



Kiama Municipal Council

Annual Surface and Groundwater Monitoring Report Gerroa Waste Disposal Depot

Report E2W-025 R001

3 March 2014



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Client: Kiama Municipal Council

Project: Annual Surface and Groundwater Monitoring Report
Gerroa Waste Disposal Depot

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Report: 3 March 2014
Reference: E2W-025 Gerroa DR001 (V1)

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1 INTRODUCTION

Earth2Water Pty Ltd (E2W) was engaged by Kiama Municipal Council (Council) to provide an annual groundwater and surface water monitoring report for the Gerroa Waste Disposal Depot (GWDD). The GWDD Environment Protection Licence (EPL) was revoked in May 2008, and altered the previous reporting periods from August–July, to 1 April 2008 - 31 March 2009. The EPL reporting periods and monitoring periods have changed since 2009 (i.e. 2009-2010 monitoring report included results from five monitoring events including February 2009, May 2009, August 2009, November 2009 and February 2010. The 2010-2011 monitoring report included results from four monitoring events including May 2010, August 2010, November 2010 and February 2011. The 2011-2012 annual report includes results from five monitoring events including May 2011, August 2011, November 2011, February 2012 and May 2012. The 2012-2013 annual report by E2W includes results from four monitoring events including May 2012, August 2012, November 2012 and February 2013).

This annual EPL report (2013-2014) by E2 W includes an assessment of four monitoring events (May 2013, August 2013, November 2013 and February 2014) and is based on Council's project brief (Ref H24/11, August 2004), ALS Environmental Pty Ltd laboratory results and E2W previous reports. This report (2013-2014) is the tenth¹ provided by E2W to the NSW EPA on behalf of Council, and meets the conditions outlined in the EPL (Lic No: 5959, R1.10).

1.1 BACKGROUND AND REMEDIATION ACTIVITIES

Council has owned and operated the GWDD since the 1960's. It was previously licensed as a Solid Waste Class 1 Landfill, operating under the EPL No. 5959. The site also functioned as a night soil depot for liquid pump out sullage. Land filling operations at the GWDD were discontinued in October 2003.

From July 2004 to February 2005, the landfill was rehabilitated to eliminate, or at least minimise the potential for landfill leachate generation. The waste mound was reshaped, capped with a 0.5 m thick clay barrier and 0.3 m thick combined drainage/re-vegetation layer. The former night soil trench was also remediated in August 2004 (i.e. approximately 300 tonnes of bio-solid sludge were excavated and placed underneath the clay cap).

In February 2005, an irrigation system was installed to assist with the re-vegetation of the landfill mound using a combination of native and annual grasses. A groundwater holding dam (30 x 30 m) was also constructed next to the two existing evaporation ponds to contain and supply water for the irrigation system. A spear point (yield ~2 L/sec) was installed on the north-west corner of the landfill mound to allow groundwater (and landfill leachate) to fill the holding dam as well as supply water for the irrigation system.

The sludge pond (southern lined dam) at Gerroa Landfill has not been used since Council ceased undertaking the septic clean-outs. Waste Processing Solutions Pty Ltd was engaged by KMC in September 2009 to de-water the sludge in the lined pond, and subsequently taken to a Soilco Pty

¹ First annual report for the period 2003 - 2004 was submitted in October 2004.

Ltd owned site. Removal of the pond liner (HDPE) was undertaken in October 2011 by Council and disposed to Shellharbour landfill (note: spillage of residual sludge may have occurred during removal of the liner).

Up until November 2008, Ecowise Pty Ltd (now ALS) performed the quarterly surface and groundwater monitoring at the landfill site. E2W and Council undertook the monitoring in November 2008, and subsequently Council and/or ALS performing the quarterly monitoring rounds herein. Water samples are sent to ALS for laboratory analyses. The landfill is kept locked at all times.

1.2 OBJECTIVES

Similar to previous years, the objective of monitoring was to assess the potential impact of the GWDD on local surface and groundwater systems. This round of monitoring provides an assessment of water quality improvements associated with the landfill rehabilitation works completed in February 2005.

2 SCOPE OF WORK

E2W was commissioned by Council to collate and interpret surface and groundwater data from the GWDD on 31 May, 30 August, 27 November 2013, and 7 February 2014. Each monitoring event comprised the following:

- Sampling of onsite and offsite groundwater wells MW-1S, MW-1D, MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7S, MW-7D, MW-9, MW-10 and MW-11.
- Sampling of surface water at two locations along Blue Angle Creek (ML-2, and ML-5²). Only ML-2 and ML-5 locations were sampled during this reporting period (i.e. ML-1, ML-3 and ML-4 were inaccessible due to being located on private property belonging to Cleary Brothers).

Similar EPL reports were completed by E2W for the 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 monitoring periods. E2W is required to conduct the following scope of work to satisfy Council's surface and groundwater monitoring program at GWDD:

- Assist Council to interpret quarterly sampling results and provide recommendations.
- Prepare this annual report for May 2013 to February 2014 to provide information in accordance with Section R1.10 of the EPL (No. 5959). The annual report is to include the following:
 1. Tabulation of the monitoring data obtained for the period.
 2. Graphical representation of the current and previous monitoring data (minimum - last three years). Statistically significant variations or anomalies will be highlighted.
 3. Analyses and interpretation of monitoring data.

² November 2008 was the first time ML-5 had been sampled since October 2004.

4. Analyses and response to any complaints received.
5. Identification of any deficiencies in the environmental performance of the GWDD, as highlighted by the monitoring data, trends and/or accidents.
6. Proposal of recommendations to address the above identified deficiencies.
7. Recommendations on improving the overall environmental performance of the facility.

3 LICENCE CRITERIA AND RELEVANT GUIDELINES

The EPL for the GWDD was revoked by the DECC in May 2008. The ongoing groundwater monitoring is undertaken to assess the effectiveness of the capping works and environmental status of the landfill post closure and rehabilitation. The revocation notice is subject to the following conditions:

- The licensee must maintain the landfill capping works.
- The licensee must undertake groundwater monitoring at groundwater wells MW-1S, MW-1D, MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7S, MW-7D, MW-9, MW-10 and MW-11 (in accordance with Table 3.1 below).
- Should the monitoring results indicate ammonia concentrations greater than 20% above ammonia concentrations reported in Table GW-1 of *Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007*, dated 17 August 2007, the licensee must notify the EPA within 7 days of receiving the results.
- The licensee must undertake surface water monitoring at surface water monitoring points ML-1, ML-2, ML-3, ML-4 and ML-5 (in accordance with Table 3.1 below).
- Should the monitoring results indicate ammonia concentrations greater than 10% above ammonia concentrations reported in Table SW-1 of *Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007*, dated 17 August 2007, the licensee must notify the EPA within 7 days of receiving the results (Appendix C).
- The licensee must dewater, clean out and cap the two HDPE lined liquid storage ponds
 - By 1 January 2009, or
 - When the ponds are no longer required, or
 - If the liner is breached (whichever is the earlier).

Table 3.1: Surface and Groundwater Monitoring Requirements

Parameters	Monitoring Frequency - Groundwater	Monitoring Frequency – surface water
Alkalinity	Quarterly	Quarterly
pH	Quarterly	Quarterly
Conductivity	Quarterly	Quarterly
Total Dissolved Solids	Quarterly	Quarterly
Nitrogen (Ammonia)	Quarterly	Quarterly
Phosphorous (Total)	Quarterly	Quarterly
Nitrate	Quarterly	Quarterly
Nitrite	Quarterly	Quarterly
Total Kjeldahl Nitrogen	Quarterly	Quarterly
Calcium	Annual	Annual
Chloride	Annual	-
Fluoride	Annual	-
Magnesium	Annual	Annual
Sulphate	Annual	-
Sodium	Annual	Annual
Bicarbonate	Annual	Annual
Carbonate	Annual	Annual
Potassium	Annual	Annual
Dissolved Organic Carbon	Annual	-
Iron	Annual	Annual
Manganese	Annual	Annual
Redox Potential	Annual	Annual
Faecal Coliforms	-	Annual
Enterococci	-	Annual

Note: Bicarbonate/alkalinity was conducted on quarterly basis (only an annual requirement).

The parameters listed in Table 3.1 have been tested in the May, August, November 2013 and/or February 2014 (Table 6). Annual parameters were sampled during the August 2013 monitoring period. Ongoing monitoring with the same parameters is proposed for the future monitoring reports.

The DECC's *Contaminated Sites: Guidelines for Assessment and Management of Groundwater Contamination* (March 2007) outlines a best-practice framework for assessing and managing groundwater contamination. The guidelines are made under the *Contaminated Land Management Act (1997)* and recommend adopting the ANZECC (2000) chemical concentration trigger values for the protection of (fresh and marine) aquatic ecosystems.

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) guidelines include risk-based trigger levels and indicative interim working levels (IIWLs). The IIWLs are of low reliability and used when insufficient data is available to calculate a trigger level. It should be noted that the ANZECC (2000) water quality guidelines are applicable to receiving water and not to groundwater. However, they form an appropriate basis for undertaking a screening level assessment of groundwater quality. The selection of the applicable guideline values should be based on an assessment of potential pathways by which human or environmental exposure might take place and the beneficial end use of the groundwater (i.e. ecosystem support).

The choice of a beneficial use classification for groundwater at the site depends on the quality of the water and its potential use in the long term. Although groundwater in the aquifer surrounding the waste disposal facility is likely to be of relatively good quality (depending on the presence of saline intrusions), there are no known groundwater extraction bores (agricultural or domestic) within the immediate vicinity. Therefore, the most appropriate beneficial use category of the groundwater is considered to be for the protection of aquatic ecosystems in the discharge zones of nearby Blue Angle Creek and Seven Mile Beach (fresh and marine water, respectively).

Based on the closest environmental receptors being both marine and fresh waters (i.e. Seven Mile Beach, Blue Angle Creek and Crooked River Estuary), the guidelines adopted for the site are based on the protection of both marine and fresh water aquatic ecosystems. These assessment guidelines are presented with the summarised analytical results (i.e. Tables GW-1, SW-1). Exceedances of reliable trigger ANZECC (2000) for marine water ecosystems have been highlighted in Tables GW-1 and SW-1.

4 ENVIRONMENTAL SETTING

The GWDD is located approximately 1.5 km southwest of the Gerroa Road bridge crossing of Crooked River and near the northern end of Seven Mile Beach. Blue Angle Creek is located around 80 m to the northwest of Crooked River Road (Figure 1).

The facility covers an area of approximately 3.2 hectares. The location and general layout of the site is shown in Figures 1 and 2. Prior to the remediation of the site in February 2005, the GWDD comprised the following:

- An elevated landfill mound ranging from 4 m to ~15 m AHD,
- Two lined evaporation sludge ponds. These accepted septic sludge associated with Gerringong's upgraded sewerage system,
- A night soil deposit, which historically accepted night soil sludge; and
- A small recycling facility.

The former night soil depot is located adjacent to the north-western slope of the landfill mound (Figure 2). The former depot consisted of two excavated infiltration trenches which, up until August 2002, received pump-out wastewater from septic tanks in the Gerringong/Gerroa region. The two trenches were approximately 100 m in length (5 m wide) and while operational, partially filled with untreated wastewater.

4.1 CLIMATE

Between 1895 and 2011, the average yearly rainfall at Gerringong Mayflower Village (Latitude 34.75° S, Longitude 150.82° E) is 1343.4 mm/year, with the heaviest rainfalls occurring in summer and autumn months. However, rainfall data from Toolijooa (Nyora) Station is taken from July 2012 due to the closure of Mayflower Village Station. Climatic data indicates Gerringong received approximately 1504.4 mm of rain from February 2013 to February 2014³ (Monthly Rainfall Graph, Appendix B). The highest month of rainfall recorded was 308.8 mm in June 2013.

³ Information obtained from the Bureau of Meteorology website (www.bom.gov.au/climate).

4.2 TOPOGRAPHY

A general layout of the site topography is presented in Figure 1. The GWDD is located in an estuarine landscape consisting of dune ridges, swamps and lagoons. The vegetation surrounding the facility comprises scrub and a littoral rainforest. Local relief is less than 5 m AHD and slopes less than 5%. The landfill forms a mound, reaching ~12 m above the surrounding ground surface.

The reduced groundwater level (RL) of the landfill footprint area ranges from ~3.3 to 5.2 m AHD. The footprint area (23,000 m²) and height of the rehabilitated landfill mound (15.9 m AHD, July 2005) is practically the same as pre-remediation conditions (i.e. October 2003).

4.3 GEOLOGY

The GWDD is located within the Seven Mile Soil Landscape as defined by Hazelton (1992). Coastal Plain Quaternary marine sands and Quaternary alluvium underlie the site.

Previous site investigations, as discussed in the URS report (2002), identified light brown fine-grained dune sands to a depth of 4 - 6 m below grade. The sands vary in thickness (between dune ridges and swales) and are largely contained above the groundwater table.

Beneath the dune sands, fine-grained grey beach sands containing shell fragments are present to a depth of approximately 14 m. The base of the sequence comprises estuarine silty and sandy clays. Further inland, the sedimentary sequence comprises estuarine clays closer to the surface, particularly in the vicinity of Blue Angle Creek where the ground surface is 2 - 3 m lower than the landfill area.

4.4 HYDROGEOLOGY

The GWDD is underlain by an unconfined and permeable sandy aquifer. Groundwater is encountered at a depth of approximately 3 - 4 m below ground level (i.e. ~1 m AHD) at the landfill area and becomes shallower towards Blue Angle Creek to the west and Seven Mile Beach to the east.

The groundwater quality varies from potable to saline, with electrical conductivities ranging from 0.3 to 60 mS/cm. The groundwater generally becomes more saline with depth and in the vicinity of tidal saline water bodies (i.e. Blue Angle Creek and Seven Mile Beach).

The hydraulic conductivity of the beach and dune sands at Gerroa has a geometric average of 10 m/day (Gerroa-Gerringong Sewerage Scheme EIS, 1999). It is noted that the organic silty sands between 0 - 0.15 mbgl have a lower permeability (approximately 0.1 m/day, E2W site investigations, March 2004).

In the area of the GWDD, groundwater gradients are controlled by topography, the Seven Mile Beach shoreline, Blue Angle Creek and Crooked River Estuary. It is interpreted that a natural groundwater divide runs through the landfill (URS 2003, E2W 2004), with groundwater to the west flowing towards Blue Angle Creek and groundwater to the east towards Seven Mile Beach. It is likely the natural groundwater divide is influenced by the coastal dunes and presence of the

landfill mound (due to increased recharge). The position of the groundwater divide may change with the tide and seasons. During 2004/2005 (a drought period), the predominant flow direction was considered to be east towards Seven Mile Beach.

Groundwater discharge at Blue Angle Creek and Seven Mile Beach will be influenced by the presence of a fresh groundwater/salt water interface. The interface results from the density difference between the groundwater and sea water and is a dynamic and complex region with upward hydraulic gradients, tidal fluctuations, micro-biological processes, groundwater and surface interaction and substantial salinity variations. The groundwater/salt water interface can be associated with enhanced natural attenuation (biodegradation, dilution, sorption etc.), which acts to reduce the levels of contaminants prior to their discharge to marine ecosystems.

Groundwater is also interpreted to discharge as baseflow within Blue Angle Creek. Due to the action of tides, salt water is intermittently present in Blue Angle Creek with salinity governed by tide levels. The saline water intrusion at high tide extends approximately 2 km upstream of the confluence between Blue Angle Creek and Crooked River.

It is understood offsite migration of contaminants (nutrients, iron and some ammonia) has occurred in the local shallow and deep groundwater systems (URS 2002, 2003; E2W 2004, 2006). This groundwater contamination arises from nutrient enrichment, which is associated with the former landfilling operations at the GWDD.

The leachate plume identified in the well network arises from historical waste disposal at the site, which commenced in the 1960s. The landfill remediation (completed in February 2005) will reduce future landfill leachate generation, however shrinking/diminishing of the existing plume will depend on natural attenuation processes (i.e. dilution, adsorption, biodegradation dispersion etc.) over time (years).

The groundwater quality immediately outside the footprint area is subjected to increased dilution arising from runoff (1 ha) and groundwater recharge from the landfill mound. This dilution together with natural attenuation decreases the leachate levels in the aquifer.

4.5 HYDROLOGY

The hydrology of the area is dominated by Blue Angle Creek, Crooked River and Seven Mile Beach (Figure 2).

The closest environmental receptors of water running through the GWDD are Blue Angle Creek, Seven Mile Beach and Crooked River Estuary (Figure 1). Blue Angle Creek flows into the Crooked River Estuary at the northern end of Seven Mile Beach. The estuary discharges into the ocean when the mouth is open.

Previous Crooked River and Blue Angle Creek surface water quality investigations were discussed in the URS report (2002). The results indicate a considerable variation in water quality, particularly between dry and wet conditions, which may be associated with inputs from the wider catchment area.

When the entrance to Crooked River is open, the lower part of the river is well flushed with oceanic waters. This results in levels of nutrients, bacteria and toxicants that generally comply with guideline levels. Immediately following wet weather, water quality in the estuarine section of Crooked River generally deteriorates, with increased levels of particulate material, bacteria, sulphide, nutrients and metals (URS, 2003).

Of the four main tributaries that feed into the estuarine section of Crooked River, water quality in Blue Angle Creek was the most degraded with phosphorus, nitrogen, hydrogen sulphide, copper and zinc (URS, 2003).

All surface water runoff from the landfill mound is diffused into the surrounding sandy soils.

5 PREVIOUS MONITORING RESULTS

The primary conclusion from the monitoring report submitted by URS (2002-2003) prior to remediation in 2005 is summarised below:

- High concentrations of nutrients, in particular ammonia-nitrogen, continue to be detected under the site and migrating offsite. The levels recorded are well in excess of ANZECC (2000) guidelines for the protection of fresh and marine water ecosystems.

The following key points are also noted:

- High concentrations of ammonia-nitrogen and TKN were consistently detected in monitoring wells MW-1 and MW-5, which are located on the outer extent of the facility. This indicates the potential for migration of the nutrient plume in a south-easterly direction towards Seven Mile Beach. High concentrations of ammonia-nitrogen were also detected in monitoring wells MW-3 and MW-7, which are also located on the outer extent of the facility, indicating the potential for migration of the nutrient plume in a north-westerly direction towards Blue Angle Creek.
- Elevated concentrations of ammonia-nitrogen were detected in the shallow monitoring wells MW-9 to MW-11, adjacent to Blue Angle Creek.

6 SURFACE AND GROUNDWATER MONITORING

Surface and groundwater monitoring between May 2013 and February 2014 was undertaken by Ecowise Pty Ltd (now ALS Environmental). Sampling was carried out on the following dates:

- 31 May 2013
- 30 August 2013
- 27 November 2013
- 7 February 2014

The recommended procedure for sample collection, storage, handling and quality control generally employed by Ecowise (ALS) is outlined in the SGMP by AWT (1999a). E2W used the November

2008 sampling round to instruct Council staff on surface and groundwater sampling protocol. The samples were sent to ALS (Sydney) for laboratory analyses. E2W understand that ALS carry out the quarterly sampling at the GWDD and submit the samples to ALS (Sydney via the Wollongong office) for analyses.

6.1 MONITORING LOCATIONS

The following outlines the nature of the monitoring and analytical program at the site and the conditions at the time of sample collection from information provided by ALS and/or Council.

Groundwater was sampled from six monitoring wells (MW-3, MW-4, MW-5, MW-9, MW-10, MW-11), and three nested wells (MW-1S/MW-1D, MW-6S/MW-6D and MW-7S/MW-7D, where S = shallow, D = deep).

Surface water was sampled at two locations (ML-2 and ML-5) along Blue Angle Creek (Figure 2). Samples were not collected from ML-1, ML-3 or ML-4 due to restricted access to sample locations (private land owned by CB). Samples were not collected from Seven Mile Beach (BS-1 to BS-4), or the ocean (OS-1 to OS-4) during May 2012 to February 2013. Previous results from these locations indicate that it is unlikely landfill leachate is impacting these areas.

Variable EC levels in surface water testing locations indicate that sampling may not have been undertaken during low tide (sampling at low tide provides a reflection of groundwater discharge).

6.1.1 Sampling Sites - Groundwater

The sampling sites are described below, while sampling depths for the bundled piezometers and conventional wells are summarised in Table 6.2.

- MW-1S (shallow - 6 m depth) and MW-1D (deep - 10.5 m depth)⁴ - Located next to the previous multilevel piezometer MW-1 and approximately 40 m from the SE corner of the landfill perimeter. The well is situated down-gradient of the landfill mound and intended to intersect flow heading towards Seven Mile Beach.
- MW3 - Approximately 20 m to the north of the landfill clearing, fronting native bushland. This well is to establish background water quality conditions and determine offsite migration of groundwater in a northerly direction.
- MW4 - Located immediately adjacent to the night soil depot, which is a source of potential nutrient and bacterial contamination.
- MW5 - Approximately 30 m to north of the night soil depot. The well is within the extent of contamination arising from the depot and landfill-impacted groundwater.
- MW-6S (shallow - 6 m depth) and MW-6D (deep - 10.5 m depth) - Located next to multilevel piezometer MW-6 and approximately 50 m NW of landfill and night soil depot. The well is situated down-gradient of the landfill and night soil depot.

⁴ Nested shallow and deep wells are constructed with a 3 m well screen.

- MW-7S (shallow - 6 m depth) and MW-7D (deep - 10.5 m depth) - Located 15 m to the east of multilevel piezometer MW-7 and approximately 100 m NW of landfill and night soil depot. This well was installed to establish background water quality conditions and determine offsite migration of groundwater contaminants towards Blue Angle Creek.
- MW9 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.
MW10 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.
MW11 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.

6.1.2 Sampling Sites - Surface Water

Blue Angle Creek

- ML-1 - Approximately 100 m upstream of the depot along Blue Angle Creek at the end of the tidal limit. This sampling location was chosen to establish upstream water quality and offsite conditions.
- ML-2 - Approximately 500 m downstream of the depot along Blue Angle Creek. This sampling location was chosen to establish offsite and downstream water quality and assess the potential for contamination associated with the depot.
- ML-4 - Approximately 100 m upstream of the flood gates along Blue Angle Creek. This sampling location was chosen to establish upstream water quality and offsite conditions.
- ML-5 - Approximately 400 m downstream of the flood gates along Blue Angle Creek, between MW-9 and MW-11. This midstream sampling location was chosen to establish offsite receptor water quality conditions.

The surface water and groundwater sample locations are illustrated in Figure 2, and Table 6.1.2.

Table 6.1.2: Monitoring Summary for May 2013 to February 2014

Sample ID	Screen Interval (m AHD) & Sample Location	31 May 2013	30 August 2013	27 November 2013	7 February 2014
MW-1S	Approx. 0 to -3	X	X	X	Dry
MW-1D	Approx. -4 to -7	X	X	X	X
MW-3	0 to 1.5	X	X	X	X
MW-4	0.79 to -0.71	X	X	X	X
MW-5	0.55 to -0.95	X	X	X	X
MW-6S	Approx 0 to -3	X	X	X	X
MW-6D	Approx -4 to -7	X	X	X	X
MW-7S	Approx 0 to -3	X	X	X	X
MW-7D	Approx -4 to -7	X	X	X	X
MW-9	-0.53 to -1.53	X	X	X	X
MW-10	-0.525 to -1.525	X	X	X	X
MW-11	0.095 to -0.905	X	X	X	X
ML-1	Upstream of landfill	No access	No access	No access	No access
ML-2	Downstream of landfill	X	X	X	X
ML-3	Upstream of landfill	No access	No access	No access	No access
ML-4	Upstream of landfill	No access	No access	No access	No access
ML-5	Opposite landfill	X	X	X	X

Notes:

X = Sample collected. MW = Monitoring well sample from landfill site. ML = Surface water sample from Blue Angle Creek. The 6 wells (MW-1S/MW-1D etc) are considered more reliable monitoring locations (compared to multilevel piezometers) as they were constructed with standalone 50 mm diameter PVC screens and not the 7 mm poly tubing (low flow system).

6.2 SAMPLE COLLECTION AND LABORATORY ANALYSIS

The surface and groundwater analytical program from May 2013 to February 2014 is presented in Tables GW-1 and SW-1. The nested wells (MW-1S, MW-1D, MW-6S, MW-6D, MW-7S, MW-7D) installed in 2006 have replaced the bundled piezometers ⁵ (i.e. MW-1, MW-6, MW-7).

7 MONITORING RESULTS

All groundwater and surface water analytical results from 2003 to 2014 are presented in Tables GW-1 and SW-1, with the most recent (4) monitoring data highlighted. The field records and laboratory reports are presented in Appendix A and Table 6 (summary of data set).

A summary of all available monitoring data (2003 to 2014) is presented in Graph-01 to Graph-07. The graphs illustrate ammonia and total phosphorous concentrations (key indicators of leachate impact) for the groundwater wells⁶ and surface water sampling locations as well as the depth to groundwater (m AHD, 2001 to February 2014).

⁵ The bundled wells were believed to provide spurious results due to the low purge volumes.

⁶ Results from multilevel piezometers MW-1, MW-6 and MW-7 (Graph-01 & Graph-03) are considered anomalous.

The graphs illustrate the ammonia concentrations in the shallow (Graph-01) and deep monitoring wells separately (Graph-02). Contaminant migration rates and flushing characteristics are different at shallow and deep levels of the aquifer.

The graphs highlight water quality trends with respect to seasonal and water level changes, as well as water quality improvements associated with the landfill rehabilitation completed in 2005.

7.1 GROUNDWATER DATA

Groundwater was collected from a network of twelve monitoring wells at onsite and offsite locations (Figure 2) in May, August, November 2013 and February 2014. The results of the groundwater results obtained are summarised in Table GW-1, Graph-01 to Graph-05 and the following subsections.

7.1.1 Groundwater Depth and Flow Regime

The depth to groundwater was measured prior to each sampling event (in conventional wells) using a water level probe. The depth to the groundwater below top of casing and relative to a common reference (i.e. Australian Height Datum, m AHD) is presented in Table GW-1. The inferred groundwater contours are presented in Figures 3A & 3B. Reduced groundwater levels (m AHD) between 2001 and 2014 are illustrated in Graph-05.

