1	468	468	165	-	-	-	-	-	-	-	6.6	1680	22.5	4.88	-	
	BH-15	16/12/2020	1360	88	-	-	298	0.280	-	10.00	0.3	31.3	-	<0.10	<0.10	<0.10	73	-	<1	<1	373	373	435	-	-	-	-	-	-	-	6.8	5330	21.3	0.79	-	
	BH-19r	16/12/2020	266	152	-	-	23	0.154	-	1.50	0.1	5.7	-	0.13	0.12	0.25	21	-	<1	<1	553	553	218	-	-	-	-	-	-	-	7.2	1960	20.5	4.56	-	
Surface Water	SWP-1	15/12/2020	251	56	34	193	15	-	0.24	0.12	-	-	-	-	-	-	-	-	<1	11	334	345	77	-	-	14	4	16	14	4	7.5	-	-	-	-	
	SWP-2	15/12/2020	380	125	60	350	27	-	-	<0.05	0.1	-	-	-	-	-	-	-	<1	30	506	536	275	-	-	15	3	27	27	0	8.2	-	-	-	-	
	SWP-4	15/12/2020	379	60	58	338	16	-	-	<0.05	<0.05	-	-	-	-	-	26	<2	<1	38	380	419	273	-	-	10	1.2	25	23	4	8.2	-	-	-	-	
	SWP-5	15/12/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry	
Rocklow Creek	SWC-up	15/12/2020	18600	428	1200	10200	367	-	<0.50	<0.50	-	-	<0.01	<0.01	2.58	2.58	-	-	<1	<1	131	131	2660	-	-	5	1	583	573	1	7.7	-	-	-	-	
	SWC-2	15/12/2020	-	-	-	-	-	-	<0.50	<0.50	-	-	0.04	<0.01	0.06	0.06	-	-	<1	<1	133	133	-	-	-	<5	-	-	-	-	7.8	-	-	-	-	
	SWC-down	15/12/2020	19100	430	1200	10200	364	-	<0.50	<0.50	-	-	0.10	<0.01	<0.01	<0.01	-	-	<1	<1	132	132	2690	-	-	<5	1	597	573	2	7.8	-	-	-	-	
	SWC-down 2	15/12/2020	18800	430	1220	10400	375	-	<0.50	<0.50	-	-	0.03	<0.01	<0.01	<0.01	-	-	<1	<1	130	130	2680	-	-	17	1	589	584	0	7.8	-	-	-	-	
Leachate	Leachate Sump	15/12/2020	1550	93	-	-	394	5.680	199	-	0.5	1240	-	<0.10	<0.10	<0.10	712	-	<1	1060	3650	4710	29	3	33	-	-	-	-	-	8.8	13100	24.2	-	-	
	Leachate Tank LP1	15/12/2020	1530	20	-	-	48	0.422	5.06	-	0.5	1260	-	<0.10	<0.10	<0.10	673	-	<1	<1	4980	4980	<20	1	15	-	-	-	-	-	8.1	14400	24.4	-	-	

[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).

APPENDICES

Appendix A

EPL 5984 Sampling Point Summary (NSW EPA, 04/03/2020)

1		Overflow drain	Catch drain collecting overflows from Sediment Dams 1 & 2 and labelled SWP1 on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
2	Leachate monitoring		Leachate tank labelled LP1 on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
3	Groundwater monitoring		BH1c - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
5	Groundwater monitoring		BH3 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
6	Groundwater monitoring		BH4 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
7	Groundwater monitoring		BH15 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
10	Groundwater monitoring		BH13 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
11	Groundwater monitoring		BH14 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
16	Groundwater monitoring		BH19 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
17	Groundwater monitoring		BH12R - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).

18	Groundwater monitoring	BH9 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
19	Surface Water Monitoring	SWC_2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
20	Surface Water Monitoring	SWC_UP - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
21	Surface Water Monitoring	SWC_DOWN - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
22	Surface Water Monitoring	SWC_DOWN2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).