A groundwater divide is interpreted to occur at the landfill mound (sand dune area) and inferred to be located midway between Crooked River and Seven Mile Beach. As the position of the groundwater divide is influenced by the surface water bodies, the prevailing climate and recharge through the waste mound, it is likely local groundwater flow characteristics have altered over recent years.

The reduced groundwater levels from the twelve wells indicate a relatively low water table elevation. Field sampling records show that the depth to groundwater between October 2003 and February 2012 is below 1.87 mAHD. The groundwater levels recorded from the 2011-2012 monitoring round are slightly higher than the 2012-2013 & 2013-2014 monitoring periods, reflecting less rainfall infiltration occurring over the last two years.

The inferred groundwater contours for the site are presented in Figures 3A & 3B. The groundwater levels and degree of mounding is generally variable, indicating a dynamic groundwater environment dependent upon rainfall recharge (aquifer is unconfined and sandy soils are highly permeable at the site).

The groundwater data indicates comparable groundwater levels during the 2012-2013 and 2013-2014 monitoring periods, approximately 0.1-0.3 m less rainfall infiltration occurring in comparison to 2011-2012 of 1628.4 mm/yr.

7.1.2 Field Parameters

The groundwater, field parameters measured during sampling are considered indicative only (small purge volumes). Insitu measurements (within borehole) are likely to provide a more accurate rendition of the field chemistry, especially with respect to dissolved oxygen.

7.1.2.1 *pH (field) and Redox*

The groundwater pH measured from the twelve wells ranges from pH 5 to 7.8 (MW-10, May 2013 and MW-7S, November 2013/February 2013, respectively). The pH in each well was generally stable over the four monitoring rounds (May 2013 to February 2014).

On its own, pH is not considered a reliable indicator of leachate contamination, as sediments and decomposing organic material associated with the creek bed also have a significant influence on pH.

Redox was not measured during the previous monitoring periods (2010 to 2011 and 2009- 2010) but was measured in August 2011 during 2011-2012 sampling round, and August 2012 during the 2012-2013 monitoring period. Similarly redox was only measured in August 2013 during the 2013-2014 sampling round, ranging from 161 to -147 mV. In each well redox is generally comparable to previous monitoring periods.

7.1.2.2 *Total Dissolved Solids (TDS and EC)*

The TDS levels in groundwater collected from the site range from 201 to 19,400 mg/L (fresh to brackish). The lowest and highest TDS levels were obtained from MW-7S and MW-10, respectively. The TDS level for MW-10 is related to the well's proximity to Blue Angle Creek. In the 2007-2008 monitoring period, the TDS levels reported from MW-9 were significantly lower than previously (<5,000 mg/L). The TDS levels reported in August 2008 to August 2010 had increased to similar levels to those reported pre-August 2007, however since November 2010 results show a significant decrease in levels once more (<6,500 mg/L) with the exception of February 2012 which increased to 9,530 mg/L. In 2012-2013, MW-9 has variable increases (TDS) to 8,220 mg/L. During 2013-14, MW-9 showed increases during November and February, and significant decrease in August (671 mg/L).

Wells located within the vicinity of the landfill mound (MW-3 to MW-6) have low TDS levels, between 219 to 496 mg/L which is similar to previous monitoring rounds (2012-2013, 2011-2012, 2010-2011, 2009-2010 and 2008-2009). The distribution of TDS levels reflects the location of rainfall recharge and fresh water near the groundwater divide (landfill area).

Salinity increases as groundwater flows towards Blue Angle Creek (MW-9 to MW-11). A decrease in salinity (TDS) occurs in several wells close the landfill perimeter (i.e. MW-3, MW-4, MW-5), which is interpreted to occur from dilution arising from an increase in stormwater runoff from the landfill mound post-capping (& decreased leachate generation).

7.1.2.3 Dissolved Oxygen (DO)

Field analyses from the twelve wells recorded dissolved oxygen (DO) concentrations ranging between 0.72 and 3.89 mg/L (MW-1S November 2013 and MW-10 February 2014, respectively). The concentrations of DO reported for the site from 2003 to 2014 are variable. However, measurements may reflect the instruments (imprecise) used and/or purging process.

Based on the distribution of DO in the groundwater at the site, it is inferred that landfill leachate caused a depletion of groundwater DO and is generally increasing due to decreasing nutrient concentrations. This phenomenon is seen on many landfill sites, where organic carbon and nutrients provide surplus electron acceptors, which react with and consume the available DO in the groundwater. It is likely the groundwater under the landfill mound is anaerobic due to the presence of the landfill leachate (DOC, ammonia etc.).

7.1.3 Nutrients

7.1.3.1 Nitrogen

Groundwater collected from the monitoring wells at the GWDD were analysed for ammonia-nitrogen, total Kjeldahl nitrogen (TKN) and oxidised nitrogen (nitrate and nitrite). Discussions regarding potential impact to the environment will focus on ammonia-nitrogen, as it is the main indicator of groundwater contamination.

The guidelines for total ammonia-nitrogen for the protection of fresh water and marine ecosystems vary according to pH and temperature. Given the range of pH and temperature measured across the site and in Blue Angle Creek, the guidelines are 1.88 and 2.84 mg/L for fresh and marine waters, respectively (at a pH of 7.3).

All groundwater samples collected from MW-6D and MW-7D in May 2013 to February 2014 exceeded the ANZECC (2000) trigger value for ammonia. Groundwater from MW-7S exceeded the ANZECC (2000) trigger value for ammonia in May 2013 only. These monitoring wells are located west of the landfill mound, indicating leachate is migrating towards Blue Angle Creek.

Groundwater wells (MW-1, MW-3 and MW-4 pre-rehabilitation) initially reported the highest concentrations of ammonia. Following the landfill rehabilitation, ammonia levels have declined in the shallow groundwater system and are below ANZECC guidelines (Graph-01). The groundwater from deep wells (MW-1D, MW-6D and MW-7D) show a clear declining trend, however MW-6D and MW-7D are still elevated above ANZECC guidelines. The ammonia concentrations show a clear reduction in nutrient loading in the deep aquifer (ammonia generally below 10 mg/L in the 3 key deep wells) and water quality improvement at the site.

Nitrate was analysed for all samples (May 2013 to February 2014) with MW-1D, MW-6S, and MW-6D exceeding the ANZECC (2000) guideline (fresh water trigger value, 0.7 mg/L) at least once in the 2013-2014 monitoring period. MW-9 which has not exceeded guidelines for nitrate since February 2007, reported elevated levels above guidelines in 2010 however decreased below 0.19 mg/L in 2011-2012, 0.11 mg/L in 2012-2013, and <0.1 mg/L in 2013-2014.

All groundwater samples analysed from all twelve wells in May, August, November 2013 and February 2014 exceeded ANZECC (2000) fresh and marine water TKN trigger values (0.5 and 0.12 mg/L, respectively). Monitoring wells located adjacent to Blue Angle Creek (i.e. MW-9, MW-10, MW-11) continue to report stable or decreasing concentrations of ammonia (Graph 1).

Table 7.1.3.1 (below) and Figure 4 provide an overview of groundwater ammonia trends from May 2013 to February 2014 reporting period.

Table 7.1.3.1: Groundwater Ammonia Trends - May 2013 to February 2014

Well ID	Ammonia Trend	Trigger 20% exceedance (Ammonia)	Comment
MW-1S	Decreasing trend. Levels below 0.34 mg/L, below ANZECC	No exceedance	Shallow sample - east of landfill
MW-1D	Variable trend Maximum November 2013 (4.13 mg/L), levels above ANZECC (except February 2013) Overall decreasing levels since August 2009	No exceedance	Deep sample - east of landfill
MW-3	Decreasing/stabilising trend. Levels below 0.93 mg/L, below ANZECC	No exceedance	North of landfill
MW-4	Decreasing/stabilising trend. Levels below 1.86 mg/L, below ANZECC mg/L	No exceedance	West of landfill
MW-5	Stable trend. Levels below ANZECC (except November 2013 @ 5.88 mg/L)	No exceedance	North of landfill
MW-6S	Stable trend. Levels below 0.29 mg/L, below ANZECC	No exceedance	Shallow sample - down-gradient of night soil deposit
MW-6D	Stable trend. Maximum May 2013 (14.6 mg/L), levels all above ANZECC	No exceedance	Deep sample - down-gradient of night soil deposit
MW-7S	Decreasing/Stabilising trend. Maximum May 2013 (1.91 mg/L). Levels below ANZECC (except for May 2013)	No exceedance	Shallow sample - down-gradient and adjacent to Crooked River Road
MW-7D	Stabilising trend. Maximum May 2013 (2.81 mg/L) Levels all above ANZECC	No exceedance	Deep sample - down-gradient and adjacent to Crooked River Road
MW-9	Stable/decreasing trend. Levels below 0.32 mg/L (November 2013), below ANZECC	No exceedance	Next to Blue Angle Creek
MW-10	Stable trend. Levels below LOR 0.3 mg/L (November 2013), below ANZECC	No exceedance	As above
MW-11	Decreasing trend. Levels below LOR 0.07 mg/L (May 2013), below ANZECC	No exceedance	As above

Note: Three wells (MW-9, 10, 11) are located on the creek bank, potentially affected by flood waters and vegetation (rotting, and new growth). ANZECC (2000) refers the marine trigger value (2.84 mg/L).

As outlined in the revocation notice, ammonia concentrations greater than 20% above ammonia concentrations reported in Table GW-1 of *Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007*, dated 17 August 2007 are to be highlighted (no exceedances, refer to Appendix C).

7.1.3.2 Total Phosphorus (TP)

The ANZECC (2000) TP guideline for fresh and marine ecosystems is 0.05 and 0.025 mg/L, respectively. Between May 2013 and February 2014, all groundwater results from MW-1S, MW-1D (except May & August 2013), MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7S, MW-7D, MW-9, MW-10 (except November 2013 & February 2014) and MW-11 exceeded the ANZECC (2000) trigger values (Table GW-1 and Graphs 3 & 4).

MW-6D (located down gradient of the former night soil deposit and landfill) reported a maximum of 6.84 mg/L in the 2011-2012 monitoring period, however decreased to a maximum of 4.8 mg/L in the 2012-2013 monitoring period. In 2013-2014 total phosphorous was reported a maximum of 9.07 mg/L indicating a variable trend. MW-7D reported an increase in maximum TP (8.46 mg/L, November 2014) compared to the previous monitoring period (1 mg/L, May 2012). TP at MW-6D and MW-7D (near former night soil) shows a variably increasing trend (Graph-4) and may relate to the recent dewatering/sludge pond decommissioning (further monitoring required to verify impacts in the deep groundwater).

During the 2013-2014 monitoring period, MW-6S (shallow nested well) initially showed a decreasing trend and a maximum of 0.8 mg/L (February 2014), comparable to the 2012-2013 maximum (0.63 mg/L) and significantly lower than the 2011-2012 maximum of 8.81 mg/L. TP at MW-4 (located south of the night soil deposit) indicate a variable but potentially increasing trend (Graph 3). The August 2012 monitoring event reported a maximum TP (4.29 mg/L) at MW-4, which is lower than the maximum TP in 2011-2012 (7.98 mg/L, the highest to date since sampling began in June 2003). The removal of the liner from the sludge pond in October 2011 may have impacted the 2011-2012 results (particularly MW-6S).

The concentrations of TP immediately east and north of the landfill (MW-3 and MW-5) and next to Blue Angle Creek (MW-9 to MW-11) are much lower, indicating that the former night soil deposit is a likely source of TP.

In relation to the former night soil deposit (primary TP source), a localised TP plume is interpreted to potentially migrate towards Blue Angle Creek (MW-4/MW-6S to MW-7S, and possibly to MW5). The TP plume is also detected at MW-4 (south of the night soil deposit). Potentially increasing TP concentrations in the deep wells (10.5 m depth, MW-6D, MW-7D) show that the plume may have reached the deep aquifer, however further monitoring is required to determine trends. The TP concentrations of TP on the east/north (MW-3/MW1) are likely to originate from the landfill mound.

TP concentrations at MW-1S (eastern side of landfill) show a variable and possibly increasing trend; however further monitoring is required to verify the trend.

7.1.4 Hydrogeochemical Indicators

Concentrations of major ions (i.e. chloride, sulphate, calcium, magnesium, sodium, alkalinity and potassium) are presented in Table GW-1. The concentrations at all monitoring wells are within previously reported ranges and characterised by the ions sodium, chloride and bicarbonate (alkalinity).

The landfill is interpreted to contribute concentrations of ions including calcium, potassium, magnesium and bicarbonate/alkalinity). Contribution of sodium and chloride is difficult to ascertain as these ions are common in marine environments (e.g. salt spray, tidal influence) and abundant in wells close to Blue Angle Creek (MW-9, MW-10, MW-11) or in proximity to Seven Mile Beach (MW-1S, MW-1D).

7.1.5 Inorganic Contaminants (Iron, Manganese and Fluoride)

Iron concentrations were only analysed for samples collected on 30 August 2013. Concentrations of total iron (filtered at the laboratory) ranged between <0.05 and 29.0 mg/L (MW-1D/MW-6D/MW-7D/MW-10/MW-7S/MW-11/MW-9/MW-6S/MW-4/MW-5/MW-3, and MW-1S, respectively). With the exception of MW-1D, MW-6D & MW-7D all samples were above the ANZECC (2000) guideline for iron in fresh water ecosystems (0.3 mg/L). Several sources of iron are likely to exist at the site (lithology and landfill).

The ANZECC (2000) guideline for iron is an indicative interim working level (IIWL) and is of low reliability. No guideline is available for iron in marine water, which is more relevant for Blue Angle Creek and Crooked River receiving water bodies.

Manganese concentrations were only analysed for samples collected on 30 August 2013. Concentrations of manganese ranged between 0.004 (MW-11/MW-9) and 0.272 mg/L (MW-4), with no exceedance of the ANZECC (2000) fresh water guideline (1.9 mg/L).

The levels of filterable iron and manganese are generally similar to previous reporting periods. Iron levels in 2013-2014 decreased at MW-3 MW-4, and MW-11 compared to 2012-2013 reporting period, however all other wells showed an increase in concentration.

Concentrations of fluoride (only sampled in August 2013) ranged from <0.1 (MW-7S, MW-10) to 0.4mg/L (MW-6S, MW-6D), which are similar to previous reporting periods (2012-2013, 2011-2012, 2010-2011). No reliable ANZECC (2000) guideline exists for fluoride in fresh or marine waters.

7.1.6 Organic Contaminants

Dissolved organic carbon (DOC) concentrations were only analysed for samples collected on the 30 August 2013. The concentration of dissolved organic carbon (DOC) in samples from the twelve

wells ranged from 8 mg/L (MW-7S) to 64 mg/L (MW-11). The results are generally comparable to previous monitoring periods. No recommended ANZECC (2000) guidelines exist for DOC.

7.1.7 Discussion and Trends - Groundwater

The key trends in groundwater levels and nutrient contamination from 2003 to 2014 are presented in Graph-01 to Graph-05. The monitoring data indicates that ammonia concentrations in the deep groundwater are elevated above ANZECC guidelines (Graph-02). Trends for the deep wells (MW-1D, MW-6D and MW-7D) show a clear declining trend since August 2009 (Graph-02).

Groundwater (ammonia) trends for the three wells (MW-09, 10, 11) located adjacent Blue Angle Creek show a declining trend (Graph-01). These three wells are influenced from tides and flooding.

Graph-01 indicates ammonia concentrations in the shallow wells have steadily decreased since land-filling operations at the GWDD ceased in October 2003.

Prior to landfill rehabilitation, groundwater quality trends indicate landfill leachate generation may be related to rainfall recharge into buried waste and subsequent groundwater and contaminant migration. The results post-landfill rehabilitation indicates landfill leachate concentrations in the shallow groundwater are decreasing, becoming diluted from attenuation/rainfall via runoff from the landfill mound. The potential for landfill leachate generation was significantly reduced following remedial works, as the buried waste was capped with an impervious clay barrier.

The groundwater ammonia trends (ammonia being a key landfill leachate indicator) indicate shallow groundwater quality is improving. The three deep wells installed in 2006 indicate the leachate plume in the deep parts of the aquifer is also improving but is taking longer (Graph-02) as flushing is lower at deeper levels in the aquifer (i.e. below sea level and across the groundwater divide).

7.2 SURFACE WATER

Surface water sampling was undertaken in May, August, November 2013 and February 2014. Samples were collected from two locations (ML-2 and ML-5, permission for accessing other locations was denied by site owner) locations along Blue Angle Creek (Figure 2).

Samples were not collected from ML-1, ML-3 or ML-4 due to restricted access (i.e. land is owned by Cleary Bros- access denied for sampling); therefore upstream water quality is relatively unknown and may be degraded due to farming and areas of acid soils. Sample locations, ML-1 ML-2 (downstream) and ML-5 (midstream) are not considered appropriate to assess water quality impacts from the landfill and potential upstream sources. All analytical results for surface water monitoring points ML-2 and ML-5 are presented in Table SW-1.

It is not known if surface water sampling was performed during wet or dry periods (note: Based on rainfall records - Appendix B - February 2014 was likely to be a wet monitoring event, May and November experienced moderate rainfall, whilst August 2013 was likely to be a dry monitoring

event). Blue Angle Creek is tidally influenced and has a marine water influence at all sample locations, as shown by the broad range of TDS results (i.e. fresh to saline, Table SW-1).

The surface water monitoring data at upstream/downstream locations is variable and likely to reflect a combination of tidal sampling regimes and inputs from the broader catchment area. (e.g. samples should be coordinated with the tide so that both creek samples are collected during a run-out tide when the maximum amount of groundwater (& potential leachate) discharges into the creek).

7.2.1 Field Parameters

7.2.1.1 *pH (field) and Redox*

The pH was similar at ML-2 and ML-5, and ranged from pH 6.4 to 7.2. Sampling results indicate that pH in Blue Angle Creek differs little from upstream (ML-5: pH 6.4 to 7.2) to downstream (ML-2: pH 6.5 to 7.2).

Redox was only measured in August 2012 during 2013-2014 monitoring period, at ML-2 (58 mV) and ML-5 (62 mV).

7.2.1.2 *Total Dissolved Solids (TDS and EC)*

Restricted access has limited the assessment of upstream and downstream locations. Previous monitoring period indicated that between August and November 2008, the concentrations of TDS at the Blue Angle Creek upstream location (ML-1) were less than those recorded downstream (ML-2). The TDS concentration upstream of the flood gates (ML-4) was less than those recorded downstream of the flood gates (ML-1 and ML-2).

Samples collected between May 2013 and February 2014 at the downstream location ML-2 were brackish to saline⁷ (TDS = 2,950 to 28,800 mg/L), while samples from the midstream location ML-5 were slightly fresher (TDS = 692 to 2,510 mg/L). The surface water samples are located in an area of the creek that is known to be influenced by tides. The presence of mangroves and other aquatic plants also reflects the typically saline water in the lower section of Blue Angle Creek.

Groundwater samples collected from MW-9, MW-10 and MW-11 were slightly less saline than surface water samples collected from Blue Angle Creek and more saline than samples from all other groundwater monitoring wells sampled between May 2013 and February 2014. This data indicates that tidal waters from Crooked River Estuary can influence water quality and salinity of the 3 wells (MW-9, MW-10 and MW-11). Higher salinity reduces (more marine water) the possibility of detecting leachate derived from the landfill.

⁷ Possibly reflecting collection of samples during high and low tide and stormwater runoff and rainfall

7.2.2 Nutrients

7.2.2.1 Nitrogen

Concentrations of ammonia in the surface waters collected from Blue Angle Creek have been, and continue to vary with time (Graph-06 and Table 7.2.2).

Table 7.2.2: Surface Water Ammonia Trends – May 2013 to February 2014

Sample ID	Minimum (mg/L)	Maximum (mg/L)	Trend	Comments & Trigger 10% Exceedance of Ammonia
ML-1	-	-	-	No site access
ML-2	0.44 (Feb 2014)	3.19 (Aug 2013)	Variable, generally decreasing	All below ANZECC guidelines, one exceedance of trigger value (1.38 mg/L)
ML-3	-	-	-	No site access
ML-4	-	-	-	No site access
ML-5	0.52 (Nov 2013)	2.6 (Aug & Nov 2012)	Variable, generally decreasing	All below ANZECC guidelines, two exceedances of trigger value (2.38 mg/L)

Note: ML-5 was sampled for the first time in four years in November 2008.

Samples collected from ML-2 reported ammonia concentrations between 0.44 and 3.19 mg/L (Table SW-1). ML-5, located midstream in Blue Angle Creek in proximity to groundwater monitoring wells MW-9, MW-10 and MW-11 ranged from 0.52 to 2.6 mg/L. Sampling at ML-5 (resumed in November 2008 but had not been sampled since October 2004) indicates that the water quality is variable (Table SW-1).

The highest ammonia concentration in surface waters (3.19 mg/L) was reported from ML-2 in August 2013. Restricted access to upstream locations (ML-1, ML-3 and ML-4) limits conclusions regarding impacts due to the absence of upstream sample locations. Elevated ammonia in surface water compared to groundwater wells in proximity to the creek (MW-9, MW-10, and MW-11) indicates that sources of ammonia also occur from the upstream catchment area (agricultural land).

Concentrations of TKN exceeded the ANZECC (2000) guidelines for fresh and marine waters for all samples collected along Blue Angle Creek. The highest concentration was reported at the downstream location (ML-2, 3.6 mg/L in August 2013).

Increases in nitrogen from upstream and downstream of the landfill have been observed during previous monitoring periods. While these increases may be attributable to the discharge of ammonia-rich groundwater from the landfill, other sources (random) of nitrogen input such as runoff from sub-catchments and nutrients bound in sediments cannot be discounted. It is also possible that poor quality estuarine waters from Crooked River move up Blue Angle Creek during tidal cycles.

Interpretation of the nutrients into surface water bodies from the landfill is complicated by the sampling regime (i.e. sampling at various tides) and other potential sources of nitrogen. The fluctuating flow regime near Blue Angle Creek and wet weather events may reduce the potential for landfill leachate to impact the creek.

Total organic carbon (TOC) was not measured during the 2013 to 2014 monitoring period.

As stipulated in the revocation notice, ammonia concentrations greater than 10% above ammonia concentrations reported in Table SW-1 of *Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007*, dated 17 August 2007 are to be highlighted (Appendix C). Exceedances greater than 10% above ammonia were noted at ML-2 (trigger value = 1.38 mg/L) for August 2013 (3.19 mg/L), and ML-5 (trigger value = 2.38) for August 2013 and February 2014. Based on the low ammonia results from monitoring wells (MW-9, MW-10, MW-11, Graph 1) in proximity to the creek, high ammonia concentrations in the surface water may be attributed to potential upstream sources (agriculture) or poor quality estuarine water (tidal or mouth closure).

7.2.2.2 Total Phosphorous (TP)

Concentrations of TP from Blue Angle Creek were analysed from all samples collected in May, August, November 2013, February 2014 (Table SW-1).

Previous levels (2011-2012 monitoring period) reported an increase in TP concentrations, which exceeded the IIWL⁸ ANZECC 2000, (fresh 0.05 mg/L, marine 0.025 mg/L) at ML-2 and ML-5 for all sampling rounds. The 2012-2013 monitoring period reported an variable increase in TP concentrations which exceeded the IIWL⁸ ANZECC 2000, (fresh 0.05 mg/L, marine 0.025 mg/L) at ML-2 (0.05 mg/L, May 2012 and 0.13 mg/L, February 2013) and ML-5 (1.95 mg/L, February 2013). The 2013-2014 monitoring period reported two exceedences of the ANZECC 2000 guidelines for ML-2 in May 2013 & February 2014 (0.09 mg/L and 0.12 mg/L respectively) and one exceedence in ML-5 in 2013 (0.06 mg/L).

TP concentrations at ML-2 ranged from 0.01 mg/L (November 2013) to 0.12 mg/L (February 2014) and continue to show a variable increasing trend.

ML-5 reported all TP concentrations ranged from below LOR⁹ 0.01 mg/L (November 2013) to 0.06 mg/L (May 2013) in the 2013-2014 reporting period, indicating a variable increase in concentrations compare to 2012-2013 monitoring period (ranged from <0.01 to 0.13 mg/L) (Graph-07).

⁸ ANZECC (2000) Indicative Interim Working Levels (IIWLs).

⁹ Laboratory Level of Reporting (LOR)

7.2.3 Bacteriological Contaminants

Surface water sample locations (ML-2 and ML-5) were analysed for thermotolerant (faecal) coliforms and enterococcus coliforms on 30 August 2013 (Table SW-1).

Both samples results in August 2013 for enterococcus were below ANZECC (2000) fresh and marine guidelines (35 CFU/100 mL), downstream sample ML-2 reported 20 CFU/100 mL and midstream sample ML-5 reported ~16 CFU/100 mL. Both locations are significantly lower than 2010-2011 monitoring period (ML-2, 1300 CFU/100 mL and ML-5, 1200 CFU/100 mL, November 2010) and are similar to 2011-2012 (ML-2, 18 CFU/100 mL and ML-5, 8 CFU/100 mL) and 2012-2013 (ML-2, 4 CFU/100 mL and ML-5, 15 CFU/100 mL)

Surface water samples reported levels of thermotolerant (faecal) coliforms below ARMCANZ (2000) guidelines for marine and fresh water ecosystems at ML-2 (24 CFU/100 mL) and ML-5 (~6 CFU/100 mL). Previous sampling results (November 2010) were above ARMCANZ guidelines, however the 2013-2014 have decreased to similar results prior to November 2010, 2011-2012, and 2012-2013.

Multiple sources of coliforms exist in the surface water system, with the capped landfill representing an insignificant contribution, due it's to distance from the creek (i.e. local fauna and flora, farms) and filtering in the aquifer.

7.2.4 Inorganic Contaminants

Dissolved organic carbon (DOC) concentrations were not analysed during the 2012-2013 monitoring period.

Surface water samples from August 2013 reported elevated concentrations of iron (ML-5, 1.99 mg/L) above ANZECC 2000 guidelines (0.3 mg/L). However, the ANZECC (2000) guideline for iron in fresh water is a low reliability IIWL.

No manganese concentrations were above ANZECC (2000) fresh water guidelines (low reliability IIWL).

7.2.5 Major Ions

Concentrations of major cations (sodium, potassium, alkalinity, magnesium, calcium) in the surface water (Blue Angle Creek) indicate domination of sodium (marine water influence), which is consistent with previous monitoring rounds.

7.2.6 Quality Assurance/Quality Control

Interpretive Quality Control Reports (QCI, Appendix A) provided by ALS (Sydney) of the surface and groundwater laboratory data were reviewed for the four sampling rounds (May, August,

November 2013 and February 2014). No laboratory outliers or exceedances of holding times were noted during the 2013-2014 monitoring period.

8 LEACHATE PLUME AND LANDFILL REHABILITATION

The monitoring results have been used to assess potential impacts to fresh and marine aquatic ecosystems. The groundwater migrating from the former landfill discharges to Blue Angle Creek and Seven Mile Beach. The range of groundwater contaminants identified from the latest monitoring events indicates the GWDD is a source of leachate (mostly ammonia and TKN), total phosphorous and iron.

Ammonia is the primary landfill leachate indicator. However, the waste is also a source of dissolved salts, metals and organics associated with the dissolution of ions (predominantly calcium and bicarbonate).

Following the closure of the landfill in 2003 and remedial works completed by Council and E2W in February 2005, the production and migration of ammonia has significantly declined in the shallow and deep groundwater system (Graphs-01 & 02). Monitoring wells MW-3, MW-4 and MW-5 are considered to reflect the typical groundwater quality arising from the landfill rehabilitation (>80% decrease in ammonia).

The deep groundwater monitoring wells (MW-1D, MW-6D and MW-7D) installed in 2006 show water quality improvements but at a slower rate relative to the shallow groundwater. The quality of the deeper groundwater system would take longer to improve due to the slower groundwater flushing at depth. However, since August 2009 the ammonia concentrations in deep wells show a clear decreasing trend (Graph-02).

The most significant contaminant is ammonia-nitrogen, with a remnant plume extending in both north-west and south-east directions reflecting flows either side of the groundwater divide. Prior to rehabilitation, leachate originating from the landfill and night soil depot infiltrated the shallow aquifer, as well as migrating under the predominant groundwater flow regime towards Seven Mile Beach and Blue Angle Creek, respectively.

E2W consider the leachate plume in the shallow/deep groundwater is shrinking due to a decrease in leachate generation as well as from natural attenuation processes (including dilution). The time series trends show that significant groundwater quality improvements occur after approximately 5 years.

Previous results (2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013) results from the three groundwater wells located along Blue Angle Creek (MW-9, MW-10 and MW-11) indicate ammonia concentrations below the ANZECC (2000) guidelines (with the exception of MW-11 in 2009-2010, Table GW-1). Recent 2013-2014 results continue to report a decrease in ammonia, which are below ANZECC (2000) guidelines (MW-11).

The landfill rehabilitation conducted between July 2004 and February 2005 has resulted in a measurable improvement in the shallow groundwater quality at GWDD. While ammonia remains

elevated in the deep groundwater, E2W consider that water quality will continue to improve in shallow/deep aquifer due to reduced leachate generation and natural attenuation.

The surface water results from the 2013-2014 monitoring period reported one guideline exceedences for ML-2 in August 2013 (3.19 mg/L) and two exceedence in ML-5 in August 2013 and February 2014 (2.6 mg/L, and 2.6 mg/L respectively).

8.1 ECOLOGICAL ISSUES

Groundwater migrating from the landfill to Seven Mile Beach is diluted by the dynamic processes operating in this environment. Contaminants contained within this discharge may be diluted and dispersed via biological, chemical and physical processes occurring at the groundwater/salt water interface. Plant uptake of excess nutrients in the groundwater may also occur as the depth to groundwater becomes shallower as it approaches the beach.

The effect of nutrient-impacted groundwater discharging to Blue Angle Creek and/or Crooked River Estuary is unclear and difficult to ascertain given the variability, dynamic environment, and multiple nutrient sources in the catchment area.

Potential impacts of landfill leachate to Blue Angle Creek would depend on the groundwater-surface water interaction, climate and the rehabilitation works. Results from MW-9, MW-10 and MW-11 (monitoring wells adjacent to the creek) indicate a reduction in ammonia (Graph-01). Previously, MW-11 had a history of variable ammonia concentrations; however since May 2010 ammonia has remained below ANZECC guidelines.

E2W interpreted that some nitrogen-impacted groundwater would discharge to the creek (and consequently to the estuary), however the extent of attenuation of the nitrogen plume prior to discharge is unclear. Attenuation is likely to occur through a combination of dilution, mixing of groundwater from the north of the creek, flows and tidal movements within the creek and estuary and oxidation of the ammonia to nitrate/nitrite and nitrogen gas.

9 CONCLUSIONS

Surface and groundwater monitoring was completed at the GWDD by ALS in May, August, November 2013 and February 2014 for the EPL (2014). The data has been assessed by E2W to identify potential impacts to the groundwater and surface water systems. The following conclusions are offered:

- The rehabilitation of the landfill mound and night soil depot (completed February 2005) has produced a measurable improvement to the local groundwater quality. The improvement to local surface water quality is not clear.
- Groundwater at the landfill site is directed towards Blue Angle Creek (base-flow discharge) and Seven Mile Beach (via a groundwater salt water interface).

- The key landfill indicator (ammonia-nitrogen) shows a decreasing/stabilising trend in several shallow wells (MW-5 with exception of November 2013= 5.88 mg/L, MW-4, MW-5, MW-1S, MW-6S and MW-7S) and deep wells (MW-1D, MW-6D, MW-7D) located next to the landfill mound and former night soil deposit.
- Elevated concentrations (above ANZECC 2000) of nutrients, in particular ammonia, continue to be detected in the shallow (MW-7S) and deep groundwater (MW-6D, MW-7D) which are above ANZECC (2000) guidelines. Concentrations of ammonia were reported below ANZECC (2000) for the onsite wells MW-1S, MW-3, MW-4, MW-5 except for Nov 2013, MW-6S and offsite wells MW-9, MW-10, and MW-11. Previously elevated (above ANZECC 2000) ammonia concentrations were reported at MW-11 during 2009-2010 reporting period (February 2010 = 5.35 mg/L, exceeded the 20% trigger value = 2.96 mg/L), but substantially decreased to below LOR in May, August and November 2010, remained below 0.42 mg/L in 2012-2013, and fallen below 0.07 mg/L in 2013-2014. Catchment characteristics, climate and tide regime all effect water quality in Blue Angle Creek and the adjacent wells (MW-9, MW-10 and especially MW-11).
- Concentrations of total phosphorous (TP) in the shallow/deep groundwater is generally variable, with a variably increasing trend at MW-4. Variable and possibly increasing TP is interpreted at two shallow wells (MW-4, MW-6S) and two deep wells (MW-6D, MW-7D, immediately down-gradient and north of the former night soil deposit).
- Nutrient (ammonia) concentrations within surface water samples collected at downstream locations (Blue Angle Creek) are variable and similar to previous years. An exceedance (greater than 10% above ammonia values in Appendix C) was noted at ML-2 for August 2013 (3.19 mg/L) and ML-5 for August 2013 and February 2014 (2.6 mg/L and 2.6 mg/L respectively). Based on the low ammonia results from monitoring wells (MW-9, MW-10, MW-11, Graph 1) in proximity to the creek, high ammonia concentrations in the surface water may be attributed to potential upstream sources (agriculture) or poor quality estuarine water (tidal- and estuary mouth closures).
- Total phosphorus (TP) concentrations at ML-5 ranged from 0.01 to 0.12 mg/L in 2011-2012, however during 2012-2013, TP slightly increased and ranged from <0.01 to 1.95 mg/L. TP in the 2013-2014 monitoring round is comparable to that reported in 2011-2012 (0.01 mg/L to 0.06 mg/L). TP in surface water is generally variable, with potentially increasing trends at ML-2 and ML-5 (downstream relative to the landfill but no upstream sample locations are available for comparing the results). It is likely that water quality in Blue Angle Creek reflects other nutrient sources in the catchment as well as potential minor input from the GWDD.
- All other water quality indicators were consistent with the previous monitoring results.

The nutrient concentrations (particularly ammonia) in the shallow and deep groundwater are likely to continue to decrease over time (note: phosphorous may take longer to decline as it is likely to adsorb/retarded by the aquifer matrix). The landfill capping system reduces rainfall infiltration into the buried waste (reduces leachate generation) and diverts runoff from the 3 ha capped mound into the aquifer, causing dilution and attenuation of the residual leachate.

Monitoring of surface and groundwater conditions at the GWDD following the completion of landfill remediation has provided beneficial data regarding the effectiveness of the rehabilitation works. It is interpreted that the "surface and shallow" groundwater quality (pending contribution of other sources) may meet the ANZECC (2000) guidelines in the next few years (2015).

The deep groundwater quality (below 3 m AHD) below the landfill mound would require a longer time frame (3+ years) to show improvements due to lack of flushing in the basal parts of the aquifer. Based on recent groundwater trends, it is interpreted that the deep groundwater may take another 3 years to meet the ANZECC (2000) guidelines for ammonia (key landfill leachate indicator).

9.1 RECOMMENDATIONS

In order to improve the quality of monitoring at the site, E2W recommends that the following be incorporated into subsequent sampling rounds:

- Obtain survey details (RL at top of PVC) for the 6 piezometer wells (MW-1S/D, MW-6S/D and MW-7S/D) to allow assessment of reduced water levels and hydraulic gradients.
- Collect and analyse at least one quality control sample (e.g. blind duplicate sample) as per NEPM (1999) guidelines.
- Field measurements (pH, EC, DO, EH and T) should be conducted during site sampling using calibrated instruments (not by laboratory).
- Assess quality assurance and control from laboratory and perform re-analyses if elevated results are obtained (verification purposes, note: E2W will review LAS QCI reports in the future and receive laboratory reports on quarterly basis).
- Perform analysis for reactive phosphorus (total & reactive) and filter samples prior to analysis, especially where TP is elevated (MW-4, MW-6S, MW-6D, MW-7D).
- Review tidal charts and climate prior to surface water sampling. Sample collection should be co-ordinated with the tide so that both creek samples are collected during a low run-out tide when the maximum amount groundwater discharges into the creek.
- Further investigate alternate sample locations to allow assessment of upstream water quality and the downgradient impacts associated with the landfill (i.e. replacement of previous locations @ ML-1, ML-3 and ML-4. It is noted that alternate locations are within private land “Cleary Bros site” and access has been denied).
- The proposed groundwater and surface water monitoring program for the GWDD is summarised in Table 3.1. The sampling methods are presented in Tables 1 and 2 of the Revocation of Licence (DECC, 29 May 2008).
- Discontinue bacteriological monitoring of surface water samples.
- The decommissioned sludge pond was backfilled with compacted clay (validated ENM) by KMC (late 2012- i.e. photographs/documentation/date recommended to verify works).

10 LIMITATIONS

Earth2Water Pty Ltd has prepared this report for the use of Kiama Municipal Council in accordance with the standard terms and conditions of the consulting profession. This report is prepared in accordance with the scope of work and for the purpose outlined in the proposal. The methodology adopted and sources of information used by E2W are outlined in this report.

E2W has made no independent verification of this information beyond the agreed scope of works and E2W assumes no responsibility for any inaccuracies or omissions.

This report was prepared in February and March 2014 and is based on the information reviewed at the time of preparation. This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

The precision with which conditions are indicated depends largely on the frequency and method of sampling and the uniformity of conditions as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report and our experience.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, E2W should be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

11 REFERENCES

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Australian Water Technologies (2000). *Surface Water and Groundwater Monitoring Program, Gerroa Waste Disposal Facility*.

DUAP (1996). *EIS Practise Guideline: Landfilling*

Hazelton (1992). *Soil Landscapes of the Kiama 1:1,000,000 Sheet, Department of Conservation and Land Management*.

Landfill Management Services Pty Ltd (2003). *Landfill Gas Evaluation Gerroa Landfill*.
NSW EPA (1996) *Environmental Guidelines: Solid Waste Landfills*.

DECC NSW (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, New South Wales Department of Environment and Climate Change, Sydney.

R.M. Koerner and T-Y. Soong, (1998). *Analysis and Design of Veneer Cover Soils. Proceedings of 6th International Conference on Geosynthetics, Vol, pp.1-23, Atlanta, Georgia, USA*.

URS Australia Pty Ltd (2002). *Annual Surface and Groundwater Monitoring Report for the Gerroa Waste Disposal Facility, July 2001 to June 2002*.

URS Australia Pty Ltd (2002). *Annual Surface and Groundwater Monitoring Report for the Gerroa Waste Disposal Facility, July 2002 to June 2003*.

Tables

T-1 Summary GW May 2010- February 2014

Gerroa Waste Disposal Depot																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
Sample ID	ANZECC, 2000		MW1S	MW 1S	MW 1S	MW1S	MW1S	MW 1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1D	MW 1D	MW 1D	MW1D	MW1D	MW 1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW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Gerroa Waste Disposal Depot																		
Sample ID	ANZECC, 2000		MW3	MW 3	MW 3	MW3	MW3	MW 3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Depth to Groundwater (m AHD)			0.37	0.59	1.18	0.83	0.87	0.95	0.48	0.25	0.79	0.49	0.25	0.40	0.88	0.97	0.35	0.12
Groundwater depth (m bTOC)			4.08	3.86	3.27	3.62	3.58	3.5	3.97	4.2	3.66	3.96	4.2	4.05	3.57	3.48	4.1	4.33
Height of Stick up (m)			0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)			3.63	3.41	2.82	3.17	3.13	3.05	3.52	3.75	3.21	3.51	3.75	3.6	3.12	3.03	3.65	3.88
Field Parameters																		
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7	7.1	7	7.2	7.50	7.50	7.80	7.40	7.50	7.3	7.5	7.4	7.20	7.6	7.4	7.4
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.74	0.74	0.754	0.48	0.56	0.70	0.47	0.46	0.39	<1	0.633	0.631	0.51	0.704	0.760	0.787
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	3	1.91	2.67	1.68	4.50	2.07	1.58	1.76	2.66	0.7	1.75	1.94	1.68	1.84	1.54	2.36
Dissolved Oxygen (%)			-	-	28.20	-	-	-	-	-	-	7			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Redox Potential (mV)			-	-	-	-	-	-81.6	-	-	-	<0.1			-	-137	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc
Laboratory Analyses																		
Major Ions (mg/L)																		
Sodium			-	-	71	-	-	37	-	-	-	27			-	49	-	-
Potassium			-	-	3	-	-	2	-	-	-	3			-	3	-	-
Calcium			-	-	90	-	-	88	-	-	-	102			-	79	-	-
Magnesium			-	-	6	-	-	8	-	-	-	9			-	8	-	-
Chloride			-	-	127	-	-	53	-	-	-	130			-	92	-	-
Alkalinity (as CaCO3)			329	274	215	171	125	259	193	235	165	183	295	270	238	227	216	194
Bicarbonate			329	274	215	171	125	259	193	235	157	183	295	270	238	227	216	194
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	8.00	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	28	-	-	3	-	-	-	<1			-	6	-	-
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Dissolved Solids (TDS)			384	436	484	318	390	414	322	340	238	496	432	268	298	363	494	443
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Heavy Metals (mg/L)																		
Iron (filtered)	0.3 (1)		-	-	14.3	-	-	7.55	-	-	-	9.44			-	6.86	-	-
Manganese	1.90		-	-	0.109	-	-	0.07	-	-	-	0.069			-	0.064	-	-
Nutrients (mg/L)																		
Nitrate (NO3 as N)	0.7 (7)		0.1	0.02	0.04	0.21	0.07	0.02	<0.01	<0.01	0.02	0.09	0.73	5.59	0.6	<0.01	0.02	0.21
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.05	0.02	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.62	0.87	0.66	0.26	0.14	0.42	0.29	0.23	0.04	0.35	0.44	7.78	0.93	0.14	0.25	0.11
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.1	1.9	1.7	0.6	0.50	0.90	0.60	0.80	0.4	0.5	2.2	7.8	1.5	0.4	0.7	0.4
Dissolved Organic Carbon			-	-	11	-	-	10	-	-	-	6			-	12	-	-
Fluoride (Electrode)			-	-	<0.1	-	-	0.1	-	-	-	0.1			-	0.1	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.14	0.22	0.31	0.18	0.21	0.62	0.16	0.14	0.22	0.19	0.42	0.13	0.15	0.16	0.33	0.27
Biological (CFU/100 ml)																		
Enterococcus MF	35 (8)	35 (8)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Note:																		
Exceeds ANZECC (2000) guidelines																		
marine/fresh water ecosystems																		
Focus of this monitoring report																		
nc = no comment																		
NA = not available																		

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Gerroa Waste Disposal Depot																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Sample ID	ANZECC, 2000		MW4	MW 4	MW 4	MW4	MW4	MW 4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW5	MW 5	MW 5	MW5	MW5	MW 5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW

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Gerroa Waste Disposal Depot																																			
Sample ID	ANZECC, 2000		MW6S	MW 6S	MW 6S	MW6S	MW6S	MW 6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6S	MW6D	MW 6D	MW 6D	MW6D	MW6D	MW 6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	
Ground Level (m AHD)			NA												-	-	-	-	NA												-	-	-	-	
Depth to Groundwater (m AHD)															-	-	-	-													-	-	-	-	
Groundwater depth (m bTOC)			4.69	4.57	4.45	4.48	4.43	4.39	4.71	4.88	4.5	4.7	4.66	4.43	4.35	4.4	4.77	4.94	4.95	4.82	4.19	4.73	4.7	4.65	4.97	5.12	4.77	4.94	4.91	4.69	4.62	4.65	5.04	5.2	
Height of Stick up (m)			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Groundwater Depth (mbgl)			4.09	3.97	3.85	3.88	3.83	3.79	4.11	4.28	3.9	4.1	4.06	3.83	3.75	3.8	4.17	4.34	4.25	4.12	3.49	4.03	4	3.95	4.27	4.42	4.07	4.24	4.21	3.99	3.92	3.95	4.34	4.5	
Field Parameters																																			
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.5	7.3	6.8	6.9	7.2	7	7.6	7.3	7.5	7.4	7.6	6.9	6.9	7.1	7.4	7.2	7	7	6.6	6.8	7.1	7.2	7.1	6.9	7	7.1	7.2	7.2	7.1	7.5			
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.52	0.65	0.502	0.37	0.569	0.511	0.504	0.504	0.475	<1	0.396	1.06	0.432	0.474	0.679	0.662	1.07	1.02	0.868	0.95	0.996	0.943	1.06	0.994	0.875	<1	0.798	0.86	0.867	0.896	0.851	0.476	
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	1.74	2.56	2.63	2.19	2.18	2.94	1.9	1.82	2.29	1.2	2.4	2.58	1.46	1.9	2.13	2.33	2.61	2.37	1.34	1.45	2.21	2.71	2.12	1.55	1.45	1	1.81	2.67	1.77	1.58	1.88	1.94	
Dissolved Oxygen (%)			-	-	27.70	-	-	-	-	-	-	11.8			-	-	-	-	-	-	14.10	-	-	-	-	-	-	10.6			-	-	-	-	
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-	
Redox Potential (mV)			-	-	-	-	-	-33.80	-	-	-	<0.1			-	-57	-	-	-	-	-	-	-	30.90	-	-	-	<0.1			-	13	-	-	
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc	nc
Laboratory Analyses																																			
Major Ions (mg/L)																																			
Sodium			-	-	8	-	-	44	-	-	-	14			-	30	-	-	-	-	18	-	-	20	-	-	-	15			-	16	-	-	
Potassium			-	-	6	-	-	8	-	-	-	8			-	6	-	-	-	-	19	-	-	11	-	-	-	10			-	15	-	-	
Calcium			-	-	80	-	-	41	-	-	-	75			-	75	-	-	-	-	120	-	-	142	-	-	-	120			-	141	-	-	
Magnesium			-	-	9	-	-	7	-	-	-	6			-	7	-	-	-	-	14	-	-	16	-	-	-	11			-	10	-	-	
Chloride			-	-	14	-	-	42	-	-	-	21			-	34	-	-	-	-	24	-	-	31	-	-	-	21			-	14	-	-	
Alkalinity (as CaCO3)			182	263	208	176	130	133	196	226	227	202	237	315	62	217	273	248	544	409	441	408	396	399	375	410	388	332	342	348	386	375	358	208	
Bicarbonate			182	263	208	176	130	133	196	226	206	202	237	315	62	217	273	248	544	409	441	408	396	399	375	410	388	332	342	348	386	375	358	208	
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	21	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Sulphate (SO4)			-	-	26	-	-	40.00	-	-	-	18			-	34	-	-	-	-	8	-	-	27	-	-	-	33			-	107	-	-	
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-		
Total Dissolved Solids (TDS)			314	350	308	332	280	334	328	342	286	314	372	616	286	309	364	356	473	504	496	542	534	586	694	636	460	484	508	436	454	496	475	280	
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-		
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-		
Heavy Metals (mg/L)																																			
Iron (filtered)	0.3 (1)		-	-	5.59	-	-	3.13	-	-	-	<0.05			-	1.17	-	-	-	-	9.48	-	-	<0.05	-	-	-	<0.05			-	0.07	-	-	
Manganese	1.90		-	-	0.116	-	-	0.06	-	-	-	0.025			-	0.019	-	-	-	-	0.184	-	-	0.119	-	-	-	0.122			-	0.161	-	-	
Nutrients (mg/L)																																			
Nitrate (NO3 as N)	0.7 (7)		0.37	1.71	0.01	1.16	7.48	0.04	<0.01	0.8	0.01	0.76	3.54	0.11	<0.01	1.05	0.62	0.05	1.99	9.29	0.14	0.17	0.61	5.61	2.93	0.02	0.03	1.29	3.14	0.48	0.41	0.96	0.02	0.02	
Nitrite (NO2 as N)			0.01	0.02	<0.01	<0.01	0.03	<0.01	<0.01	0.31	0.01	0.08	0.32	<0.01	<0.01	0.92	0.1	0.04	<0.01	0.09	<0.01	<0.01	0.02	0.04	0.32	<0.01	<0.01	0.08	0.17	0.21	0.03	0.06	0.04	<0.01	
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.83	1.8	1.73	0.48	0.23	0.19	0.4	0.25	0.12	0.08	0.2	0.91	0.04	0.29	0.04	0.04	16.4	10.6	21.8	8.9	13.80	3.24	2.25	10.80	7.62	7.06	7.17	12.8	14.60	11.30	10.40	1.97	
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.5	2.6	2.5	1	2.40	0.60	0.80	2.00	0.9	3.1	1	4.2	1.9	1.1	1	0.6	22.5	17.5	26.4	16.1	15.20	6.70	9.20	12.40	11.6	9.4	12.4	14	16.5	11.2	10.8	2.2	
Dissolved Organic Carbon			-	-	8	-	-	7	-	-	-	4			-	9	-	-	-	-	15	-	-	11	-	-	-	11			-	21	-	-	
Fluoride (Electrode)			-	-	0.3	-	-	0.60	-	-	-	0.6			-	0.4	-	-	-	-	0.4	-	-	0.4	-	-	-	0.4			-	0.4	-	-	
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.33	1.04	0.79	0.42	0.68	0.53	3.10	8.81	0.54	0.63	0.4	0.4	0.44	0.12	0.2	0.8	2.92	1	8.06	3.92	4.27	1.39	1.45	6.84	4.80	5.46	0.88	0.38	2.23	2.52	9.07	2.55	
Biological (CFU/100 ml)																																			
Enterococcus MF	35 (8)	35 (8)	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-		
Note:																																			
Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems			35																																
Focus of this monitoring report																																			
nc = no comment			NA = not available																																

T-1 Summary GW May 2010- February 2014

[illegible]

Gerroa Waste Disposal Depot																		
Sample ID	ANZECC, 2000		MW9	MW 9	MW 9	MW9	MW9	MW 9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Depth to Groundwater (m AHD)			0.53	0.55	0.95	0.63	0.52	0.48	0.47	0.39	0.52	0.47	0.88	1.03	0.53	0.4	0.49	0.38
Groundwater depth (m bTOC)			1.79	1.77	1.37	1.69	1.8	1.84	1.85	1.93	1.8	1.85	1.44	1.29	1.79	1.92	1.83	1.94
Height of Stick up (m)			0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Groundwater Depth (mbgl)			0.84	0.82	0.42	0.74	0.85	0.89	0.9	0.98	0.85	0.9	0.49	0.34	0.84	0.97	0.88	0.99
Field Parameters																		
pH (field)	6.5-8.0 (a)	8-8.4 (a)	5.9	6	6.3	6.5	6.7	6.8	6.8	6.3	6.7	6.3	6.5	6.7	6.4	6.2	6.4	6.2
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		21.7	16.6	1.4	8.66	7.39	4.91	6.23	13	6.41	11	9.32	12.7	6.39	1.08	10.2	18.9
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.74	5.42	3.36	8.68	2.24	2.89	2.14	2.89	3.31	1.2	1.73	1.68	3.71	1.97	2.14	1.9
Dissolved Oxygen (%)			-	-	35.60	-	-	-	-	-	-	12.5			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Redox Potential (mV)			-	-	-	-	-	101	-	-	-	<0.1			-	38	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc
Laboratory Analyses																		
Major Ions (mg/L)																		
Sodium			-	-	759	-	-	904	-	-	-	2330			-	190	-	-
Potassium			-	-	33	-	-	37	-	-	-	101			-	13	-	-
Calcium			-	-	34	-	-	31	-	-	-	147			-	6	-	-
Magnesium			-	-	67	-	-	77	-	-	-	392			-	14	-	-
Chloride			-	-	912	-	-	1410	-	-	-	4620			-	275	-	-
Alkalinity (as CaCO3)			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86
Bicarbonate			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	33	-	-	258	-	-	-	679			-	37	-	-
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Dissolved Solids (TDS)			15600	10900	3270	6560	3900	2920	3660	9530	4000	7670	6540	8220	3320	671	7530	13100
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Heavy Metals (mg/L)																		
Iron (filtered)	0.3 (1)		-	-	4.64	-	-	0.57	-	-	-	0.11			-	0.68	-	-
Manganese	1.90		-	-	0.015	-	-	0.002	-	-	-	0.005			-	0.004	-	-
Nutrients (mg/L)																		
Nitrate (NO3 as N)	0.7 (7)		0.4	1.98	6.83	0.52	0.19	0.17	<0.01	<0.01	0.06	0.11	<0.10	0.02	<0.01	<0.10	<0.01	0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	0.84	0.06	0.05	<0.01	1	<0.10	0.03	0.04	0.23	1.08	<0.01	0.02	0.32	0.24
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.8	2.7	94.1	1.6	2.40	1.70	2.60	1.00	1.9	1.8	2.4	2.8	3.1	3.1	1.6	1.1
Dissolved Organic Carbon			-	-	430	-	-	51	-	-	-	17			-	64	-	-
Fluoride (Electrode)			-	-	0.5	-	-	0.4	-	-	-	0.2			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	<0.01	0.83	<2.00	0.07	0.12	0.07	0.22	0.08	0.14	0.05	0.17	0.23	0.34	0.24	0.09	0.06
Biological (CFU/100 ml)																		
Enterococcus MF	35 (8)	35 (8)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Note:																		
Exceeds ANZECC (2000) guidelines																		
marine/fresh water ecosystems																		
Focus of this monitoring report																		
nc = no comment																		
NA = not available																		