Appendix B

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 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
OFFICE:	41 Burelli St WOLLONGONG NSW 2500
PROJECT:	Dunmore Quarterly Ground Waters
ORDER NUMBER:	
PROJECT MANAGER:	Joel Culton
SAMPLER:	SAMPLER MOBILE:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):
Email Reports to :	
Email Invoice 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)
Custo... N/A
Free ... receip... N/A
Rando...
Other...

Environmental Division
Wollongong
Work Order Reference
EW2005662

RELINQUISHED BY:	RECEIVED BY:	RELINQUIS...
Robert	Aneta	
DATE/TIME: 16.12.20. 15:00	DATE/TIME: 16/12/20	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 list... Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field fil...								...levels, dilutions, or samples requiring specific QC analysis etc.
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So4, Cl, Fl) Filtered Ca, K	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)				
	BHA	16.12.20 8:40	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH2	13:40	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH10	9:20	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH16	9:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH17R	8:15	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH18	8:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH18R	9:50	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH20	12:40	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH20s	12:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH21	11:15	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH22	11:00	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.

ENFM204

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2005663**	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	: 16-Dec-2020 16:00
Order number	: 130985	Date Analysis Commenced	: 16-Dec-2020
C-O-C number	: ----	Issue Date	: 29-Dec-2020 10:19
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS 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.**
- EK059G: LOR raised for NOx on sample 1 due to sample matrix.
- EK057G: LOR raised for Nitrite on sample 8 due to sample matrix.
- ED041G: LOR raised for Sulfate on sample 1 due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- 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.
- 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	16-Dec-2020 10:35	16-Dec-2020 13:15	16-Dec-2020 13:30	16-Dec-2020 10:15	16-Dec-2020 12:50
Compound	CAS Number	LOR	Unit	EW2005663-001	EW2005663-002	EW2005663-003	EW2005663-004	EW2005663-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.0	7.3	7.0	6.8	6.7
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7360	1770	2250	4090	2560
EA116: Temperature								
Temperature	----	0.1	°C	25.9	20.3	21.2	20.4	22.5
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	2460	399	706	1580	729
Total Alkalinity as CaCO3	----	1	mg/L	2460	399	706	1580	729
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	82	170	88	318
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	861	255	280	434	325
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	130	138	218	208	246
Potassium	7440-09-7	1	mg/L	212	30	20	59	59
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.093	0.193	0.228	0.628	0.516
Iron	7439-89-6	0.05	mg/L	7.96	1.85	6.25	6.12	4.75
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	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	338	37.4	10.3	77.9	5.79
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.03	0.06	<0.01	<0.01	0.04
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	11.1	<0.01	<0.01	0.28
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	11.2	<0.01	<0.01	0.32
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	176	17	20	78	29

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	BH1C	BH3	BH4	BH9	BH12R
			Sampling date / time	16-Dec-2020 10:35	16-Dec-2020 13:15	16-Dec-2020 13:30	16-Dec-2020 10:15	16-Dec-2020 12:50
Compound	*CAS Number*	*LOR*	*Unit*	**EW2005663-001**	**EW2005663-002**	**EW2005663-003**	**EW2005663-004**	**EW2005663-005**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**3.39**	**3.15**	**4.41**	**3.48**	**4.43**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH13	BH14	BH15	BH19R	----
			Sampling date / time	16-Dec-2020 12:05	16-Dec-2020 13:05	16-Dec-2020 11:40	16-Dec-2020 12:50	----
Compound	CAS Number	LOR	Unit	EW2005663-006	EW2005663-007	EW2005663-008	EW2005663-009	--------
				Result	Result	Result	Result	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	6.6	6.8	7.2	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1790	1680	5330	1960	----
EA116: Temperature								
Temperature	----	0.1	°C	22.3	22.5	21.3	20.5	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	697	468	373	553	----
Total Alkalinity as CaCO3	----	1	mg/L	697	468	373	553	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	208	165	435	218	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	113	215	1360	266	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	206	106	88	152	----
Potassium	7440-09-7	1	mg/L	31	32	298	23	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.106	0.150	0.280	0.154	----
Iron	7439-89-6	0.05	mg/L	0.06	<0.05	10.0	1.50	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.6	0.3	0.1	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.28	0.26	31.3	5.67	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.04	0.06	<0.10	0.13	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	14.9	3.44	<0.10	0.12	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	14.9	3.50	<0.10	0.25	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	15	31	73	21	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**BH13**	**BH14**	**BH15**	**BH19R**	**----**
			Sampling date / time	16-Dec-2020 12:05	16-Dec-2020 13:05	16-Dec-2020 11:40	16-Dec-2020 12:50	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2005663-006**	**EW2005663-007**	**EW2005663-008**	**EW2005663-009**	**--------**
				Result	Result	Result	Result	----
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**4.32**	**4.88**	**0.79**	**4.56**	**----**