Gerroa Waste Disposal Depot																		
Sample ID	ANZECC, 2000		MW10	MW 10	MW 10	MW10	MW10	MW 10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475
Depth to Groundwater (m AHD)			0.295	0.295	0.785	0.395	0.295	NA	0.185	0.035	0.275	0.225	0.605	0.765	0.365	0.195	0.235	0.105
Groundwater depth (m bTOC)			2.14	2.14	1.65	2.04	2.14	-	2.25	2.4	2.16	2.21	1.83	1.67	2.07	2.24	2.2	2.33
Height of Stick up (m)			0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)			1.18	1.18	0.69	1.08	1.18	NA	1.29	1.44	1.2	1.25	0.87	0.71	1.11	1.28	1.24	1.37
Field Parameters																		
pH (field)	6.5-8.0 (a)	8-8.4 (a)	4	4.1	5.8	5	5.4	-	5.3	4.9	5.2	4.7	5	5.1	5	5.4	5.3	5.1
Temperature (T deg C)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		29	6.45	3.06	8.94	5.12	-	5.7	14.8	6.3	12	15.2	13.1	6.64	6.72	14.4	28.2
Salinity (ppt)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.69	4.93	4.7	9.61	6.1	-	4.16	3.05	3.26	2.4	2.03	3.43	2.01	3.02	2.38	3.89
Dissolved Oxygen (%)			-	-	50.30	-	-	-	-	-	-	24.9			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	<0.1			-	161	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc				nc	nc	nc	nc
Laboratory Analyses																		
Major Ions (mg/L)																		
Sodium			-	-	406	-	-	-	-	-	-	2390			-	1100	-	-
Potassium			-	-	20	-	-	-	-	-	-	102			-	48	-	-
Calcium			-	-	7	-	-	-	-	-	-	114			-	44	-	-
Magnesium			-	-	13	-	-	-	-	-	-	336			-	136	-	-
Chloride			-	-	449	-	-	-	-	-	-	4730			-	1760	-	-
Alkalinity (as CaCO3)			<1	<1	28	3	10	-	6	2	6	4	1	<1	5	9	10	4
Bicarbonate			<1	<1	28	3	10	-	6	2	6	4	1	<1	5	9	10	4
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	42	-	-	-	-	-	-	642			-	304	-	-
pH (lab)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Dissolved Solids (TDS)			20500	10100	1810	5740	2700	-	3440	10500	3980	8280	10700	7550	3870	3760	10800	19400
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-			-	-	-	-
Heavy Metals (mg/L)																		
Iron (filtered)	0.3 (1)		-	-	10.4	-	-	-	-	-	-	0.28			-	0.54	-	-
Manganese	1.90		-	-	0.003	-	-	-	-	-	-	0.015			-	0.014	-	-
Nutrients (mg/L)																		
Nitrate (NO3 as N)	0.7 (7)		0.2	0.3	1.36	0.44	0.05	-	0.15	<0.01	0.03	0.25	<0.01	0.01	<0.01	0.04	0.02	0.16
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.02	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	<0.10	<0.10	0.03	-	0.02	<0.10	0.02	0.02	<0.10	0.58	0.05	0.06	0.3	0.09
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	2.2	6.2	59.3	1.2	2.6	-	5.2	8	1.5	10	1.4	1.4	3.1	6.1	0.3	<0.2
Dissolved Organic Carbon			-	-	430	-	-	-	-	-	-	12			-	24	-	-
Fluoride (Electrode)			-	-	<0.1	-	-	-	-	-	-	0.2			-	<0.1	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.15	0.52	<1.00	0.03	0.14	-	0.46	0.8	0.3	0.94	0.03	0.04	0.21	0.45	<0.01	<0.02
Biological (CFU/100 ml)																		
Enterococcus MF	35 (8)	35 (8)	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Note:																		
Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems			35															
Focus of this monitoring report																		
nc = no comment			NA = not available															

Gerroa Waste Disposal Depot																		
Sample ID	ANZECC, 2000		MW11	MW 11	MW 11	MW11	MW11	MW 11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Depth to Groundwater (m AHD)			0.405	0.485	0.955	0.495	0.405	0.375	0.345	0.265	0.375	0.385	0.785	0.965	0.505	0.315	0.375	0.265
Groundwater depth (m bTOC)			2.25	2.17	1.7	2.16	2.25	2.28	2.31	2.39	2.28	2.27	1.87	1.69	2.15	2.34	2.28	2.39
Height of Stick up (m)			0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)			1.29	1.21	0.74	1.2	1.29	1.32	1.35	1.43	1.32	1.31	0.91	0.73	1.19	1.38	1.32	1.43
Field Parameters																		
pH (field)	6.5-8.0 (a)	8-8.4 (a)	5.1	5.2	5.7	6.1	6.2	6.3	6.4	6	6.1	5.4	5.7	6.2	5.5	6.2	5.7	5.6
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		18.6	16.2	0.178	6.12	4.05	1.67	3.83	6.26	3.4	8	12.1	7.05	7.3	1080	4.73	8.28
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.41	3.32	5.13	9.66	2.66	1.56	6.61	2.58	2.16	1.2	1.8	1.63	2.05	1.97	2.25	2.15
Dissolved Oxygen (%)			-	-	53.30	-	-	-	-	-	-	12.4			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-
Redox Potential (mV)			-	-	-	-	-	111	-	-	-	<0.1			-	38	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc
Laboratory Analyses																		
Major Ions (mg/L)																		
Sodium			-	-	368	-	-	298	-	-	-	1900			-	190	-	-
Potassium			-	-	16	-	-	10	-	-	-	67			-	13	-	-
Calcium			-	-	10	-	-	31	-	-	-	100			-	6	-	-
Magnesium			-	-	15	-	-	40	-	-	-	249			-	14	-	-
Chloride			-	-	400	-	-	493	-	-	-	3690			-	275	-	-
Alkalinity (as CaCO3)			24	24	51	103	102	93	60	64	79	28	23	87	28	53	32	26
Bicarbonate			24	24	51	103	102	93	60	64	79	28	23	87	28	53	32	26
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	30	-	-	121	-	-	-	471			-	37	-	-
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Dissolved Solids (TDS)			12800	10700	1530	3710	2260	1330	2370	3570	1990	6370	8300	4310	3950	671	2900	5480
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-
Heavy Metals (mg/L)																		
Iron (filtered)	0.3 (1)		-	-	6.2	-	-	2.57	-	-	-	1.69			-	0.68	-	-
Manganese	1.90		-	-	0.005	-	-	0.01	-	-	-	0.028			-	0.004	-	-
Nutrients (mg/L)																		
Nitrate (NO3 as N)	0.7 (7)		0.06	0.17	0.93	0.48	<0.01	0.04	<0.01	<0.01	<0.01	0.08	<0.01	0.81	<0.01	<0.10	<0.01	<0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	<0.10	0.13	0.06	0.03	0.03	0.01	0.03	0.05	<0.10	0.42	0.07	0.02	0.01	<0.01
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	2.8	3.9	67.7	3.2	4.30	4.70	2.60	3.40	3	5	2.7	2.3	6	3	1.2	5.0
Dissolved Organic Carbon			-	-	440	-	-	145	-	-	-	48			-	64	-	-
Fluoride (Electrode)			-	-	0.1	-	-	0.2	-	-	-	0.2			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.11	0.52	<1.00	0.31	0.25	0.44	0.25	0.12	0.07	0.3	0.06	0.06	0.32	0.2	0.07	0.47
Biological (CFU/100 ml)																		
Enterococcus MF	35 (8)	35 (8)	-	-	-	-	-	-	-	-	-				-	-	-	-

Note:
Exceeds ANZECC (2000) guidelines
marine/fresh water ecosystems
Focus of this monitoring report
nc = no comment NA = not available

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Table SW-1: Summary Analytical Results for Surface Water Locations (2003 to 2014)

Gerroa Waste Disposal Depot

Sample ID	ANZECC, 2000		ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	
Field Measurements	Fresh	Marine	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04				
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.8	6.9	7	7.2	7	7.3	7.4	6.5	7	7.2	6.9	7.63	7.42	7.65	7.26	4.25	No access (Cleary Bros. Land) - no samples taken 18/02/2009; 19/05/2009; 27/08/2009; 27/11/2009 and 26/02/2010	No access (Cleary Bros. Land) - no samples taken 21/05/2010; 17/08/2010; 30/11/2010 and 23/02/2011	No access (Cleary Bros. Land) - no samples taken 24/05/2011; 24/08/2011; 3/11/2011 and 1/02/2012	
Temperature										-	-	-	-	20.5	21.34	13.03	13.16	18.75				
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.41	6.73	19	15.7	20	46.9	19.6	5.13	6.88	13.6	40	13.1	5.3	3.1	8.5	0.4				
Eh (ORP) (mV)										-	-	-	-	nm	nm	nm	nm	nm				
Salinity (ppt)										-	-	-	-	7.53	2.85	1.62	4.72	0.21				
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	6.05	6.68	6.25	5.66	3.2	6.03	5.39	4.61	4.97	11.1	5.22	4.6	4.5	2.2	0.8	1.2				
Dissolved Oxygen (%)							33.2			-	-	-	-	52.9	41.1	24	7.6	12.2				
Turbidity (NTU)	6-50 (a)	0.5-10 (a)								-	-	-	-	30.1	27.1	21.5	20.6	15.1				
Laboratory Analyses																						
Sodium (ICP)			189				7180			-	1200	-	-	-	-	-	-	-				
Potassium (ICP)			10				272			-	52	-	-	-	-	-	-	-				
Calcium (ICP)			32				255			-	79	-	-	-	-	-	-	-				
Magnesium (ICP)			29				701			-	140	-	-	-	-	-	-	-				
Chloride										-	-	-	-	-	-	-	-	-				
Alkalinity (as CaCO3)			50	66	128		121	128	117	43	160	127	115	-	-	-	-	-				
Sulphate (SO4)										-	-	-	-	-	-	-	-	-				
pH										-	-	-	-	-	-	-	-	-				
Redox Potential (mV)			73.5				<0.1			-	58	-	-	-	-	-	-	-				
Total Dissolved Solids (TDS)			846	6730	13700	11800	18100	34600	12900	2950	4260	9920	28800	-	-	-	-	-				
Total Suspended Solids (TSS)										-	-	-	-	-	-	-	-	-				
Metals (mg/L)																						
Iron (ICP)	0.3 (1)		0.89				<0.50			-	1.45	-	-	-	-	-	-	-				
Manganese (ICP)	1.90		0.12				0.031			-	0.052	-	-	-	-	-	-	-				
Nutrients (mg/L)																						
Nitrate (NO3 as N)	0.7 (7)		0.08	0.12	0.07	0.24	0.18	<0.01	0.23	0.02	0.15	0.06	0.01	-	-	-	-	-				
Nitrite (NO2 as N)			<0.01	0.02	0.09	0.06	0.02	<0.01	<0.01	0.02	0.02	0.06	0.05	-	-	-	-	-				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	1.69	1.03	1.7	1.8	1.09	<0.10	<0.10	0.75	3.19	1	0.44	0.08	0.04	0.08	0.07	0.03				
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	2	1.6	2.4	2.9	1.3	0.2	1	2	3.6	2.2	1	-	-	-	-	-				
Total Organic Carbon (TOC)										-	-	-	-	-	-	-	-	-				
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.1	0.03	0.06	0.05	<0.01	<0.01	0.13	0.09	0.04	0.01	0.12	-	-	-	-	-				
Biological (CFU/100 ml)																						
Enterococcus	35 (8)	35 (8)	~18				4			-	20	-	-	10	390	72	60	140				
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	~17				2			-	24	-	-	16	32 (app)	50	18 (app)	220				

Exceeds ANZECC (2000) guidelines

0.054

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

Table SW-1: Summary Analytical Results for Surface Water Locations (2003 to 2014)

Gerroa Waste Disposal Depot

Sample ID		ANZECC, 2000		ML-3	ML-3	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4		
Field Measurements		Fresh	Marine	No access (Cleary Bros. Land) - no samples taken 31/05/2011; 10/08/2012; 21/11/2011 and 18/02/2013	No access (Cleary Bros. Land) - no samples taken 31/05/2013; 30/08/2013; 27/11/2013 and 07/02/2014	10/07/03	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04	16/02/05	29/06/05	30/08/05	23/11/05	27/02/06	31/05/06	31/08/06	28/11/06	27/02/07	23/05/07	22/08/07	
pH (field)		6.5-8.0 (a)	8-8.4 (a)			6.99	7.66	7.77	7.7	17.24	4.26	7.33	6.48	7.22	7.67	7.43	6.58	6.42	6.04	6.76	7.6	5.86	
Temperature						12.7	19.99	21.72	12.68	12.43	18.66	19	13.77	16.62	18.86	22.14	12.58	15.36	20.6	22.61	14.2	13.56	
Electrical Conductivity (mS/cm)		0.125-2.2 (a)				1.2	13.3	5.4	3.2	8.1	0.4	2.7	4.4	1.98	5.547	10.24	15.62	5.126	13.68	10.9	24.37	1.381	
Eh (ORP) (mV)						-67	nm	nm	nm	nm	nm	nm	-172	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
Salinity (ppt)						0.63	7.63	2.93	1.7	4.48	0.21	1.44	2.33	1.01	3.01	5.79	9.15	2.77	7.92	6.19	14.84	0.7	
Dissolved Oxygen (mg/L)		8.5-11.0 (a)	9.0-10.0 (a)			5.1	4	4.1	2.5	0.6	0.5	4.6	7.4	9.48	8.26	5.06	6.3	14.45	7.36	5.02	4.71	8.19	
Dissolved Oxygen (%)						46.5	46.1	47.6	23.3	6.6	4.9	50.3	71.6	97.9	90.4	60	62.7	146.8	85.8	58.3	46.2	79	
Turbidity (NTU)		6-50 (a)	0.5-10 (a)			17.3	28.8	28.4	22.7	20.4	14.7	26	32.8	10.5	1	3.2	20.2	31.6	2.8	14.4	5.6	4.7	
Laboratory Analyses																							
Sodium (ICP)				152	2612	1080	584	1589	40	461	677	219	907	3600	2500	670	3	1700	3600	150			
Potassium (ICP)				8	103	48	26	57	9.3	23	33	13	38	230	130	39	0.75	75	160	10			
Calcium (ICP)				34	121	62	50	90	13	38	47	39	66	180	67	59	160	66	120	29			
Magnesium (ICP)				28	-	119	76	174	9.2	61	95	34	122	450	290	85	0.008	210	500	32			
Chloride				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Alkalinity (as CaCO3)				282	93	108	83	95	14	60	11.5	71	49	119	15	63	83	52	100	-			
Sulphate (SO4)				-	-	-	-	-	-	-	-	-	-	-	-	-	0.017	-	-	-			
pH				6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Redox Potential (mV)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Dissolved Solids (TDS)				744	8944	3480	1892	5176	160	1532	2496	1232	4236	13124	9400	3100	17000	6700	17400	602			
Total Suspended Solids (TSS)				-	48	-	2	7	40	15	36	8	12	9	56	18	43	16	13	15			
Metals (mg/L)																							
Iron (ICP)		0.3 (1)		0.23	2.9	0.39	0.27	0.2	3.4	0.095	0.1	0.05	0.28	0.05	3.2	2.4	<0.04	0.06	0.36	0.4			
Manganese (ICP)		1.90		0.15	0.096	0.007	0.04	0.032	0.48	<0.001	0.29	<0.01	0.06	0.053	0.1	0.1	0.03	0.05	0.06	0.16			
Nutrients (mg/L)																							
Nitrate (NO3 as N)		0.7 (7)		0.04	0.03	0.12	<0.02	0.08	0.04	0.02	0.075	<0.04	<0.04	<0.04	1.4	<0.04	190	0.16	0.09	0.1			
Nitrite (NO2 as N)				<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	0.019	0.01	0.003	0.008	0.016	0.003	4600	0.012	0.007	0.02			
Ammonia (NH3 as N)		1.88 (2)	2.84 (2)	0.04	0.02	<0.02	<0.02	0.06	<0.02	0.21	<0.02	<0.10	0.05	0.55	0.29	0.37	<0.1	0.09	1.5	0.37			
Total Kjeldahl Nitrogen (TKN)		0.5 (5)	0.12 (6)	0.37	0.15	0.75	0.48	0.7	2.1	0.8	0.66	0.62	0.42	1.3	2	1.4	0.75	0.83	2.3	0.44			
Total Organic Carbon (TOC)				7	5	3	8	6	28	10	9	10	6	2	NR	10	3	6		8			
Total Phosphorus (TP)		0.05 (7)	0.025 (7)	<0.002	0.049	0.036	<0.002	<0.002	0.3	0.021	0.04	<0.002	<0.005	0.029	0.098	0.01	0.017	0.036	0.008	0.44			
Biological (CFU/100 ml)																							
Enterococcus		35 (8)	35 (8)	<1	10	320	60	72	100	180	<1	52	160	100	80	60	30 (app)	1800(ap)	230	<2			
Thermotolerant (Faecal) coliforms		150 (8)	150 (8)	<1	15	28 (app)	44	20 (app)	240	24 (app)	<1	64	25	60	112	30 (app)	14 (app)	2000	12 (app)	<2			

Exceeds ANZECC (2000) guidelines 0.054

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

Table SW-1: Summary Analytical Results for Surface Water Locations (2003 to 2014)

Gerroa Waste Disposal Depot

Sample ID			ANZECC, 2000		ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5				
Field Measurements			Fresh	Marine	21/11/07	22/02/08	29/05/08	25/08/08	19/11/08						10/07/03	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04				
pH (field)			6.5-8.0 (a)	8-8.4 (a)	7.19	6.94	6.64	6.8	7.07	No access (Cleary Bros. Land) - no samples taken 18/02/2009; 19/05/2009; 27/08/2009; 27/11/2009 and 26/02/2010	No access (Cleary Bros. Land) - no samples taken 21/05/2010; 17/08/2010; 30/11/2010 and 23/02/2011	No access (Cleary Bros. Land) - no samples taken 24/05/2011; 24/08/2011; 3/11/2011 and 1/02/2012	No access (Cleary Bros. Land) - no samples taken 31/05/2011; 10/08/2012; 21/11/2011 and 18/02/2013	No access (Cleary Bros. Land) - no samples taken 31/05/2013; 30/08/2013; 27/11/2013 and 07/02/2014	7.26	7.97	7.54	7.51	7.51	6.6				
Temperature					23.26	20.85	14.86	14.3	20						13.6	22.51	23.47	16.41	14.26	19.03				
Electrical Conductivity (mS/cm)			0.125-2.2 (a)		9.749	1.825	1.533	1.7	5.49						3	40.3	19.7	36.1	14.6	0.7				
Eh (ORP) (mV)					nm	nm	nm	nm	89						-63	nm	nm	nm	nm	nm				
Salinity (ppt)					5.49	1.01	0.97	1.1	nm						1.58	25.7	11.7	22.78	8.48	0.34				
Dissolved Oxygen (mg/L)			8.5-11.0 (a)	9.0-10.0 (a)	5.31	4.88	5.11	8.2	nm						4.3	5.9	3	1.6	0.5	1				
Dissolved Oxygen (%)					64.2	54.9	63.2	81	46						41.8	79	37	18.2	4.8	11.3				
Turbidity (NTU)			6-50 (a)	0.5-10 (a)	0	30.5	1.1	4.6	nm						15.4	33.3	26.8	26.1	32.3	14.1				
Laboratory Analyses																								
Sodium (ICP)					1500	230	440	200	740															
Potassium (ICP)					70	14	20	11	30															
Calcium (ICP)					70	36	100	40	67															
Magnesium (ICP)					210	36	64	34	96															
Chloride					-	-	-	-	-															
Alkalinity (as CaCO3)					90	97	<2	61	80															
Sulphate (SO4)					-	-	-	-	-															
pH					-	-	-	-	7.2															
Redox Potential (mV)					-	-	-	-	170															
Total Dissolved Solids (TDS)					6400	1000	1100	990	3100															
Total Suspended Solids (TSS)					-	-	-	-	-															
Metals (mg/L)																								
Iron (ICP)			0.3 (1)		0.22	2.9	0.68	0.43	1.3															
Manganese (ICP)			1.90		0.017	0.12	0.04	0.09	0.08															
Nutrients (mg/L)																								
Nitrate (NO3 as N)			0.7 (7)		0.05	<0.04	-	-	0.05															
Nitrite (NO2 as N)					0.011	0.01	-	-	<0.01															
Ammonia (NH3 as N)			1.88 (2)	2.84 (2)	<0.02	1.7	<0.10	0.27	<1															
Total Kjeldahl Nitrogen (TKN)			0.5 (5)	0.12 (6)	0.49	2.9	0.53	0.76	0.8															
Total Organic Carbon (TOC)					11	16	10	10	-															
Total Phosphorus (TP)			0.05 (7)	0.025 (7)	0.019	0.05	<0.005	<0.005	<0.05															
Biological (CFU/100 ml)																								
Enterococcus			35 (8)	35 (8)	32	70	18	8 (app)	14 (app)						2	4	600	36 (app)	40	80				
Thermotolerant (Faecal) coliforms			150 (8)	150 (8)	16 (app)	16 (app)	15	13	16 (app)						<1	16	44	12 (app)	12 (app)	160				

Exceeds ANZECC (2000) guidelines 0.054

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

Table SW-1: Summary Analytical Results for Surface Water Locations (2003 to 2014)

Gerroa Waste Disposal Depot

Sample ID	ANZECC, 2000		ML-5	ML-5	ML-5	ML5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5
Field Measurements	Fresh	Marine	19/11/08	18/02/09	19/05/09	27/08/09	27/11/09	26/2/10	21/05/10	17/08/10	30/11/10	23/02/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.23	6.9	6.7	5.9	6.3	6.8	6.7	6.7	5.8	6.8	7	6.8	6.9	7	7.2	6.9	7	7.3	6.4	7	7.2
Temperature			20.2	-	-	-	-	-	-	-	-	-									-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		16.67	13	27	31	19	9.6	21.3	5.1	0.294	16.6	8	9.19	2.89	9.59	5.08	5	45.9	18.9	1.26	1.81	4.26
Eh (ORP) (mV)			88	-	-	-	-	-	-	-	-	-									-	-	-
Salinity (ppt)			nm	-	-	-	-	-	-	-	-	-									-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	nm	8.1	6.4	5.4	4.9	5.2	6.36	9.44	5.18	6.24	5.38	6.39	6.86	6.68	7.37	3.6	6.82	4.5	5.22	3.91	6.65
Dissolved Oxygen (%)			67	-	-	62	-	-	-	-	54.00	-						33.7			-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	nm	-	-	-	-	-	-	-	-	-									-	-	-
Laboratory Analyses																							
Sodium (ICP)			2100	2100	-	6300	-	-	-	-	21	-		102				1030			-	274	-
Potassium (ICP)			84	88	-	310	-	-	-	-	3	-		7				43			-	16	-
Calcium (ICP)			90	110	-	200	-	-	-	-	7	-		31				74			-	48	-
Magnesium (ICP)			240	260	-	820	-	-	-	-	5	-		21				122			-	36	-
Chloride			-	-	-	-	-	-	-	-	-	-									-	-	-
Alkalinity (as CaCO3)			110	110	110	120	100	106	103	55	6	129	112	45	52	148	132	111	117	114	37	148	112
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-									-	-	-
pH			7	-	-	-	-	-	-	-	-	-									-	-	-
Redox Potential (mV)			190	-4	-	82	-	-	-	-	-	-		72.6				<0.1			-	62	-
Total Dissolved Solids (TDS)			1200	8800	24000	24000	12000	6380	15400	3060	146	10800	4450	538	1660	6530	2880	3890	29700	12700	692	936	2510
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-	-									-	-	-
Metals (mg/L)																							
Iron (ICP)	0.3 (1)		0.57	0.66	-	0.11	-	-	-	-	0.98	-		0.89				0.94			-	1.99	-
Manganese (ICP)	1.90		0.06	0.26	-	<0.01	-	-	-	-	0.062	-		0.139				0.042			-	0.083	-
Nutrients (mg/L)																							
Nitrate (NO3 as N)	0.7 (7)		0.08	1.4	0.1	0.2	0.13	0.19	0.16	0.08	0.03	0.36	0.1	0.05	0.05	0.11	0.13	0.38	0.02	0.16	0.03	0.06	0.05
Nitrite (NO2 as N)			0.02	0.43	0.02	0.09	0.04	0.02	0.1	<0.01	<0.01	0.1	0.03	<0.01	<0.01	0.12	0.02	0.01	<0.01	<0.01	<0.01	<0.01	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	1.6	2	1.2	2.8	3	2.17	1.52	0.94	0.04	1.83	3.12	1.6	0.85	3.07	1.73	1.73	<0.10	<0.10	0.81	2.6	0.52
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	2.4	2.1	1.2	2.9	3.6	4.6	1.7	1.6	1.5	3.3	4.2	2	1.2	4.1	2.5	1.9	0.2	1.7	1.7	3.1	0.6
Total Organic Carbon (TOC)			-	-	-	-	-	-	-	-	-	-									-	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	<0.05	<0.005	0.01	0.04	<0.05	1.78	<0.01	<0.01	<0.01	<0.01	0.03	0.12	0.03	0.03	<0.01	0.02	<0.01	1.95	0.06	0.03	0.01
Biological (CFU/100 ml)																							
Enterococcus	35 (8)	35 (8)	116 (app)	180	-	-	-	-	-	-	~1200	-		~8				12			-	~16	-
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	58	64	-	6	-	-	-	-	~9100	-		<2				4			-	~6	-