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	**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
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		

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 comments:			

SAMPLER: Robert DaLio	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert	**RECEIVED BY:**
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to :		**DATE/TIME:** 15.12.20 14:40	**DATE/TIME:**
Email Invoice to :			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
DATE/TIME:	**DATE/TIME:**	**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.
	SWP2	15.12.20 11:10	W			✓	✓		✓	✓				Field Tests - pH
	SWP4 - Sand Mine Dam	" 11:20	W			✓	✓	✓	✓	✓				Field Tests - pH
	SWP5	" 10:45	W			✓	✓	✓	✓	✓				Field Tests - pH
				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 - Airfr
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 Spec
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag. de Preserved Glass;

Environmental Division
Wollongong
Work Order Reference
EW2005657

Telephone : 02 4225 3125

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2005657**	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 Quarterly Surface Water	Date Samples Received	: 15-Dec-2020 16:00
Order number	: 130985	Date Analysis Commenced	: 15-Dec-2020
C-O-C number	: ----	Issue Date	: 22-Dec-2020 15:27
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 Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordace 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	15-Dec-2020 11:10	15-Dec-2020 11:20	15-Dec-2020 10:45	----	----
Compound	CAS Number	LOR	Unit	EW2005657-001	EW2005657-002	EW2005657-003	--------	--------
				Result	Result	Result	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**8.2**	**8.2**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**15**	**10**	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**3.0**	**1.2**	----	----	----
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	**30**	**38**	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**506**	**380**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**536**	**419**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**275**	**273**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**380**	**379**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**125**	**60**	----	----	----
Magnesium	7439-95-4	1	mg/L	**60**	**58**	----	----	----
Sodium	7440-23-5	1	mg/L	**350**	**338**	----	----	----
Potassium	7440-09-7	1	mg/L	**27**	**16**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**0.05**	<0.05	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**27.2**	**24.7**	----	----	----
ø Total Cations	----	0.01	meq/L	**27.1**	**22.9**	----	----	----
ø Ionic Balance	----	0.01	%	**0.12**	**3.92**	----	----	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	----	**DRY**	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	**26**	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	----	<2	----	----	----

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:			
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: 15.12.20 14:40	DATE/TIME:	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.
	SWP1	15.12.20 11:30	W			✓	✓		✓					Field Tests - pH
	SWC_2	12:15	W			✓			✓		✓	✓		Field Tests - pH & Temp
	SWC_UP	12:10	W			✓	✓		✓	✓	✓			Field Tests - pH & Temp
	SWC_DOWN	12:20	W			✓	✓		✓	✓	✓			Field Tests - pH & Temp
	SWC_DOWN_2	12:30	W			✓	✓		✓	✓	✓			Field Tests - pH & Temp
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2005661

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 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 = 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	: **EW2005661**	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 EPL	Date Samples Received	: 15-Dec-2020 16:00
Order number	: 130985	Date Analysis Commenced	: 15-Dec-2020
C-O-C number	: ----	Issue Date	: 22-Dec-2020 20:31
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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS 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.**
- EG020: LOR's have been raised due to matrix interference. (High Total Dissolved Solids)
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordace with in-house sampling method EN/67.6 Rivers and Streams.
- 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**)