Exceeds ANZECC (2000) guidelines 0.054

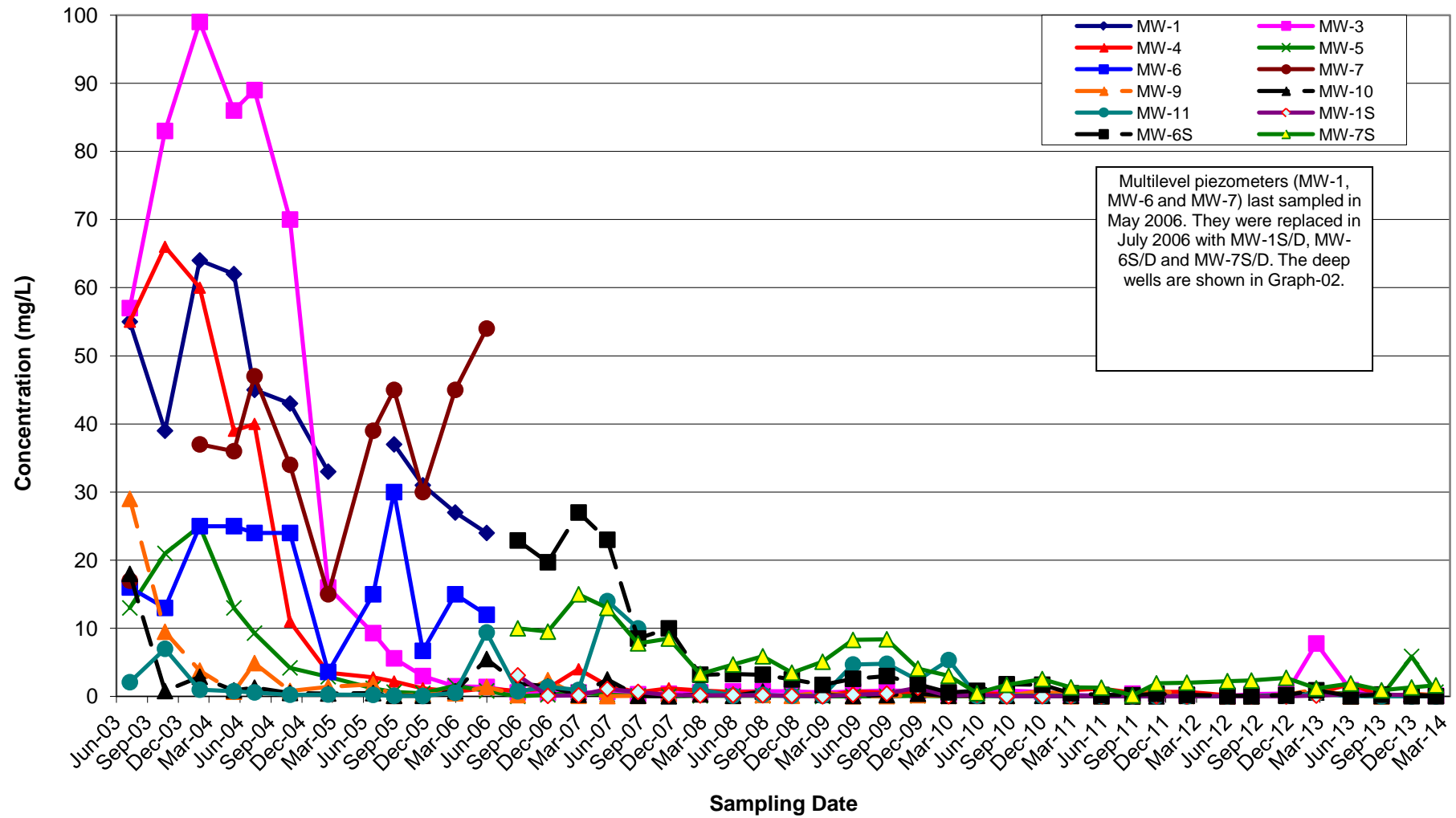
Focus of this monitoring report
nm = not measured (app) = approximately NR = no result

Table 6: Groundwater and Surface Water Monitoring - 2013 to 2014

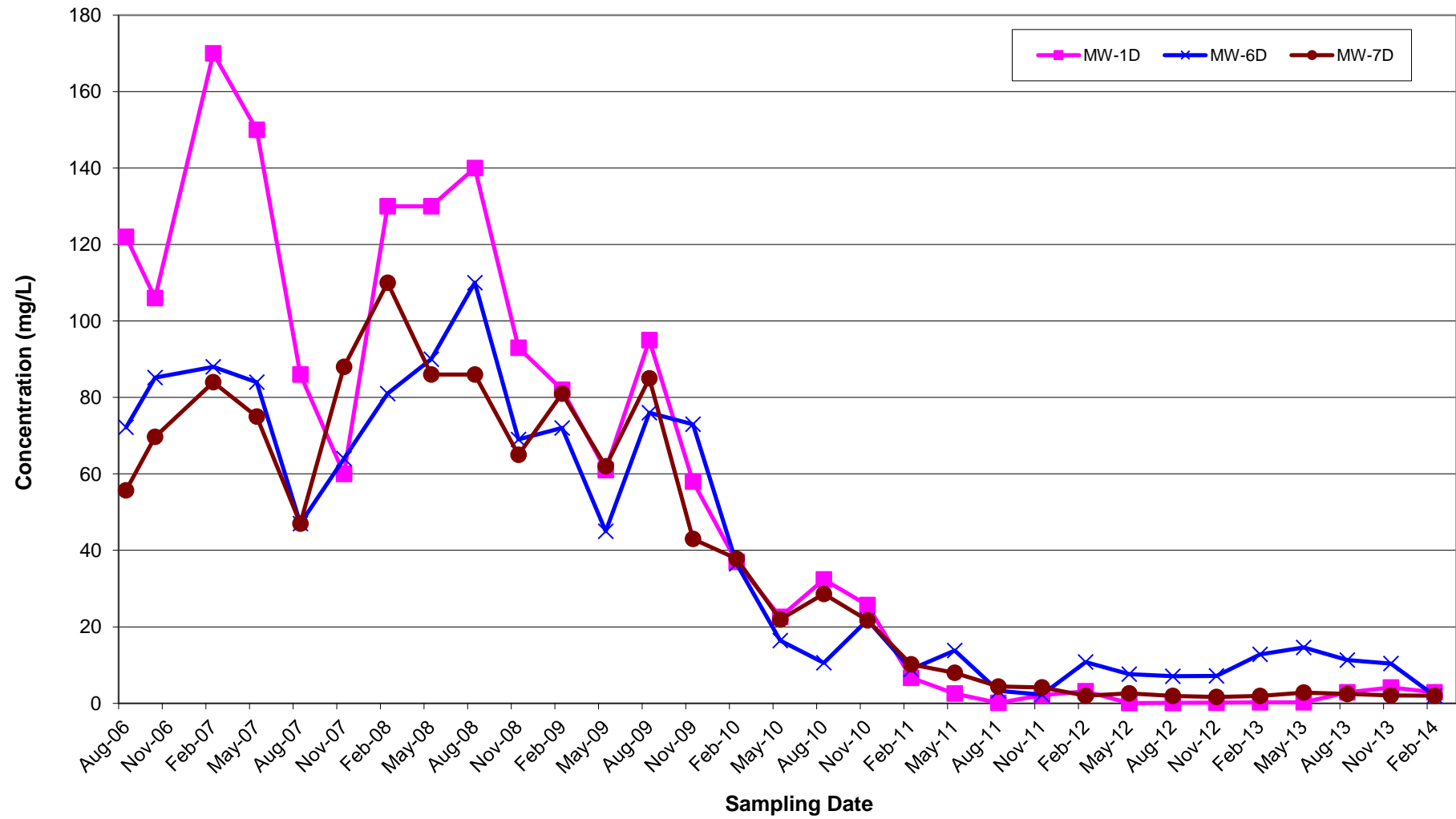
Analytes	Groundwater				Blue Angle Creek				Detection Limit	Method Reference
	31/05/13	30/08/13	27/11/13	7/02/14	31/05/13	30/08/13	27/11/13	7/02/14		
Physical Properties										
pH	X	X	X	X	X	X	X	X	0.01 pH unit	pH meter and probe/APHA4500-HB
Electrical Conductivity	X	X	X	X	X	X	X	X	0.01 mS/cm	Conductivity meter and probe
Dissolved Oxygen	X	X	X	X	X	X	X	X	0.0001	DO meter and probe
Redox (Orp)		X				X			1 mV	Platinum electrode probe
Temperature									1 °C	Temperature meter and probe
Total Dissolved Solids	X	X	X	X	X	X	X	X	5 mg/L	Determined gravimetrically by drying (APHA 2540 C)
Suspended Solids									2 mg/L	APHA2540D
Turbidity									1 NTU	Turbidmeter
Nutrients										
Ammonia-nitrogen	X	X	X	X	X	X	X	X	0.01 mg/L	FIA
Total Phosphorus	X	X	X	X	X	X	X	X	2 µg/L	FIA
Nitrate-nitrogen	X	X	X	X	X	X	X	X	10 µg/L	FIA
Nitrite-nitrogen	X	X	X	X	X	X	X	X	1 µg/L	FIA
Total Kjeldhal Nitrogen	X	X	X	X	X	X	X	X	50 µg/L	FIA
Hydro-chemical										
Calcium		X				X			0.5 mg/L	USEPA 6010 A
Chloride		X							0.5 mg/L	Titrated with mercuric nitrate using diphenol-carbazonel/xylene cyanol FF indicator
Fluoride		X							0. 1 mg/L	APHA4500-FC
Magnesium		X				X			0.02 mg/L	USEPA 6010 A
Sulphate		X							1 mg/L	ICID/MS
Sodium		X				X			0.05 mg/L	USEPA 6010 A
Bicarbonate/Alkalinity	X	X	X	X	X	X	X	X	0.5 mg/L	APHA2340C
Potassium		X				X			0.05 mg/L	USEPA 6010 A
Organic Contaminants										
Dissolved Organic Carbon		X							0.50 mg/L	APHA 5310C
Total Organic Carbon									0.1 mg/L	APHA 5310C
Inorganic Contaminants										
Iron		X				X			1 µg/L	USEPA 6010 A
Manganese		X				X			1 µg/L	USEPA 6010
Biological Contaminants										
Thermotolerant (Faecal) coliforms MF						X			1cfu/100 ml	WMM 009 (~AS 4276.7 - 1995)
Enterococcus MF						X			1cfu/100 ml	WMM 013 (~AS 4276.9 - 1995)

Graphs

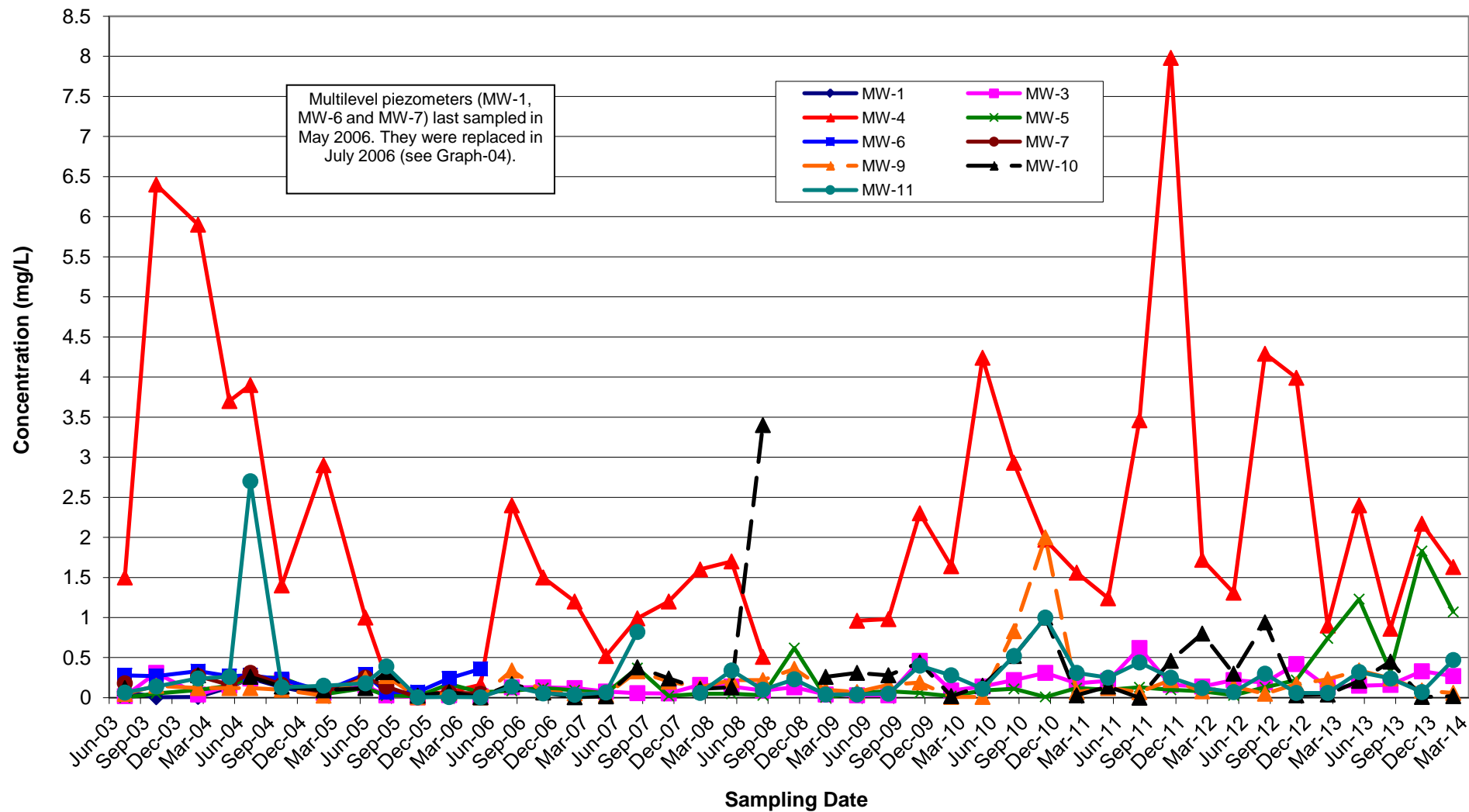
Graph-01: Groundwater Ammonia Time-Series Trends - Shallow & Creek Wells



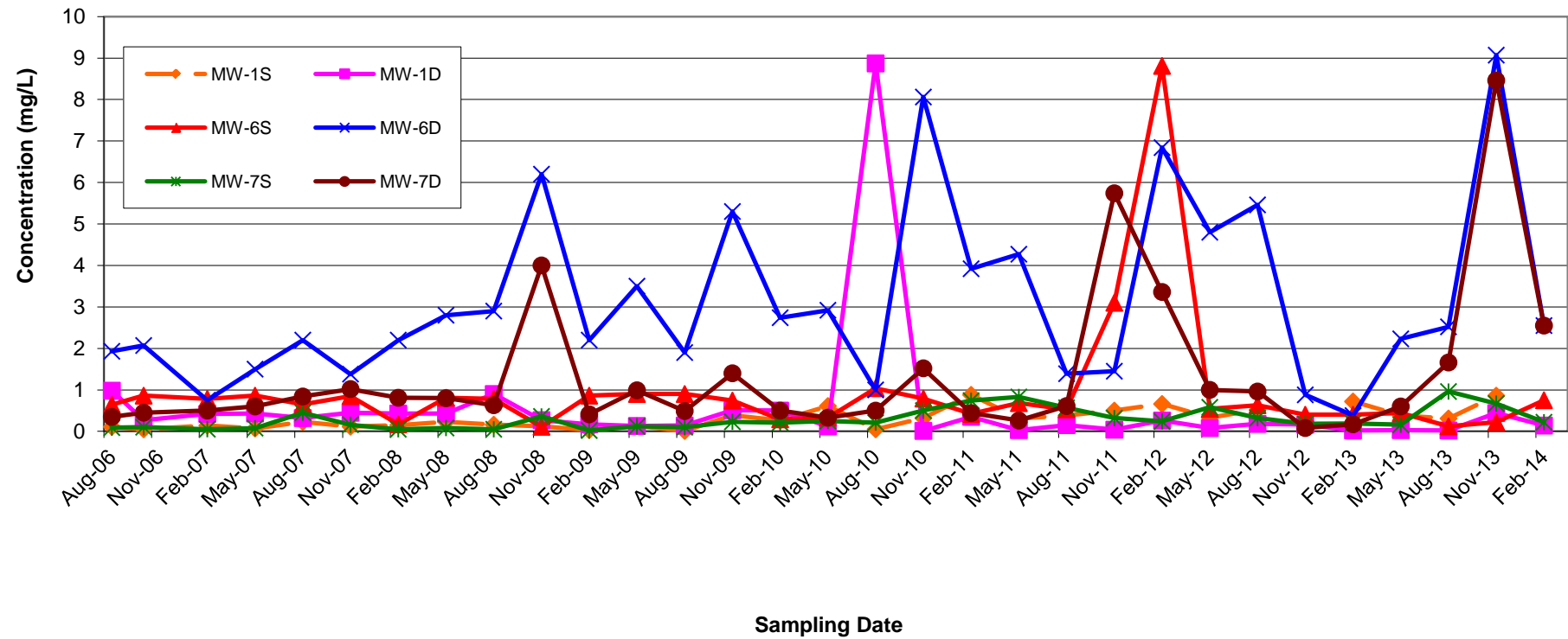
Graph -02: Groundwater Ammonia Time-Series Trends - Deep Wells



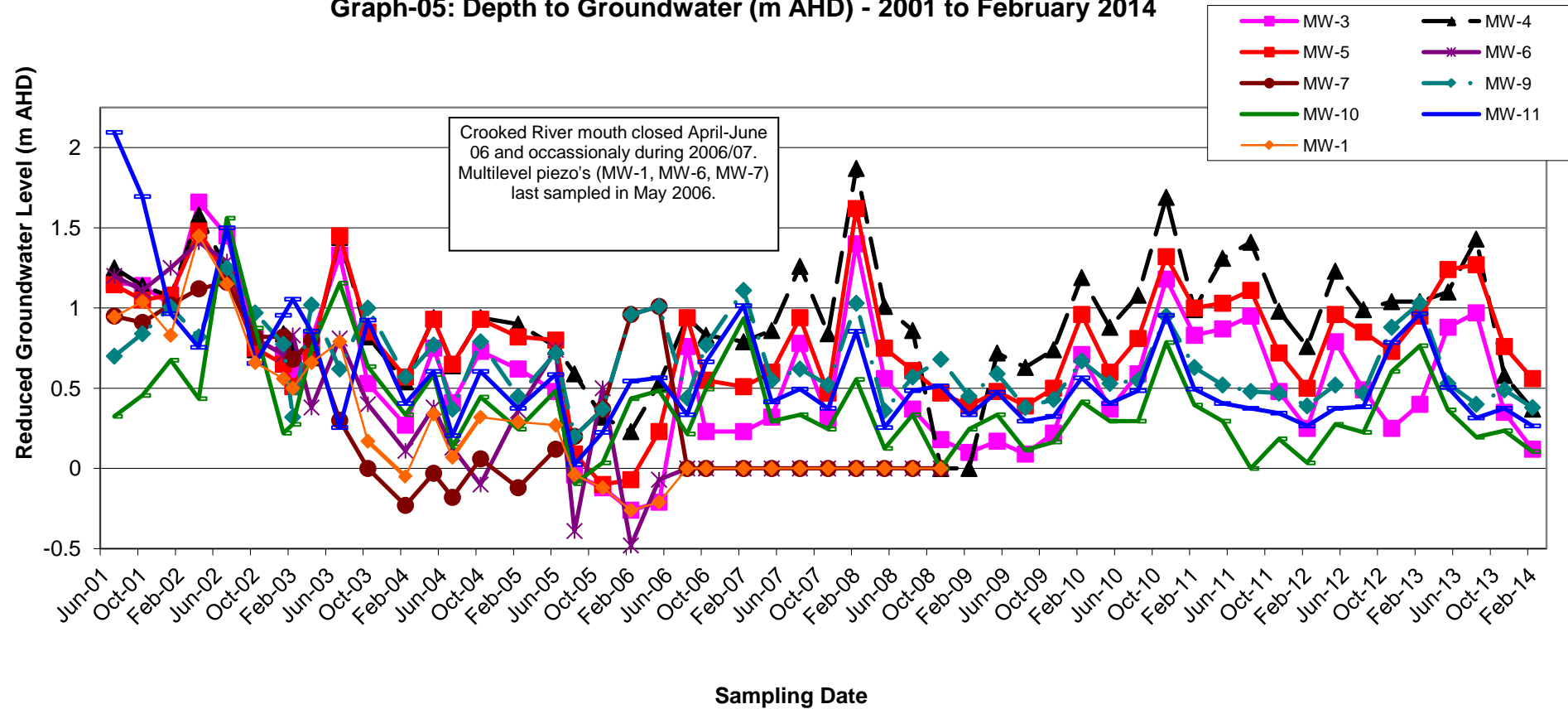
Graph-03: Groundwater Total Phosphorous Time-Series Trends - Standard Wells



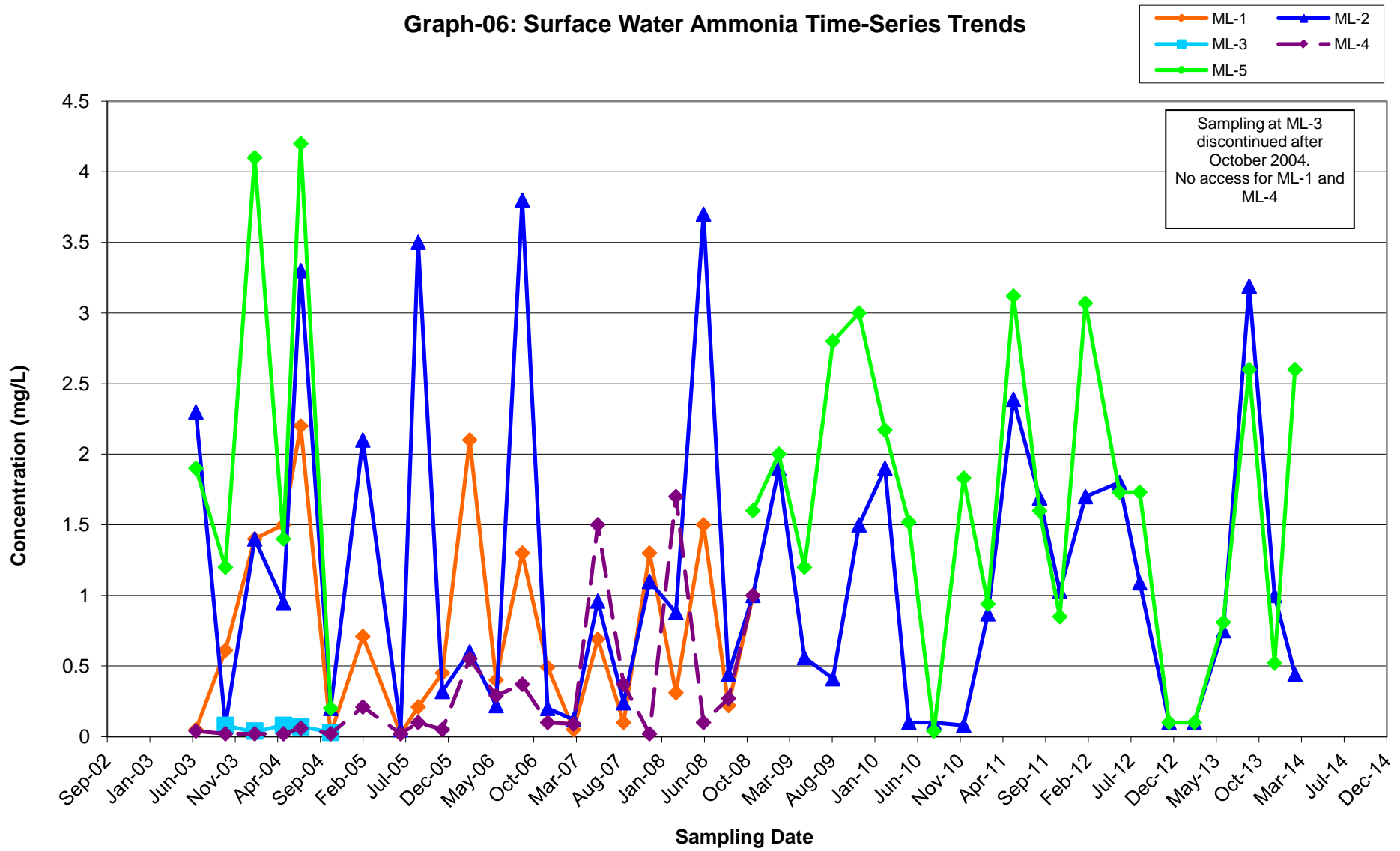
Graph-04: Groundwater Total Phosphorous Time-Series Trends - New Shallow and Deep Wells