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	15-Dec-2020 11:30	15-Dec-2020 12:15	15-Dec-2020 12:10	15-Dec-2020 12:20	15-Dec-2020 12:30
					EW2005661-001	EW2005661-002	EW2005661-003	EW2005661-004	EW2005661-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.5**	**7.8**	**7.7**	**7.8**	**7.8**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**14**	<5	**5**	<5	**17**
EA045: Turbidity									
Turbidity	----	0.1	NTU		**4.0**	**----**	**1.1**	**0.9**	**1.0**
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		**11**	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**334**	**133**	**131**	**132**	**130**
Total Alkalinity as CaCO3	----	1	mg/L		**345**	**133**	**131**	**132**	**130**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**77**	**----**	**2660**	**2690**	**2680**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**251**	**----**	**18600**	**19100**	**18800**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**56**	**----**	**428**	**430**	**430**
Magnesium	7439-95-4	1	mg/L		**34**	**----**	**1200**	**1200**	**1220**
Sodium	7440-23-5	1	mg/L		**193**	**----**	**10200**	**10200**	**10400**
Potassium	7440-09-7	1	mg/L		**15**	**----**	**367**	**364**	**375**
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.12**	<0.50	<0.50	<0.50	<0.50
EG020T: Total Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.24**	<0.50	<0.50	<0.50	<0.50
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**----**	**0.04**	<0.01	**0.10**	**0.03**
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
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**----**	**0.06**	**2.58**	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**----**	**0.06**	**2.58**	<0.01	<0.01
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**15.6**	**----**	**583**	**597**	**589**

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	15-Dec-2020 11:30	15-Dec-2020 12:15	15-Dec-2020 12:10	15-Dec-2020 12:20	15-Dec-2020 12:30
Compound	CAS Number	LOR	Unit		EW2005661-001	EW2005661-002	EW2005661-003	EW2005661-004	EW2005661-005
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
ø **Total Cations**	----	0.01	meq/L		**14.4**	**----**	**573**	**573**	**584**
ø **Ionic Balance**	----	0.01	%		**4.02**	**----**	**0.82**	**2.07**	**0.42**

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: samples.perth@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Adelaide:** 2-1 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): ☐ 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 Dalio	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert,	**RECEIVED BY:**
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to :		DATE/TIME: 15.12.23 14:40.	DATE/TIME:
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.
	Leachate Sump	15.12.23 15:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2005658

Telephone : +61 2 4225 3125

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	: **EW2005658**	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	: 16-Dec-2020 12:39
Order number	: 130985	Date Analysis Commenced	: 15-Dec-2020
C-O-C number	: ----	Issue Date	: 22-Dec-2020 15:27
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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G: LOR raised for Nitrite due to sample matrix.
- EK059G: LOR raised for NOx 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 completed by ALS Wollongong in accordace with in-house sampling method EN/67.6 Rivers and Streams.
- 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.
- 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	15-Dec-2020 10:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2005658-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**8.8**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**13100**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**24.2**	----	----	----	----
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	**1060**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**3650**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**4710**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**29**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1550**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**93**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**394**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**5.68**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**199**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1240**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**712**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Sample ID	**Leachate Sump**	**----**	**----**	**----**	**----**
				Sampling date / time	15-Dec-2020 10:10	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EW2005658-001**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**2.75**	**----**	**----**	**----**	**----**
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**32.6**	**----**	**----**	**----**	**----**

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):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		☐ Non Standard or urgent TAT (List due date):
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 Dalo	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert.	**RECEIVED BY:**
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to :		**DATE/TIME:** 15.12.2 14'40	**DATE/TIME:**
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.
	Leachate Storage Tank - LP1	15.12.2 9:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2005659

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	: **EW2005659**	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 Tank EPL	Date Samples Received	: 15-Dec-2020 16:00
Order number	: 130985	Date Analysis Commenced	: 15-Dec-2020
C-O-C number	: ----	Issue Date	: 22-Dec-2020 15:27
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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G: LOR raised for Nitrite due to sample matrix.
- ED041G: LOR raised for Sulfate due to sample matrix.
- EK059G: LOR raised for NOx 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 accordace with in-house sampling method EN/67.10 Wastewaters
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Leachate Storage Tank LP1	----	----	----	----
			Sampling date / time	15-Dec-2020 09:55	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2005659-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**8.1**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**14400**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**24.4**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**4980**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**4980**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<20	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1530**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**20**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**48**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.422**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**5.06**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1260**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----
EP005: Total Organic Carbon (TOC)								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Sample ID	**Leachate Storage Tank LP1**	**----**	**----**	**----**	**----**
				Sampling date / time	15-Dec-2020 09:55	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EW2005659-001**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EP005: Total Organic Carbon (TOC) - Continued									
Total Organic Carbon	----	1	mg/L		**673**	**----**	**----**	**----**	**----**
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**1.26**	**----**	**----**	**----**	**----**
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**14.9**	**----**	**----**	**----**	**----**

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		

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 Dalo	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Robert,	**RECEIVED BY:**
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to :		**DATE/TIME:** 15.12.20 14:40	**DATE/TIME:**
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	A04 (Ash, CM, TIS)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	DDG1	15.12.20 10:30	AIR			✓								
	DDG2	10:35	AIR			✓								
	DDG3	11:05	AIR			✓								
	DDG4	9:40	AIR			✓								
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2005660

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	: **EW2005660**	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-Dec-2020 12:38
Order number	: 130985	Date Analysis Commenced	: 17-Dec-2020
C-O-C number	: ----	Issue Date	: 30-Dec-2020 22:19
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.

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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.

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)			Sample ID	**DDG1 13-11/2020 - 15/12/2020**	**DDG2 13-11/2020 - 15/12/2020**	**DDG3 13-11/2020 - 15/12/2020**	**DDG4 13-11/2020 - 15/12/2020**	**----**
			Sampling date / time	15-Dec-2020 10:30	15-Dec-2020 10:35	15-Dec-2020 11:05	15-Dec-2020 09:40	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2005660-001**	**EW2005660-002**	**EW2005660-003**	**EW2005660-004**	**--------**
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.6**	**0.4**	**1.9**	**3.7**	**----**
Ash Content (mg)	----	1	mg	**11**	**8**	**35**	**70**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**0.2**	**0.3**	**0.7**	**1.8**	**----**
Combustible Matter (mg)	----	1	mg	**5**	**5**	**14**	**33**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**0.8**	**0.7**	**2.6**	**5.5**	**----**
Total Insoluble Matter (mg)	----	1	mg	**16**	**13**	**49**	**103**	**----**

Appendix D

Surface Gas (Methane) Field Sheets

ALS Landfill Emissions Report

Client: Shellharbour City Council
Site: Dunmore
Date: 9/12/2020
Sampler(s) Robert DaLio,

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A	1	6168 183	302 344	3.0	
A	2	6168 166	302 352	3.2	
A	3	6168 143	302 349	3.0	
A	4	6168 123	302 346	2.9	
A	5	6168 092	302 346	2.8	
A	6	6168 066	302 341	3.8	
B	1	6167 960	302 318	2.9	
B	2	6167 993	302 328	2.8	
B	3	6168 010	302 332	2.9	
B	4	6168 043	302 339	2.9	
B	5	6167 086	302 335	3.0	
B	6	6167 113	302 341	3.0	
B	7	6168 114	302 337	2.9	
B	8	6168 158	302 338	3.0	
B	9	6168 186	302 334	3.2	
C	1	6168 277	302 260	2.8	
C	2	6168 235	302 276	2.9	
C	3	6168 179	302 291	2.9	
C	4	6168 106	302 309	2.9	
C	5	6168 043	302 317	2.9	
C	6	6167 991	302 319	2.9	
C	7	6167 910	302 308	2.9	
C	8	6167 847	302 300	2.9	
D	1	6167 980	302 277	3.4	
D	2	6167 989	302 278	4.0	
D	3	6168 011	302 268	3.4	
D	4	6168 027	302 270	3.4	
D	5	6168 046	302 270	3.5	
D	6	6168 056	302 270	3.5	
D	7	6168 065	302 268	3.5	
D	8	6168 070	302 266	3.5	
E	1	6168 069	302 227	3.0	
E	2	6168 059	302 232	3.0	
E	3	6168 040	302 235	3.0	
E	4	6168 019	302 241	3.2	
E	5	6167 997	302 246	3.2	
E	6	6167 986	302 245	3.4	
E	7	6167 986	302 254	3.4	
F	1	6167 937	302 249	9.4	
F	2	6167 957	302 239	2.8	
F	3	6167 976	302 230	2.8	
F	4	6167 005	302 215	2.8	
F	5	6167 022	302 209	2.9	
F	6	6168 037	302 203	2.9	
G	1	6168 219	302 166	2.8	
G	2	6168 236	302 196	2.8	
G	3	6168 254	302 226	2.8	
G	4	6168 266	302 243	2.8	