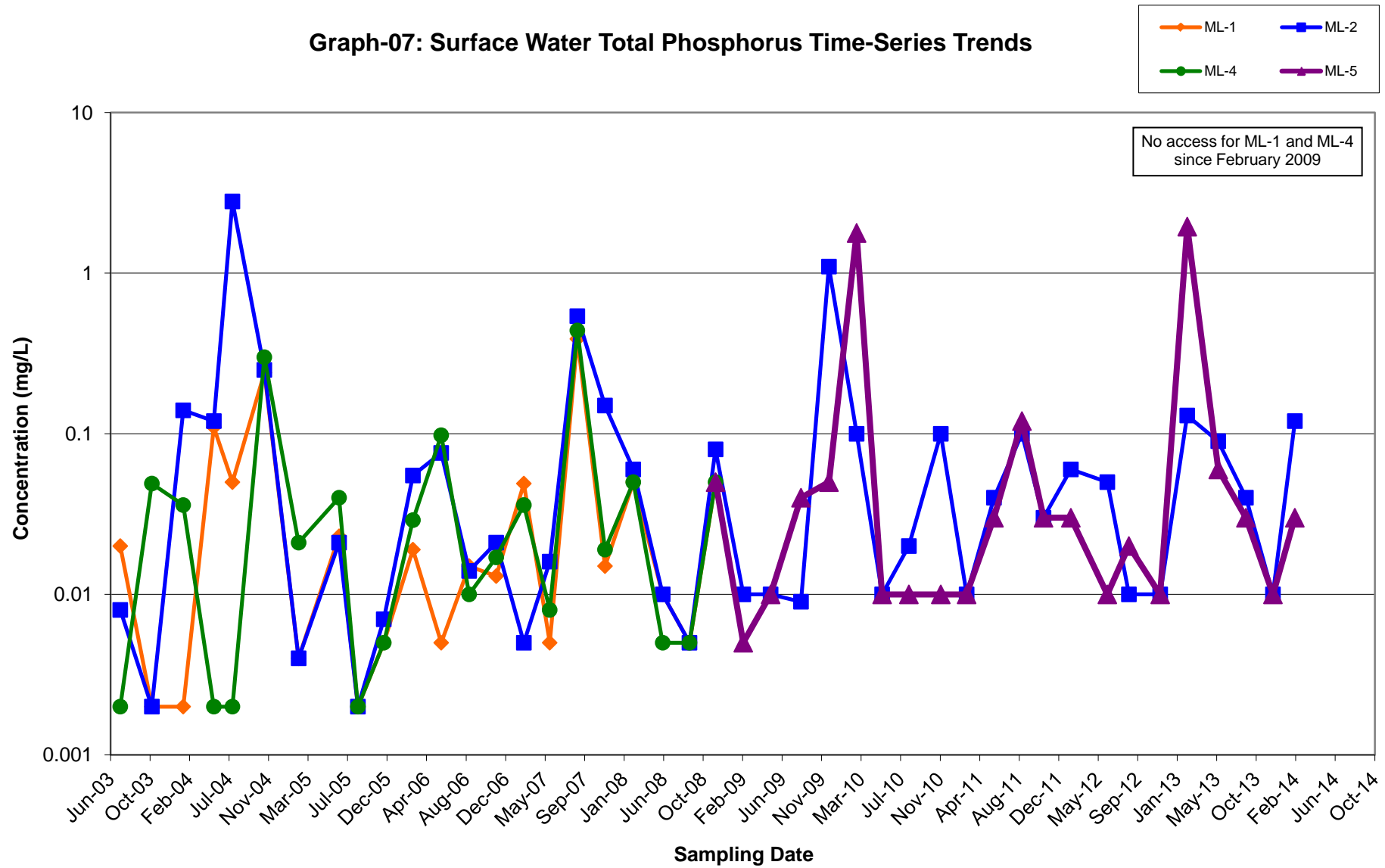
Graph-05: Depth to Groundwater (m AHD) - 2001 to February 2014



Graph-06: Surface Water Ammonia Time-Series Trends



Graph-07: Surface Water Total Phosphorus Time-Series Trends



Figures



Source: Neil Charters Pty Ltd

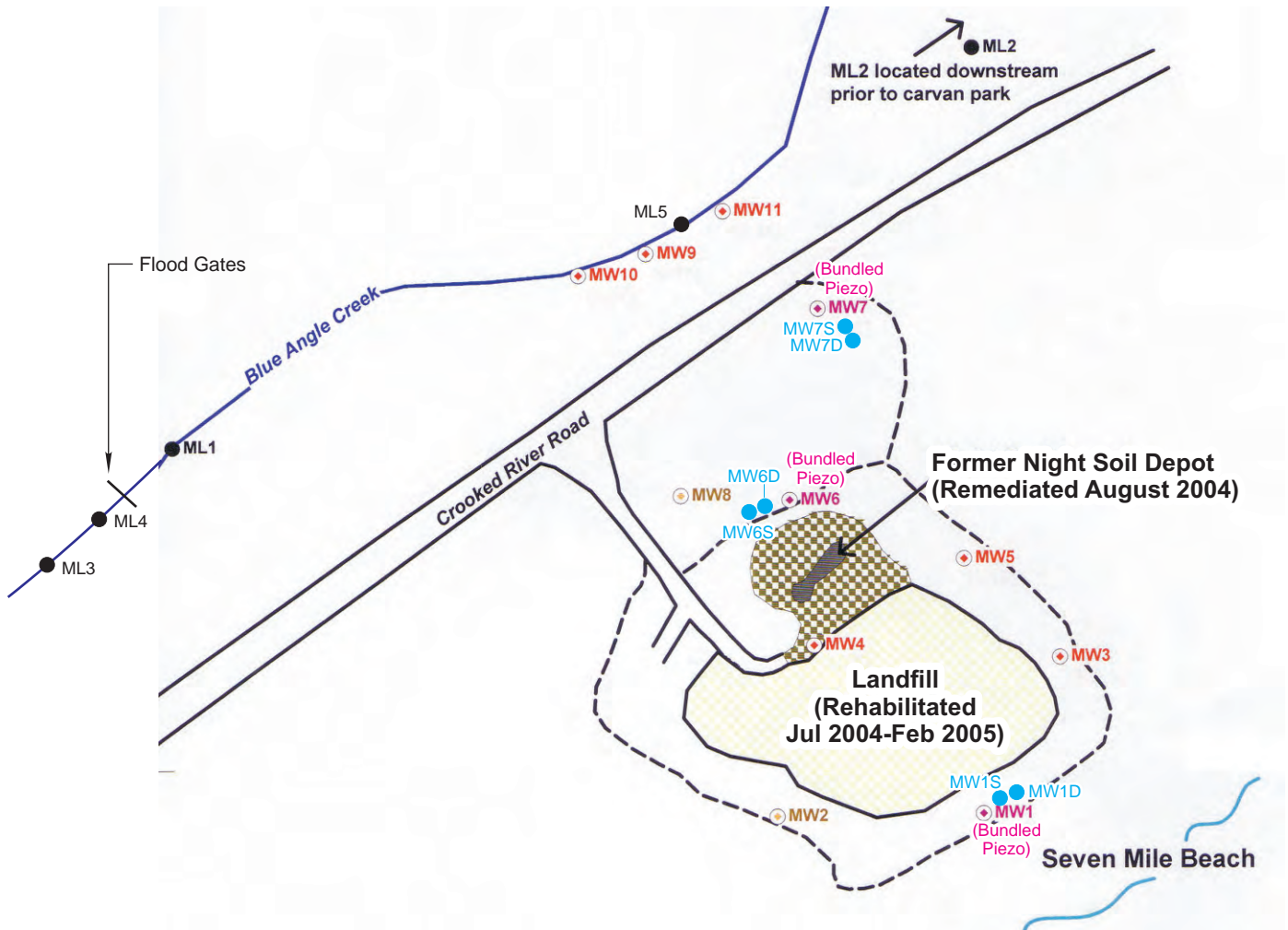
SITE LOCATION

Date: 4 March 2014

GERROA ANNUAL MONITORING REPORT (2013-2014)

Reference: E2W-025_55.cdr

Figure 1



KEY

MW1S ● Monitoring Well - Shallow, August 2006

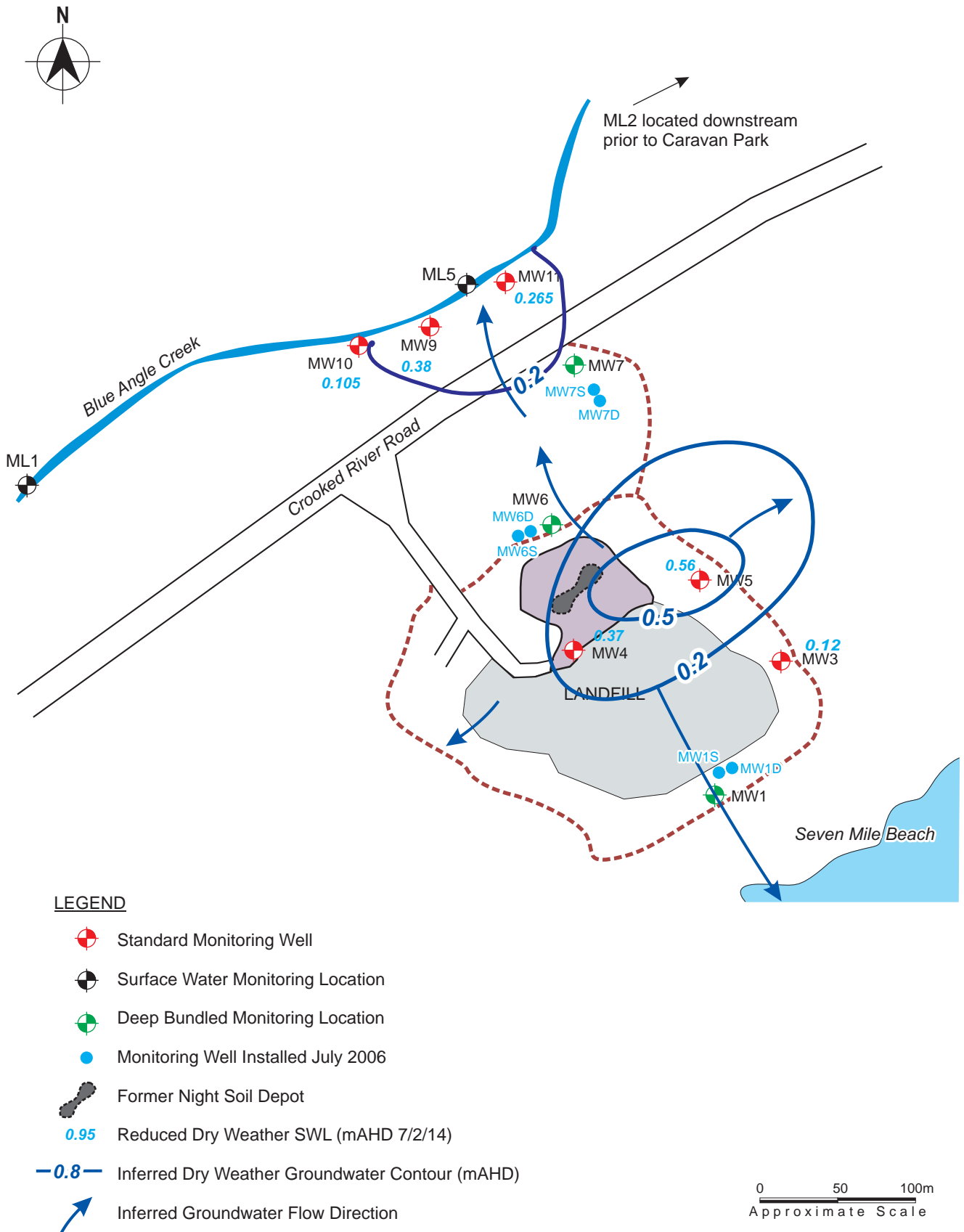
MW1D ● Monitoring Well - Deep, August 2006

MW1 ● Standard Monitoring Well

ML1 ● Surface Water Monitoring

Note: Bundled Piezometers MW1,6,7 - not sampled
MI3 no longer sampled, ML-2 and ML-4 no access

0 50 100m
Approximate Scale



Source: URS Australia Pty Ltd- baseplan

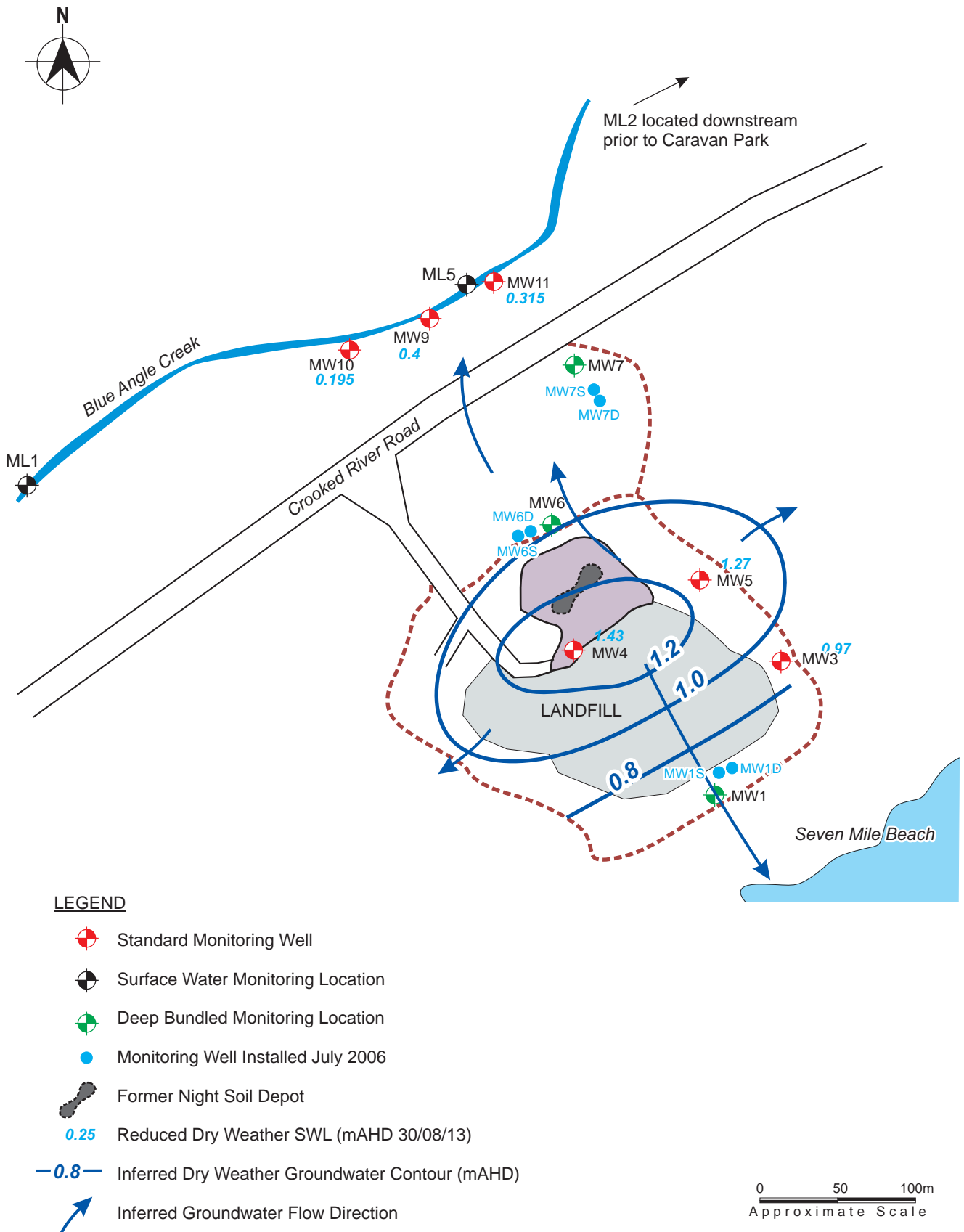
INFERRED GROUNDWATER FLOW REGIME (Wet, February 2014)

GERROA ANNUAL MONITORING REPORT (2013-2014)

Date: 5 March 2014

Reference: E2W-025_59.cdr

Figure 3A



Source: URS Australia Pty Ltd- baseplan

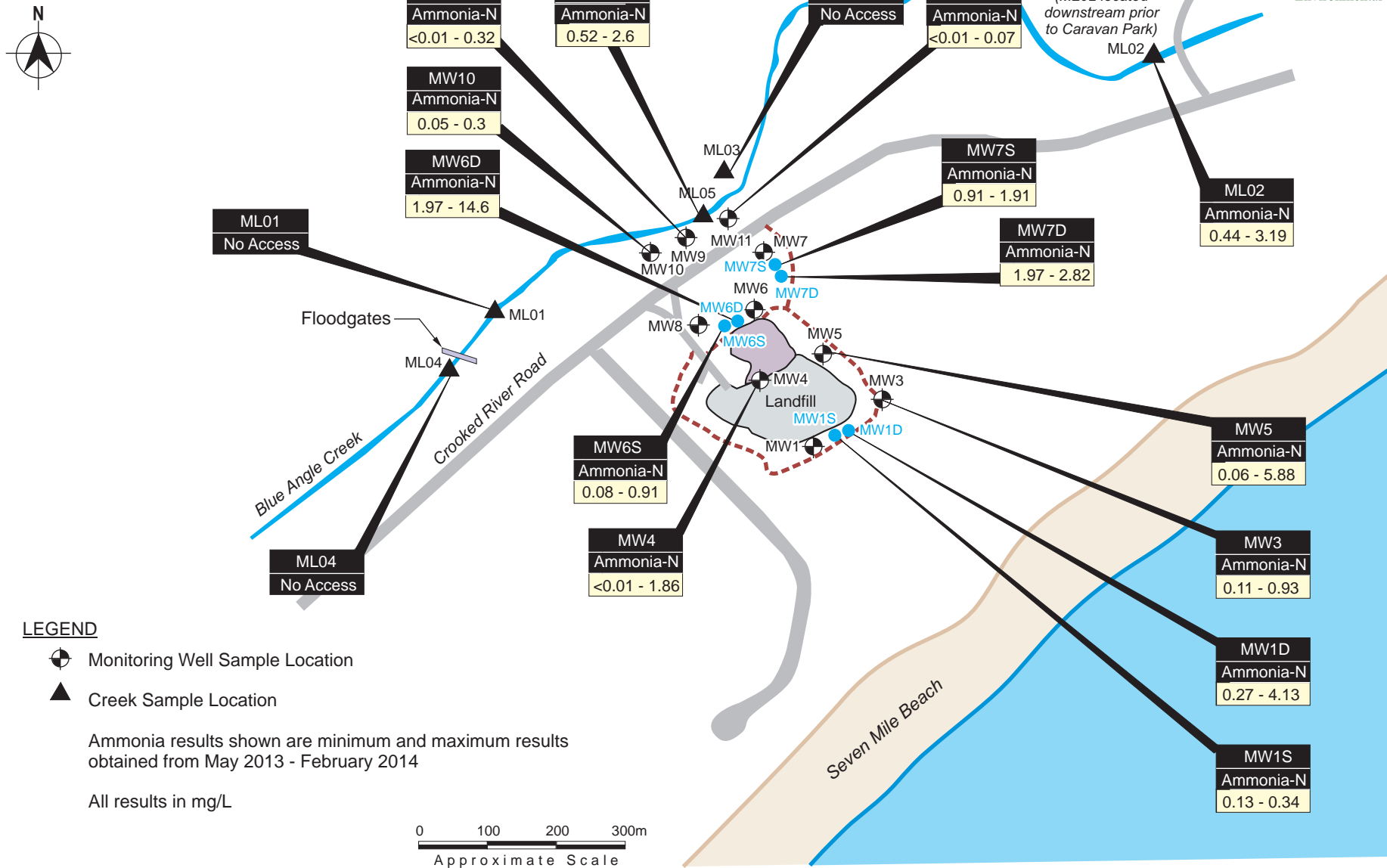
INFERRED GROUNDWATER FLOW REGIME (Dry, August 2013)

GERROA ANNUAL MONITORING REPORT (2013-2014)

Date: 5 March 2014

Reference: E2W-025_59.cdr

Figure 3B



Source: Base Plan, URS Australia Pty Ltd

AMMONIA RESULTS (mg/L) 2013-2014

GERROA ANNUAL MONITORING REPORT (2013-2014)

Date: 5 March 2014

Reference: E2W_025_58.cdr

Figure 4

Appendix A

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EW1301595	Page	: 1 of 6
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: paulc@kiama.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill Quarterly	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 31-MAY-2013
C-O-C number	: ----	Issue Date	: 05-JUN-2013
Sampler	: Craig Wilson	No. of samples received	: 17
Site	: ----	No. of samples analysed	: 17
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

- Sites - ML1, ML-3 & ML-4 No access at time of sampling.
- TDS by method EA-015 may bias high for sample #2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.



Analytical Results

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

Client sample ID

Client sampling date / time

				MW1D	MW1S	MW3	MW4	MW5
				31-MAY-2013 09:55	31-MAY-2013 09:45	31-MAY-2013 09:30	31-MAY-2013 08:25	31-MAY-2013 09:15
Compound	CAS Number	LOR	Unit	EW1301595-001	EW1301595-002	EW1301595-003	EW1301595-004	EW1301595-005
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	372	362	298	262	240
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	284	100	238	137	172
Total Alkalinity as CaCO3	----	1	mg/L	284	100	238	137	172
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.27	0.34	0.93	1.86	0.45
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	0.08	<0.01	0.02	0.88	0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	1.06	<0.01	0.60	0.36	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	1.14	<0.01	0.62	1.24	0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.9	1.5	15.3	16.8
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	2.2	1.9	2.1	16.5	16.8
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.03	0.38	0.15	2.40	1.23
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.3	6.4	7.2	6.3	7.0
Electrical Conductivity (Non Compensated)	----	1	µS/cm	628	406	512	440	130
Dissolved Oxygen	----	0.01	mg/L	1.97	1.57	1.68	2.26	1.52
Depth	----	0.01	m	3.10	3.25	3.57	4.14	3.51



Analytical Results

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

Client sample ID

Client sampling date / time

				MW6D	MW6S	MW7D	MW7S	MW9
				31-MAY-2013 08:40	31-MAY-2013 08:50	31-MAY-2013 09:10	31-MAY-2013 09:00	31-MAY-2013 10:25
Compound	CAS Number	LOR	Unit	EW1301595-006	EW1301595-007	EW1301595-008	EW1301595-009	EW1301595-010
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	454	286	338	238	3320
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	386	62	203	141	125
Total Alkalinity as CaCO3	----	1	mg/L	386	62	203	141	125
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	14.6	0.04	2.82	1.91	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	0.03	<0.01	0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.41	<0.01	0.16	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.44	<0.01	0.17	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	16.5	1.9	3.9	2.6	3.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	16.9	1.9	4.1	2.6	3.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	2.23	0.44	0.60	0.16	0.34
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.2	6.9	7.4	7.4	6.4
Electrical Conductivity (Non Compensated)	----	1	µS/cm	867	432	526	442	6390
Dissolved Oxygen	----	0.01	mg/L	1.77	1.46	1.54	2.12	3.71
Depth	----	0.01	m	4.62	4.35	4.38	4.23	1.79



Analytical Results

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

Client sample ID

Client sampling date / time

				MW10	MW11	ML-1	ML-2	ML-3
				31-MAY-2013 10:15	31-MAY-2013 10:40	31-MAY-2013 10:55	31-MAY-2013 10:50	31-MAY-2013 11:00
Compound	CAS Number	LOR	Unit	EW1301595-011	EW1301595-012	EW1301595-013	EW1301595-014	EW1301595-015
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	3870	3950	----	2950	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	5	28	----	43	----
Total Alkalinity as CaCO3	----	1	mg/L	5	28	----	43	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.07	----	0.75	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	----	0.02	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	----	0.02	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	----	0.04	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.1	5.6	----	2.0	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	3.1	5.6	----	2.0	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.21	0.32	----	0.09	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	5.0	5.5	----	6.5	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	6640	7300	----	5130	----
Dissolved Oxygen	----	0.01	mg/L	2.01	2.05	----	4.61	----
Depth	----	0.01	m	2.07	2.15	----	----	----
Field Observations	----	0.01	--	----	----	No Access	----	No Access



Analytical Results

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

Client sample ID

Client sampling date / time

				ML-4	ML-5	----	----	----
				31-MAY-2013 11:05	31-MAY-2013 10:35	----	----	----
Compound	CAS Number	LOR	Unit	EW1301595-016	EW1301595-017	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	----	692	----	----	----
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	----	37	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	37	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.81	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	----	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	----	0.03	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.03	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	1.7	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	----	1.7	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	0.06	----	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	----	6.4	----	----	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1260	----	----	----
Dissolved Oxygen	----	0.01	mg/L	----	5.22	----	----	----
Field Observations	----	0.01	--	No Access	----	----	----	----



CHAIN OF CUSTODY

ALS Laboratory, please tick →

☐ Sydney 2111 Macquarie Rd, Smithfield NSW 2116
☐ Brisbane 31 Grand St, St Albans QLD 4155
☐ Melbourne 24 Vasey Rd, Springvale VIC 3171
☐ Perth 16 Hoot Way, Midvale WA 6150
PO Box 75 Kiama NSW 2533
PO Box 674 655 E. Airport Sydney NSW 1501
PO Box 2243 7222 E. Samuels Brisbane QLD 4155
PO Box 8548 3601 E. Samuels Melbourne VIC 3171
PO Box 16201 7655 E. Samuels Perth WA 6150
PROJECT: Geroa Landfill Quarterly
ALS QUOTE NO.: WL083/11
COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

CLIENT: Kiama Municipal Council

OFFICE: PO Box 75 Kiama NSW 2533

PROJECT: Geroa Landfill Quarterly

ORDER NUMBER:

PROJECT MANAGER: Paul Czuliowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): paulc@kiama.nsw.gov.au

Email Invoice to (will default to PM if no other addresses are listed): paulc@kiama.nsw.gov.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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 fees)
Where Metals are required, specify Total (unfiltered bottles required) or Dissolved (acid filtered bottles required)

Additional Information

Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

LAB ID

SAMPLE ID

DATE / TIME

MATRIX

TYPE & PRESERVATIVE (refer to codes below)

TOTAL BOTTLES

TDS

NT-8 (TN, NH3, TP, TKN, NO2, NO3)

Alkalinity

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

13 ML-1 2/3/13 1055 W P-500mL, SP 2 ✓ ✓ ✓ No Access

14 ML-2 1050 W P-500mL, SP 2 ✓ ✓ ✓ No Access

15 ML-3 1100 W P-500mL, SP 2 ✓ ✓ ✓ No Access

16 ML-4 1105 W P-500mL, SP 2 ✓ ✓ ✓ No Access

17 ML-5 1035 W P-500mL, SP 2 ✓ ✓ ✓

TOTAL

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 = Airtight Unpreserved Plastic
V = VOA Vial HQ Preserved; VB = VOA Vial Sodium Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airtight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Specimen bottle; SP = Sulfu
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solis; B = Unpreserved Bag



CHAIN OF CUSTODY

ALS Laboratory please tick ->

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159 Albany St, Melbourne VIC 3006
Ph: 03 9594 4555 E: samples@melbourne.vic.aus
1 Newmarket Rd, Richmond VIC 3121
Ph: 03 9594 4555 E: samples@richmond.vic.aus

CLIENT: Kiama Municipal Council

OFFICE: PO Box 75 Kiama NSW 2533

PROJECT: Gerroa Landfill Quarry *Re test*

ORDER NUMBER:

PROJECT MANAGER: Paul Czuliowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed) paul.c@kiama.nsw.gov.au

Email Invoice to (will default to PM if no other addresses are listed) paul.c@kiama.nsw.gov.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☐ Standard TAT (list due date)

(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

☐ Non Standard or urgent TAT (list due date):

WU/083/1

COC SEQUENCE NUMBER (Circle)

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

RECEIVED BY: *Auefa*

DATE/TIME: 2/6/13 15:00

RECEIVED BY:

DATE/TIME:

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?

Free Ice / frozen ice bricks present upon receipt?

Random Sample Temperature on Receipt?

Other comment:

Yes No N/A

Yes No N/A

Yes No N/A

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 blanks are required specify Total (unfiltered bottle required) or Dissolved (filtered bottle required)	Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
--------------	---	-----------------------	---	--

LAB ID SAMPLE ID DATE / TIME MATRIX TYPE & PRESERVATIVE (refer to codes below) TOTAL BOTTLES

1 MW 1D 2/6/13 1335 W SP 1 ✓ Ammonia

2 MW 1S 1330 W SP 1 ✓

3 MM4 1305 W SP 1 ✓

4 MM6 1320 W SP 1 ✓

5 MW 6D 1315 W SP 1 ✓



Telephone : 02 42253125

Environmental Division
NSW South Coast
Work Order
EW1301823

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

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EW1302492	Page	: 1 of 10
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: paulc@kiama.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill Annual	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 30-AUG-2013
C-O-C number	: ----	Issue Date	: 10-SEP-2013
Sampler	: Craig Wilson	No. of samples received	: 18
Site	: ----	No. of samples analysed	: 18
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

- **EA015 : TDS may bias high for sample ID MW 1S due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **EK057G: LOR raised for Nitrite on sample ID (MW 11) due to sample matrix.**
- **EK059G: LOR raised for NOx on sample ID (MW 11) due to sample matrix.**
- **It has been noted that Ammonia is greater than TKN for sample ID (MW 6D) , however this difference is within the limits of experimental variation.**
- **Microbiological Comment: Membrane filtration (MF) results for MW006 and MW023 are reported as an estimate (~) when the growth of bacteria on the filter membrane is counted <10cfu and/or >100cfu.**
- **MW006 is ALS's internal code and is equivalent to AS4276.7.**
- **MW023 is ALS's internal code and is equivalent to AS4276.9.**



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
		Sydney Inorganics
Tony De Souza	Senior Microbiologist	Sydney Microbiology

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 1D	MW 1S	MW 3	MW 4	MW 5
Client sampling date / time					30-AUG-2013 09:15	30-AUG-2013 09:25	30-AUG-2013 09:00	30-AUG-2013 07:30	30-AUG-2013 08:45
Compound	CAS Number	LOR	Unit	EW1302492-001	EW1302492-002	EW1302492-003	EW1302492-004	EW1302492-005	
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L	328	309	363	248	224	
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	316	128	227	215	170	
Total Alkalinity as CaCO3	----	1	mg/L	316	128	227	215	170	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	6	3	6	10	4	
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L	20	51	92	13	34	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	62	24	79	68	54	
Magnesium	7439-95-4	1	mg/L	24	8	8	6	7	
Sodium	7440-23-5	1	mg/L	22	42	49	13	15	
Potassium	7440-09-7	1	mg/L	15	2	3	4	5	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.010	0.050	0.064	0.272	0.041	
Iron	7439-89-6	0.05	mg/L	<0.05	29.0	6.86	1.61	3.22	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.1	0.2	0.1	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	2.88	0.28	0.14	<0.01	0.06	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L	0.07	<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	0.97	<0.01	<0.01	0.09	0.06	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	1.04	<0.01	<0.01	0.09	0.07	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.4	1.3	0.4	0.6	1.1	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	4.4	1.3	0.4	0.7	1.2	
EK067G: Total Phosphorus as P by Discrete Analyser									



Analytical Results

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

Client sample ID

Client sampling date / time

				MW 1D	MW 1S	MW 3	MW 4	MW 5
				30-AUG-2013 09:15	30-AUG-2013 09:25	30-AUG-2013 09:00	30-AUG-2013 07:30	30-AUG-2013 08:45
Compound	CAS Number	LOR	Unit	EW1302492-001	EW1302492-002	EW1302492-003	EW1302492-004	EW1302492-005
EK067G: Total Phosphorus as P by Discrete Analyser - Continued								
Total Phosphorus as P	----	0.01	mg/L	0.02	0.31	0.16	0.86	0.33
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	7.01	4.06	7.26	4.87	4.44
Total Cations	----	0.01	meq/L	6.75	4.04	6.99	4.69	4.27
Ionic Balance	----	0.01	%	1.89	0.23	1.88	1.98	1.94
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.5	6.5	7.6	6.9	7.7
Electrical Conductivity (Non Compensated)	----	1	µS/cm	624	418	704	470	427
Dissolved Oxygen	----	0.01	mg/L	1.62	2.51	1.84	2.49	1.62
Redox Potential	----	0.1	mV	-78.0	-57.0	-137	-34.0	-147
Depth	----	0.01	m	3.03	3.16	3.48	3.81	3.48
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	15	58	12	12	12

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 6D	MW 6S	MW 7D	MW 7S	MW 9
Client sampling date / time				30-AUG-2013 08:00	30-AUG-2013 08:10	30-AUG-2013 08:25	30-AUG-2013 08:35	30-AUG-2013 09:55	
Compound	CAS Number	LOR	Unit	EW1302492-006	EW1302492-007	EW1302492-008	EW1302492-009	EW1302492-010	
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L	496	309	298	201	5040	
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	375	217	250	109	135	
Total Alkalinity as CaCO3	----	1	mg/L	375	217	250	109	135	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	107	34	18	9	372	
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L	14	34	16	48	2590	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	141	75	76	24	78	
Magnesium	7439-95-4	1	mg/L	10	7	7	5	187	
Sodium	7440-23-5	1	mg/L	16	30	17	40	1420	
Potassium	7440-09-7	1	mg/L	15	6	6	4	62	
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.161	0.019	0.064	0.010	0.010	
Iron	7439-89-6	0.05	mg/L	0.07	1.17	0.09	0.66	0.58	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.2	<0.1	0.2	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	11.3	0.29	2.43	0.91	0.84	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L	0.06	0.92	0.10	0.04	<0.01	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.96	1.05	0.49	0.16	<0.01	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	1.02	1.97	0.59	0.20	<0.01	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	11.2	1.1	2.6	1.5	1.6	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	12.2	3.1	3.2	1.7	1.6	
EK067G: Total Phosphorus as P by Discrete Analyser									



Analytical Results

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

Client sample ID

Client sampling date / time

				MW 6D	MW 6S	MW 7D	MW 7S	MW 9
				30-AUG-2013 08:00	30-AUG-2013 08:10	30-AUG-2013 08:25	30-AUG-2013 08:35	30-AUG-2013 09:55
Compound	CAS Number	LOR	Unit	EW1302492-006	EW1302492-007	EW1302492-008	EW1302492-009	EW1302492-010
EK067G: Total Phosphorus as P by Discrete Analyser - Continued								
Total Phosphorus as P	----	0.01	mg/L	2.52	0.12	1.66	0.96	0.12
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	10.1	6.00	5.82	3.72	83.5
Total Cations	----	0.01	meq/L	9.80	5.78	5.60	3.60	82.6
Ionic Balance	----	0.01	%	1.64	1.89	1.96	1.63	0.54
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.2	7.1	7.4	7.4	6.6
Electrical Conductivity (Non Compensated)	----	1	µS/cm	896	474	528	381	7820
Dissolved Oxygen	----	0.01	mg/L	1.58	1.90	1.56	1.77	2.73
Redox Potential	----	0.1	mV	13.0	-57.0	-28.0	-39.0	77.0
Depth	----	0.01	m	4.65	4.40	4.40	4.26	1.92
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	21	9	13	8	37

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW 10	MW 11	ML-1	ML-2	ML-3
Client sampling date / time					30-AUG-2013 09:45	30-AUG-2013 10:20	30-AUG-2013 10:40	30-AUG-2013 10:35	30-AUG-2013 10:45
Compound	CAS Number	LOR	Unit		EW1302492-011	EW1302492-012	EW1302492-013	EW1302492-014	EW1302492-015
EA015: Total Dissolved Solids									
Total Dissolved Solids @180°C	----	1	mg/L		3760	671	----	4260	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		9	53	----	160	----
Total Alkalinity as CaCO3	----	1	mg/L		9	53	----	160	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		304	37	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		1760	275	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		44	6	----	----	----
Magnesium	7439-95-4	1	mg/L		136	14	----	----	----
Sodium	7440-23-5	1	mg/L		1100	190	----	----	----
Potassium	7440-09-7	1	mg/L		48	13	----	----	----
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		----	----	----	79	----
Magnesium	7439-95-4	1	mg/L		----	----	----	140	----
Sodium	7440-23-5	1	mg/L		----	----	----	1200	----
Potassium	7440-09-7	1	mg/L		----	----	----	52	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.014	0.004	----	----	----
Iron	7439-89-6	0.05	mg/L		0.54	0.68	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		----	----	----	0.052	----
Iron	7439-89-6	0.05	mg/L		----	----	----	1.45	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	0.2	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.06	0.02	----	3.19	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.10	----	0.02	----
EK058G: Nitrate as N by Discrete Analyser									



Analytical Results

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

Client sample ID

Client sampling date / time

				MW 10	MW 11	ML-1	ML-2	ML-3
				30-AUG-2013 09:45	30-AUG-2013 10:20	30-AUG-2013 10:40	30-AUG-2013 10:35	30-AUG-2013 10:45
Compound	CAS Number	LOR	Unit	EW1302492-011	EW1302492-012	EW1302492-013	EW1302492-014	EW1302492-015
EK058G: Nitrate as N by Discrete Analyser - Continued								
Nitrate as N	14797-55-8	0.01	mg/L	0.04	<0.10	----	0.15	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.04	<0.10	----	0.17	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	6.1	3.1	----	3.6	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	6.1	3.1	----	3.8	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.45	0.24	----	0.04	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	56.6	9.81	----	----	----
Total Cations	----	0.01	meq/L	62.5	10.0	----	----	----
Ionic Balance	----	0.01	%	4.93	2.33	----	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	5.4	6.2	----	7.0	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	6720	1080	----	6880	----
Dissolved Oxygen	----	0.01	mg/L	3.02	1.97	----	4.97	----
Redox Potential	----	0.1	mV	161	38.0	----	58.0	----
Depth	----	0.01	m	2.24	2.34	----	----	----
Field Observations	----	0.01	--	----	----	No Access	----	No Access
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	24	64	----	----	----
Microbiological parameters								
Enterococci	----	1	CFU/100mL	----	----	----	20	----
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	----	----	----	24	----

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID		ML-4	ML-5	Blank	----	----
				Client sampling date / time		30-AUG-2013 10:50	30-AUG-2013 10:05	30-AUG-2013 07:40	----	----
Compound	CAS Number	LOR	Unit	EW1302492-016	EW1302492-017	EW1302492-018	----	----		
EA015: Total Dissolved Solids										
Total Dissolved Solids @180°C		----	1	mg/L	----	936	----	----	----	
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	----	148	----	----	----	
Total Alkalinity as CaCO3		----	1	mg/L	----	148	----	----	----	
ED093F: Dissolved Major Cations										
Calcium		7440-70-2	1	mg/L	----	----	<1	----	----	
Magnesium		7439-95-4	1	mg/L	----	----	<1	----	----	
Sodium		7440-23-5	1	mg/L	----	----	<1	----	----	
Potassium		7440-09-7	1	mg/L	----	----	<1	----	----	
ED093T: Total Major Cations										
Calcium		7440-70-2	1	mg/L	----	48	----	----	----	
Magnesium		7439-95-4	1	mg/L	----	36	----	----	----	
Sodium		7440-23-5	1	mg/L	----	274	----	----	----	
Potassium		7440-09-7	1	mg/L	----	16	----	----	----	
EG020F: Dissolved Metals by ICP-MS										
Manganese		7439-96-5	0.001	mg/L	----	----	<0.001	----	----	
Iron		7439-89-6	0.05	mg/L	----	----	<0.05	----	----	
EG020T: Total Metals by ICP-MS										
Manganese		7439-96-5	0.001	mg/L	----	0.083	----	----	----	
Iron		7439-89-6	0.05	mg/L	----	1.99	----	----	----	
EK055G: Ammonia as N by Discrete Analyser										
Ammonia as N		7664-41-7	0.01	mg/L	----	2.60	----	----	----	
EK057G: Nitrite as N by Discrete Analyser										
Nitrite as N		----	0.01	mg/L	----	<0.01	----	----	----	
EK058G: Nitrate as N by Discrete Analyser										
Nitrate as N		14797-55-8	0.01	mg/L	----	0.06	----	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser										
Nitrite + Nitrate as N		----	0.01	mg/L	----	0.06	----	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser										
Total Kjeldahl Nitrogen as N		----	0.1	mg/L	----	3.1	----	----	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser										



Analytical Results

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

Client sample ID

Client sampling date / time

				ML-4	ML-5	Blank	----	----
				30-AUG-2013 10:50	30-AUG-2013 10:05	30-AUG-2013 07:40	----	----
Compound	CAS Number	LOR	Unit	EW1302492-016	EW1302492-017	EW1302492-018	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser - Continued								
^ Total Nitrogen as N	----	0.1	mg/L	----	3.2	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	0.03	----	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	----	7.0	----	----	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1810	----	----	----
Dissolved Oxygen	----	0.01	mg/L	----	3.91	----	----	----
Redox Potential	----	0.1	mV	----	62.0	----	----	----
Field Observations	----	0.01	--	No Access	----	----	----	----
Microbiological parameters								
Enterococci	----	1	CFU/100mL	----	~16	----	----	----
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	----	~6	----	----	----



CHAIN OF CUSTODY

ALS Laboratory: please tick ->

☐ Dandenong 277 Moorabbin Rd, Cranthorpe VIC 3170
Ph: 07 8794 8535 E: dandenong@als.com.au
☐ Newcastle 115 Newcastle Rd, Warminster NSW 2258
Ph: 07 4985 5433 E: newcastle@als.com.au
☐ Brisbane 27 Sharn Rd, Springwood QLD 4127
Ph: 07 3243 7222 E: brisbane@als.com.au
☐ Adelaide 111 Main Rd, Adelaide SA 5005
Ph: 08 8359 0895 E: adelaide@als.com.au
☐ Perth 10 First View, Albany WA 6170
Ph: 08 8309 7665 E: perth@als.com.au
☐ Launceston 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@als.com.au

CLIENT: Kiama Municipal Council

OFFICE: PO Box 75 Kiama NSW 2533

PROJECT: Geroa Landfill Annual

ORDER NUMBER:

PROJECT MANAGER: Paul Czulkowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): paul@kiama.nsw.gov.au, julien@kiama.nsw.gov.au

Email Invoice to (will default to PM if no other addresses are listed): paul@kiama.nsw.gov.au, julien@kiama.nsw.gov.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS :
☐ Standard TAT (last due date):
☐ (Standard TAT may be longer for some tests)
☐ Non Standard or urgent TAT (last due date):

ALS QUOTE NO.: WL083/11

CONTACT PH: 4232 0418

SAMPLER MOBILE: 0408 261 560

EDD FORMAT (or default):

RELINQUISHED BY: Craig

DATE/TIME: 30/8/13 11:35

RECEIVED BY: Aneta

DATE/TIME: 30.8.13 11:35

COC SEQUENCE NUMBER (circle):
OP: 1 2 3 4 5 6 7

RELINQUISHED BY:

DATE/TIME:

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

Environmental Division
NSW South Coast
Work Order
EW1302492




Telephone : 02 42253125

ALS USE ONLY		SAMPLE DETAILS		CONTAINER INFORMATION		ANALYSIS REQUIRED INCLUDING SUITES (NB: Suite Codes must be listed to allow Where Metals are required, specify Total (unfiltered bottles included) or Dissolved (filtered bottles)					
		MATRIX: Solid(s) Water(W)									
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TDS	NT- 8 (TN, NH3, TP, TKN, NO2, NO3)	NT -2A (Cl, SO4, Alkalinity, Fluoride)	DOC (Filtered)	(Dissolved Filtered) Fe, Mn, NT -1 (Mg, Ca, Na, K)	
1	MW 1D	30/8/13 9:15	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
2	MW 1S	9:25	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
3	MW 3	9:00	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
4	MW 4	7:30	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
5	MW 5	8:45	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
6	MW 6D	8:00	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
7	MW 6S	8:10	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
8	MW 7D	8:25	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
9	MW 7S	8:35	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
10	MW 9	9:55	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
11	MW10	9:45	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
12	MW 11	10:20	W	P-500mL, SP, VS, N	4	✓	✓	✓	✓	✓	YSI Field Tests - pH, EC, DO, Depth
TOTAL											

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; QRC = Nitric Preserved QRC; SH = Sodium Hydroxide/QRC Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airtight Unpreserved Plastic

VDA = Vial HQ Preserved; VB = VDA Vial Sodium Bisulphate Preserved; VS = VDA Vial Sulfuric Preserved; AV = Airtight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;

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



Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic, N = Nitric Preserved Plastic, ORC = Nitric Preserved ORC, SH = Sodium Hydroxide Preserved Plastic, AG = Amber Glass Unpreserved, AP = Air-tight Unpreserved Plastic
V = VOA Vial HCl Preserved, VS = VOA Vial Sodium Bisulfate Preserved, VS = VOA Vial Sulfuric Preserved, AV = Air-tight Unpreserved Vial SG = Sulfuric Preserved Amber Glass, H = HCl preserved Plastic, HS = HCl preserved Specimen bottle, SP = Sulfuric Preserved Plastic, F = Formaldehyde Preserved Glass
Z = Zinc Acetate Preserved Bottle, E = EDTA Preserved Bottle, ST = Sterile Bottle, ASS = Plastic Bag for Acid Sulphate Solids, B = Unpreserved Bag



CHAIN OF CUSTODY

ALS Laboratory, please tick ->

□ Sydney 277 Wentworth Rd, Smithfield NSW 2176
Ph 02 9714 2555 E samples.syd@als.com.au
□ Newcastle 5 Rossington Rd, Warialook NSW 2304
Ph 02 1552 5433 E samples.newcastle@als.com.au

□ Brisbane 32 Shand St, Stafford QLD 4053
Ph 07 3243 7222 E samples.brisbane@als.com.au
□ Townsville 14-15 Deanna Ct, Bulimba QLD 4811
Ph 07 4786 0500 E samples.townsville@als.com.au

□ Melbourne 3-4 Warrall Rd, Springvale VIC 3171
Ph 03 8740 1800 E samples.melbourne@als.com.au
□ Adelaide 2-1 Burns Rd, Burnside SA 5068
Ph 08 8339 0800 E samples.adelaide@als.com.au

□ Perth 101 Midway, Marica WA 6150
Ph 08 9209 7555 E samples.perth@als.com.au
□ Lancaster 27 Wellington St, Lancaster TAS 7250
Ph 03 6521 2158 E samples.lancaster@als.com.au

CLIENT: Kiama Municipal Council

OFFICE: PO Box 75 Kiama NSW 2533

PROJECT: Garra Landfill Annual

ORDER NUMBER:

PROJECT MANAGER: Paul Czuiowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed)

Email Invoice to (will default to PM if no other addresses are listed)

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNOVER REQUIREMENTS: ☐ Standard TAT (last due date):

(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

ALS QUOTE NO.: WL083/11

CONTACT PH: 4232 0418

SAMPLER MOBILE: 0408 261 560

EDD FORMAT (or default):

RELINQUISHED BY: Craig

DATE/TIME: 30/8/13

FOR LABORATORY USE ONLY (Circle)

COC SEQUENCE NUMBER (Circle)

RECEIVED BY: DATE/TIME: RECEIVED BY: DATE/TIME:

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

SAMPLE DETAILS

MATRIX: Solid(S) Water(W)

CONTAINER INFORMATION

TYPE & PRESERVATIVE (refer to codes below)

ANALYSIS REQUIRED INCLUDING SUITES

(NB: Suite Codes must be listed to attract suite prices)

Additional Information

Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc

LAB ID

SAMPLE ID

DATE / TIME

MATRIX

TYPE & PRESERVATIVE (refer to codes below)

TOTAL BOTTLES

TDS, Total Alkalinity

NT- 8 (TN, NH3, TP, TKN, NO2, NO3)

(Dissolved Filtered) Fe, Mn, NT -1 (Mg, Ca, Na, K)

(Total) Fe, Mn, Mg, Ca, Na, K

Faecal Coliforms, Enterococci

No Access

No Access

No Access

YSI Field Tests - pH, EC, DO, ORP, Depth

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Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: EW1302735	Page	: 1 of 3
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: paulc@kiama.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 20-SEP-2013
C-O-C number	: ----	Issue Date	: 26-SEP-2013
Sampler	: Craig Wilson	No. of samples received	: 2
Site	: ----	No. of samples analysed	: 2
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics

Address 99 Kenny Street, Wollongong 2500

Environmental Division NSW South Coast Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541

ALS Group An ALS Limited Company

Environmental

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

- Sites - ML1, ML-3 & ML-4 No access at time of sampling.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	ML-2	ML-5			
				20-SEP-2013 13:20	20-SEP-2013 13:10			
				EW1302735-001	EW1302735-002			
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.04			



Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EW1303404	Page	: 1 of 6
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: paulc@kiama.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill Quarterly	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 27-NOV-2013
C-O-C number	: ----	Issue Date	: 05-DEC-2013
Sampler	: Craig Wilson	No. of samples received	: 17
Site	: ----	No. of samples analysed	: 17
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

- **EK057G-EK059G: LOR raised for Nitrite and NOx analysis on sample ID (MW7D ,MW7S) due to sample matrix.**
- **EK058G: LOR raised for Nitrate analysis on sample ID (MW7D ,MW7S) due to sample matrix.**
- **Sites - ML1, ML-3 & ML-4 No access at time of sampling.**



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				MW1D	MW1S	MW3	MW4	MW5
				27-NOV-2013 09:35	27-NOV-2013 09:45	27-NOV-2013 09:25	27-NOV-2013 07:55	27-NOV-2013 09:15
Compound	CAS Number	LOR	Unit	EW1303404-001	EW1303404-002	EW1303404-003	EW1303404-004	EW1303404-005
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	328	442	494	314	219
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	298	163	216	276	158
Total Alkalinity as CaCO3	----	1	mg/L	298	163	216	276	158
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	4.13	0.21	0.25	0.37	5.88
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	<0.01	0.02	0.03	0.14
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	<0.01	0.02	0.03	0.14
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	4.4	4.6	0.7	1.7	9.4
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	4.4	4.6	0.7	1.7	9.5
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.44	0.86	0.33	2.17	1.83
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.5	6.8	7.4	7.1	7.0
Electrical Conductivity (Non Compensated)	----	1	µS/cm	624	548	760	632	395
Dissolved Oxygen	----	0.01	mg/L	2.50	0.72	1.54	2.32	2.13
Depth	----	0.01	m	3.64	3.74	4.10	4.66	3.99



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				MW6D	MW6S	MW7D	MW7S	MW9
				27-NOV-2013 08:15	27-NOV-2013 08:25	27-NOV-2013 08:40	27-NOV-2013 08:50	27-NOV-2013 10:15
Compound	CAS Number	LOR	Unit	EW1303404-006	EW1303404-007	EW1303404-008	EW1303404-009	EW1303404-010
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	475	364	307	282	7530
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	358	273	265	153	130
Total Alkalinity as CaCO3	----	1	mg/L	358	273	265	153	130
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	10.4	0.04	2.09	1.33	0.32
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	0.04	0.10	<0.10	<0.10	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.02	0.62	<0.10	<0.10	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.06	0.72	<0.10	<0.10	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	10.8	0.6	2.9	2.0	1.6
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	10.9	1.3	2.9	2.0	1.6
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	9.07	0.22	8.46	0.67	0.09
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.1	7.4	7.4	7.8	6.4
Electrical Conductivity (Non Compensated)	----	1	µS/cm	851	679	547	518	10200
Dissolved Oxygen	----	0.01	mg/L	1.88	2.13	2.20	2.03	2.14
Depth	----	0.01	m	5.04	4.77	4.80	4.68	1.83



Analytical Results

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

Client sample ID

Client sampling date / time

				MW10	MW11	ML-1	ML-2	ML-3
				27-NOV-2013 10:00	27-NOV-2013 10:35	27-NOV-2013 09:50	27-NOV-2013 10:50	27-NOV-2013 09:55
Compound	CAS Number	LOR	Unit	EW1303404-011	EW1303404-012	EW1303404-013	EW1303404-014	EW1303404-015
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	10800	2900	----	9920	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	10	32	----	127	----
Total Alkalinity as CaCO3	----	1	mg/L	10	32	----	127	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.30	0.01	----	1.00	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	----	0.06	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.02	<0.01	----	0.06	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.02	<0.01	----	0.12	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	1.2	----	2.2	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.3	1.2	----	2.3	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	0.07	----	0.01	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	5.3	570	----	7.2	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	14400	4730	----	13600	----
Dissolved Oxygen	----	0.01	mg/L	2.38	2.25	----	11.1	----
Depth	----	0.01	m	2.20	2.28	----	----	----
Field Observations	----	0.01	--	----	----	0	----	0