H	1	6168 025	302 413	2.5	
H	2	6168 029	302 459	2.5	
H	3	6168 011	302 391	2.5	
H	4	6167 975	302 393	2.5	
H	5	6167 950	301 395	2.5	
H	6	6167 915	301 401	2.5	
H	7	6167 884	301 406	2.5	
H	8	6167 889	302 411	2.5	
H	9	6167 921	302 429	2.6	
H	10	6167 949	302 438	2.6	
H	11	6167 992	302 413	2.6	
H	12	6167 848	302 459	2.7	
H	13	6167 794	302 391	3.0	
H	14	6167 847	302 393	3.2	
H	15	6167 887	302 395	2.9	
H	16	6167 941	302 401	2.9	
H	17	6167 974	302 406	2.9	
H	18	6168 024	302 411	3.0	
H	19	6168 143	302 429	2.8	
H	20	6168 214	302 430	2.7	
H	21	6168 271	302 368	2.5	
H	22	6168 296	302 354	2.5	
H	23	6168 299	302 293	2.6	
H	24	6168 279	302 202	2.6	
H	25	6168 238	302 152	2.8	
H	26	6168 187	302 104	2.8	
H	27	6168 143	302 061	2.8	
H	28	6168 111	302 027	2.8	
H	29	6168 075	301 997	2.8	
H	30	6168 035	301 973	2.8	
H	31	6167 985	301 970	2.9	
H	32	6167 931	301 970	2.8	
H	33	6167 884	301 972	2.9	
H	34	6167 824	302 018	5.0	
H	35	6167 786	302 056	30.3	
H	36	6167 681	302 160	4.2	
H	37	6167 681	302 243	4.0	
H	38	6167 703	302 350	4.6	
I	1	6167 933	302 150	2.9	
I	2	6167 930	302 101	3.1	
I	3	6167 930	302 053	3.0	
I	4	6167 934	301 990	2.8	
J	1	6168 152	302 102	2.8	
J	2	6168 120	302 113	2.8	
J	3	6168 077	302 127	2.9	
J	4	6168 025	302 144	2.9	
J	5	6167 992	302 155	2.9	
K	1	6168 320	302 264	2.8	
K	2	6168 335	302 297	2.8	
K	3	6168 351	302 345	2.9	
K	4	6168 383	302 352	2.9	
K	5	6168 400	302 303	3.0	
K	6	6168 381	302 266	2.9	
K	7	6168 365	302 282	2.9	
K	8	6168 378	302 317	2.9	
L	1	6168 561	302 226	3.8	
L	2	6168 536	302 213	3.8	
L	3	6168 501	302 193	3.8	
L	4	6168 474	302 160	3.8	
L	5	6168 443	302 135	3.8	
L	6	6168 407	302 116	3.8	
L	7	6168 329	302 045	3.8	
Compressor Shed	1			6.0	
Office	1			2.8	
Community Recycling Centre	1			2.5	
OLD Weighbridge				2.8	
OLD Weighbridge Toilet				10.4	
Revolve Shop				2.6	
Building Truckwash	1			2.8	
New Weighbridge	1			2.6	
Methane Blank (Pre testing)				2.1	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				2.2	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: 19252 H-02174