Analytical Results

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

Client sample ID

Client sampling date / time

				ML-4	ML-5	----	----	----
				27-NOV-2013 09:57	27-NOV-2013 10:20	----	----	----
Compound	CAS Number	LOR	Unit	EW1303404-016	EW1303404-017	----	----	----
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	----	2510	----	----	----
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	----	112	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	112	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.52	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	----	0.02	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	----	0.05	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.07	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	0.6	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	----	0.7	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	0.01	----	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	----	7.2	----	----	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	4260	----	----	----
Dissolved Oxygen	----	0.01	mg/L	----	6.65	----	----	----
Field Observations	----	0.01	--	0	----	----	----	----



Environmental

CERTIFICATE OF ANALYSIS

Work Order	: EW1400217	Page	: 1 of 6
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 99 Kenny Street, Wollongong 2500 Unit 4 / 13 Geary Place, PO Box 3105, North Nowra 2541 AUSTRALIA
E-mail	: paulc@kiama.nsw.gov.au	E-mail	: glenn.davies@alsglobal.com
Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill Quarterly	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 07-FEB-2014
Sampler	: Craig Wilson	Issue Date	: 17-FEB-2014
Site	: ----		
Quote number	: Gerroa Landfill WL/083/11	No. of samples received	: 17
		No. of samples analysed	: 17

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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- Analytical Results



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Signatories

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Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics

Address 99 Kenny Street, Wollongong 2500

Environmental Division NSW South Coast, PO Box 3105, North Nowra 2541, Australia. An ALS Limited Company

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General Comments

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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

- **EK067G: LOR raised for Total P on sample ID(MW10) due to sample matrix.**
- **It has been noted that Nitrite is greater than NOx for sample ID (MW7S), however this difference is within the limits of experimental variation.**
- **Sites - ML1, ML-3 & ML-4 No access at time of sampling.**
Site - MW1S - Dry at time of sampling.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				MW1D	MW1S	MW3	MW4	MW5
				07-FEB-2014 10:05	07-FEB-2014 10:15	07-FEB-2014 09:50	07-FEB-2014 08:35	07-FEB-2014 09:40
Compound	CAS Number	LOR	Unit	EW1400217-001	EW1400217-002	EW1400217-003	EW1400217-004	EW1400217-005
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	309	----	443	351	264
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	254	----	194	284	155
Total Alkalinity as CaCO3	----	1	mg/L	254	----	194	284	155
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	2.88	----	0.11	0.22	0.64
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	----	<0.01	<0.01	0.11
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.11	----	0.21	0.02	0.61
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.11	----	0.21	0.02	0.72
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.1	----	0.4	0.7	2.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	3.2	----	0.6	0.7	2.9
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.14	----	0.27	1.63	1.07
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.5	----	7.4	7.0	7.3
Electrical Conductivity (Non Compensated)	----	1	µS/cm	590	----	787	683	425
Dissolved Oxygen	----	0.01	mg/L	1.82	----	2.36	1.97	2.09
Depth	----	0.01	m	3.90	----	4.33	4.87	4.19
Field Observations	----	0.01	--	----	DRY	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				MW6D	MW6S	MW7D	MW7S	MW9
				07-FEB-2014 09:00	07-FEB-2014 08:50	07-FEB-2014 09:15	07-FEB-2014 09:25	07-FEB-2014 10:40
Compound	CAS Number	LOR	Unit	EW1400217-006	EW1400217-007	EW1400217-008	EW1400217-009	EW1400217-010
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	438	356	280	312	13100
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	325	248	208	143	86
Total Alkalinity as CaCO3	----	1	mg/L	325	248	208	143	86
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	9.08	0.04	1.97	1.64	0.24
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	0.04	<0.01	0.02	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.05	0.05	0.02	<0.01	0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	0.09	0.02	<0.01	0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	9.4	0.6	2.2	1.8	1.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	9.4	0.7	2.2	1.8	1.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	3.86	0.75	2.55	0.22	0.06
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	7.1	7.2	7.5	7.8	6.2
Electrical Conductivity (Non Compensated)	----	1	µS/cm	850	662	476	580	18900
Dissolved Oxygen	----	0.01	mg/L	2.75	2.33	1.94	1.97	1.90
Depth	----	0.01	m	5.20	4.94	4.98	4.84	1.94



Analytical Results

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

Client sample ID

Client sampling date / time

				MW10	MW11	ML-1	ML-2	ML-3
				07-FEB-2014 10:30	07-FEB-2014 11:10	07-FEB-2014 10:55	07-FEB-2014 11:25	07-FEB-2014 11:00
Compound	CAS Number	LOR	Unit	EW1400217-011	EW1400217-012	EW1400217-013	EW1400217-014	EW1400217-015
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	19400	5480	----	28800	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	26	----	115	----
Total Alkalinity as CaCO3	----	1	mg/L	4	26	----	115	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.09	<0.01	----	0.44	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	<0.01	----	0.05	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.16	<0.01	----	0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.16	<0.01	----	0.06	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.2	5.0	----	1.0	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.2	5.0	----	1.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.02	0.47	----	0.12	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	5.1	5.6	----	6.9	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	28200	8280	----	40400	----
Dissolved Oxygen	----	0.01	mg/L	3.89	2.15	----	5.22	----
Depth	----	0.01	m	2.33	2.39	----	----	----
Field Observations	----	0.01	--	----	----	NO ACCESS	----	NO ACCESS



Analytical Results

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

Client sample ID

Client sampling date / time

				ML-4	ML-5			
				07-FEB-2014 11:05	07-FEB-2014 10:50			
Compound	CAS Number	LOR	Unit	EW1400217-016	EW1400217-017			
EA015: Total Dissolved Solids								
Total Dissolved Solids @180°C	----	1	mg/L	----	24400	----	----	----
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	----	138	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	138	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	2.60	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	----	0.15	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	----	0.02	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.17	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	2.7	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	----	2.9	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	0.03	----	----	----
EN67 PK: Field Tests								
pH	----	0.1	pH Unit	----	6.9	----	----	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	34500	----	----	----
Dissolved Oxygen	----	0.01	mg/L	----	5.52	----	----	----
Field Observations	----	0.01	--	NO ACCESS	----	----	----	----



Environmental

QUALITY CONTROL REPORT

Work Order	: EW1400217	Page	: 1 of 7
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
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Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
Facsimile	: +61 02 4232 0555	Facsimile	: 02 4225 3128
Project	: Gerroa Landfill Quarterly	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 07-FEB-2014
C-O-C number	: ----	Issue Date	: 17-FEB-2014
Sampler	: Craig Wilson	No. of samples received	: 17
Order number	: ----	No. of samples analysed	: 17
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

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



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compliance with
ISO/IEC 17025.

Signatories

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

Signatories

Ankit Joshi
Glenn Davies
Hoa Nguyen

Position

Inorganic Chemist
Environmental Services Representative
Senior Inorganic Chemist

Accreditation Category

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

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

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

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA015: Total Dissolved Solids (QC Lot: 3289224)									
ES1402758-010	Anonymous	EA015: Total Dissolved Solids @180°C	----	1	mg/L	174	154	12.2	0% - 20%
EW1400217-004	MW4	EA015: Total Dissolved Solids @180°C	----	1	mg/L	351	353	0.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3285524)									
ES1402460-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	58	58	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	58	58	0.0	0% - 20%
ES1402588-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	10	11	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	10	11	0.0	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3285526)									
EW1400217-011	MW10	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	3	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	4	3	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3287292)									
EW1400217-004	MW4	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.22	0.26	15.4	0% - 20%
EW1400217-008	MW7D	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.97	1.97	0.0	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3285402)									
ES1402540-003	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW1400217-006	MW6D	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3287290)									
ES1402430-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.04	39.5	No Limit
ES1402536-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.63	0.63	0.0	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3287293)									
EW1400217-008	MW7D	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.02	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3286235)									
ES1402477-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.0	2.0	0.0	0% - 20%
ES1402585-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.4	1.3	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3286237)									
EW1400217-006	MW6D	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	9.4	9.3	0.0	0% - 20%
ME1400178-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.1	<0.1	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3286236)									



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3286236) - continued									
ES1402477-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	7.64	7.56	1.1	0% - 20%
ES1402585-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	1.13	1.11	1.6	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3286238)									
EW1400217-006	MW6D	EK067G: Total Phosphorus as P	----	0.01	mg/L	3.86	3.89	0.7	0% - 20%
ME1400178-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.05	21.1	No Limit

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

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA015: Total Dissolved Solids (QCLot: 3289224)								
EA015: Total Dissolved Solids @180°C	----	1	mg/L	<1	293 mg/L	90.4	88	126
ED037P: Alkalinity by PC Titrator (QCLot: 3285524)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	90.9	81	111
ED037P: Alkalinity by PC Titrator (QCLot: 3285526)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	89.8	81	111
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3287292)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	100	86	112
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3285402)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.2	83	119
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287290)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	87	119
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287293)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	87	119
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286235)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	89.6	66	126
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286237)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	87.1	66	126
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286236)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	97.6	67	124
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286238)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	92.8	67	124

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

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLOT: 3287292)							
EW1400217-008	MW7D	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	93.1	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLOT: 3285402)							



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3285402) - continued							
ES1402540-003	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	97.4	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287290)							
ES1402430-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	71.8	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287293)							
EW1400217-008	MW7D	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	101	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286235)							
ES1402477-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	10 mg/L	89.5	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286237)							
EW1400217-007	MW6S	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	87.1	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286236)							
ES1402477-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	101	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286238)							
EW1400217-007	MW6S	EK067G: Total Phosphorus as P	----	1 mg/L	106	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value Control Limit
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3285402)									
ES1402540-003	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	97.4	----	70	130	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286235)									
ES1402477-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	10 mg/L	89.5	----	70	130	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286236)									
ES1402477-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	101	----	70	130	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3286237)									
EW1400217-007	MW6S	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	87.1	----	70	130	----
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3286238)									
EW1400217-007	MW6S	EK067G: Total Phosphorus as P	----	1 mg/L	106	----	70	130	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287290)									
ES1402430-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	71.8	----	70	130	----
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3287292)									
EW1400217-008	MW7D	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	93.1	----	70	130	----



Sub-Matrix: WATER

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3287293)						
EW1400217-008	MW7D	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	101	----	70	130	----	----



Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: EW1400217	Page	: 1 of 7
Client	: KIAMA COUNCIL	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Glenn Davies
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Telephone	: +61 02 4232 0444	Telephone	: 02 4225 3125
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Project	: Gerroa Landfill Quarterly	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 07-FEB-2014
C-O-C number	: ----	Issue Date	: 17-FEB-2014
Sampler	: Craig Wilson	No. of samples received	: 17
Order number	: ----	No. of samples analysed	: 17
Quote number	: Gerroa Landfill WL/083/11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

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

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

Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural (EA015)		07-FEB-2014	---	14-FEB-2014	----	11-FEB-2014	14-FEB-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		07-FEB-2014	---	21-FEB-2014	----	07-FEB-2014	21-FEB-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G)		07-FEB-2014	---	07-MAR-2014	----	10-FEB-2014	07-MAR-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								



Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G)		07-FEB-2014	---	09-FEB-2014	----	07-FEB-2014	09-FEB-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G)		07-FEB-2014	---	07-MAR-2014	----	10-FEB-2014	07-MAR-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G)		07-FEB-2014	10-FEB-2014	07-MAR-2014	✓	10-FEB-2014	07-MAR-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)		07-FEB-2014	10-FEB-2014	07-MAR-2014	✓	10-FEB-2014	07-MAR-2014	✓
MW1D,	MW3,							
MW4,	MW5,							
MW6D,	MW6S,							
MW7D,	MW7S,							
MW9,	MW10,							
MW11,	ML-2,							
ML-5								



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EN67 PK: Field Tests								
Field Test Dummy Bottle (EN67 PK)		07-FEB-2014	----	----	----	07-FEB-2014	07-FEB-2014	✔
MW1D,	MW1S,							
MW3,	MW4,							
MW5,	MW6D,							
MW6S,	MW7D,							
MW7S,	MW9,							
MW10,	MW11,							
ML-1,	ML-2,							
ML-3,	ML-4,							
ML-5								



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	3	24	12.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	27	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	18	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	35	11.4	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	4	36	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	24	8.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	27	7.4	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	6	35	17.1	15.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	6	36	16.7	15.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	27	7.4	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	35	5.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	36	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	27	7.4	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	35	5.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	36	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids	EA015	WATER	In-House, APHA 21st ed., 2540C A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.



CHAIN OF CUSTODY

ALS Laboratory, please tick ->

□ Sydney 377 Villingdon Rd, Sydney NSW 2176
Ph: 07 3754 5555 E: samples@kiamia.nsw.gov.au
□ Newcastle 5 Rossington Rd, Waratah NSW 2204
Ph: 02 4908 5433 E: samples@kiamia.nsw.gov.au

□ Brisbane 33 Strand St, St Albans VIC 3021
Ph: 07 3043 7222 E: samples@kiamia.nsw.gov.au
□ Melbourne 1411 Debra Ct, Boroondara VIC 3083
Ph: 03 8555 4400 E: samples@kiamia.nsw.gov.au

□ Adelaide 211 Ryma Rd, Ryma SA 5093
Ph: 08 8555 4400 E: samples@kiamia.nsw.gov.au
□ Perth 111 Mid Way, Midway WA 6006
Ph: 08 9205 7855 E: samples@kiamia.nsw.gov.au

□ Launceston 27 Villingdon St, Launceston TAS 7250
Ph: 03 5231 2155 E: samples@kiamia.nsw.gov.au

CLIENT: Kiamia Municipal Council

OFFICE: PO Box 75 Kiamia NSW 2533

PROJECT: Geroa Landfill Quarry

ORDER NUMBER:

PROJECT MANAGER: Paul Czislowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): paulc@kiamia.nsw.gov.au

Email Invoice to (will default to PM if no other addresses are listed): paulc@kiamia.nsw.gov.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☐ Standard TAT (list due date)

(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (list due date)

ALS QUOTE NO.: WL083/11

CONTACT PH: 4232 0418

SAMPLER MOBILE: 0408 251 560

EDD FORMAT (or default):

RELINQUISHED BY: Craig

DATE/TIME: 7/2/14 1250

RECEIVED BY: Craig

DATE/TIME: 7/2/14 1250

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:

RECEIVED BY:

DATE/TIME:

ALS USE ONLY

SAMPLE DETAILS
MATRIX: Solid(s) water(w)

CONTAINER INFORMATION

ANALYSIS REQUIRED including SUITES (NB: Suite Codes must be listed to attract suite price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (filtered bottle required)

Additional Information
Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

LAB ID

SAMPLE ID

DATE / TIME

MATRIX

TYPE & PRESERVATIVE
(refer to codes below)

TOTAL BOTTLES

TDS

NT- 8 (TN, NH3, TP, TKN, NO2, NO3)

Alkalinity

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

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Field Tests pH, EC, DO mg/L, Depth

Field Tests pH, EC, DO mg/L, Depth

Environmental Division
NSW South Coast
Work Order

EW1400217



Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORG = Nitric Preserved ORG; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Air-tight Unpreserved Plastic

V = VOA Via HCl Preserved; VB = VOA Via Sodium Bisulphate Preserved; VS = VOA Via Sulphuric Preserved; AV = Air-tight Unpreserved Via SG = Sulphuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speculation bottle; SP = Sulphuric 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



CHAIN OF CUSTODY

ALS Laboratory/ please tick ->

City: Sydney 2177 (Mascot) SA: Springvale NSW 3176
Ph: 02 8714 8155 E: sales@als.com.au
Newcastle: 5 Ross St, Newcastle NSW 2300
Ph: 02 4928 3433 E: sales@als.com.au

Brisbane: 32 Grand St, St Albans VIC 3023
Ph: 07 3241 7222 E: sales@als.com.au
Townsville: 1415 Central St, Edithvale QLD 4818
Ph: 07 4786 0600 E: sales@als.com.au

Melbourne: 24 West St, South Melbourne VIC 3207
Ph: 03 9541 9600 E: sales@als.com.au
Adelaide: 2 x Burns Rd, Adelaide SA 5006
Ph: 08 8230 0900 E: sales@als.com.au

Perth: 111-113 Wally Way, Kalamunda WA 6060
Ph: 08 9208 7055 E: sales@als.com.au
Launceston: 27 Wellington St, Launceston TAS 7250
Ph: 02 8231 2158 E: sales@als.com.au

CLIENT: Kiama Municipal Council

OFFICE: PO Box 75 Kiama NSW 2533

PROJECT: Gerroa Landfill Quarterly

ORDER NUMBER:

PROJECT MANAGER: Paul Czuiowski

SAMPLER: Craig Wilson

COC emailed to ALS? (YES / NO)

Email Reports to (will default to PM if no other addresses are listed): paulc@kiama.nsw.gov.au

Email Invoice to (will default to PM if no other addresses are listed): paulc@kiama.nsw.gov.au

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: ☐ Standard TAT (Last due date): ☐ Non Standard or urgent TAT (Last due date):

(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

ALS QUOTE NO.: WL083/11

COC SEQUENCE NUMBER (Circle)

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:

CONTACT PH: 4232 0418

SAMPLER MOBILE: 0408 261 560

EDD FORMAT (or default):

RELINQUISHED BY: Craig

DATE/TIME: 7/2/14 1250

RECEIVED BY:

DATE/TIME: 7/2/14 1250

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

SAMPLE DETAILS
MATRIX: Solid(S) Water(W)

CONTAINER INFORMATION

ANALYSIS REQUIRED INCLUDING SUITES (NB: Suite Codes must be listed to attract suite price)
When Media are required, specify Total (unfiltered bottle required) or Dissolved (filtered bottle required)

Additional Information

Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

LAB ID

SAMPLE ID

DATE / TIME

MATRIX

TYPE & PRESERVATIVE
(refer to codes below)

TOTAL BOTTLES

TDS

NT- 8 (TN, NH3, TP, TKN, NO2, NO3)

Alkalinity

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

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Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

Field Tests pH, EC, DO mg/L

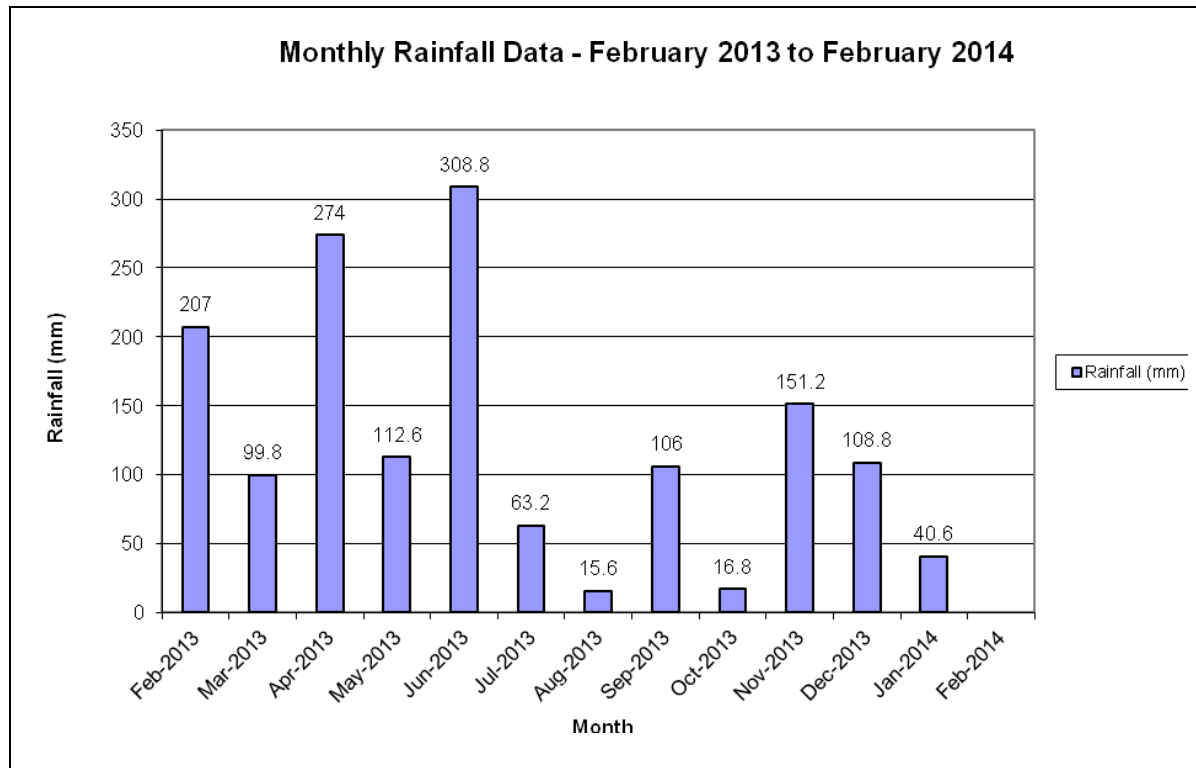
TOTAL

Water Container Codes: P = Unpreserved Plastic, N = Nitric Preserved Plastic, ORC = Nitric Preserved ORC, SH = Sodium Hydroxide Preserved Plastic, AG = Amber Glass Unpreserved, AP = Air-tight Unpreserved Plastic, V = VOA Vial HCl Preserved, VB = VOA Vial Sodium Bisulfate Preserved, VS = VOA Vial Sulfuric Preserved, AV = Air-tight Unpreserved Vial SG = Sulfuric Preserved Amber Glass, H = HCl preserved Plastic, HS = HCl preserved Speciation bottle, SP = Sulfuric Preserved Plastic, E = EDTA Preserved Bottle, ST = Sterile Bottle, ASS = Plastic Bag for Acid Sulphate Soils, B = Unpreserved Bag

Z = Zinc Acetate Preserved Bottle

Appendix B

Rainfall – February 2013 to February 2014



Rainfall data obtained from Bureau of Meteorology 2013, Station ID: Toolijooa (Nyora), Number – 68175, approximately 3.3 km from Gerroa (<http://www.bom.gov.au/climate/data/index.shtml>)

Note: February 2014 rainfall data was not available during the time of reporting.

Appendix C: Ammonia Trigger Values

Ammonia levels and 20% trigger factor for Groundwater and 10% trigger factor for Surface water at Gerroa Landfill

Date Sampled	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11	ML-1	ML-2	ML-3	ML-4	ML-5
20% trigger level (mg/L)	164.4	1.32	39.24	21.8	7.07	98.8	27.78	85.32	14.3	4.26	2.85	2.96					
10% trigger level (mg/L)													0.836	1.38	0.066	0.23	2.38
22/02/08	130	0.16	-	0.88	0.1	81	3.2	110	3.3	0.34	0.3	0.99	0.31	0.88	-	1.7	-
29/05/08	130	0.18	0.75	0.65	0.10	90	3.3	86	4.7	0.10	0.10	0.12	1.5	3.7	-	0.10	-
25/08/08	140	0.18	0.77	0.65	0.10	110	3.2	86	5.9	0.22	0.73	0.24	0.22	0.44	-	0.27	
19/11/08	93	0.10	0.78	-	0.10	69	2.5	65	3.5	0.10	-	0.10	<1	<1	-	<1	1.6
18/02/09	82	0.02	0.60	-	0.02	72	1.7	81	5.1	0.62	0.25	0.10	Cleary Bros land - No access	1.9	Cleary Bros land - No access	Cleary Bros land - No access	2
19/05/09	61	0.25	0.73	0.79	0.03	45	2.6	62	8.3	0.05	0.08	4.7		0.56			1.2
27/08/09	95	0.42	0.89	0.54	0.02	76	3.0	85	8.4	0.06	0.21	4.8		0.41			2.8
27/11/09	58	1.3	0.8	0.5	0.1	73	1.8	43	4.1	0.2	0.4	2.4		1.5			3.0
26/2/10	37	0.04	0.31	0.24	0.02	36.5	0.6	37.8	3.03	<0.1	<0.1	5.35		1.9			2.17
21/05/10	22.6	0.27	0.62	0.38	0.08	16.4	0.83	21.9	0.49	<0.1	<0.1	<0.1		<0.1			1.52
17/8/10	32.4	<0.01	0.87	0.44	<0.01	10.6	1.8	28.6	1.7	<0.1	<0.1	<0.1		<0.1			0.04
30/11/10	25.7	0.05	0.66	0.22	0.04	21.8	1.73	21.7	2.56	0.84	<0.1	<0.1		0.08			1.83
23/2/11	6.67	0.05	0.26	0.91	0.03	8.9	0.48	10.2	1.34	0.06	<0.1	0.13		0.87			0.94
24/5/11	2.56	0.04	0.14	1.16	0.03	13.8	0.23	7.99	1.3	0.05	0.03	0.06		2.39			3.12
24/8/11	0.12	0.06	0.42	0.58	0.03	3.24	0.19	4.38	0.16	<0.01	Dry	0.03		1.69			1.6
3/11/11	2.15	0.02	0.29	0.64	0.08	2.25	0.4	4.17	1.93	1	0.02	0.03		1.03			0.85
1/2/12	3.16	<0.01	0.23	0.68	0.02	10.8	0.25	1.98	2.03	<0.1	<0.1	0.01		1.7			3.07
31/5/2012	0.07	0.05	0.04	0.18	0.03	7.62	0.12	2.61	2.25	0.03	0.02	0.03		1.8			1.73
10/8/2012	0.09	<0.01	0.35	0.1	0.05	7.06	0.08	1.94	2.34	0.04	0.02	0.05		1.09			1.73
21/11/2012	0.17	-	0.44	0.15	0.23	7.17	0.2	1.67	2.74	0.23	<0.1	<0.1		<0.10			<0.10
18/2/2013	0.26	0.13	7.78	0.44	0.55	12.8	0.91	1.93	1.2	1.08	0.58	0.42		<0.10			<0.10
31/5/2013	0.27	0.34	0.93	1.86	0.45	14.6	0.04	2.82	1.91	<0.01	0.05	0.07		0.75			0.81
30/8/2013	2.88	0.28	0.14	<0.01	0.06	11.3	0.29	2.43	0.91	0.02	0.06	0.02		3.19			2.6
27/11/2013	4.13	0.21	0.25	0.37	5.88	10.4	0.04	2.09	1.33	0.32	0.3	0.01		1			0.52

Legend: 2.39 = 10% or 20% trigger level exceeded

LAST PAGE OF REPORT



Thank you for the opportunity to work with your organisation.

Your feedback is welcomed regarding Earth2Water Pty Ltd professional services.

Dino Parisotto (dino@earth2water.com.au)

earth²water
Pty Ltd
Environmental & Groundwater Consulting