Instrument: Laser One **Seriennummer - Serial number** 19252

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	2.2	2.3	2.3	2.27	0.50	0.05	0.05
1000	3.1	3.2	3.2	3.2	3.20	0.10	0.01	0.01
1000	10.3	10.3	10.3	10.3	10.30	0.00	0.00	0.00
1000	107	99	99	99	99.00	8.00	0.80	0.80
1000	1000	995	996	996	995.67	5.00	0.50	0.50

Unsicherheit - Uncertainty	0.80		%
Maximaler Fehler % - Max % error	0.80		% 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	5.00	5.00	5.00	5.00	0.00	0.00	0.00
100.00	15.00	15.30	15.30	15.30	15.30	0.30	0.30	0.30
100.00	50.00	50.50	50.50	50.50	50.50	0.50	0.50	0.50
100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00	0.00

Unsicherheit - Uncertainty	0.50		%
Maximaler Fehler % - Max % error	0.50		% 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	1.99	1.99	1.99	1.99	0.01	0.10	0.10
100.00	50.00	50.00	50.00	50.00	50.00	0.00	0.00	0.00

Incertezza - Uncertainty	0.10		%
Massimo errore % - Max % error	0.10		% FS

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Umgebungsbedingungen für die Kalibrierung - Environmental conditions during calibration

Temperature	21.2	C
Pressure	990	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: 24/02/2021

Kalibrierungsdatum / Calibration date: 24/02/2020

Kalibrierungsmanager / Calibration done by: Laura McBride

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

Customer Name: **Azienda:**	**HGS SAS Huber Guenther & C**	**Date of Service:** **Data manutenzione:**	**24-Feb-20**
Model: **Modello:**	**Laser One**	**Next Service due:** **Prossima data di manutenzione:**	**Feb-21**
Serial Number: **Numero di serie:**	**19252**		
Service comments: **Verbale di manutenzione:**		**Full service, opened tables to 100% and calibrated device.**	

Calibration / Taratura
Standard service checks carried out / Manutenzione standard
Pump cleaned / Pulizia della pompa
Adhesive filter/Filtro adesivo

Service Engineer / Operatore:

Laura McBride

Signature / Firma

17025	**5**	**50**	**65**	**7,384**	**340**	**25**
Our ISO accreditation for our customised auto-calibration facilities	Number of days we aim to complete your service within	Number of checks instruments are subject to when serviced	Number of countries from which we service instruments /accessories each year	Number of calibrations completed in last 12 months	Minimum number of service instruments we process each month	Cost (in £) of fully insured analyser collection for our UK customers

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

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

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

17025	5	50	65	7,384	340	25
Our ISO accreditation for our customised auto-calibration facilities	Number of days we aim to complete your service within	Number of checks instruments are subject to when serviced	Number of countries from which we service instruments /accessories each year	Number of calibrations completed in last 12 months	Minimum number of service instruments we process each month	Cost (in £) of fully insured analyser collection for our UK customers

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

Registered in England and Wales 1898734

Appendix F

Overflow Event Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2005038**	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 Overflows	Date Samples Received	: 06-Nov-2020 14:24
Order number	: 130985	Date Analysis Commenced	: 06-Nov-2020
C-O-C number	: ----	Issue Date	: 13-Nov-2020 16:33
Sampler	: Glenn Davies		
Site	: ----		
Quote number	: WO/030/19 TENDER OVERFLOW DISCHARGE		
No. of samples received	: 2		
No. of samples analysed	: 2		

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. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Administration - Wollongong, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordace with in-house sampling method EN/67.4 Lakes and Reservoirs

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**SWP1 Point 1**	**SWP2 Point**	**----**	**----**	**----**
				Client sampling date / time	06-Nov-2020 10:40	06-Nov-2020 10:30	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EW2005038-001**	**EW2005038-002**	**--------**	**--------**	**--------**
					Result	Result	----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.1**	**7.9**	**----**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**11**	<5	**----**	**----**	**----**
Sampling Method									
Dummy Analyte	----	1	-		<1	<1	**----**	**----**	**----**